

The Routledge Companion to Global Value Chains

Endorsements –

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 policy makers for shaping international trade. This handbook is a great resource for researchers and policy makers 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 is 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 globalization to take new factors into account.

Mona Haddad
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Washington D.C., 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.

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

Bringing together the wide and diverse field of global value chain 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.

Prof A Gunasekaran
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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.

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 policy makers, business leaders and decision makers.

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 mega trends. Will global mega trends such as offshoring be reversed by new technology such as block chain and industry 4.0? As demonstrated in 2020 – unplanned events can throw even the best plans into disarray. This book provides a survival guide.

Professor Graham Wren OBE FEng
FIMechE, FIET, FCIM, FloD, FRSA, Eurlng, 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.

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 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.

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 policy makers on how best they should go about transforming and recalibrating globalization.

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.

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/policy-maker involved in GVCs – this handbook is all that you will need!

Professor Amrik Sohal
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List of Abbreviations

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

Abbreviation	Expanded form of Abbreviation
3-D	Three dimensional
3PL	3rd 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	Analytical 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 Treaties
BT D	Bilateral Trade Database
CEPT	Common Effective Preferential Tariff
CFA	Confirmaty 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 Resource Planning
EEF	(Now Make UK)
E2E	End to End
ERP	Enterprise Resource Planning
EU	European
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 Communication 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
LDA	Least Developed Countries
LBE	Learning-By-Exporting
LCD	Liquid Crystal Display
M&A	Merger and Acquisition
MAR	Medical Administration Record
MNC	Multinational Corporation
MNE	Multinational Enterprise
MRIO	Multi-Region Input–Output
MRP	Materials Requirement Planning
NAIT	National Animal Identification and Tracing
NGO	Non Government Organisation
NIC	Newly Industrialised Countries
NSW	New South Wales
OEA	Original Equipment Assembling
OECD	Organisation for Economic Co-operation and Development
OBM	Original Brand Manufacture
OEM	Original Equipment Manufacturing
ODM	Original Design Manufacturing
OSCM	Operations & 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	Solution and Operational Planning
SC	Supply Chain
SKU	Stock Keeping Level
SME	Small Medium Enterprise
SOE	Standard Operating
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 & Ambiguous
WEF	World Economic Forum
WIOD	World Input-Output Database
WRI	Working Relations Index
WTO	World Trade Organization

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The Editors

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Renu Agarwal is an Associate Professor, Operations and Supply Chain Management and the Director of Strategic Supply Chain Management Programs at the University of Technology Sydney. Previously Renu has had extensive industry experience working for SRA, Telstra and REACH. Now, Renu provides leadership in the disciplinary fields of service innovation, service value networks, supply chain management, dynamic capability building, management practices, management education, innovation and productivity. Renu has been instrumental in managing research projects funded by DIISR Canberra, MED New Zealand, NSW Health, and Queensland Health working in collaboration with LSE, McKinsey and Stanford University which have all contributed to the broader International World Management Survey. One of the many research projects led to the 2009 landmark study - **Management Matters in Australia – Just how productive are we?** – which has had an impact on Australian government policy making. Recently, Renu led the design of the Australian Management Capability Survey in collaboration with DIISR and ABS which resulted in the release of the data cube output 8172.0 - Management and Organisational Capabilities of Australian Business. Besides, Renu has undertaken research for many organisations including Deloitte Access Economics, NSW Innovation and Productivity Council and the Department of Industry, Australian Industry Group, ResMed, SGEN, Microsoft, ASCI, Hargraves Institute, FIAL, CSIRO, Centre for Workplace Leadership, Melbourne University. Renu has published several edited books and top-tier refereed management journal articles.

Christopher Bajada

Dr. Christopher Bajada is Associate Professor of Economics at the University of Technology Sydney. Chris has previously been the Associate Dean (Education) and Chair of the University's Teaching and Learning Committee. Chris 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. Chris' research is primarily in applied macroeconomics, with a special interest in management practices, tax compliance, circular economy, productivity and curriculum design. Chris has published several research books, academic textbooks and refereed journal articles in highly reputable economics journals. Chris 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.

Roy Green

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overseas, most recently as Dean of the UTS Business School. He is also a Conjoint Professor at the University of Newcastle and a Fellow of the Royal Society for Arts, Manufactures & Commerce (RSA) and the Irish Academy of Management. Roy chaired the Australian Government's Innovative Regions Centre, CSIRO Manufacturing Sector Advisory Council, NSW Manufacturing Industries Advisory Council and Queensland Competition Authority, and he was a member of the 2010-12 Prime Minister's Manufacturing Taskforce. He has led and prepared reports for a range of industry reviews, including the 2015 Senate Innovation System Inquiry. Currently, Roy chairs the Port of Newcastle and Advanced Robotics Manufacturing Hub and is a board member of the Innovative Manufacturing Cooperative Research Centre.

Katrina Skellern

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

The Rise of Global Value Chains

(Agarwal, Bajada, Green and Skellern)

“GVCs have become the world economy’s backbone and central nervous system”

Cattaneo, Gereffi, & Staritz, 2010, p. 7¹

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 summarized as “made-here-sold-there goods crossing borders” (Daria and Winkler, 2016)². Globalization has now evolved alongside automation and digitalization 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)³. While multinational enterprises account for one-third of world production and half of world trade (OECD, 2018)⁴, 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)⁵.

Significantly, the scale and pervasiveness of the 2008-09 Global Financial Crisis (GFC) reflected the increased complexity of globalization, and the COVID-19 pandemic has even more viscerally exposed the vulnerability of GVCs and the loss of ‘sovereign capability’. Over-layering 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 globalization is unlikely to go into full-scale retreat, organizations 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, organizations are changing the locations from which they source their resource requirements (Wu, 2020)⁶ while also instigating new collaborative relationships not previously entered into or possibly even considered (Skellern and Markey 2018). Consequently, the future growth and sustainability of GVCs will need to accommodate some element of ‘deglobalization’ as businesses re-shore identified strategic activities and avoid excessive dependence on externally developed and controlled technologies (Economist, 2020)⁷.

¹ Cattaneo, O., Gereffi, G., & Staritz, C. (2010). *Global value chains in a postcrisis world: A development perspective*. Washington, DC: The World Bank.

² Taglioni, Daria, and Deborah Winkler. 2016. *Making Global Value Chains Work for Development*. Trade and Development series. Washington, DC: World Bank. doi:10.1596/978-1-4648-0157-0.

³ Ibid 2.

⁴ OECD (2018), “Multinational Enterprises in the Global Economy: Heavily Debated but Hardly Measured”, OECD Publishing, Paris, <https://www.oecd.org/industry/ind/MNEs-in-the-global-economy-policy-note.pdf>.

⁵ OECD (2020), “Trade Policy Implications of Global Value Chains”, *OECD Trade Policy Brief*, https://issuu.com/oecd.publishing/docs/trade_policy_implications_of_global

⁶ Wu, D. (2020). Supply lines: Not made in china is global tech’s next big trend. *Bloomberg*. Retrieved on 2 August 2020 from <https://www.bloomberg.com/news/articles/2020-03-31/supply-chains-latest-not-made-in-china-is-tech-s-next-move>.

⁷ The changes covid-19 is forcing on to business. (2020). *The Economist*. Retrieved on 24 July 2020 from <https://www.economist.com/briefing/2020/04/11/the-changes-covid-19-is-forcing-on-to-business>

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, 2019)⁸. 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 energized by GVCs which have reduced trade barriers, lowered the costs of logistics and distribution, precipitated 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 2019)⁹.

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 internationalization that have facilitated expansion into new markets (OECD, 2013, Skellern and Markey 2018)^{10 11}. 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, 2019)¹². Yet the growth of GVCs has slowed since the GFC. From 2000-07, 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 is 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 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 & Cobb, 2019)¹³ and outsourcing enabling more cost competitive externalization of business activities (Kano et al., 2019)¹⁴.

GVCs are both global and regional and their characteristics have varied over time. Between 2000-17, 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

⁸ WorldBank (2019) The Global Value Chain Development Report Technological Innovation, Supply Chain trade, and Workers in a Globalized world (2019) accessed on 31 July 2020 via <https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-2019>.

⁹ WorldBank (2019) The Global Value Chain Development Report Technological Innovation, Supply Chain trade, and Workers in a Globalized world (2019) accessed on 31 July 2020 via <https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-2019>.

¹⁰ OECD (2013), *Interconnected Economies: Benefiting from Global Value Chains*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264189560-en>

¹¹ Skellern and Markey (2018) Interfirm customer-supplier collaboration for a sustainable transition

¹² World Bank (2019), *World Development Report 2020: Trading for Development in the Age of Global Value Chains*, The World Bank, Washington, DC.

¹³ Clarke-Sather, A., & Cobb, K. (2019). Onshoring fashion: Worker sustainability impacts of global and local apparel production. *Journal of Cleaner Production*, 208, 1206-1218.

¹⁴ Kano, L., Tsang, E.W., & Yeung, H.W.-C. (2020). Global value chains: A review of the multi-disciplinary literature. *Journal of International Business Studies*, 1-46.

stronger linkages with “Factory Asia”. Among leading economies, China has emerged as an important hub in traditional trade and ‘simple GVC networks’, but the United States and Germany remain the most important hubs in ‘complex GVC networks’¹⁵.

Global collaboration, integration and alignment

According to the OECD¹⁶, 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)¹⁷. 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 other 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 labor-intensive, processes in manufacturing.

The second megatrend involves digitalization of GVCs (Schniederjans, Curado, & Khalajhedayati, 2020)¹⁸ through emergence of ‘blockchain’ (Chalmers, Matthews, & Hyslop, 2019)¹⁹, Industry 4.0 technologies (Bibby & Dehe, 2018²⁰; Fatorachian & Kazemi, 2018²¹) and data analytics (Sivarajah et al., 2017²²; Yasmin et al., 2020²³). 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 labor-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 re-organization 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

¹⁵ WorldBank (2019) The Global Value Chain Development Report Technological Innovation, Supply Chain trade, and Workers in a Globalized world (2019) accessed on 20 July 2020 via <https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-2019>.

¹⁶ OECD (2020) COVID-19 and global value chains: policy options to build more resilient production networks, accessed on 28 July 2020 at (2020)<http://www.oecd.org/coronavirus/policy-responses/covid-19-and-global-value-chains-policy-options-to-build-more-resilient-production-networks-04934ef4/>.

¹⁷ Miroudot, S. and H. Nordström (2019), “Made in the World Revisited”, *RSCAS Applied Network Science Working Paper* No. 2019/84, European University Institute.

¹⁸ Schniederjans, D.G., Curado, C., & Khalajhedayati, M. (2020). Supply chain digitisation trends: An integration of knowledge management. *International Journal of Production Economics*, 220, 107439.

¹⁹ Chalmers, D., Matthews, R., & Hyslop, A. (2019). Blockchain as an external enabler of new venture ideas: Digital entrepreneurs and the disintermediation of the global music industry. *Journal of Business Research*.

²⁰ Bibby, L., & Dehe, B. (2018). Defining and assessing industry 4.0 maturity levels—case of the defence sector. *Production Planning & Control*, 29(12), 1030-1043.

²¹ Fatorachian, H., & Kazemi, H. (2018). A critical investigation of industry 4.0 in manufacturing: Theoretical operationalisation framework. *Production Planning & Control*, 29(8), 633-644.

²² Sivarajah, U., Kamal, M.M., Irani, Z., & Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research*, 70, 263-286.

²³ Yasmin, M., Tatoglu, E., Kilic, H.S., Zaim, S., & Delen, D. (2020). Big data analytics capabilities and firm performance: An integrated MCDM approach. *Journal of Business Research*, 114, 1-15.

and the Internet of Things. With the adoption of these emerging technologies, complex GVC activities will be reshaped and reimagined (World Bank, 2016)²⁴.

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 specialized interdependent units of the production process, small and medium-sized enterprises (SMEs) have also become more globalized. Even during the broader productivity slowdown in the advanced economies over recent years, they 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)²⁵.

SMEs face a range of challenges including limited access to resources and finance for new investments and typically lower skills related to management, information and technology, as well as lower levels of productivity, thus making it harder for them to grow and scale globally (Gonzalez et al. 2019)²⁶. GVCs can help SMEs access better and cheaper inputs to increase their global presence and competitiveness, and offer new opportunities through ‘smart specialization’ 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 competitive advantage in global ecosystems (OECD, 2008)²⁷.

To maximize the potential gains for SMEs, a holistic approach is crucial, particularly one that combines high quality management, investment in 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

²⁴ WorldBank (2019) The Global Value Chain Development Report Technological Innovation, Supply Chain trade, and Workers in a Globalized world (2019) accessed via <https://www.worldbank.org/en/topic/trade/publication/global-value-chain-development-report-2019>.

²⁵ López González, J, Munro, L, Gourdon, J, Mazzini, G, and Andrenelli, A. (2019), “Participation and benefits of SMEs in GVCs in Southeast Asia”, OECD Trade Policy Papers, No. 231, OECD Publishing, Paris. <http://dx.doi.org/10.1787/3f5f2618-en>

²⁶ López González, J, Munro, L, Gourdon, J, Mazzini, G, and Andrenelli, A. (2019), “Participation and benefits of SMEs in GVCs in Southeast Asia”, OECD Trade Policy Papers, No. 231, OECD Publishing, Paris. <http://dx.doi.org/10.1787/3f5f2618-en>

²⁷ OECD (2008), *Enhancing the Role of SMEs in Global Value Chains*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264051034-en>.

(Schoemaker, 2018)²⁸. 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 Economist, 2020)²⁹.

For some time GVCs have been hailed as “the world economy’s backbone and central nervous system” (Cattaneo, Gereffi, & Staritz, 2010, p. 7)³⁰ and they are recognized 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)³¹. 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, & Sturgeon, 2005)³².

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)³³ 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 characterized as more a policy failure than a market failure necessitating more resilient supply chains and diversified sourcing patterns (Gereffi, 2020)³⁴. Whilst in other similar health-related crises, such as the SARS, Ebola and Swine Flu, 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

²⁸ Schoemaker, P. J. H., Heaton, S. and Teece, D (2018) Innovation, Dynamic Capabilities, and Leadership. *California Management Review* 2018, Vol. 61(1) 15–42.

²⁹ The changes covid-19 is forcing on to business. (2020). *The Economist*. Retrieved 1 August 2020 from <https://www.economist.com/briefing/2020/04/11/the-changes-covid-19-is-forcing-on-to-business>

³⁰ Cattaneo, O., Gereffi, G., & Staritz, C. (2010). *Global value chains in a postcrisis world: A development perspective*. Washington, DC: The World Bank.

³¹ Lund, S., Manyika, J., Woetzel, J. Barriball, E., Krishnan, M., Alicke, K., Birshan, M., George, K., Smit, S., Swan, D. and Hutzler, K. (2020). Risk, Resilience, and rebalancing in global value chains, A McKinsey Report. See <https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains?cid=other-eml-alt-mip-mck&hlkid=613f28d440d54d8fbd394c7d3eb20aca&hctky=2749456&hdpid=6f558006-aeb4-489b-9c38-d1d9421f2077>

³² Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, 12(1), 78-104.

³³ The World Health Organization (WHO) (2020). Novel coronavirus (2019-ncov) situation report – 18 [Press release]. Retrieved 2 August 2020 from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200207-sitrep-18-ncov.pdf?sfvrsn=fa644293_2

³⁴ Gereffi, G (2020). What does the COVID-19 pandemic teach us about global value chains? The case of medical supplies. *Journal of International Business Policy* (2020) 3, 287–301 © 2020 Academy of International Business All rights reserved 2522-0691/20.

socioeconomic disruptions (Gupta, 2020)³⁵ where “companies need an understanding of their exposure, vulnerabilities, and potential losses to inform reliance strategies” (Lund et al, 2020)³⁶.

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)³⁷. 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 digitalization, 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 globalization 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 organizations (Harari, 2020)³⁸. While it is not possible to predict exactly how globalization 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.

The Editors

(Renu Agarwal, Christopher Bajada, Roy Green and Katrina Skellern)

³⁵ Gupta, A. (Producer). (2020). After covid: The new normal webinar. Retrieved 7 August 2020 from <https://www.youtube.com/watch?v=uqBqSII3ItU&app=desktop>.

³⁶ Lund, S., Manyika, J., Woetzel, J. Barriball, E., Krishnan, M., Alicke, K., Birshan, M., George, K., Smit, S., Swan, D. and Hutzler, K. (2020). Risk, Resilience, and rebalancing in global value chains, A McKinsey Report. See <https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains?cid=other-eml-alt-mip-mck&hlkid=613f28d440d54d8fbd394c7d3eb20aca&hctky=2749456&hdpid=6f558006-aeb4-489b-9c38-d1d9421f2077>

³⁷ Green, R (2020). 'Making it in Australia', in Dawson, E. & McCalman, J. (eds) *What Happens Next? Reconstructing Australia after COVID-19*. Melbourne University Publishing.

³⁸ Harari, Y. N. (2020). The world after Coronavirus. Retrieved 7 August, 2020 from <https://www.ft.com/content/19d90308-6858-11ea-a3c9-1fe6fedcca75>.

Handbook Structure

The *Routledge Companion to Global Value Chain: reinterpreting and reimagining mega trends in the world economy* is organised into five parts that draw together key insights into the mega trends driving global value chains which are themed as follows:

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

As evident from above, 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.

The Contributions

Part 1 History of Global Value Chains

The Companion on Global Value Chains commences in Part I with the theme *History of Global Value Chains*. Before being able to understand the changing nature of global value chains, it is paramount to first understand of how global value chains have evolved.

In the chapter “The development of the discipline and historical trends; global supply chain, manufacturing and services historiography; and operations and global value chains”, Godsell outlines how global supply chains throughout history have undergone substantial change adapting to the many different innovations that ultimately have shaped this trajectory. Godsell provides an overview of the history of supply chains, from ancient times to more recent times, and discusses some trends that will determine the nature of supply chains of the future.

Part 2 Global Value Chains : Theory and Practice

The Companion then turns to reviewing *Global Value Chains – Theory and Practice* in Part 2.

Part 2 commences with Gattorna’s chapter titled “The use of requisite collaboration to align and drive value in contemporary value chains” . The days of ‘one-size-fits all are dead and buried. We now know that customers and consumers in all market-product combinations exhibit several different buying behaviours, and suppliers in each case have to find ways to align with these, and move between these buying behaviours. One buying behaviour (Collaborative) in particular has been largely ignored to date, yet it promises significant rewards to suppliers who recognise the opportunity, and pay special attention to their genuinely collaborative customers. It is a subset of the Transactional segment, served by the Lean SC type. Gattorna discusses what a genuine collaborative supply chain looks like in design terms, and how it can be implemented successfully in practice by shaping the appropriate underlying subculture. Examples and a short case study are used to support this explanation.

In Chapter 3 Arndt et. al., go on to discuss dynamic capability building in global value chains. Organisational Dynamic Capabilities (ODCs) and Global Value Chains (GVCs) are currently hot issues in strategy and management, but not yet cross-fertilised. Drawing on earlier work by Pitelis and Teece (2010) that has defined ecosystem co-creation as the mother of all DCs, Arndt et. al., argue that a key constituent part of successful GVC creation and management involves the purposeful development and leverage of good for purpose ODCs-thereafter ODCs4GVCs. They go on to look at how the traditional functions of ODCs, namely sensing, seizing and reconfiguring/maintaining, are applied in the case of ODCs4GVCs, how they are modified for the purpose in question and how they can be developed and leveraged to create Sustainable Competitive Advantage (SCA).

In Chapter 4, Skellern and Markey bring the theme of sustainability to the forefront of global value chain in their chapter titled “Interfirm customer-supplier collaboration for a sustainable transition”. The transition literature has given little attention to the role that interfirm customer-supplier relationships might play in sustainable projects. This chapter draws on the contributions from technological innovation systems and sustainable collaboration literature to examine whether and how collaborations between the customer-supplier in a traditional

manufacturing context can influence a shift towards a sustainable transition. An analysis of four cases of collaborations between the supplier (manufacturer) and the customer (original equipment manufacturer or OEM) highlight that a collaborative alliance can indeed influence a shift of the traditional manufacturing mind-set. By blending regional and extra-regional proximity, this transition is achieved by employing seven key resource formation processes: a direction and vision for sustainability, knowledge creation and diffusion, market-niche formation, resource investment, creation of legitimacy, demand articulation and policy coordination.

In Chapter 5, titled “Building Climate-Resilient Supply Chain” by Dubey et. al., discuss the climate-resilient supply chain that is becoming increasingly important for its impact on sustainability. Growing complexity and increased supply chain disruptions have raised questions for supply chain managers with limited answers from current literature. To answer these questions and explain resilience in supply chain networks, we conceptualized a theoretical framework firmly grounded in resource-based view (RBV) and relationship theories. A survey instrument was developed with data collected from 250 Indian manufacturing organizations for testing eleven research hypotheses. The authors tested their theoretical model using confirmatory factor analysis (CFA) as well as tested their research hypotheses using hierarchical regression analyses, and interaction effect using hierarchical moderation regression analysis. Supply chain visibility and cooperation have a significant impact on supply chain resilience. The results offer a more nuanced understanding of the implications of: supply chain resilience, visibility, cooperation, trust, commitment, behavioral uncertainty, and addressing the crucial question of why resources and capabilities have limited benefits under external influences.

Part 3 Role of Emerging Technologies and Data Analytics in Global Value Chains

The theme of Part 3 focuses on *the role of emerging technologies and data analytics in global value chains* .

In Chapter 6 Padman, et. al., introduces “Integration of ICT systems and processes” which draws upon the illustrative example from healthcare delivery to highlight some opportunities with analytics in patient safety initiatives and implications for healthcare supply chains. The emerging mega trends in healthcare and continuing digital transformation of the healthcare sector worldwide has opened up new opportunities to improve healthcare delivery and this paper introduces these new perspectives.

In Chapter 7, Krishnan et. al., discuss “Blockchain and Allied Technologies for Food Supply Chain Risk Mitigation”. Globalisation of value chain activities, such as sourcing, design, production, distribution and marketing have improved the benefits and opportunities to the stakeholders. However, this has also increased the associated risks due to the complexity and involvement of too many entities. This, especially, matters in food and agricultural value chains, which are facing a number of challenges, including a lack of transparency, variation in quality, high price fluctuation, different government regulations, etc. Underpinning this megatrend and its associated risks, managing Global Food Value Chain (GFVC) risks using advanced technologies is becoming important for transformation. Considered as one of the most

disruptive technologies of recent times, the impact of blockchain in integration with internet of things and big data analytics ought to be crucial to managing risks in the GFVC. This study is among the few to identify the potential risks associated with GFVC and explores the significant roles of blockchain and its allied technologies in mitigating the identified global food value chain risks.

In Chapter 8, Agarwal, et. al., discuss the “Rise of new management practices and business models as a consequence of technological, process and systems change, and organisational transformations”. In this chapter, the authors review the recent trends in management practices for global value chains. They investigate the megatrends in emerging technologies in global value chains and examine the implications this has on the management practices within organisations.

In the final chapter of Part 2, Happy et al. illustrate “A multi-criteria decision model for mitigating block chain adoption challenges in supply chain” which is proving to be a game changer in supply chain management, with expectations that it may change the competitive landscape with the global business arena. The authors use study findings to develop a conceptual model after which, Fuzzy-Analytical hierarchy process (AHP) is used to prioritize challenges using expert opinion. Theoretical and managerial significance are employed.

Two case studies conclude Part 3. The first case study, “Internet Of Things (IoT) Enabled Smart Solutions For Agri-Food Supply Chain Management: A New Zealand Case” by Zhong and Zhang. This case study outlines IoT-enabled ASCM consisting of three components: smart farming, smart logistics, and smart supply chain visibility and traceability. The second case study “Zespri global supply chain integration” by Childerhouse and Zhang . Stresses the importance of effective supply chain management in the horticultural industry.

Part 4 Megatrends in Global Value Chains

Part 4 illustrates *the main megatrends in global value chains*. In Chapter 10, Wixted and Bliemel illustrate “Global value chains are not always global – the ‘global factory’ and ‘exo-net’ value architectures”. Despite, a burgeoning genre of analysis focussed on global value chains (GVCs), there is still yet to emerge a clear picture of their geographic structure or indeed how their pattern differs between ‘industries’. The lack of clarity extends to questioning whether GVCs are truly global, or only regionalised. This study uses inter-country input-output data to develop a ‘global value architectures’ analysis across 22 industries. We reframe each industry as a trade complex, which considers the supply of foreign value added from inter-country and inter-industry sources. This meso-level of analysis sits between the micro-level (e.g. firm or product) and macro-level (aggregated national trade) and enables industry specific insights in a global context. Our analysis of the 22 trade complexes reveals three distinct archetypes of what we call Global Value Architectures (GVAs). The GVA archetypes include the sparsely interconnected ‘exo-nets,’ the globally highly interconnected ‘global factory,’ and a ‘fusion’ archetype that is interconnected within regions with few inter-regional ties. The GVA has implications for how global value chains and trade relations can be managed by individual firms

or on behalf of sectors by their government representatives, as elaborated in the accompanying case study.

In Chapter 11, Bliemel, Wixted and Roos go on to “link the interconnectedness and innovativeness of global value chains”. There is a strong conceptual link between the structure of Global Value Chains (GVCs) and innovativeness. However, evidence of the link has largely been limited to the study of GVCs in industries that are purported to be innovative, and the studies have largely been at the level of an individual firm or product. This sampling bias and level of analysis creates a lack of an objective measure of innovativeness which would enable generalisation to other firms in a given industry and with which to perform inter-industry comparison. This chapter extends the typology of Global Value Architectures (GVA) by Wixted and Bliemel to use the same trade data to quantify the structures of 22 industry complexes via a measure of significant sourcing pathways per economy (SPE). We use the SPE results to rank the industries according to their level of interconnectedness and then reveal how this measure of trade complex structure correlates to well-established innovation measures based on R&D intensity, alliancing, and modularity. These correlations suggest that measures of trade in GVCs are complementary to these innovativeness measures. We thus propose that these innovativeness measures can be replaced by ours, as it is a more objective, replicable and thus reliable measures of innovativeness which also explicitly accounts for the dispersion of innovation across regions thereby representing the aggregate structure of all GVCs of a given industry.

Next in chapter 12, “Maximizing the Developmental Benefits of GVC Integration while Addressing Emerging Challenges” is prepared by Engel, Taglioni and Winkler. Illustrating how countries engage with GVCs determines how much they benefit from them. For an effective and sustainable strategy of GVC participation, governments must identify key binding constraints and design the necessary policy and regulatory interventions, including investing in infrastructure and capacity building. Countries that understand the opportunities that GVCs offer and adopt the appropriate policies to mitigate the risks associated with them have the opportunity—through GVCs—to boost employment and productivity in agriculture, manufacturing, and services. The new policy framework that allows developing countries to maximize the gains from GVC integration is one in which a “whole of supply chain approach” must be adopted. This reflects the fact that in a world economy where GVCs play a dominant role, imports matter as much as, if not more than, exports, and in which the flows of goods, services, people, ideas, and capital are interdependent and must be assessed jointly. However, within the context of increased automation in many of the entry stages of GVC production in most industries, as well as rising protectionism in advanced countries, developing countries’ efforts to engage and upgrade in GVCs face a more challenging global trading landscape than in the past.

Chapter 13 titled “SME Participation in GVCs and FTAs: A firm-level perspective” is next presented by Arudchelvan and Wignaraja. This chapter undertakes a comparative, micro-level analysis of joining global supply chain trade in selected developing Asian economies to improve our understanding of fragmentation of manufacturing across borders. It uses a large scale firm-level dataset collected by the World Bank to investigate micro-level behaviour in supply chains

in developing Asian economies and explore policy implications. The findings suggests that firm size (reflecting economies of scale to overcome entry costs) matters for joining supply chain trade with large firms playing the dominant role in Asian economies. Meanwhile, small and medium-sized enterprises (SMEs) make a small contribution to supply chain trade relatively to the sectors employment contribution. However, firm size is not the whole story. Efficiency—particularly investment in building technological capabilities and skills—and access to commercial bank credit also influence joining supply chain trade. The chapter suggests that governments can facilitate SMEs joining supply chain trade through a market-oriented strategy, modern physical infrastructure, streamlined regulations and efficient business support services.

Following, “Global Value Chains and Least Developed Countries: Influencing Value Chain Governance and Upgrading Processes” is discussed in Chapter 14 by Keane. Whilst the mainstream literature posits a range of new trade opportunities created by the fragmentation of global production and increase in intermediate goods trade, there is a notable absence of critical reflection on contemporaneous upgrading processes within Global Value Chains (GVCs) and role of international support measures. The absence of critical reflection is surprising in view of the automaticity of upgrading processes posited through GVC participation. The available empirical evidence, explored in this paper drawn from comparative GVC case-studies of the participation by selected Least Developed Countries (LDCs) is more suggestive of upgrading avenues closed rather than opened. Within this context, the upgrading process for LDCs trading within contemporary GVCs requires bridging divergent governance structures, demanding heightened governance capabilities. This pressure demands a commensurate response from the international support architecture, not all aspects of which are adequately reflected in the recent universal adoption of the Sustainable Development Goals.

Debacker and Miroudot in Chapter 15 titled “Map GVCs, services and intangible assets”. The chapter first reviews the recent developments in input-output analysis and discuss the new indicators available for researchers together with their strength and weaknesses. Using the World Input-Output Database (WIOD) - 43 countries and 56 industries over the period 2000-2014 - the chapter then uses some of these indicators to provide a broad mapping of GVCs, focusing on dispersion of income along the value chain and what is the role of different countries and industries. Debacker and Miroudot then discuss three determinants of income in GVCs: the role of services and how in particular wholesale and retail as well as interactions with customers shape some value chains, the role of intellectual assets and how income is also captured or maintained in other segments of the value-chain on the basis of intangible capital, and the role of business ecosystems and how co-operative value chains as opposed to captive value chains offer an alternative model to create and retain value in GVCs. In a final section, the chapter draws some implications from the new findings.

Next, Zhao, et al. in Chapter 16 discuss “Global Value Chain at a crossroad: a trade and investment perspective”. Global trade and investment have been key factors in shaping GVCs. The current stagnation of trade is a concern at the global level. The estimated trade growth at 1.7% and global GDP growth at 2.2% in 2016 are the lowest since the financial crisis of 2009. The contribution of trade to output growth seems to be at a stake after having experienced a trade growth that doubled that of global GDP during 1985-2007, which was still barely standing

during the last four years. However, globalization is taking new forms and with that trade and GVCs. Structural transformations such as the shortening of GVCs, digitalization of trade and servicification, among others, might be playing a role in trade slowdown.

The final Chapter 17 rounding out Part 4 is from Matthews, “Industrial strategy, innovation and Global Value Chains”. This chapter assesses a broad range of literature in order to take stock of current understanding of the relationships between industrial strategy, innovation and Global Value Chains (GVCs). The aim is to focus attention on these important relationships and to suggest a way forward in improving our understanding of how GVCs are shaped by, and also shape, national industrial strategies and innovation performance. As such, a set of issues are addressed in combination in a way that is relatively unusual. In highlighting these important connections, the intention is that the future treatment of industrial strategy, innovation and GVCs will be less fragmented and, as a result, more accurately reflect political, economic and technological realities. Given the breadth of the literature covered in this practitioner-oriented ‘stocktake’, which must cover work on industrial strategy, innovation and GVCs, the flow of the argument has not been disruptive with exhaustive references to the literature. An extensive list of the sources drawn upon is provided in the References. The aim is to distil the main messages and lessons from the broad body of literature in order to focus on how best to move forward in the future when translating this academic understanding into practical initiatives.

Two case studies are presented to complete Part 4. Case study one looks at “Meso-level GVC analysis of Korean shipbuilding by Wixted and Bliemel”. Korean trade policy makers are concerned with increased talk about trade wars and the impact of trade tariffs on one of the country’s major industries, shipbuilding. To understand which countries to target for specific trade policies, the first challenge is to understand who their significant trade partners are for this industry (in this case the suppliers of input to shipbuilding, not the buyers of finished vessels).

Case study two explores “GVC vulnerability to disruption” with Bliemel, Wixted and Roos. Despite the benefits of modularization and highly-interconnected GVC, recent natural disasters have provided evidence that global supply chains can be quite vulnerable to interruptions.

Finally, Part five draws the chapters and perspectives together to consider implications for global value chains. In this summary chapter, Melnyk et al explore how the developments discussed in this book apply to supply chain management practitioners and researchers. To do so, the following questions are the focus: What changes are taking place in the supply chain due to the factors discussed in this book? How will these changes affect the theory and practice of supply chain management?

Lastly, the Epilogue by the editors Agarwal, Bajada, Green and Skellern summarises the achievements and serves as a conclusion to what has been presented in this handbook.

Acknowledgements

Authors' biography

Part 1 – History of Global Value Chains

1. PAST, PRESENT, AND FUTURE OF SUPPLY CHAINS

Professor Janet Goodsell and Dr Donato Masi

Biography

Professor Jan Goodsell 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, Professor Goodsell 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 R&D, customer logistics, purchasing and manufacturing.

Professor Goodsell is a Chartered Engineer and Member of the IMechE. She is on the board and scientific committee of EurOMA (European Operations Management Association), the cabinet of the UK roundtable of CSCMP (Council of Supply Chain Management Professionals) and the manufacturing steering committee of the IMechE. She is on the editorial board of 3 journals, including the International Journal of Operations and Production Management, and she is an advocate for improving the uptake of STEM subjects by school children.

Dr Donato Masi is Senior Lecturer in Operations Management at Aston Business School in Birmingham. He holds a PhD degree 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 the top ranked international journals for this area. He actively collaborates with industry through private and public 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.

Abstract

Global supply chains have gone under substantial changes over the history. Different ways of exchanging materials, information, and money shaped the nature of supply chains, with profound implications on the people involved. The innovations that radically changed the nature of supply chains range from new transportation means like ocean vessels to containerization and computerization. In parallel with these technological innovation, societal changes and macro-economic transformations also had profound implications on the nature of supply chains. This chapter will provide an overview of the history of supply chains, from ancient times to modern times, and will discuss some trends that will determine the nature of the supply chains of the future.

Part 2 – Theory and practice in GVCs

The use of *requisite* collaboration to better align and drive value in contemporary value chains

Professor John Gattorna

Biography

John Gattorna is unique among thought leaders in the supply chain space. John continues to define and refine his insight and wisdom regarding how to design supply chains and organisations around the concept of segmented demand signals.

Abstract

The days of 'one-size-fits-all' are dead and buried. We now know that customers and consumers in all market-product combinations exhibit different buying behaviours depending on the particular product/service category. Suppliers in each case have to find ways to align with these differing buying behaviours, and the movement between them. One buying behaviour (Collaborative) in particular has been largely ignored to date, yet it promises significant rewards to suppliers who recognise the opportunity, and pay special attention to their genuinely collaborative customers. It is a subset of the Transactional buying behaviour segment, which is itself served by the Lean supply chain type. This chapter will go deep into what a genuine Collaborative Supply Chain looks like in design terms, and how it can be implemented successfully in practice by shaping the appropriate underlying subculture to drive the appropriate operational strategies.

Dynamic Capabilities for Global Value Chains: From Selection to Deployment

Felix Arndt, Mile Katic, Anushree Mistry, Sarwat Nafei

Biography

Felix Arndt

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. Dr 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 how entrepreneurs overcome extreme challenge (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*, the *Journal of Business Ethics*, the *Journal of Business Venturing Insights*, *Industrial and Corporate Change*, *Entrepreneurship and Regional Development*, *Technological Forecasting and Social Change*, *Technovation* among others. Teaching has been a passion and privilege. Felix has taught in top MBA and EMBA programs around the world. He was involved in the foundation of several entrepreneurship centers, entrepreneurship and executive programs teaching a range of topics from innovation, entrepreneurship, strategy, leadership to international business. Felix 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. Felix is a recognized 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, Felix has been affiliated to universities in the UK (Leicester Castle Business School), USA (Wharton School), China (University of Nottingham) in various faculty and director positions. He has appeared in print, radio and TV media outlets.

Mile is currently undertaking a PhD research project concerning Engineer to Order (ETO) manufacturing operations and strategy. His academic interests are inspired by professional experience in the Australian manufacturing industry as a project engineer specialising in one-off bespoke manufacturing projects in a wide range of industrial contexts. This also feeds into a keen interest in other organisational aspects of project-based manufacturing including business model innovation, project/portfolio management, operations strategy, quality management as well as leadership. Mile is also an active member of the School of Information, Systems and Modelling at the University of Technology Sydney as a casual academic

Dr Anushree Mistry has recently completed her PhD in Engineering with a focus on Complex Systems and Energy Systems with a view to providing policy recommendations. Anushree 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 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. Anushree is open to collaboration and co-authorship in research projects involving complex systems and policy decision-making.

Sarwat 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 big4 firms (i.e Deloitte, EY, &KPMG) lately he was the Vice President for National Cybersecurity CGI-Canada (one of the largest Multinational IT corporations). He also served at the cybersecurity committee of the International Telecom Union a UN organization. He has a degree in Electrical Engineering, MBA, and currently Phd researcher at Leicester Castle Business school. He holds multiple industry certification including, a certified information system security professional (CISSP), certified information system auditor (CISA), PSEC System Engineer and was the head of the International Association of Privacy Professionals chapter (IAPP). He has always a passion for education and taught at well ranked universities i.e York university, American university and others. 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.

Abstract

The participation in global value chains (GVCs) has become an increasingly necessary and (potentially) lucrative endeavour for organisations operating in today's markets. As the 2020 pandemic shows, this endeavour is not of a trivial nature. Whilst the rise in "born global" enterprises, open innovation practices and inter-organisational collaboration spurred on a raft of literature that seeks to explicate the nature of capability investments in GVCs (vis a vis multinational enterprise, international business and so forth), the increasingly volatile and uncertain environments that recently came to characterise GVCs have become a pressing concern. Bifurcated governance and decoupling of value chains appears the norm as organisations continue to navigate the volatile and uncertain environment that places increased complexity to collaboration efforts amongst GVC members. Co-specialisation and co-creation remain key areas of concern for organisations operating on a global level, thus identifying new areas of growth, orchestrating the necessary capabilities to facilitate constantly emerging and changing opportunities and reconfiguring the organisation to address these opportunities become pertinent for survival and prosperity. Building on earlier work on dynamic capabilities in MNE (Pitelis and Teece, 2010) as well as emerging research in dynamic capabilities (DC) in volatile and uncertain environments (Schoemaker et al.

2018 Petricevic and Teece, 2019) we seek to clarify the DC that help organisation survive in, and leverage, GVCs. We shed light on capability selection and deployment in GVCs in today's times. Leveraging GVCs better than others has become the grail to competitiveness. In times of ecosystem competition, this has become an increasingly complex task that merits further investigation and makes this chapter most timely.

Interfirm customer-supplier collaboration for a sustainable transition

Dr Katrina Skellern and Professor Ray Markey

Biography

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

Professor 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 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 (2006-11) as well as Associate Dean Research (2006-9). 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.

Abstract

Drawing on technological innovation systems and global sustainable collaboration literature, this article examines the role of interfirm collaborations between the customer-supplier in influencing sustainable transition in a traditional manufacturing context. The role that interfirm customer-supplier relationships might play in building sustainable global value chains has received little attention previously. We analyse four Australian cases of collaborations between the supplier (manufacturer) and the customer (original equipment manufacturer or OEM), demonstrating that a collaborative alliance can indeed influence a shift of the traditional manufacturing mind-set towards reconfiguring its value chain. By blending regional and extra-regional proximity, this transition is achieved by employing seven key resource formation processes: a direction and vision for sustainability, knowledge creation and diffusion, market-niche formation, resource investment, creation of legitimacy, demand articulation and policy coordination.

Climate-Resilient Supply Chains: A Resource Based View

Rameshwar Dubey, Cyril Foropon and V G Venkatesh

Biography

Dr. Rameshwar Dubey is a Reader-Operations Management at Liverpool Business School. Rameshwar is also a Senior Editor of International Journal of Physical Distribution and Logistics Management and Associate Editors of 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 Liverpool Business School, Rameshwar was a full time Associate Professor-Supply Chain Management at Montpellier Business School, Montpellier, France which he still associated as an Affiliate Professor. He also has taught at some of the leading international school which includes Indian Institute of Management, Jammu, India, the Faculty of Engineering, UNESP, Bauru, SP, 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. Rameshwar research interests include supply chain management, operations management and business analytics with strong focus on humanitarian operations management, sustainable supply chain management, supply chain design issues and application of emerging technologies in disaster relief operations. Rameshwar has published some of the most cited papers in 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 and Technological Forecasting and Social Change and Management Decision. For his academic work, Rameshwar has received several awards: outstanding reviewer award International Journal of Production Economics, Journal of Business Research, Journal of Cleaner Production, best reviewer award Journal of Humanitarian Logistics and Supply Chain Management (2014, 2016), Management Decision (2018) and received a title on 8th November 2019 at Bauru, SP, 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. Rameshwar is an active member of several professional societies, active reviewer of over 75 leading international scientific journals, reviewer of PhD thesis and other professional bodies engaged in dissemination of grant.

Dr. Cyril Foroapon is Full Professor of Operations and Supply Chain Management, and the 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 organizations, quality management practices within ISO 9000 candidate organizations, process management within humanitarian non-governmental organizations, 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, TFSC, amongst other leading academic journals. He serves as an Associate Editor of Global Journal of Flexible Systems Management. Cyril is the Director of Doctorate in Business Administration (DBA) Programs at MBS offered successfully in China and Tunisia.

Dr. 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.

Abstract

The climate-resilient supply chain is increasingly important for its impact on sustainability. Growing complexity and increased supply chain disruptions have raised questions for supply chain managers with limited answers from current literature. To answer these questions and explain resilience in supply chain networks, we conceptualized a theoretical framework firmly grounded in resource-based view (RBV) and relationship theories. A survey instrument was scientifically developed with data collected from 250 Indian manufacturing organizations for testing eleven research hypotheses. We tested our theoretical model using confirmatory factor analysis (CFA). We further tested our research hypotheses using hierarchical regression analyses, and interaction effect using hierarchical moderation regression analysis. Supply chain visibility and coordination have a significant impact on supply chain resilience. The results offer a more nuanced understanding of the implications of: supply chain resilience, visibility, coordination, trust, commitment, behavioral uncertainty, and addressing the crucial question of why resources and capabilities have limited benefits under external influences.

Part 3 – Role of Emerging Technologies and Data Analytics in GVCs

Integration of ICT Systems and Processes: Supply Chain, Process Management and Patient Safety with Data Analytics to Enhance Healthcare Delivery

Rema Padman, Ramesh Krishnan and Renu Agarwal

Biography

Dr 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, USA. She is also Thrust Leader of Healthcare Informatics Research at iLab and 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 modeling 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 behavioral 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 organizations. She has also served on proposal review panels of US and international funding agencies, and received funding from federal agencies and foundations. Becker's Hospital Review recognized 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.

Mr Ramesh Krishnan is currently doing Joint PhD at 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 International Journal of

Production Research, Journal of Cleaner Production, Cleaner Technology and Environmental Policy and Total Quality Management and Business Excellence. He has also reviewed articles for International Journal of Production Research, Computer and Industrial Engineering and International Journal of Lean Six Sigma. He has obtained his Masters degree in Industrial Engineering from National Institute of Technology, Tiruchirappalli, India. and Bachelors degree in Mechanical Engineering from Anna University, Tiruchirappalli, India.

Dr Renu Agarwal is an Associate Professor, Operations and Supply Chain Management in the Management Discipline Group, UTS Business School. She is currently the Director of Strategic Supply Chain Management Programs and in these roles 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. Renu 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. Renu has published in many top tier international, has edited The Handbook Service Innovation published by Springer-Verlag UK, and the Global Value Chains, Flexibility and Sustainability edited book published by Springer. Renu is amidst editing a book on Innovation and Creativity as part of the new Routledge Series Key Ideas in Business and Management in 2021.

Abstract

The emerging mega trends in healthcare and continuing digital transformation of the healthcare sector worldwide has opened up new opportunities to improve healthcare delivery as well as financial, organizational and health outcomes from many perspectives. In the context of global supply chains, the convergence of supply chain technologies, data analytics and availability of vast amounts of digital data from devices and software tools have made possible both the adaptation of people-process-technology strategies to new healthcare delivery requirements, but have also accelerated operational efficiencies in care delivery and improved access to quality healthcare and actionable data. Integrating and streamlining healthcare supply chains with Internet of Things (IoT) devices and sensors and leveraging the resulting data for advanced analytics at the point of decision making has the potential to provide healthcare professionals with actionable insights for planning and strategic decision-making, for both operational improvements and better care delivery. This chapter draws on an illustrative example from healthcare delivery to highlight some opportunities with analytics in patient safety initiatives and implications for healthcare supply chains.

Biography

Mr Ramesh Krishnan is currently doing Joint PhD at 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 International Journal of Production Research, Journal of Cleaner Production, Cleaner Technology and Environmental Policy and Total Quality Management and Business Excellence. He has also reviewed articles for International Journal of Production Research, Computer and Industrial Engineering and International Journal of Lean Six Sigma.

Ms. Yen Phan is a third year PhD student and a Research assistant in the Business school at 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 system at 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 System. She was a core member of E-commerce project at Vietnam National University and co-authored a book "Electronic commerce" published by Vietnam National University publisher in 2015.

Dr. Arshinder Kaur is currently working as Professor in the Department of Management Studies, IIT Madras, Chennai. She has worked in Curtin University, Australia for 1 year in Curtin Business School in 2014 as Senior Lecturer. She has more than 35 publications in reputed international journals like Omega, J. of Cleaner Production, Int. J. 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, Sustainable and food supply chain. She has coordinated many industry programmes.

Dr Sanjoy Paul is currently working as a 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 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, Journal of Intelligent Manufacturing and so on. He is also an active reviewer of many reputed journals. Dr Paul has received several awards in his career, including ASOR Rising Star Award to recognise early career researchers in operations research, Excellence in Early Career Research Award from the UTS Business School, the Stephen Fester prize for most outstanding thesis, and high impact publications award from UNSW. His

research interest includes supply chain risk management, modelling, applied operations research, and intelligent decision making.

Abstract

Over the past decades, there has been a megatrend regarding the international diffusion of value chain activities, such as sourcing, design, production, distribution and marketing. This leads to a notion of global value chains (GVCs), in which all the value chain activities are distributed globally. GVCs have altered the nature of specialisation and production in many sectors regarding the selection of best practices and producers, reduction of cost, availability of raw materials and improvement in quality, of both input and output, across the global chain. Although such huge benefits and opportunities can be achieved, the associated risks are also increased due to the complexity and involvement of too many entities in the GVC network. This, especially, matters in food and agricultural value chains, which are facing a number of challenges, such as high trade barriers, strict government regulations, changing climate conditions, fluctuations in supply and demand, as well as high risks associated with food security and safety.

Underpinning this megatrend and its associated risks, managing global food value chain risks using advanced technologies is becoming important for GVC transformation. Considered as one of the most disruptive technologies of recent times, the impact of blockchain ought to be crucial to managing risks in the global food value chain. In order to make full use of blockchain, the technology is usually integrated with other innovative and emerging technologies, such as the Internet of Things (IoT) and big data analytics. This combination is driving a revolution in which firms are strengthening their GVCs' through mitigating risks, consequently creating the safety and complete integrity of the value chains. This study is, therefore, among the few to identify the potential risks associated with GVC and explore the significant roles of blockchain and its allied technologies in mitigating the identified global food value chain risks.

Technological Trends and Future Management Practices in Global Value Chains

Assoc Prof Renu Agarwal, Chris Bajada, Mile Katic and Manjot Bhatia

Biography

Dr Renu Agarwal is an Associate Professor, Operations and Supply Chain Management in the Management Discipline Group, UTS Business School. She is currently the Director of Strategic Supply Chain Management Programs and in these roles 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. Renu 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. Renu has published in many top tier international, has edited The Handbook Service Innovation published by Springer-Verlag UK, and the Global Value Chains, Flexibility and Sustainability edited book published by Springer. Renu is amidst editing a book on

Innovation and Creativity as part of the new Routledge Series Key Ideas in Business and Management in 2021.

Dr. Christopher Bajada is Associate Professor of Economics at the University of Technology Sydney. Chris has previously been the Associate Dean (Education) and Chair of the University's Teaching and Learning Committee. Chris 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. Chris' research is primarily in applied macroeconomics, with a special interest in management practices, tax compliance, circular economy, productivity and curriculum design. Chris has published several research books, academic textbooks and refereed journal articles in highly reputable economics journals. Chris 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.

Mile Katic Has Completed A Phd Research Project In The School Of Information, Systems And Modelling Within The University Of Technology Sydney. His Research Interests Extend Towards Manufacturing Strategy, Organisational Ambidexterity And The Role Of Firm-Level Capabilities And Resources In Organisational Performance Outcomes.

Manjot Singh Bhatia is working as 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: International Journal of Production Research, Production Planning and Control, IEEE Transactions on Engineering Management, Annals of Operations Research, etc. His current research areas include: Closed Loop supply chain, Industry 4.0, Blockchain and sustainability.

Abstract

Recent advancements in technology such as the internet of things, 3D printing, and blockchain will undoubtedly have a disruptive impact on the business models of many organisations. By examining the megatrends in emerging technologies, this chapter will examine the implications these recent advancements in technologies may have on the management practices within organisations. More specifically, this chapter will consider how these changing management practices may affect the management of global value chains (GVCs). The implications for managers and organisations in developing capabilities to support these changing management practices is fundamentally important for competitively positioning the organisation and contributing effectively within GVCs, and so a discussion on the implication for managers and management practices ensues. The conclusions in this chapter suggest that megatrends in GVCs are critically dependent on emerging technologies, which in turn require appropriate capabilities within an organisation, reflected in the management practices of the firm.

Blockchain Adoption Challenges in Global Supply Chain

Anwara Happy, Kazi Waziur Rahman, Md Maruf Hossan Chowdhury, Mesbahuddin Chowdhury and Moira Scerri

Biography

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 of Philosophy degree in 2020, from Western Sydney University, Sydney, Australia. She received her Master of Business in Operations & Supply Chain Management (Procurement Stream) degree in 2014, from UTS. Anwara has professional experience both in Government and private sectors in Australia and Bangladesh with specialisation in Supply Chain related field. As part of the job, she trained fellow small to medium groups of employees on various aspects of operational issues. Her ten years of experience as a procurement professional in Technicolor Australia (from 2001-2011) provided her with an opportunity to understand profound practical knowledge relating to supply chain management.

Along with the industrial experience, Anwara 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.

Kazi Waziur Rahman is a final year postgraduate student at the University of Technology Sydney (UTS). He is pursuing Master of Strategic Supply Chain program and will be eligible for CIPS (Chartered Institute of Procurement and Supply) membership. He received his Bachelor of business (Major- Management) degree in 2009, from Southern cross university, Australia. He has several years professional experience in Australian retail and Bangladeshi Apparel supply chain segment. He has successfully co-authored two book chapters previously and 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.

Maruf 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. Dr Chowdhury has multiple methodological skills and he worked extensively in different national and international projects. As an expert of supply chain management Dr Chowdhury has taught in different universities of Australia such as University of Technology Sydney, University of Western Australia (UWA) and Curtin University. Dr Chowdhury has professional experiences in different industrial settings such as Textile and Apparel industry, Petroleum refinery and others.

Mesbahuddin Chowdhury, PhD, is a 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 Master in Industrial Management from Katholieke Universiteit Leuven, Belgium. He also served as a Research Fellow in the Department of Accounting at Monash University for 2 years. Mesbahuddin teaches Strategic Management, Operations Management, Purchasing and Supply Chain Management and Business Research Method. He completed Postgraduate Certificate on Tertiary Teaching from University of

Canterbury in 2016. His current research interests are on social capital, supply chain resilience, organizational 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 also published in top tier tourism journals such as Journal of Travel Research, Annals of Tourism Research, and Current Issues in Tourism.

Moira Scerri, PhD, is a 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.

Abstract

Blockchain, is proving to be a game-changer in supply chain management, with expectations it may change the competitive landscape within in the global business arena. In a complex supply chain network blockchain has the potential to address numerous disruptions such as inefficient transactions, fraud, pilferage, , lack of trust, poor information sharing, verifiability all of which leads to inferior supply chain performance. However, there are many impediments hindering the widespread adoption of blockchain in global supply chains. While studies on blockchain technology have gained popularity, the focus on blockchain adoption challenges in global supply chain is lacking. Considering this gap in the literature this study aims to identify and prioritize blockchain adoption challenges in global supply chain through an extensive literature review. We use our findings here, to develop a conceptual model. After which, Fuzzy-Analytical hierarchy process (AHP) is used to prioritize challenges using expert opinion. Theoretical and managerial significance are then discussed.

Case study 1 - Internet Of Things (Iot) Enabled Agri-Food Supply Chain Management: A New Zealand Case

Ray Y Zhong and Abraham Zhang.

Dr. Ray Zhong is an Assistant Professor in the Department of Industrial and Manufacturing Systems Engineering, The University of Hong Kong. He was a Lecturer in The Department of Mechanical Engineering, University of Auckland, New Zealand from June 2016- Jan 2019. Ray gained his M.Phil. and Ph.D. in Signal & Information Processing and Industrial & 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 & SCM and data-driven APS. He has published over 160 research publications (~80 SCI journals and ~80 conference papers). The total citation from Google Scholar is over 4700 with the H-index: 32, i10-index: 70 (Dated: 14 Aug 2020). He got five 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 (HK), IET (UK), IEEE (USA) and LSCM HK. Ray 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.

Abraham Zhang is a 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 the 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, Journal of Cleaner Production, etc. His current research focuses on supply chain sustainability, especially on circular supply chain management and Blockchain based sustainable supply chain management.

Case Study 2 - Zespri global supply chain integration

Professor Paul Childerhouse and Dr Abraham Zhang

Biography

Professor Paul Childerhouse is the Director of Quality and Supply Chain Management at Massey University and one 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 Paul is currently working with scholars from around the world investigating the effects of different national cultures on supply chain management. Together with he's 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.

Abraham Zhang is a 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 the 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, Journal of Cleaner Production, etc. His current research focuses on supply chain sustainability,

especially on circular supply chain management and Blockchain based sustainable supply chain management.

Part 4 – Megatrends in GVCs

Global value chains are not always global – the ‘global factory’ and ‘exo-net’ value architectures

Dr Brian Wixted and Associate Professor Martin Bliemel

Biography

Brian’s research work has focused on cluster and value chains. In STI policy I am interested in the both role of charities in funding research & how our conception of innovation policy needs to change as digital technologies restructure econ & techno-landscapes.

Martin’s research interests include entrepreneurial networks, accelerators, education, research commercialization, 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 \$23m Incubator Support Programme by the Department of Industry. Martin’s research has been published in several prestigious journals including Nature Nanotechnology, Entrepreneurship Theory and Practice, Entrepreneurship & Regional Development, Education+Training, International Journal of Entrepreneurial Behavior & Research, and the Entrepreneurship Research Journal where one of his articles on entrepreneurship education is ERJ’s most downloaded article. Martin 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.

Abstract

Despite, a burgeoning genre of analysis focussed on global value chains (GVCs), there is still yet to emerge a clear picture of their geographic structure or indeed how their pattern differs between ‘industries’. The lack of clarity extends to questioning whether GVCs are truly global, or only regionalised. This study uses inter-country input-output data to develop a ‘global value architectures’ analysis across 22 industries. We reframe each industry as a trade complex, which considers the supply of foreign value added from inter-country and inter-industry sources. This meso-level of analysis sits

between the micro-level (e.g. firm or product) and macro-level (aggregated national trade) and enables industry specific insights in a global context. Our analysis of the 22 trade complexes reveals three distinct archetypes of what we call Global Value Architectures (GVAs). The GVA archetypes include the sparsely interconnected 'exo-nets,' the globally highly interconnected 'global factory,' and a 'fusion' archetype that is interconnected within regions with few inter-regional ties. The GVA has implications for how global value chains and trade relations can be managed by individual firms or on behalf of sectors by their government representatives, as elaborated in the accompanying case study.

Linking the interconnectedness and innovativeness of global value chains

Associate Professor Martin Bliemel, Dr Brian Wixted and Professor Goran Roos

Biography

Martin's research interests include entrepreneurial networks, accelerators, education, research commercialization, 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 \$23m Incubator Support Programme by the Department of Industry. Martin's research has been published in several prestigious journals including Nature Nanotechnology, Entrepreneurship Theory and Practice, Entrepreneurship & Regional Development, Education+Training, International Journal of Entrepreneurial Behavior & Research, and the Entrepreneurship Research Journal where one of his articles on entrepreneurship education is ERJ's most downloaded article. Martin 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.

Brian's research work has focused on cluster and value chains In STI policy I am interested in the both role of charities in funding research & how our conception of innovation policy needs to change as digital technologies restructure econ & techno-landscapes.

Göran Roos is a member of the advisory board for Investment Attraction South Australia, an Invited Chair of 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; Visiting Professor at Australian Industrial Transformation Institute, Flinders University. Göran 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).

Abstract

There is a strong conceptual link between the structure of Global Value Chains (GVCs) and innovativeness. However, evidence of the link has largely been limited to the study of GVCs in industries that are purported to be innovative, and the studies have largely been at the level of an individual firm or product. This sampling bias and level of analysis creates a lack of an objective measure of innovativeness which would enable generalisation to other firms in a given industry and with which to perform inter-industry comparison. This chapter extends the typology of Global Value Architectures (GVA) by Wixted and Bliemel to use the same trade data to quantify the structures of 22 industry

complexes via a measure of significant sourcing pathways per economy (SPE). We use the SPE results to rank the industries according to their level of interconnectedness and then reveal how this measure of trade complex structure correlates to well-established innovation measures based on R&D intensity, alliancing, and modularity. These correlations suggest that measures of trade in GVCs are complementary to these innovativeness measures. We thus propose that these innovativeness measures can be replaced by ours, as it is a more objective, replicable and thus reliable measures of innovativeness which also explicitly accounts for the dispersion of innovation across regions thereby representing the aggregate structure of all GVCs of a given industry.

Making GVCs work for development in the age of automation and globalization scepticism

Jakob Engel, Daria Taglioni and Deborah Winkler

Biography

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.

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 Organization for Economic Cooperation 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 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.

Deborah Winkler is a Senior Consultant in the World Bank Group's Macroeconomics, Trade and Investment Global Practice. Deborah 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). Deborah 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. Deborah 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.

Abstract

How countries engage with GVCs determines how much they benefit from them. For an effective and sustainable strategy of GVC participation, governments must identify key binding constraints and design the necessary policy and regulatory interventions, including investing in infrastructure and capacity building. Countries that understand the opportunities that GVCs offer and adopt the appropriate policies to mitigate the risks associated with them have the opportunity—through GVCs—to boost employment and productivity in agriculture, manufacturing, and services. The new policy framework that allows developing countries to maximize the gains from GVC integration is one in which a “whole of supply chain approach” must be adopted. This reflects the fact that in a world economy where GVCs play a dominant role, imports matter as much as, if not more than, exports, and in which the flows of goods, services, people, ideas, and capital are interdependent and must be assessed jointly. However, within the context of increased automation in many of the entry stages of GVC production in most industries, as well as rising protectionism in advanced countries, developing countries’ efforts to engage and upgrade in GVCs face a more challenging global trading landscape than in the past.

SME Participation in GVCs and FTAs: A firm-level perspective

Menaka Arudchelvan and Ganeshan Wignaraja

Biography

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

Ganeshan Wignaraja is the Executive Director of the Lakshman Kadirgamar Institute of International Relations and Strategic Studies in Sri Lanka. He is also a Senior Research Associate at the Overseas Development Institute in London and a Visiting Scholar at the IMF in Washington DC. Previously, Ganeshan was the Director of Research at the ADB Institute in Tokyo. He has published widely on international economics and regional economic integration. Ganeshan has a DPhil in economics from Oxford University.

Abstract

Growing internationalization of firms in Asia through participation in global value chains (GVCs) and free trade agreements (FTAs) has focused attention on small and medium-sized enterprises (SMEs). Yet there is scant literature on the characteristics of SMEs involved in GVCs and FTAs. Malaysia is reputed for its engagement in GVCs and is actively pursuing FTAs. Drawing on a survey of Malaysian enterprises, this paper examines the characteristics of SMEs in GVCs and FTAs and explores the policy implications. It finds that even among SMEs, firm size matters for participation in GVCs and FTAs. But size is not the whole story for SME internationalization. Licensing of foreign technology and investment in research and development are also positively associated with SMEs joining GVCs. Furthermore, increased exposure to international trade, knowledge of FTA provisions and central location positively affects the use of FTAs by SMEs. More business support for SMEs can help them to engage in GVCs and FTAs.

Global Value Chains and Least Developed Countries: Influencing Value Chain Governance and Upgrading Processes

Jodie Keane

Biography

Dr Jodie Keane is a 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. Jodie 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, Dr 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.

Abstract

Whilst the mainstream literature posits a range of new trade opportunities created by the fragmentation of global production and increase in intermediate goods trade, there is a notable absence of critical reflection on contemporaneous upgrading processes within Global Value Chains (GVCs) and role of international support measures. The absence of critical reflection is surprising in view of the automaticity of upgrading processes posited through GVC participation. The available empirical evidence, explored in this paper drawn from comparative GVC case-studies of the participation by selected Least Developed Countries (LDCs) is more suggestive of upgrading avenues closed rather than opened. Within this context, the upgrading process for LDCs trading within contemporary GVCs requires bridging divergent governance structures, demanding heightened governance capabilities. This pressure demands a commensurate response from the international support architecture, not all aspects of which are adequately reflected in the recent universal adoption of the Sustainable Development Goals.

Mapping of GVCs, services and intangible assets

Koen De Backer and Sébastien Miroudot

Biography

Koen De Backer is Head of Division in the Directorate for Science, Technology and Innovation (STI) of the 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. Mr. 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, Mr. De Backer held post-doctoral positions at the Universitat Pompeu Fabre in Barcelona (Spain) and at the Department of Applied Economics of the K.U.Leuven, acted as advisor to the Minister of Economic Affairs in Belgium, and was professor at the Vlerick Leuven Gent Management School. Mr. De Backer holds a PhD degree of the K.U. Leuven (Belgium) and a Master of Business Administration degree of the K.U.Leuven/UCI (USA).

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 SciencesPo 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 SciencesPo Paris.

Abstract

Global value chains (GVCs) have changed the way we look at world trade and production. While trade has traditionally been regarded upon as the exchange of products fully manufactured in one country and competing with varieties from other economies, international trade is now understood as being mostly about exchanges of intermediate products and capital goods within international production networks. Instead of industries from different countries competing to sell products in the international marketplace, the literature on GVCs has introduced a different perspective on international production by describing how in the process of bringing final products to consumers a variety of producers interact, co-operate and compete across different stages of production that take place in different countries.

While initially limited to case studies, the analysis of GVCs has largely benefitted from new theoretical and empirical developments in the field of input-output analysis. To answer questions at the aggregate or sectoral level, global input-output tables have been used to calculate new indicators characterising the involvement of countries and industries in GVCs .

The chapter first reviews the recent developments in input-output analysis and discuss the new indicators available for researchers together with their strength and weaknesses. Using the World Input-Output Database (WIOD) - 43 countries and 56 industries over the period 2000-2014 - the chapter then uses some of these indicators to provide a broad mapping of GVCs, focusing on dispersion of income along the value chain and what is the role of different countries and industries.

The chapter then discusses three determinants of income in GVCs: the role of services and how in particular wholesale and retail as well as interactions with customers shape some value chains, the role of intellectual assets and how income is also captured or maintained in other segments of the value-chain on the basis of intangible capital, and the role of business ecosystems and how co-operative value chains as opposed to captive value chains offer an alternative model to create and retain value in GVCs. In a final section, the chapter draws some implications from the new findings.

The role of trade in global value chains

Quan Zhao, Wenwen Shen, Wei Zhang, Jimena Sotelo

Biography

Mr. Quan Zhao is trade policy advisor 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, Mr. Zhao was a trade negotiator and diplomat at the Permanent Mission of China to the World Trade Organization 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 FTA negotiations.

Wenwen Sheng is the 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 to 2016. She holds a PhD in economics (2014) from Renmin University of China. Her research interests include financial development, monetary policy and international finance.

Wei Zhang is an economic affairs officer in the Accessions Division of the World Trade Organization. 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. Ms Zhang holds a Summa Cum Laude Master in International Law and Economics at the World Trade Institute, University of Bern. Her research focuses on digital trade, global value chain and WTO accessions.

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 10 years of experience working on trade in international organizations 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 honors. She also holds a Master of International Law and Economics from the World Trade Institute (WTI) at the University of Bern, where she graduated Summa Cum Laude.

Abstract

Global Value Chain (GVC) has been the driving force behind global economic growth in recent decades. However, trade and investment figures since the 2009 financial crisis suggest that this trend may have arrived at a turning point. This chapter explores the fundamental role of trade and investment in formulating and shaping GVC, examines the structural changes contributing to the slowdown of global trade and invest in the recent decade, and discusses emerging megatrends and possible evolution path of GVC. Technological advancements and trade and investment policy landscape remain the two main factors shaping GVC. With the increased geopolitical tension and evolution in disruptive technologies, GVC is heading for more rapid and drastic changes in the coming decade, towards the direction of shorter, regional, resilient and sustainable value chains.

Industrial strategy, innovation and Global Value Chains

Mark Matthews

Biography

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. Mark 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 datasets now becoming available. Mark is currently Special Advisor for public policy and innovation at Steer Economic Development in the UK.

Abstract

This chapter assesses a broad range of literature in order to take stock of current understanding of the relationships between industrial strategy, innovation and Global Value Chains (GVCs). The aim is to focus attention on these important relationships and to suggest a way forward in improving our understanding of how GVCs are shaped by, and also shape, national industrial strategies and innovation performance. As such, a set of issues are addressed in combination in a way that is relatively unusual. In highlighting these important connections, the intention is that the future treatment of industrial strategy, innovation and GVCs will be less fragmented and, as a result, more accurately reflect political, economic and technological realities. Given the breadth of the literature covered in this practitioner-oriented 'stocktake', which must cover work on industrial strategy, innovation and GVCs, the flow of the argument has not been disruptive with exhaustive references to the literature. An extensive list of the sources drawn upon is provided in the References. The aim is to distil the main messages and lessons from the broad body of literature in order to focus on how best to move forward in the future when translating this academic understanding into practical initiatives.

Case Study 3 - Meso-level GVC analysis of Korean shipbuilding

Dr Brian Wixted and Associate Professor Martin Bliemel

Bios as before

Case study 4 - GVC vulnerability to disruption

Associate Professor Martin Bliemel, Dr Brian Wixted and Professor Goran Roos

Bios as before

Part 5 – Implications of GVCs

Steven A. Melnyk, Norma Harrison and Derek Friday

Biography

STEVEN A. MELNYK (Ph.D., 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. Dr. 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, Dr. Melnyk was a member of the APICS Board of Directors. From 2017 to 2019, Dr. 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 -- recognized Dr. Melnyk as a Distinguished Scholar in the field. Dr. Melnyk is recognized for this ability to bridge the gap between theory and practice. In 2018, Dr. 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.

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.

Professor Harrison's teaching, research and consulting interests are in the areas of innovation and technology management, sustainable supply chains, the globalization 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, Professor Harrison has conducted a series of public webinars on Response and Resilience in Supply Chains Amid COVID-19 involving panelists from industry, government and academia.

Dr. Derek Friday is a Lecturer of Operations and Supply Schain 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. Derek has over 10years of experience in Supply Chain Management as an academic and practitioner. Derek 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. In addition to co-authoring several refereed journal articles, Derek is grateful for the opportunity to contribute to this publication.

Abstract

In differential calculus, an inflection point, on a continuous plane curve, is where the curve changes from being concave to convex, or vice versa. When applied to business, a point of inflection denotes a period of significant change. It is a period in which past practice, perspectives, and frameworks are no longer as attractive or relevant. In reviewing the various chapters of this book, it should be obvious to the reader that supply chain management is at an inflection point.

In this summary chapter, the authors explore how the developments discussed in this book apply to supply chain management practitioners and researchers. To do so, the following themes are a focus – themes discussed either directly or indirectly in the preceding chapters of this book. Central to this discussion are the following two questions:

- What changes are taking place in the supply chain due to the factors discussed in this book?
- How will these changes affect the theory and practice of supply chain management?

To address these two questions, this chapter will be organized as follows. In the first section, the authors examine the changes now taking place in supply chain management. The key message in this section is that there is a fundamental transformation in suppliers from being cost-driven and tactical to being value-driven and strategic. This section will also identify the four critical traits of this new supply chain. The second section will examine the impact of the new supply chain for practitioners. The message is simple – a new type of supply chain demands a new class of supply chain manager. The third and final section will conclude this chapter by returning to the theme of “supply chain management at the point of inflection.