

The Routledge Companion to Global Value Chains

This Companion provides a review of global value chains (GVCs) and the megatrends that are shaping them and will continue to reshape them in deep-set trajectories of change over the next few decades. Megatrends herald both challenges and opportunities. With the growing interest among business leaders and researchers in GVCs, this is a reference work which fills a gap in current literature by focusing on the new features of GVCs, including the shift of global purchasing power towards developing economies, the significance of emerging technologies and data analytics, the increasing tensions between globalisation and de-globalisation, and the role of micro-multinationals, start-up entrepreneurs, the public sector and middle markets in a fast-changing global economy.

The early chapters are essentially *intradisciplinary* in character, with the first seeking to explore some historical aspects of GVCs. Subsequent chapters cover the theory and practice of operations and supply chain management, emerging supply chain technologies, and the impact of inter-firm collaboration across sectors and economies. The final chapters take a more *interdisciplinary* approach and examine topics at the interface of GVCs with the economy, society, culture and politics.

This comprehensive handbook provides a timely analysis of leading-edge global megatrends and practices in one volume.

Renu Agarwal is Associate Professor, Operations and Supply Chain Management, and the Director of Strategic Supply Chain Management Programs at the University of Technology Sydney. Agarwal has extensive industry experience and now provides leadership in the disciplinary fields of service innovation, service value networks, supply chain management, dynamic capability building, management practices, innovation and productivity. Agarwal has undertaken research for many organisations and has published several edited books and top-tier refereed management journal articles.

Christopher Bajada is Associate Professor of Economics at the University of Technology Sydney. Bajada's research is primarily in applied macroeconomics, with a special interest in management practices, supply chains, tax compliance, circular economy and productivity. Bajada has published widely, including in top-tier journals, research books and academic textbooks. Bajada has undertaken research for many organisations, including federal and state governments, and industry groups and associations.

Roy Green is Emeritus Professor and Chair of the Innovation Council at the University of Technology Sydney. Green also chairs the Port of Newcastle and Advanced Robotics for Manufacturing Hub and is a board member of the Innovative Manufacturing Cooperative Research Centre.

Katrina Skellern is a post-doctoral research fellow with the Centre for Business & Social Innovation at the University of Technology Sydney (UTS) Business School. She has over 20 years of experience in project management, policy development, program evaluation, business model innovation, and community and stakeholder engagement in Australia and internationally. Skellern is currently working on a business model transformation project with the Innovative Manufacturing Cooperative Research Centre.

“The rise of Global Value Chains in the 1990s and 2000s has transformed international trade. Today, about 70% of global trade flows through GVCs. This has a large impact on trade policy and the tools available to policymakers for shaping international trade. This handbook is a great resource for researchers and policymakers to navigate their way through the complexities of GVCs and design better and more accurate solutions to the challenges of today.”

Xiaozhun Yi, Deputy Director-General, World Trade Organisation, Geneva, Switzerland

“The Covid-19 pandemic showed us the importance – and fragility – of global value chains and the need to rethink our established paradigms. This handbook assembles the who’s who of researchers, analysts, strategic thinkers and doers in the field of supply chain management in a global context. What interests me most is the role intangible assets such as management practices, collaboration and dynamic capabilities in global value chains. We’ve always known intangible assets are an essential ingredient of a successful supply chain – as it turns out, their importance is amplified during these challenging times. This handbook provides a solid overview of the state of the art in this field and has plenty of inspiration for future GVCs design and management which will inspire future research and practice alike.”

Tim Reed, President, Business Council of Australia, Australia

“Over the past decade, my position at OECD has allowed me to witness how global value chains analysis has profoundly changed policymaking at national and international level. This authoritative book provides an excellent account of where the concept comes from, why it matters, how it is changing and the implications for different policy domains. Perhaps most importantly, the book also offers relevant insights on future trends from the best experts in the field.”

Andrew Wyckoff, Director, OECD Directorate for Science, Technology and Innovation, Paris, France

“Today, global value chains are evolving because of trade wars, technology, demands for more inclusiveness and sustainability, and now COVID. Given the importance of global value chains in trade, and the importance of trade for development, it is key to understand the new dynamics driving them. This book provides an incredible analysis of the new trends, their drivers, and the way forward. It is extremely timely as changes are happening now and it is critical to provide sound advice to policymakers in the developing world based on thorough analysis and evidence. Having been at the World Bank Group for over 20 years providing trade policy advice to countries around the world, this book is a necessary input into the current debate on the role of trade in development and how best to go about recalibrating globalisation, to take new factors into account.”

noindent

Mona Haddad, Practice Manager, East Asia and Pacific, Trade & Competitiveness, World Bank Group, Washington DC, USA

“In today’s turbulent and uncertain world, the challenges facing organisations dependent upon global demand and supply networks have never been greater. This timely and scholarly book brings new insights into how global value chains need to be re-shaped to adapt to the changed conditions that they must confront.”

noindent

Professor Martin Christopher, Emeritus Professor of Marketing & Logistics, Cranfield School of Management, Cranfield University, UK

“Bringing together the wide and diverse field of global value chains into a single, comprehensive and insightful text is a daunting challenge. Yet, this is exactly what *The Routledge Companion to Global Value Chains* handbook does. With Covid-19, this is a hugely important area and this handbook contains chapters from some of the leading academics and practitioners in the field covering a range of topics such as the historical evolution of global value chains, its theory and practice, future megatrends in GVCs amongst

many. Based on my 20 years of teaching and research experience in the area of supply chain management, this handbook is great and compelling to read, which I wholeheartedly recommend.”

noindent

Professor A. Gunasekaran, Dean and Professor, School of Business and Public Administration, California State University, USA

“When emphasizing today the need for a digital transformation of organizations and industries, we sometimes overlook that we predominantly live in a material, physical world that is built on a complex global network of supply chains moving physical goods around the world (and, soon, into and from space as well). This handbook provides a solid introduction into the principles, models, and success factors of this field – also illustrating how digital technologies are creating smart supply chains utilizing information and communication technologies in novel ways.”

noindent

Professor Frank Piller, Professor of Management and Co-Director, Institute for Technology & Innovation Management; Scientific Director, Institute for Management Cybernetics (IfU e.V.), RWTH Aachen, Germany

“As we emerge into the new world – either post Covid or living with Covid – the fabric of our economic interactions are forever changed. The success of strong global value chains in a world grappling with technological change, increasing protectionist sentiment and the need to upscale industry are now more important than ever in driving our economic success, building competitiveness and developing our skills base. In these times of challenge and opportunity, this collection is more needed than ever for policymakers, business leaders and decision makers.”

noindent

Innes Willox, Chief Executive, Australian Industry Group, Australia

“Global Value Chains make up over two-thirds of global trade. Yet despite centuries of evolution and rapidly developing digital systems, Global Value Chains are inherently unstable – continuously evolving to market and technology drivers and megatrends. Will global megatrends such as offshoring be reversed by new technology such as blockchain and Industry 4.0? As demonstrated in 2020 – unplanned events can throw even the best plans into disarray. This book provides a survival guide.”

noindent

Professor Graham Wren OBE FEng, FIMechE, FIET, FCIM, FIoD, FRSA, EurIng, CEng, CDir, CMar, Special Advisor to the Principal and Major Projects Director, University of Strathclyde, UK

“This volume is comprehensive and deeply steeped in both theory and practice. Readers will quickly come to appreciate that value chains are the heart of wealth creation and that their effective design, management and improvement are core to economic, environmental and societal progress. We learn from the studies and contributions of this book that globalisation has many ongoing challenges and opportunities that manifest in both risks and returns, such as new technologies. The contributions on megatrends in global value chains are particularly insightful, as both practitioners and researchers will be able to use these to project forward from today’s challenges into the future. Congratulations to the authors and editors on integrating this body of knowledge.”

noindent

Professor Danny Samson, Department of Management and Marketing, University of Melbourne, Australia

“The opportunity for investment and participation in local and global supply chains – particularly for SMEs – will continue to increase, with a shift to competing on value rather than cost, and through unique and service-based business models. This handbook comes at an important time – supply chain disruptions and uncertainty creates an opportunity for those who can competitively and collaboratively embrace Industry 4.0 technologies to design, manufacture and build service platforms for local and global markets.”

noindent

David Chuter, CEO and Managing Director, Innovative Manufacturing Cooperative Research Centre, Australia

“Given the incredible turbulence in trade, understanding global value chains is so topical and even more important than ever as we emerge into the new world – either post Covid-19 or living with Covid-19. The fabric of our global economic interactions are forever changed. This handbook provides an excellent account of various theoretical concepts, why they matter, their enablers which help identify implications for different policy domains. This handbook as a knowledge resource is even more pertinent especially when the new factors of intangible resources such as management practices and dynamic capability are deemed essential in modern days. No matter what, this book provides an ideal map for academics, researchers, practitioners and policymakers on how best they should go about transforming and recalibrating globalization.”

noindent

Professor Nicholas Bloom, William D. Eberle Professor of Economics, Stanford University, USA

“Recent events have added new considerations to established trends in supply chains the world over. The days of efficiency above all are now behind us – with resilience and sustainability now crucial elements of a Supply Chain for a single business, an industry sector or indeed a country. This well-researched book is timely for those wanting to re-evaluate the value delivered through Global Supply Chains in the light of today’s challenges.”

noindent

Andrew Stevens, Chairman, Industry, Innovation and Science Australia, Australia

“This is a comprehensive coverage of theory and practice of Global Value Chains providing more or less everything that one needs in a single source – from the historical evolution of GVCs to the current mega trends and how GVCs will transform because of the COVID-19 pandemic. Chapters written by leading academics and practitioners provide up-to-date coverage of topics. As a researcher of GVCs or a practitioner/policymaker involved in GVCs – this handbook is all that you will need!”

noindent

Professor Amrik Sohal, Department of Management, Monash Business School, Monash University, Australia

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Contributors

Renu Agarwal is Associate Professor, Operations and Supply Chain Management in the Management Discipline Group, University of Technology Sydney (UTS) Business School. She is currently the director of Strategic Supply Chain Management Programs and in this role she provides leadership within the UTS Business School in the disciplinary fields of service innovation, service value networks, supply chain management, dynamic capability building, management practices, management education, innovation and productivity. Agarwal is also the director of management practices projects and has been instrumental in managing several federal and state government research project grants, including the 2009 landmark study “Management Matters in Australia – Just how productive are we?” which has had an impact on government policy and contributed to the broader international WMS study. Agarwal has published in many top-tier international journals; edited *The Handbook Service Innovation* published by Springer-Verlag UK; and edited *Global Value Chains, Flexibility and Sustainability* published by Springer. Agarwal is amidst editing a book on innovation and creativity as part of the new Routledge Series Key Ideas in Business and Management in 2021.

Felix Arndt is the John F. Wood Chair in Entrepreneurship in the Department of Management; a Research Fellow at the Center for Business and Sports of the Stockholm School of Economics, Sweden; and a Visiting Professor at the University of Agder, Norway. Arndt’s research intersects strategy, entrepreneurship and innovation. He looks at how firms use organisational renewal and technological innovation to stay ahead of the competition (dynamic capabilities, ecosystems, business models). A second field of interest is best captured by the question of how entrepreneurs overcome extreme challenges (e.g. of socio-economic or medical nature). His research has frequently used the emerging market context (e.g. China). Some of his research uses corporate social responsibility questions and the context of contested industries (tobacco, nuclear power, etc.). His work has been published in the *Academy of Management Review*, *Journal of Business Ethics*, *Journal of Business Venturing Insights*,

Industrial and Corporate Change, Entrepreneurship and Regional Development, Technological Forecasting and Social Change, and Technovation, among others. Teaching has been a passion and privilege. Arndt has taught in top MBA and EMBA programs around the world. He was involved in the foundation of several entrepreneurship centres, and entrepreneurship and executive programmes teaching a range of topics from innovation, entrepreneurship, strategy, leadership to international business. Arndt is an active entrepreneur and investor. As an engineer by training, he is fascinated by new technologies and their application. He has held patents, has experience as an entrepreneur (including scaling and exits), on the director level in consulting and as a lobbyist. Arndt is a recognised executive and start-up coach, provides consulting services to the private sector and policy advice to the government. He is currently a board member of Innovation Guelph. Prior to coming to Guelph, Arndt was affiliated with universities in the UK (Leicester Castle Business School), USA (Wharton School) and China (University of Nottingham) in various faculty and director positions. He has appeared in print, radio and TV media outlets.

Menaka Arudchelvan has a keen interest in applied economics, trade, regional integration, SME and inclusive growth. She has worked as a data analyst, consultant and economist for several organisations, including Teikoku Databank, Asian Development Bank Institute, New Zealand Ministry of Foreign Affairs, and Trade and Statistics New Zealand. Arudchelvan graduated from Victoria University of Wellington in New Zealand.

Koen De Backer is Head of Division in the Directorate for Science, Technology and Innovation (STI) of the Organisation for Economic Co-operation and Development (OECD) with special oversight of the steel and shipbuilding sectors. He coordinates the activities of the OECD Steel Committee and the OECD Council Working Party on Shipbuilding. He also facilitates and coordinates the work of the Global Forum on Steel Excess Capacity within the G20. De Backer joined the OECD in 2006 and has worked on different topics in the Directorate for Science, Technology and Industry and the Statistics Directorate: economic globalisation, multinational enterprises, offshoring/outsourcing, R&D internationalisation, industrial policy, open innovation, entrepreneurship, structural business statistics and micro-data. He was one of the persons leading the OECD work on global value chains. Prior to joining the OECD, De Backer held post-doctoral positions at the Universitat Pompeu Fabre in Barcelona (Spain) and at the Department of Applied Economics of the KU Leuven, acted as adviser to the Minister of Economic Affairs in Belgium, and was professor at the Vlerick Leuven Gent Management School. De Backer holds a PhD degree from KU Leuven (Belgium) and a Master of Business Administration degree from KU Leuven/UCI (USA).

Christopher Bajada is Associate Professor of Economics at the University of Technology Sydney. Bajada has previously been the Associate Dean (Education) and Chair of the University's Teaching and Learning Committee. Bajada has held several external appointments, including council member of the Economic Society of Australia (NSW Branch), member of the Australian Taxation Office's Cash Economy Task Force and on the expert committee for developing Economics Learning Standards for Australian Higher Education. Bajada's research is primarily in applied macroeconomics, with a special interest in management practices, tax compliance, circular economy, productivity and curriculum design. Bajada has published several research books, academic textbooks and refereed journal articles in highly reputable economics journals. Bajada has undertaken research for several organisations, including the Department of Industry, Innovation and Science; Australian Bureau of Statistics; Export Council of Australia; Deloitte Access Economics; NSW Office of Environment and Heritage; National Association of Testing Authorities; NSW Innovation and Productivity Council; and the NSW Department of Industry.

Manjot Singh Bhatia is Assistant Professor at Jindal Global Business School, OP Jindal Global University, India. He has completed a Doctorate in Operations Management from the Indian Institute of Management, Lucknow, India (AACSB accredited). His research has been published/accepted in reputed journals such as the *International Journal of Production Research, Production Planning and Control; IEEE Transactions on Engineering Management; and Annals of Operations Research*. His current research areas include closed loop supply chain, Industry 4.0, blockchain and sustainability.

Martin Bliemel's research interests include entrepreneurial networks, accelerators, education, research commercialisation and entrepreneurial ecosystems. He has been bringing these interests together under the umbrella concept of the entrepreneurial university. In particular, his work on accelerators played a key role in the design of the \$23 million Incubator Support Programme by the Department of Industry. Bliemel's research has been published in several prestigious journals, including *Nature Nanotechnology, Entrepreneurship Theory and Practice, Entrepreneurship and Regional Development, Education + Training, International Journal of Entrepreneurial Behavior and Research*, and the *Entrepreneurship Research Journal*, where one of his articles on entrepreneurship education is *ERJ's* most downloaded article. Bliemel is a recipient of the nationally competitive Office of Learning and Teaching Citation for "For preparing students studying management to become entrepreneurs by creating authentic and respectful learning experiences that immerse students in collaborative interactions with external stakeholders." He is a member of the advisory committee for the Australian Centre for Entrepreneurship Research Exchange (ACERE), a member of the Talent Flows sub-committee of the NSW Innovation & Productivity Council and a member of the FTDI Faculty Board.

Paul Childerhouse is Director of Quality and Supply Chain Management at Massey University and one of New Zealand's leading supply chain academics. His research into supply chain integration and supply chain auditing is internationally renowned. The latter focuses on the assessment of organisational supply chain competence and has led to the development of a string of collaborative relationships with industry. Over time he has become interested in the behavioural aspects of supply chain management. For example, he is currently working with scholars from around the world investigating the effects of different national cultures on supply chain management. Together with his current crop of doctoral students he is researching the power and dependency of logistical service providers and the effects of social networks on supply chain relationships.

Md. Maruf Hossan Chowdhury is a senior lecturer of Operations and Supply Chain Management in the University of Technology Sydney (UTS). He has extensive teaching and research experience in operations, supply chain management and decision modelling. He has published his research papers in the top-tier journals of operations and supply chain management. Chowdhury has multiple methodological skills and has worked extensively in different national and international projects. As an expert of supply chain management Chowdhury has taught at several universities in Australia, including the University of Technology Sydney, University of Western Australia (UWA) and Curtin University. Chowdhury has professional experience in different industrial settings such as textile and apparel, and petroleum refinery.

Mesbahuddin Chowdhury, PhD, is Senior Lecturer in Operations and Supply Chain Management in the Department of Management, Marketing and Entrepreneurship at the University of Canterbury, New Zealand. He received his PhD in supply chain management from Monash University, Australia; MBA (major – management of technology) from Asian Institute of Technology, Thailand; and a master's in industrial management from Katholieke

Universiteit Leuven, Belgium. He also served as a research fellow in the Department of Accounting at Monash University for two years. Chowdhury teaches strategic management, operations management, purchasing and supply chain management, and business research methods. He earned his Postgraduate Certificate on Tertiary Teaching from the University of Canterbury in 2016. His current research interests are on social capital, supply chain resilience, organisational resilience, certification, and health and safety management practice. His works have appeared in leading operations and supply chain management journals such as the *International Journal of Production Economics*, *International Journal of Production Research*, *Supply Chain Management: An International Journal*, *International Journal of Disaster Risk Reduction*, and *Australasian Journal of Environmental Management*. He has also published in top-tier tourism journals such as the *Journal of Travel Research*, *Annals of Tourism Research* and *Current Issues in Tourism*.

Rameshwar Dubey is Reader in Operations Management at Liverpool Business School. Dubey is also a senior editor of the *International Journal of Physical Distribution and Logistics Management* and associate editor of the *Journal of Humanitarian Logistics and Supply Chain Management*, *International Journal of Information Management*, *Benchmarking: An International Journal*, *Global Journal of Flexible Systems Management* and *Management of Environmental Quality*. Before joining the Liverpool Business School, Dubey was a full-time associate professor in Supply Chain Management at Montpellier Business School, Montpellier, France, in which he is still associated as an affiliate professor. He also has taught at some of the leading international schools, including the Indian Institute of Management, Jammu, India; the Faculty of Engineering, UNESP, Bauru, São Paulo, Brazil; Southern University of Science and Technology of China; Stockholm School of Business, Stockholm, Sweden; Audencia Business School, Nantes, France; SIBM, Pune, India; SIOM, Nashik, India; SCMHRD, Pune; MDI, Murshidabad; MDI, Gurgaon; and School of Management Studies, MNNIT Allahabad. Dubey's research interests include supply chain management, operations management and business analytics with a strong focus on humanitarian operations management, sustainable supply chain management, supply chain design issues and application of emerging technologies in disaster relief operations. Dubey has published some of the most cited papers in the *International Journal of Operations and Production Management*; *International Journal of Production Economics*; *International Journal of Production Research*; *British Journal of Management*, *Production, Planning & Control*; *IEEE Transactions on Engineering Management*; *Journal of Business Research*; *Journal of Cleaner Production*; *Annals of Operations Research*; *Technological Forecasting and Social Change*; and *Management Decision*. For his academic work, Dubey has received several awards: outstanding reviewer award, *International Journal of Production Economics*, *Journal of Business Research*, and *Journal of Cleaner Production*; best reviewer award, *Journal of Humanitarian Logistics and Supply Chain Management* (2014, 2016), and *Management Decision* (2018); and received a title on 8 November 2019 at Bauru, São Paulo, Brazil, for lifetime commitment to advancing scientific knowledge on supply chain management, operations management, information systems and technology for promoting innovation, enhancing industrial competitiveness and improving quality of life, both in Brazil and worldwide. Dubey is an active member of several professional societies, active reviewer of over 75 leading international scientific journals, and reviewer of PhD theses and other professional bodies engaged in the dissemination of grants.

Jakob Engel is an economist in the World Bank's Macroeconomics, Trade and Investment Global Practice. His research focus is on issues related to the economics and politics of regional integration, the emergence and impact of global value chains and production networks, trade and industrial policy, and financial regulation. He is the author of multiple publications in journals and edited volumes. He previously worked for the UK Department for International

Development, the Overseas Development Institute, and the Smith School for Enterprise and Environment at the University of Oxford, where he also completed his PhD in economic geography.

Cyril Foropon is Full Professor of Operations and Supply Chain Management, and Director of Doctorate in Business Administration (DBA) Programs at Montpellier Business School (MBS). He holds a PhD in management from HEC Paris. His research interests are in the fields of quality management and humanitarian supply chain management. He is particularly interested in the implementation of Lean management within both service and manufacturing organisations, quality management practices within ISO 9000 candidate organisations, process management within humanitarian non-governmental organisations, the impact of emerging technologies in the field of operations and supply chain management, and the use of metaphors in operations management theory building. His articles are published in *IJPE*, *IJPR*, *IJOPM*, *AOR*, *JCP*, *MD*, *IJIM*, *JEIM*, *IJLM* and *TFSC*, amongst other leading academic journals. He serves as an associate editor of the *Global Journal of Flexible Systems Management*.

Derek Friday is Lecturer of Operations and Supply Chain Management at the University of Newcastle Australia. His PhD research focused on developing a new collaborative risk management framework to improve the resilience of supply chains against disruptions. Friday has over ten years of experience in supply chain management as an academic and practitioner. Friday is passionate about engaging with industry and is a chartered member of the Chartered Institute of Logistics and Transport Australia. He has worked as a consultant and project manager for inland transportation and related services projects with the United Nations missions in Africa. Friday has co-authored several refereed journal articles.

Dr John Gattorna, Supply Chain ‘thought leader’ and Author; Partner, Gattorna Alignment, Sydney, Australia

John has spent the last four decades working inside numerous multi-national companies, seeking to shape theory from observed practice, and he has succeeded. It is through this in-depth applied research that he and his co-workers formulated the Dynamic Alignment™ business model, which has been progressively refined through use over time. Those companies that have applied John’s concepts have exhibited large improvements in operational and financial performance, and corresponding increases in customer satisfaction.

Janet Godsell joined WMG in October 2013 from her prior position of Senior Lecturer at Cranfield University School of Management. Her career has been split between both industry and academia. She joined the faculty of Cranfield in 2001, following the completion of her Executive MBA there. She also completed her PhD at Cranfield, researching the development of a customer responsive supply chain. Prior to her return to academia, Godsell developed a successful career within industry, beginning at ICI/Zeneca Pharmaceuticals. Following this, she worked up to senior management level at Dyson, in both supply chain and operations management functions. At Dyson, she undertook a number of operational and process improvement roles within research and development, customer logistics, purchasing and manufacturing. Godsell is a chartered engineer and member of the IMechE. She is on the board and scientific committee of the European Operations Management Association (EurOMA), the cabinet of the UK roundtable of the Council of Supply Chain Management Professionals (CSCMP), and the manufacturing steering committee of the IMechE. She is on the editorial board of three journals, including the *International Journal of Operations and Production Management*, and she is an advocate for improving the uptake of STEM subjects by schoolchildren.

Anwara Happy is a PhD candidate of operations and supply chain management at the School of Business in the University of Technology Sydney (UTS), Sydney, Australia. She has

completed her master's of philosophy in 2020 from Western Sydney University, Sydney, Australia. She received her master's of business in operations and supply chain management (procurement stream) degree in 2014 from UTS. Happy has professional experience both in government and private sectors in Australia and Bangladesh with specialisation in supply chain-related fields. As part of the job, she trained fellow employees on various aspects of operational issues. Her ten years of experience as a procurement professional in Technicolor Australia (from 2001 to 2011) provided her with an opportunity to understand profound practical knowledge relating to supply chain management. Along with the industrial experience, Happy has academic experience; she has presented a paper at the international conference of ANZIBA 2020. She has successfully contributed two book chapters. Her current research interests are in emerging technologies such as blockchain, cloud computing in the context of operations and supply chain management, including the adoption of Lean, Agile and Six Sigma philosophies in supply chain management.

Norma Harrison is Professor of Management, Macquarie Business School, and Past Dean at the Macquarie Graduate School of Management (MGSM). She has served as professor of operations management at the China Europe International Business School, and as the foundation head of the Graduate School of Business at the University of Technology, Sydney. Harrison's teaching, research and consulting interests are in the areas of innovation and technology management, sustainable supply chains, the globalisation of operations and performance improvement. She continues to publish in academic journals and to serve on journal editorial review boards. She chaired and conducted the Production and Operations Management Society (POMS) 2017 International Conference in Sydney (<http://pomssydney2017.com>) and she is the co-chair of the 2020 International Conference of Operations and Supply Chain Management (ICOSCM) (<https://www.icoscm-anzam2020.com>). Since May 2020, Harrison has conducted a series of public webinars titled "Response and Resilience in Supply Chains Amid COVID-19" involving panellists from industry, government and academia.

Mile Katic is a multi-disciplinary management scholar with expertise that spans the likes of technology and innovation management, operations management as well as strategic management. He has been involved in facilitating teaching and learning across multiple faculties, disciplines and education levels at both the University of Technology Sydney and other institutions abroad. With professional experience in the Australian manufacturing industry, Mile is particularly interested in boundary-spanning research that helps transfer leading edge management theory into practical know-how. To this end, he has collaborated with various government agencies as well as other universities to deliver practice-centred research concerning Australian management capabilities, the nexus between strategic management and technology convergence and, more recently, the managerial implications of industrial energy efficiency and strategic decision making under uncertainty.

Arshinder Kaur is currently working as Professor in the Department of Management Studies, IIT Madras, Chennai. She worked at Curtin University, Australia, for one year in the Curtin Business School in 2014 as a senior lecturer. She has more than 35 publications in reputed international journals like *Omega*, *Journal of Cleaner Production* and *International Journal of Production Economics*. Her doctoral work on the topic supply chain coordination has been accepted as a Highly Commended Award Winner of the 2008 Emerald/EFMD Outstanding Doctoral Research Award. Her areas of research interests are supply chain coordination and contracts, and sustainable food supply chains. She has coordinated many industry programmes.

Jodie-Anne Keane is Senior Research Fellow with the International Economic Development Group at the Overseas Development Institute, London. She has a PhD in economics from SOAS, University of London. She has taught seminars on comparative growth and more

recently on the political economy of trade, Department of International Relations, London School of Economics. She has published journal articles, book chapters and an edited volume on governance and global value chains. She is an experienced trade economist and project manager who has worked with multiple governments across the developing world to secure their trade policy outcomes. Keane began her career in Vietnam and Cambodia as a country economist with a local consultancy working on non-market economy issues for the World Bank in 2005, with a focus on China. Subsequently, she joined the Overseas Development Institute in 2007 as a research officer, before progressing to become a research fellow in 2012, with a portfolio focusing on trade and development issues between the European Union and the African, Caribbean and Pacific countries, as trading relations changed from non-reciprocal to reciprocal regimes. Between 2015 and 2020, Keane was an economic adviser within the Trade, Oceans and Natural Resources Directorate of the Commonwealth Secretariat with responsibility for global advocacy on emerging trade issues and the supporting global architecture.

Ramesh Krishnan is currently doing a joint PhD at the Department of Management Studies of the Indian Institute of Technology Madras, India, and Business School of the University of Technology Sydney, Australia. His research interest includes operations research, supply chain network design, sustainability and circular economy. He has publications in the *International Journal of Production Research*, *Journal of Cleaner Production*, *Cleaner Technologies and Environmental Policy*, and *Total Quality Management and Business Excellence*. He has also reviewed articles for the *International Journal of Production Research*, *Computers and Industrial Engineering*, and *International Journal of Lean Six Sigma*. He obtained his master's degree in industrial engineering from the National Institute of Technology, Tiruchirappalli, India, and bachelor's degree in mechanical engineering from Anna University, Tiruchirappalli, India.

Ray Markey joined Macquarie University at the end of 2011 as Professor of Employment Relations in the Department of Marketing and Management and Director of the new Centre for Workforce Futures. He had previously spent almost seven years as a professor of employment relations at the Auckland University of Technology Business School (2005–11), and was foundation director of the New Zealand Work and Labour Market Institute (2006–2011) as well as associate dean of research (2006–2009). Prior to that he was convenor of the Industrial Relations Programme at the University of Wollongong from 1979 to 2005, where he also established and led the Centre for Work and Labour Market Studies.

Donato Masi is Senior Lecturer in Operations Management at Aston Business School in Birmingham. He holds a PhD in management engineering and an MSc in mechanical engineering from Politecnico di Milano, Italy. He is a specialist in sustainable operations and supply chain management, and he published several scientific papers in top-ranked international journals for this area. He actively collaborates with industry through private and publicly funded research projects. He is currently focusing on how digitalisation and the emerging Industry 4.0 approach can enhance the sustainability of operations and supply chains.

Mark Matthews is a public policy and innovation strategy specialist who has worked in both academia and consulting. He has a doctorate in science and technology policy studies from the Science Policy Research Unit (SPRU), University of Sussex. Matthews has held senior positions in universities in the UK and Australia, and has also worked on innovation strategy for a number of consulting firms. In addition to innovation strategy and economic development, he has a research interest in the management (and mismanagement) of uncertainty and risk in the public sector. His work on global value chains (GVCs) has a strong focus on empirical analyses of the structure and performance of GVCs using the new global data sets now becoming available. Matthews is currently a special adviser for public policy and innovation at Steer Economic Development in the UK.

Steven A. Melnyk (PhD, Western, 1981) is Professor of Supply Chain Management at Michigan State University. He has co-authored 21 books, over 100 refereed journal articles and numerous practitioner articles. His research focus includes supply chain risk and resilience, strategic supply chain management, supply chain cyber security, and certified management standards. Melnyk sits on the editorial review board for numerous journals, including the *Journal of Business Logistics*, the *International Journal of Production Research*, and the *International Journal of Operations and Production Management*. From 2014 to 2016, Melnyk was a member of the APICS Board of Directors. From 2017 to 2019, Melnyk had a joint appointment from the University of Newcastle (Australia) where he was the Newcastle Global Innovation Chair in Supply Chain Management. In 2017, the Academy of Management, the Operations and Supply Chain Division, recognised Melnyk as a Distinguished Scholar in the field. Melnyk is recognised for this ability to bridge the gap between theory and practice. In 2018, Melnyk received the Withrow Teacher-Scholar Award from the Eli Broad School of Business, Michigan State University, in recognition of his work as both a researcher and a teacher. His recent work has included a study for the Department of the Navy addressing the question of how good a customer was the Navy and a study for the National Defense Industry Association regarding supply chain cybersecurity.

Sébastien Miroudot is senior trade policy analyst in the Trade in Services Division of the OECD Trade and Agriculture Directorate. He has spent 15 years working on trade and investment issues, including the creation of trade statistics in value-added terms (TiVA), the construction of a services trade restrictiveness index (STRI) and the analysis of the policy implications of global value chains. Before joining the OECD, he was researcher at Sciences Po in Groupe d'Economie Mondiale and taught international economics. In 2016-2017, he was visiting professor at the Graduate School of International Studies (GSIS) of Seoul National University. His research interests focus on trade in services, the role of multinational enterprises in trade and the analysis of global value chains. He holds a PhD in international economics from Sciences Po, Paris.

Anushree Mistry recently completed her PhD in engineering with a focus on complex systems and energy systems with a view to providing policy recommendations. Mistry is also an active member of the School of Information, Systems and Modelling in the Faculty of Engineering and IT and the Management Discipline Group in the UTS Business School at the University of Technology Sydney as a casual academic involved in subject development, coordination and facilitating learning at both undergraduate and postgraduate levels in a variety of subjects revolving around energy systems and management. Mistry is open to collaboration and co-authorship in research projects involving complex systems and policy decision-making.

Sarwat Nafei is a cybersecurity expert with 20 years of experience in the information technology field. He held many executive positions at the fortune 500 corporations and the Big 4 firms (i.e. Deloitte, EY, PwC, and KPMG). Recently he was the vice president for National Cybersecurity CGI-Canada (one of the largest multinational IT corporations). He also served on the cybersecurity committee of the International Telecom Union, a United Nations organisation. He has a degree in Electrical Engineering, MBA, and is currently a PhD researcher at Leicester Castle Business School. He holds multiple industry certifications, including certified information system security professional (CISSP), certified information system auditor (CISA), and PSEC System Engineer, and was the head of an International Association of Privacy Professionals (IAPP) chapter. He has a passion for education and taught at well-ranked universities, including York University and American University. In his capacity as a program director and professor he was developing courses, exams and teaching

cybersecurity, IT management, IT audit for undergrads as well as for graduate programs and EMBA's.

Rema Padman is Trustees Professor of Management Science and Healthcare Informatics in the Heinz College of Information Systems and Public Policy at Carnegie Mellon University in Pittsburgh, Pennsylvania. She is also Thrust Leader of Healthcare Informatics Research at iLab, research area director for Operations and Informatics at the Center for Health Analytics at the Heinz College, and adjunct professor in the Department of Biomedical Informatics at the University of Pittsburgh School of Medicine. Her research investigates healthcare informatics, analytics and operations, data-driven decision support, and process modelling and risk analysis in the context of clinical (using electronic health records) and consumer-facing IT interventions in healthcare, such as e-health, m-health, chronic and infectious disease management, and workflow analysis. She has developed, applied, and evaluated models and methods drawn from operations research, machine learning, and behavioural science for designing and investigating these IT interventions in the emergency, inpatient, ambulatory, and consumer self-health management settings. She has published extensively in major academic journals and served on their editorial boards; been a keynote speaker at multiple conferences; and advised healthcare informatics projects for provider, payer, pharmaceutical, consulting and non-profit organisations. She has also served on proposal review panels of the US and international funding agencies, and received funding from federal agencies and foundations. *Becker's Hospital Review* recognised her as one of the top 110 women in MedTech in 2017 and she was nominated for the 2018 HIMSS Most Influential Women in Health IT Award.

Sanjoy Paul is currently working as Senior Lecturer in Operations and Supply Chain Management at UTS Business School of the University of Technology Sydney. He has published more than 60 articles in top-tier journals and conferences, including the *European Journal of Operational Research*, *International Journal of Production Economics*, *Computers and Operations Research*, *International Journal of Production Research*, *Annals of Operations Research*, *Journal of Management in Engineering*, *Journal of Cleaner Production*, *Computers and Industrial Engineering*, *Journal of Retailing and Consumer Services*, and *Journal of Intelligent Manufacturing*. He is also an active reviewer of many reputed journals. Paul has received several awards in his career, including the ASOR Rising Star Award to recognise early career researchers in operations research, the Excellence in Early Career Research Award from the UTS Business School, the Stephen Fester prize for most outstanding thesis and the high impact publications award from UNSW. His research interest includes supply chain risk management, modelling, applied operations research and intelligent decision-making.

Yen Phan is a third year PhD student and a research assistant in the business school at the University of Technology Sydney. Her doctoral research investigates supply chain innovation in the context of Vietnamese agricultural supply chain, based on mixed methods of qualitative and quantitative research. She is also a lecturer at the University of Economics and Law, Vietnam National University HCMC. She holds a master's degree in logistics and supply chain management from Sheffield Hallam University, England, and a bachelor's degree in management information systems from Vietnam National University HCMC. Yen's research interests span a wide range of disciplines: operations management, logistics, supply chain management, innovation, e-commerce and management information systems. She was a core member of the e-commerce project at Vietnam National University and co-authored a book *Electronic Commerce* published by Vietnam National University in 2015.

Kazi Waziur Rahman is a final year postgraduate student at the University of Technology Sydney (UTS). He is pursuing a master's of strategic supply chain and will be eligible for CIPS (Chartered Institute of Procurement and Supply) membership. He received his bachelor's of business (major – management) degree in 2009 from Southern Cross University, Australia. He

has several years professional experience in Australian retail and the Bangladeshi apparel supply chain segment. He has successfully co-authored two book chapters and is currently serving as a research assistant at UTS. His current research interests are on supply chain resilience, disruptive innovation and design, modularity in system design, understanding ripple effect dynamics and time criticality, due diligence in global food supply chain, and operational sustainability.

Göran Roos is a member of the advisory board for Investment Attraction South Australia, an Invited Chair of the CSIRO Manufacturing Business Unit Advisory Committee. He is a Stretton Fellow appointed by the City of Playford at University of Adelaide; visiting professor at Tongji University, Shanghai; adjunct professor at the Institute of Economics and Management of the Immanuel Kant Baltic Federal University; and visiting professor at Australian Industrial Transformation Institute, Flinders University. Roos is a CSIRO fellow and a fellow of the Australian Academy of Technological Sciences and Engineering (ATSE) and of the Royal Swedish Academy of Engineering Sciences (IVA).

Moira Scerri, PhD, is Lecturer in Operations and Supply Chain Management at the University of Technology Sydney. She is also a director of the Centre of Business and Social Innovation (CBSI). She teaches in the areas of operations and quality management, problem solving, creativity and solution setting, and supply chain technology management. Her research interests include digital transforming with a focus on new and emerging technologies such as blockchain, 3D printing, artificial intelligence, machine learning, cloud-based computing and the sharing economy. She is also the recipient of a number of internal and external competitive research grants. Her work has appeared in leading journals such as *Service Theory and Practice*, *Technology Forecasting* and *Social Change*.

Wenwen Sheng is Associate Professor at the Economic Institute, National Development and Reform Commission of China. She worked at the Division of Market Development, International Trade Centre (ITC) from 2019 to 2020 as the Junior Professional Officer. Previously, she worked at the State Administration of Foreign Exchange and Research Bureau of the People's Bank of China during 2014–2016. She holds a PhD in economics (2014) from Renmin University of China. Her research interests include financial development, monetary policy and international finance.

Katrina Skellern is Post-Doctoral Research Fellow with the Centre for Business & Social Innovation at the University of Technology Sydney (UTS) Business School. She has over 20 years of experience in project management, policy development, program evaluation, business model innovation, and community and stakeholder engagement in Australia and internationally. Skellern is currently working on a business model transformation project with the Innovative Manufacturing Cooperative Research Centre.

Jimena Sotelo is Project Lead of Digital Trade at the Centre for the Fourth Industrial Revolution of the World Economic Forum, based in San Francisco. Her work focuses on the intersection of new technologies and trade. She has ten years of experience working on trade in international organisations and the private sector. She worked for the International Trade Centre and the think tank ICTSD in Geneva, as well as for the Organization of American States in Washington DC. Her experience in the private sector was at Banco Comafi SA and DuPont, in Buenos Aires. She has a bachelor's degree in international trade and a postgraduate course in international business from the Universidad Argentina de la Empresa (UADE), where she was awarded top honours. She also holds a master's in international law and economics from the World Trade Institute (WTI) at the University of Bern, where she graduated summa cum laude.

Daria Taglioni is Lead Economist in the World Bank Chief Economist Office. She has been with the World Bank Group since 2011, covering issues of international trade and countries'

trade competitiveness. Her career started with the Organisation for Economic Co-operation and Development in Paris and she also worked at the European Central Bank for several years. She has published extensively in peer-reviewed journals, and her work has been cited in the *New York Times* and *Forbes*. She has authored various books on international trade, including *Making Global Value Chains Work for Development* (with Deborah Winkler), *Inclusive Global Value Chains* (with Ana Paula Cusolito and Raed Safadi), *Vietnam at a Crossroads: Engaging in the Next Generation of Global Value Chains* (with Claire Hollweg and Tanya Smith), and *Valuing Services in Trade* (with Sebastian Saez, Erik van der Marel, Claire Hollweg and Veronika Zavaka). She was also the Task Team Leader for the World Development Report 2020, *Trading for Development in the Age of Global Value Chains*. She is Italian and holds a PhD in international economics from the Graduate Institute, Geneva.

V. G. Venkatesh is a faculty member with EM Normandie Business School, France. He has years of industrial and teaching experience in the supply chain domain from Honduras, Sri Lanka, New Zealand, Colombia, USA, France and Bangladesh. He has been actively publishing his academic research in reputable journals in the areas of supplier networks, social sustainability, transportation infrastructure and strategic procurement.

Ganeshan Wignaraja is a Non-Resident Senior Fellow at the Institute of South Asian Studies at the National University of Singapore and a Senior Research Associate at the Overseas Development Institute in London. Previously, Wignaraja was the Executive Director of the Lakshman Kadirgamar Institute of International Relations and Strategic Studies in Sri Lanka, the Director of Research at the ADB Institute in Tokyo and a Visiting Scholar at the IMF in Washington DC. He has published widely on international economics and regional economic integration in Asia including *Production Networks and Enterprises in East Asia* and *Asia's Free Trade Agreements: How is Business Responding?*. Wignaraja has a DPhil in economics from Oxford University.

Deborah Winkler is Senior Consultant in the World Bank Group's Macroeconomics, Trade and Investment Global Practice. Winkler has worked on issues of global value chains; export competitiveness; foreign direct investment; trade in services; offshoring; and their determinants, welfare and distributional effects. She is the author of *Making Global Value Chains Work for Development* (with Daria Taglioni, World Bank, 2016), *Outsourcing Economics* (with William Milberg, Cambridge University Press, 2013) and *Services Offshoring and Its Impact on the Labor Market* (Springer, 2009). Winkler is the editor of *Making Foreign Direct Investment Work for Sub-Saharan Africa* (with Thomas Farole, World Bank, 2014). She has published over 30 articles in peer-reviewed journals and edited volumes. Winkler was a core team member of the *World Development Report 2020*. She is a former research associate of the New School for Social Research and received her PhD in economics from the University of Hohenheim in Germany.

Brian Wixted's research work has focused on cluster and value chains in science, technology and innovation (STI) policies. His interests include both the role of charities in funding research and how our conception of innovation policy needs to change as digital technologies restructure econ and techno landscapes.

Abraham Zhang is Senior Lecturer in Supply Chain Management at Auckland University of Technology (AUT), where he received the Emerging Scholar Award from the Faculty of Business, Economics and Law in 2018. He is an honorary Senior Research Fellow of Lumen Research Institute, Excelsia College (Australia) and Indiana Wesleyan University (USA). He obtained his PhD from the University of Hong Kong in 2011. He received the Dean's Award for Outstanding Emerging Scholar in 2015 from the University of Waikato Management School. Before he moved into academia, he was a production supervisor in Singapore and a

Lean management consultant serving the Asia-Pacific region. He has been actively publishing his research and consulting works in reputable academic journals, including *Omega*, *International Journal of Production Economics*, *International Journal of Operations and Production Research*, *Supply Chain Management: An International Journal*, *International Journal of Production Research* and *Journal of Cleaner Production*. His current research focuses on supply chain sustainability, especially on circular supply chain management and blockchain-based sustainable supply chain management.

Wei Zhang is Economic Affairs Officer in the Accessions Division of the World Trade Organization (WTO). She serves as co-secretary of a number of accession working parties, and covers technical assistance and publications. Prior to that, she served as a trade negotiator at the Permanent Mission of China to the WTO and Ministry of Commerce, China. Zhang holds a summa cum laude master's in international law and economics from the World Trade Institute, University of Bern. Her research focuses on digital trade, global value chain and WTO accessions.

Quan Zhao is Trade Policy Adviser in the Office of the Chief Economist, International Trade Centre (ITC). He leads the trade in services team at ITC and is responsible for policy research and project management in the areas of trade in services, e-commerce, digital economy and cross-border investment. He also advises the senior management on trade and investment issues in the context of the G20. Prior to joining the ITC, Zhao was a trade negotiator and diplomat at the Permanent Mission of China to the World Trade Organization (WTO) and the Ministry of Commerce of China. He served as the chair of the WTO's Committee on Trade in Financial Services, and lead services negotiator in a number of China's free trade agreement (FTA) negotiations.

Ray Zhong is Assistant Professor in the Department of Industrial and Manufacturing Systems Engineering, University of Hong Kong. He was a Lecturer in the Department of Mechanical Engineering, University of Auckland, New Zealand, from June 2016 to January 2019. Zhong gained his MPhil and PhD in signal and information processing and industrial and manufacturing systems engineering from the Guangdong University of Technology (China) and the University of Hong Kong (Hong Kong), respectively. His research interests include internet of things (IoT)-enabled manufacturing, big data in manufacturing and supply chain management, and data-driven APS. He has published over 160 research publications (~80 Science Citation Index journals and ~80 conference papers). The total citations from Google Scholar is over 4700 with the H-index: 32, i10-index: 70 (as of 14 August 2020). He has five of the most cited papers from Web of Science. In addition, he has participated in a set of projects sponsored by the NSFC, National R&D Department, HK ITF and HKU. He is a member of CIRP RA (2017–2020), ASME (USA), HKIE (Hong Kong), IET (UK), IEEE (USA) and LSCM Hong Kong. Zhong was awarded the Young Author Prize in the 15th IFAC/IEEE/IFIP/IFORS Symposium on Information Control Problems in Manufacturing, Young Scientist Award (2017) from New Zealand Chinese Scientist Association (Only Awardee), and several best conference papers in reputable IEEE conferences.

Preface: The rise of global value chains

GVCs have become the world economy's backbone and central nervous system.

O. Cattaneo, G. Gereffi, and C. Staritz, 2010, *Global Value Chains in a Postcrisis World: A Development Perspective*, Washington, DC: The World Bank, p. 7

This Companion provides a review of global value chains (GVCs) and the megatrends shaping them. We have seen over the last century the various ways in which the world manages the

production and delivery of goods and services, sometimes summarised as “made-here-sold-there goods crossing borders” (Daria and Winkler, 2016). Globalisation has now evolved alongside automation and digitalisation such that finished products are now the result of manufacturing and assembly across multiple countries around the globe. In particular, GVCs have expanded each country’s reach into international trade by enabling them to “make things, not just sell things” (Daria and Winkler, 2016). While multinational enterprises account for one-third of world production and half of world trade (OECD, 2018), GVCs now make up more than two-thirds of world trade. They have become an all-pervasive mechanism that facilitates the exchange of raw materials and intermediate parts for the production of goods and services, services for businesses, and capital goods (OECD, 2020).

Significantly, the scale and pervasiveness of the 2008–2009 global financial crisis (GFC) reflected the increased complexity of globalisation, and the COVID-19 pandemic has even more viscerally exposed the vulnerability of GVCs and the loss of “sovereign capability.” Overlaying the impact of the pandemic is the re-emergence of geopolitical conflict and the struggle for technological pre-eminence, particularly between the US and China. As a result, while globalisation is unlikely to go into full-scale retreat, organisations are actively seeking new ways to diversify and shorten their supply chains, so as to become less dependent on any single country’s production and assembly. For example, in an attempt to mitigate risk, organisations are changing the locations from which they source their resource requirements (Wu, 2020), while also instigating new collaborative relationships not previously entered into or possibly even considered (see Chapter 4). Consequently, the future growth and sustainability of GVCs will need to accommodate some element of “deglobalisation” as businesses reshore identified strategic activities and avoid excessive dependence on externally developed and controlled technologies (“The changes Covid-19,” 2020).

Characteristics of GVCs

It is sometimes said that the global economy can be viewed either through the lens of growth and structural change in individual countries, developed and developing, or through GVCs, the complex network structure of flows of goods, services, capital and technology across national borders (World Bank, 2019a). This Companion covers both aspects as they are complementary to one another and demonstrate the underlying technological and broader economic forces at work in shaping the patterns of interconnectedness at both the regional and global levels. Over the last two decades, the world has been transformed and energised by GVCs, which have reduced trade barriers, lowered the costs of logistics and distribution, precipitated a massive structural change, and created many new jobs in developing countries. Combined with technological advances, GVCs are transforming the way international trade operates and have become a major driver of global economic growth, which must also be re-engineered for environmental sustainability (World Bank, 2019a).

A major contribution of GVCs has been to source inputs more efficiently and effectively, as well as access knowledge and capital through innovative collaborations and internationalisation that have facilitated expansion into new markets (OECD, 2013; also see Chapter 4). The evidence suggests that GVCs have had a pivotal role in reducing poverty and have been instrumental in offering opportunities to developing countries to grow and catch up with more affluent nations (World Bank, 2019b). Yet the growth of GVCs has slowed since the GFC. From 2000 to 2007, complex GVCs expanded at a faster rate than world production. During the GFC there was naturally some retrenchment of GVCs followed by recovery during 2010–2011, but subsequently GVC growth was sluggish. It was only recently, since 2017, that complex GVCs again began to grow faster than world production, and until COVID-19 their

rise was considered unstoppable due to the fragmentation and dispersion of business activities across the globe. Now we see as a result of technological change and an increasing emphasis in business models on core competences, an increasing tension between on-shoring through the move of production and sourcing closer to the end user (Clarke-Sather and Cobb, 2019) and outsourcing enabling more cost-competitive externalisation of business activities (Kano et al., 2019).

GVCs are both global and regional, and their characteristics have varied over time. Between 2000 and 2017, intra-regional GVC trade increased in “Factory Asia” reflecting, in part, upgrading by China and other Asian economies. In contrast, intra-regional GVC trade in “Factory Europe” and “Factory North America” decreased slightly relative to inter-regional GVC trade reflecting stronger linkages with Factory Asia. Among leading economies, China has emerged as an important hub in traditional trade and “simple GVC networks,” but the US and Germany remain the most important hubs in “complex GVC networks.”

Global collaboration, integration and alignment

According to the Organisation for Economic Co-operation and Development (OECD), there is evidence of a decline in fragmentation of production across the world, and even when the growth of GVCs declined during 2011, firms were not only reducing their use of foreign inputs but became part of shorter GVCs (Miroudot and Nordström, 2019). Essentially there are two GVC megatrends in progress here. The first megatrend involves a shift in the share of global purchasing power towards developing economies with major changes in the characteristics of GVCs. Regional trade has risen as a share, especially in Asia, resulting in more production being consumed in domestic markets in these developing countries instead of being exported to countries outside the region. This is shifting the trade paradigm from being one based on comparative advantage to one based on differential labour costs and labour arbitrage. Whilst this megatrend is still in transition, these low-income developing countries will continue to depend on access to global demand using traditional, labour-intensive processes in manufacturing.

The second megatrend involves digitalisation of GVCs (Schniederjans, Curado, and Khalajhedayati, 2020) through emergence of blockchain (Chalmers, Matthews, and Hyslop, 2019), Industry 4.0 technologies (Bibby and Dehe, 2018; Fatorachian and Kazemi, 2018) and data analytics (Sivarajah et al., 2017; Yasmin et al., 2020). This will over time transform entire economies and the way in which manufacturing and trade take place. Future GVCs will ultimately be built on digital foundations, and these new technologies and skills will become core across GVCs. In Asia, GVCs have already displaced the labour-intensive technologies, especially in the textile and clothing sector. The future of GVCs not only relies on the traditional growth model but also increasingly on the ability of the “industries of the future” to adopt Supply Chain 4.0 principles. By this is meant the reorganisation of supply chains – design and planning, production, distribution, consumption, and reverse logistics functions – using big data, 3D printing, advanced (autonomous) robotics, smart sensors, augmented reality, artificial intelligence, cloud computing and the internet of things (IoT). With the adoption of these emerging technologies, complex GVC activities will be reshaped and reimaged (World Bank, 2019a).

Small and medium enterprises

Whilst the rise of GVCs is a phenomenon of our time as a result of the fragmentation and dispersion of business activities throughout most of the world, the benefits have so far primarily been accrued by large multinationals, which are best placed to take advantage of the new opportunities. However, with the shift from vertically integrated mass production to smaller, more specialised interdependent units of the production process, small and medium-sized enterprises (SMEs) have also become more globalised. Even during the broader productivity slowdown in the advanced economies over recent years, SMEs have become the “frontier

firms” experiencing significantly greater productivity growth than the “laggards,” which still comprise the vast majority of SMEs. The problem is that many SMEs have not taken the step to becoming “micromultinationals,” as there is limited awareness of the benefits they gain from participation in international trade (Gonzalez et al., 2019).

SMEs face a range of challenges, including limited access to resources and finances for new investments, lower skills related to management, limited access information and technology, and lower levels of productivity, thus making it harder for them to grow and scale globally (Gonzalez et al., 2019). GVCs can help SMEs access better and cheaper inputs to increase their global presence and competitiveness, and offer new opportunities through “smart specialisation” in intermediate products rather than attempting to master all the tasks required to produce final goods. New research finds that when a manufacturing SME has a fully functional, interactive website, not surprisingly its participation in GVCs and trade generally significantly increases. In particular, such SMEs are more likely to use foreign inputs for production and export a larger share of their output. Further, digital connectivity is found to be more important for smaller firms than for large ones whether or not the firm participates in trade. As such, with the rise of the digital economy, being able to exploit the potential of digital platforms will allow SMEs to improve their international trade performance and build a competitive advantage in global ecosystems (OECD, 2008).

To maximise the potential gains for SMEs, a holistic approach is crucial, particularly one that combines high-quality management, investment in information and communications technology (ICT) infrastructure and human capital, access to finance and logistics, and trade-based reforms. Additionally, more resilient GVC networks can be achieved by strategies at the firm level that place an emphasis on risk awareness, risk mitigation and greater transparency, integration, and alignment across the network. It has been noted that this can be achieved through programs supporting greater agility and adaptability, as SMEs operate under extremely volatile, uncertain, complex and ambiguous (VUCA) environments (Schoemaker, 2018). Improving the availability of historical data also helps to better understand and integrate SMEs in GVC networks.

Impact of COVID-19: A future megatrend

Change can be so profound and dislocating that it is challenging to distinguish disaster from opportunity.

“The changes covid-19 is forcing on to business,” 2020, *The Economist*, <https://www.economist.com/briefing/2020/04/11/the-changes-covid-19-is-forcing-on-to-business>

For some time GVCs have been hailed as “the world economy’s backbone and central nervous system” (Cattaneo, Gereffi and Staritz, 2010, p. 7) and they are recognised as the vital governance structures of business value creation. However, according to a new McKinsey report, “supply chain disruptions lasting a month or longer now happen every 3.7 years on average” (Lund et al., 2020). In addition, the operation of GVCs has been challenged by the COVID-19 pandemic, reigniting an old debate about the supply chain risks associated with international production systems. The pandemic has exposed the vulnerabilities of interconnected and interdependent trade relationships that involve multiple actors spanning multiple countries with supply chain activities and resources running both upstream and downstream (Gereffi, Humphrey and Sturgeon, 2005).

The COVID-19 outbreak shook the world and not only restricted the value chain flow of medical supplies needed for patient treatment, protection and control (World Health Organization, 2020), but also brought the movement of people and goods across national boundaries to almost a complete halt. In some countries, particularly the US, the pandemic has

been characterised as more a policy failure than a market failure necessitating more resilient supply chains and diversified sourcing patterns (Gereffi, 2020). Whilst in other similar health-related crises, such as SARS, Ebola and swine flu, when serious supply chain disruptions were experienced, the sheer scale and the devastating economic impact of COVID-19 is on a different scale, recalling the Depression of the 1930s. This puts the current crisis into a unique category of global socioeconomic disruptions (Gupta, 2020), where “companies need an understanding of their exposure, vulnerabilities, and potential losses to inform reliance strategies” (Lund et al., 2020).

While businesses, governments and researchers are grappling with the fallout from the pandemic, those engaged in GVCs and the revival and reinvention of manufacturing capability are already identifying the new opportunities created by this disruption (Green, 2020). Certainly, the pandemic has triggered alarm bells about the pitfalls of reliance in any GVC on a single country or market, but it has also accelerated the trend to the shorter, more manageable GVCs associated with digitalisation, artificial intelligence and the rise of Industry 4.0. It has also refocused attention on the role of GVCs in addressing the major issues of climate change and worker protections. This will signify not a reversal of globalisation but the transition to new forms of global connectivity with production and sourcing closer to the end user and a discontinuous shift in the choices and expectations of consumers, suppliers and organisations (Harari, 2020). While it is not possible to predict exactly how globalisation will evolve from here, we can be sure that COVID-19 will have a major impact in accelerating current observable trends and preparing the way for new ones.

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Handbook structure

The *Routledge Companion to Global Value Chains: Reinterpreting and Reimagining Megatrends in the World Economy* is organised into five parts that draw together key insights into the megatrends driving global value chains:

Part I: History of global value chains

Part II: Global value chains: Theory and practice

Part III: Role of emerging technologies and data analytics in global value chains

Part IV: Megatrends in global value chains

Part V: Implications

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These five parts cover a range of topics, both emergent and traditional. The aim of this GVC companion handbook, as with others in the Routledge series, is to provide a state-of-the-art and an up-to-date, enduring and authoritative account of the GVC field.

Abbreviations

Following is a list of terms used as abbreviations in *The Routledge Companion to Global Value Chains*, along with their extended form. The abbreviations are listed in alphabetical order and by no means are exhaustive.

Abbreviation	Expanded form
3D	three dimensional
3PL	third-party logistics
G20	Group of Twenty
AD	Anno Domini
ADB	Asian Development Bank
ACP	African, Caribbean and Pacific
ADB I	Asian Development Bank Institute
AfCFTA	African Continental Free Trade Area
AFTA	ASEAN Free Trade Area
AHP	analytic hierarchy process
ASCM	agri-food supply chain management
ASEAN	Association of Southeast Asian Nations
Ai	Australian Industry
B2B	business-to-business
B2C	business-to-consumer
BCMA	barcoded medication administration
BERD	business expenditure on R&D
BC	Before Christ
BIT	bilateral investment treaty
BTD	Bilateral Trade Database
CEPT	Common Effective Preferential Tariff
CFA	confirmatory factor analysis
CEO	chief executive officer
CMB	common method bias
CoV	coefficient of variation
COVID-19	2019 novel coronavirus or 2019-nCoV
CR	consistency ratio

CRM	customer relationship management
DC	dynamic capabilities
DDMRP	Demand Driven Materials Requirements Planning
EEF	(now Make UK)
E2E	end to end
ERP	enterprise resource planning
EU	European Union
FDI	foreign direct investment
FOIK	first of a kind
FTA	free trade agreement
FVA	foreign value added
FVC	food value chain
GATT	General Agreement on Trade and Tariffs
GDP	gross domestic product
GM	General Motors
GPN	Global Production Network
GSP	Generalised System of Preferences
GFVC	global food value chain
GVA	global value architecture
GVC	global value chain
IAS	Innovation Activity Separability
ICIO	inter-country input–output
ICT	information and communications technology
ICTSD	International Centre for Trade and Sustainable Development
IoT	internet of things
IP	intellectual property
IPR	intellectual property rights
ITA	Information Technology Agreement
KPIs	key performance indicators
LDC	least developed country
LBE	learning by exporting
LCD	liquid crystal display
M&A	mergers and acquisitions
MAR	medical administration record
MNC	multinational corporation
MNE	multinational enterprise
MRIO	multi-regional input–output
MRP	materials requirement planning
NAIT	National Animal Identification and Tracing
NGO	non-government organisation
NIC	newly industrialised country
NSW	New South Wales
OEA	original equipment assembling
OECD	Organisation for Economic Co-operation and Development
OBM	original brand manufacturing
OEM	original equipment manufacturing
ODM	original design manufacturing
OSCM	operations and supply chain management
PPID	positive patient Identification
PwC	PricewaterhouseCoopers

R&D	research and development
RBV	resource-based view
RCEP	Regional Comprehensive Economic Partnership
RFID	radio frequency identification
RI	Random Index
RTA	regional trade agreement
S&OP	sales and operations planning
SC	supply chain
SKU	stock-keeping unit
SME	small and medium enterprise
SOE	state-owned enterprise
SPE	sourcing pathways per economy
TiVA	OECD–WTO Trade in Value Added
TFA	Trade Facilitation Agreement
TOC	theory of constraints
TQM	total quality management
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
UNCTAD-EORA	UNCTAD-Eora Global Value Chain database
US	United States
VA	value added
VMI	vendor management inventory
VUCA	volatile, uncertain, complex and ambiguous
WEF	World Economic Forum
WIOD	World Input-Output Database
WRI	Working Relations Index
WTO	World Trade Organization