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# Global value chains and liability of international connectivity: MNE strategy post COVID-19

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**Abstract:** The COVID-19 pandemic has impacted the world economy to such an extent that there is now widespread debate about how multinational enterprises (MNEs) may restructure global value chains and potentially retreat from globalisation. This article unpacks the consequences of the pandemic for MNEs and develops a new concept of the Liability of International Connectivity (LOIC). We illustrate how the LOIC affects ownership, location and internalisation advantages and may compromise lead MNE control of supply, production, or distribution due to (1) global value chain (GVC) governance; (2) power asymmetries with nation states; and (3) power asymmetries with suppliers. We further discuss how the sudden exposure of MNE vulnerability in relation to international connections within GVCs may alter MNEs' orchestration of activities and generate new strategic directions in pursuit of more optimal ownership, location and internalisation advantages. Our paper advances understanding of why MNE responses to the COVID-19 pandemic may span a continuum that ranges from minimal change through to extensive reconfiguration of GVC governance and geographic structures.

**Keywords:** COVID-19; pandemic; liability of international connectivity; global value chain; MNE strategy; internationalisation; GVC governance; OLI.

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## 1 Introduction

The coronavirus (COVID-19) outbreak and ensuing pandemic has brought devastating human suffering and major economic disruption. This has fundamentally changed the way we all think about business and interactions – both domestically and across national borders. The global economy is highly interconnected – more so than ever before in history – and this interdependent global economic system brings enormous benefits, but also massive risks. Globalisation is about the scale and speed of international business, facilitated by easier travel, information technology, automated manufacturing, trade deals and new rapidly developing economies. Together, these factors have combined to create a system of global connectivity that is much more dependent now on what is happening on the other side of the world than it ever was. This has become clear with the outbreak and rapid spread of the coronavirus, which has had such an immediate and debilitating impact on the world economy. It seems the very strength of globalisation is now turning into a liability of international connectivity.

MNEs are severely impacted by the COVID-19 global health crisis due to their heavy reliance on globally interconnected yet geographically dispersed Global Value Chains (GVCs) (McWilliam et al., 2019; Kano et al., 2020). The disruption of production activities, interruptions of people's movement and heightened barriers within supply chains brings about cracks in international trust as the pitfalls of global interdependency increase business risks and expose vulnerabilities. This is translated into a tendency of MNEs to now consider shifting their strategies inward and seek ways of strengthening their location specific advantages, to diversify their assets and businesses, to accelerate digitalisation and be more safeguarded in their investments. When global value chains are disrupted, it is only natural to look for alternative suppliers and customers at home, strengthening the city-region approach (Lorenzen et al., 2020; Goerzen et al., 2013). This re-shoring of activities brings not only certainty and reduced risks but may also provide opportunities to diversify the customer and supplier bases as a way to hedge future risks from global (and local) disruptions, including health threats, trade wars, etc. (Ciabuschi

et al., 2019). Hence, one might expect to see a move towards local (domestic or regional) business at the expense of international/global business as firms react to the increased liability of international connectivity. Yet, globalisation is not only about moving manufactured goods around the world and optimising the supply-chains. Indeed, the service sector plays a fundamental role in the world economy.

As Covid-19 uncertainty drove successive governments to close their borders to international travellers, some industries fared better than others. Knowledge-intensive value chains related to information industries, finance and insurance, and professional, science and technical services were most able to accommodate interruptions to travel, due to being at the top of the "Remote Labour Index" (Rio-Chanona et al., 2020). However, the restrictions on the movement of people had devastating consequences for many countries relying heavily on tourism, education and other people-heavy service industries. Firms operating in such industries cannot readily redeploy assets, relocate value chain activities, or diversify their product portfolio to meet new demands. Hence, the impact of liability of international connectivity and subsequent MNE strategic responses will differ with industry.

Our aim in this perspectives article is to unpack the consequences of the COVID-19 pandemic for MNEs, to develop a new concept of Liability of International Connectivity (LOIC) and to discuss how it will potentially affect GVC governance as MNEs alter their orchestration of global value chain activities. This paper builds upon the holistic approach of Dunning's OLI paradigm (Dunning and Lundan, 2008; Dunning, 1977, 1988, 2000) for explaining the extent, pattern and geographic dispersion of a MNE's foreign value-adding activities. Structured around three sub-paradigms related to ownership advantages (O), location advantages (L) and internalisation advantages (I), this eclectic framework provides the foundation for analysing how a global health crisis like the Covid-19 pandemic may shake up the existing "global factory" system and lead to new GVC configurations (McWilliam et al., 2019; Kano et al., 2020). We focus specifically on the evident liability of international connectivity inherent in MNE's reliance on GVCs to source, produce, and deliver products and services around the world. We discuss how ownership, location and internalisation advantages may change the way MNEs do business in a post-Covid-19 world.

Our development of the concept of LOIC makes contributions that are important both to International Business (IB) theory development and to managerial decision making. We explain why IB scholars need to explicitly account for LOIC in relation to internalisation and GVC governance theories, in response to the unfolding pandemic. We also use examples to illustrate why the concept of LOIC is equally important to the strategic decisions of managers within MNEs, supporting their evaluation of risk associated with value chain structure and location strategy.

The paper is structured as follows. First, we lay out the context of how the COVID-19 pandemic has impacted the world economy (up to the time of writing, early August 2020), disrupted GVCs and exposed LOIC. Second, we contextualise LOIC into a broader set of liabilities originating with the fragmentation of production long before Covid-19, whereby coordination, cooperation and connectivity risks were a trade-off for MNE performance advantages. Third, we delve deeper into the concept of LOIC, defining how its underlying drivers relate to the GVC and OLI frameworks. We use these theoretical insights to explore why levels of LOIC differ between GVCs, illustrated with examples of the strategies MNEs adopt in response to different categories of impact from the Covid-19 pandemic. Finally, building on these theoretical insights, we discuss how

emergent MNE strategies mitigate LOIC in relation to the three sub-paradigms of ownership, location, and internalisation advantages. Our findings support a perspective on why MNE responses to the Covid-19 pandemic may span a continuum that ranges from minimal change through to extensive reconfiguration of GVC governance and geographic structures.

## 2 Covid-19 economic impact on global value chains

UNCTAD's World Investment Report (2020) draws on estimates of COVID-19's economic impact and revisions of earnings of the largest MNEs to suggest that FDI flows will drop by up to 40% during 2020–2021. Of the top 100 MNEs 57% have warned of the global demand shock's impact on sales, illustrating that Covid-19 has wide implications beyond supply chain disruptions. Meanwhile, 94% of Fortune 1000 companies are facing supply chain disruptions due to the coronavirus. In addition, the top 5000 MNEs, which account for a significant share of global FDI, have now seen downward revisions of –36% on average for 2020 earnings estimates. And with increasing global infection rates and vaccines still in development, these trends are likely to continue. The hardest-hit sectors are the energy and basic materials industries (–208% for energy, with additional shock caused by the recent drop in oil prices), airlines (–116%) and the automotive industry (–47%) (UNCTAD, 2020).

The pandemic has exposed the vulnerability of the World economy to disruptions to flows of goods and people. The exponential growth in global trade has all but stopped and most countries including China will face zero if not negative growth in 2020. The heavy dependence of many MNEs on China as the "factory of the world", accounting for about 16% of global output, has backfired amidst the virtual shutdown of international trade. Similarly, service industries relying on free movement of people experienced an overnight halt to their key customers.

The benefits of expanding production and supplier operations internationally have lulled major companies into building globally distributed, lean production systems. Simultaneously, technology has become highly complex; this means that it is rarely feasible to possess all necessary skills in just one place. Manufacturers have therefore turned to specialists and subcontractors who narrowly focus on just one area — and even those specialists have to rely on many others. These multi-layered interdependencies drive the complexity and vulnerability of contemporary global value chains. One example of this vulnerability is that the length of fragmented supply chains means there is limited capacity for inventory. Inventory along the supply chain risks obsolescence as it represents tied-up cash that could otherwise be re-purposed. Hence, as companies have moved from a "Toyota City" model, with suppliers clustered in a tight geographical area, to global supply chains with dependable and predictable logistics links, firms have continued to squeeze inventory out wherever possible. A consequence of these complex interdependencies is a deep tiering of supply chains, with manufacturers dependent on their first-tier suppliers, which, in turn, are dependent on a second tier, which are themselves dependent on a third tier and so on. Visibility into third, fourth and more distant tiers is challenging, making wholesale replacement of anyone in the chain, let alone the entire chain, extremely difficult.

While the benefits of such interconnections are evident (e.g., OECD, 2013), the magnitude of risk involved has now been abruptly exposed by the recent pandemic.

When MNEs experience a supply shock or sudden disruption in raw materials, components, or whole product supply, there is little buffer inventory around to absorb that shock. When Indian drug manufacturers started running short of active pharmaceutical ingredients manufactured in China, the Indian government responded both by offering to fly materials in and restricting exports of finished products. It would have made more sense to carry six months of buffer inventory in a strategic stockpile.

COVID-19 has highlighted the perils associated with inflexible supply chains, with the consequence that MNEs are now more than ever incentivised to diversify their production networks. For example, MNEs may respond to the pandemic by investing in production redundancy; moving production nearer to end-markets; or selecting supply chains nearer home. UNCTAD (2020) found the overall trend in international production points to shorter value chains, higher concentration of value added and declining international investment in production assets. It seems that the lean, Just-In-Time (JIT) inventory and manufacturing philosophy, perfected by Toyota and heralded by most MNEs (and indeed governments) may need to revert in some instances to a just-in-case approach (Kogan and Guasch, 2003; Suri and De Treville, 1986). UNCTAD (2020) also predicts that countries will move to more regulation of FDI to limit exposure in specific sectors. This in turn brings about changes in location advantages encountered by firms.

MNEs are mitigating the vulnerabilities exposed since the pandemic began with a growing tendency to re-shore critical industries and supply chains back to the home country. Governments and sectors have acknowledged an over-reliance on China (and a few other countries), both as suppliers and manufacturing bases. From automotive parts to surgical masks, the offshoring model has somewhat backfired. Some carmakers, including Nissan and Hyundai, have temporarily closed factories outside China due to parts supply shortages, while European manufacturing is suffering considerably due to its extensive links with China through supply chains. Already, four of the world's biggest carmakers are expected to shut down European production (WEF, 2020). By the same token, hospitals and healthcare providers around the world are realising that 80% of the ingredients for the world's prescription drugs come from China and India. An illuminating example of how MNEs respond to external shocks involves Huawei, the Chinese telecommunications company. The US government, along with governments in Australia, New Zealand and Japan among others, have imposed restrictions on the use of Huawei 5G solutions (Kaska et al., 2019). As a response, the company "de-Americanised" its supply chains and replaced all US technology from its P30 Mate smart phone and the next generation of 5G base stations. This indicates that MNEs re-orient their strategies continuously, especially when there are external events that increase risks, uncertainties and costs.

These trends all point to potential liabilities associated with two complementary forces: (1) the fragmentation of production across the global economy and (2) the resulting international connectivity between MNEs. The magnitude of risk associated with these liabilities indicates a downside of globalisation which may prompt MNEs to reconsider their GVC strategies.

## 3 Fragmentation of production and MNE performance

The Liability of Foreignness (LOF), or the costs of doing business abroad, reflects all of the additional costs that a firm operating in a market overseas incurs compared to a local

firm (Hymer, 1976; Kindleberger, 1969). These costs may arise from at least four, potentially interdependent, sources: (1) spatial distance (travel, transportation and coordination costs), (2) unfamiliarity with and lack of roots in the local environment, (3) lack of legitimacy and discrimination faced by foreign firms and (4) formal (legal) restrictions imposed on MNEs by the host country (Zaheer, 1995). Although LOF may vary by industry or country, foreign firms, all else being equal, will have lower profitability than local firms and perhaps even a lower probability of survival. Hence, it is critical for MNEs to understand the sources of LOF and their impact on firm strategy to minimise and overcome the costs of LOF. However, since the theories underlying LOF were developed, the MNE's business environment has become further complicated by the situation succinctly described by Kobrin (1997) as complex interdependence. With ever-increasing global integration, the MNE's value chain activities are spread over many more countries and they now have to contend not only with multiple host country environments but also complex interactions and interdependencies among multiple firms, connected in various ways throughout the entire value chain. Few companies today are fully integrated operations as most rely on a network of relationships to deliver increasingly complex solutions rather than products or services to customers.

Understanding the context of such networks of inter-organisational relationships is critical to answering the key question of "why firms differ in their conduct and profitability" (Gulati et al., 2000; Nielsen, 2003). This assertion is characterised in the recent research impetus centred on the disaggregation of global value chains (Pedersen et al., 2017), network governance (Gereffi et al., 2005) and the significance of value-creating activities that are outside the ownership boundary of the lead MNE (Mudambi and Puck, 2016). In this context, an MNE's orchestration skills are the defining capability of lead firms and lie at the heart of sustained competitive advantage (Augier and Teece, 2007). Accordingly, a lead firm's "orchestration capabilities" constitute perhaps the most important vehicle for coordinating strategy across a GVC, and for determining related MNE performance outcomes (Pitelis and Teece, 2018). MNEs utilise orchestration capabilities to organise and control inputs from external actors within their value chains. Their financial performance has been linked to the governance of different types of these external relationships including strategic alliances (Nielsen, 2007), joint ventures (Choi and Beamish, 2004), outsourcing (Gregorio et al., 2008) and offshoring (Wagner, 2011).

MNE performance has also been linked to their now widespread context of GVCs (Fortanier et al., 2019) and the global factory (Buckley, 2011), thus capturing interdependencies with the wider organisational system. As recognised by Schmeisser (2013, p.402), contemporary offshoring practices moved away from firms offshoring specific activities and towards the "effective configuration of the organisational system on a global scale". Performance outcomes are unsurprisingly mixed. Positive performance benefits have been associated with outsourced collaborative ventures within GVCs (Enderwick and Buckley, 2019); relational governance (Lew et al., 2016); and modular governance (Sturgeon, 2002). Equally, negative performance has been linked to GVC disaggregation and fine slicing of the value chain (Reilly and Sharkey Scott, 2014); and to the management challenges and complexity associated with extensive outsourcing and offshoring (Celo et al., 2018).

Despite these endeavours to link firm-level advantages, such as capability development and performance, with GVC-level variables, such as complexity and inter-firm governance, the nature of the relationship between GVC governance and MNE

performance posed a significant challenge for both academics and industry practitioners before the pandemic. Different theoretical perspectives such as transaction cost economics, internalisation theory, the resource-based view, the knowledge-based view and dynamic capabilities contribute to our understanding of the firm-level perspective on the determination of GVC governance and related performance outcomes (McWilliam et al., 2019). However, Covid-19 has provided a costly illustration of the extent to which the relationship between GVC governance decisions and performance outcomes has been a liability, growing in magnitude alongside decades of structural changes in the global economy.

As trade and communication costs declined rapidly towards the end of the 20th century, observers recognised that the ongoing fragmentation of production represented a paradigm shift for world trade. The natural question arose, how far would the fragmentation of production go? In response, De Backer and Miroudot (2013) interrogated the nature of "fragmentation" by mapping the length of value chains over time and across industries, arguing for an optimal level of fragmentation that depends on the level of trade and transaction costs. As GVCs approached the optimal level of fragmentation, expansion would slow. Indeed, some consolidation of GVCs was observed following the financial crisis in 2008 (De Backer and Miroudot, 2013). This view of trade-offs between the advantages of fragmented production systems (such as low-cost labour and access to specialist knowledge) and the downside of increased transaction costs establishes a basis for recognising the liabilities of fragmentation.

The concept of liabilities associated with fragmentation recognises that not all (foreign) firms are equal; some are more (internationally) connected than others. Anderson et al. (1994) recognised that firms operate in complex networks of connected business relationships. The term "connected" means that exchange in one relationship is linked to exchange in another. These webs of connected relationships are sometimes referred to as business networks and typically refer to both weak and strong ties (Granovetter, 1983). In the context of international business and MNE strategy and structure, such connectivity may be thought of in terms of GVC activities and exposure to external (environmental) influences. The extent to which an MNE is connected to and dependent upon other firms' value chain activities to bring its product or service to its ultimate customers may be thought of as a measure of MNE "connectivity".

Connectivity has been associated primarily with positive benefits for internationalising firms (e.g., Johanson and Mattsson, 1984). For instance, Johanson and Vahlne (2009) in their revision of the Uppsala model, argued for the importance of strong network positions and pointed to "liability of outsidership" as a constraint to successful internationalisation. Yet there is also recognition of liabilities associated with fragmentation and connectivity. Risks and costs are associated with managing: a high degree of outsourcing (Celo et al., 2018), complex inter-firm coordination (Gomes and Dahab, 2010), and co-operation between multiple lead firms (Ponte, 2014). These examples recognised the validity and importance of the costs for MNEs operating within highly fragmented GVCs, long before the Covid-19 pandemic. In particular, Celo et al. (2018) find that although the global factory literature emphasises the advantages of extensive outsourcing and offshoring to lead firms, it underestimates the added difficulties firms face in coordinating the complex GVC structures that result. Their study of the aviation industry finds these difficulties increase coordination costs, which disrupts lead firm performance. Prior studies have similarly found that high complexity and high

coordination costs decrease MNE performance (Ambos and Birkinshaw, 2010; Bouquet and Birkinshaw, 2008; Wiersema and Bowen, 2011).

Before the Covid-19 pandemic, MNEs were finding ways to gain competitive advantage by reducing their liabilities of fragmentation through more advanced digitalisation that reduced excess inventory, enhanced coordination of complex information, and supported more efficient just-in-time logistics. Such digitalisation was a critical enabler for incumbent MNEs to redefine their organisational structures and value propositions. Yet compared to the coordination, cooperation, and outsourcing risks that MNEs were using digital technologies to mitigate against, the risk associated with "international connectivity" appears to be of a magnitude few had comprehended. The Covid-19 pandemic may be understood as a black swan event exposing the widespread underestimation of LOIC, which we now recognise as a potentially catastrophic determinant of MNE performance.

## 4 Liability of international connectivity (LOIC)

The current Covid-19 crisis has fundamentally disrupted movement of people, products and services across international borders, rendering international connectivity a liability for MNEs. There are multiple interacting drivers underlying LOIC, which are related to elements of the GVC framework (Gereffi and Fernandez-Stark, 2016). LOIC costs arise where connectivity across national borders can compromise lead MNE control of supply, production, or distribution. Such control and therefore LOIC is influenced by three interrelated forces: (1) GVC governance; (2) power asymmetries with nation states and (3) power asymmetries with suppliers. GVC governance establishes the *extent* of international connectivity; the latter two power asymmetries determine the *magnitude* of the associated liabilities.

Typically established by a lead MNE, governance decisions drive the organisation and control of GVCs (McWilliam et al., 2019). The organisational structure establishes the *extent* of international connectivity in relation to the locations and characteristics of value chain nodes (including internalisation or externalisation decisions). Control of GVCs drives the *magnitude* of liabilities associated with international connectivity, manifesting as power asymmetries with suppliers and nation states.

Power asymmetries with suppliers typically favour lead firms to lesser or greater extents, varying with governance typologies. They range from high asymmetries in captive governance structures, to low asymmetries in modular or market governance. When supplier power is higher as with modular or market governance, MNEs have less control over the external relationship, thereby increasing the magnitude of LOIC. There are two critical levers that moderate power asymmetries with suppliers: the level of specialist input and the codifiability of information. The level of specialist input (either knowledge or labour) increases supplier power because the reliance on high supplier capabilities and complex transactions typically raise switching costs. Conversely, highly codified information can reduce supplier power by limiting reliance on tacit information exchange, lowering transaction complexity and reducing switching costs.

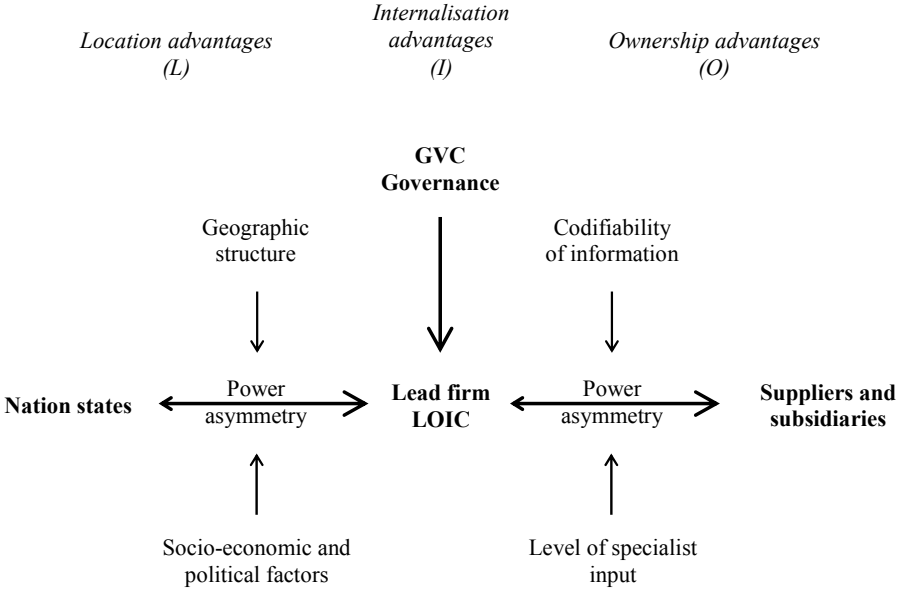
With nation states, as evidenced by the recent COVID-19 pandemic, power asymmetries lean towards favouring governments. Developments such as the UK's exit from the European Union and protectionist-oriented national initiatives under the Trump administration in the United States have previously indicated the increasing relevance of

state roles beyond facilitating GVCs and GPNs (Horner, 2017). Two critical moderators of nation states' influence over the LOIC of MNEs are the geographic structure of the GVC (i.e., which states the GVC spans) and the associated socio-economic and political dynamics of those states.

While these elements of the GVC framework provide a lens into macro-level dynamics that drive LOIC, a deeper understanding of the behaviour of the MNE related to LOIC can be achieved by also drawing on Dunning's (1977; 1988) eclectic paradigm. The eclectic or OLI paradigm provides a holistic approach to the study of MNEs' activities abroad by integrating ownership (O), location (L), and Internalisation advantages (I). The OLI framework combines the competitive advantages of firms (ownership advantages) and the comparative advantage of nations (location advantages) to explain how MNEs expand abroad and grow through various types of governance (internalisation or externalisation) of activities. Despite the criticisms based on its generality, and hence its limited ability to identify the behaviour of specific enterprises, OLI continues to be the most influential paradigm that facilitates theoretical thinking in IB (Cantwell and Narula, 2001; McWilliam et al., 2019). As MNEs expand their activities abroad, geographically dispersing their production and sourcing activities, they leverage global value chains to operate as "stateless entities". Inevitably MNEs become orchestrators of global value chains, strengthening interconnectedness among their different economic activities, spread worldwide.

When we overlay the OLI framework to the drivers underlying LOIC, we find a strong alignment. Ownership advantages align with the power asymmetry between MNEs and suppliers (or subsidiaries). Location advantages align with the power asymmetry between MNEs and nation states. Internalisation advantages or governance is directly linked to LOIC. Figure 1 illustrates these dynamics.

**Figure 1** The level of LOIC is determined by power asymmetries with nation states, suppliers and subsidiaries



Examples explored by Gereffi (2020), illustrate how different combinations of these variables impacted the capacity of the medical supplies industry to meet demand, constraining MNE performance, and damaging trust in the resilience of their supply chains. During the pandemic, both face masks and ventilators faced spikes in demand that MNEs were unable to adequately meet. For ventilator manufacturers, LOIC originated in reliance on specialised subsidiary inputs from niche global locations. The geographic structure of the GVC was therefore concentrated, rather than distributed. The governance structure of manufacturers like Philips supported higher control (and lower LOIC) due to vertically integrated GVCs. However, reliance on inputs from subsidiaries in locations specialising in high-tech medical device production (such as Ireland and New Zealand), gave rise to LOIC related to the MNE's geographic structure. Production capacity was constrained by the limited number of locations, while distribution from those locations was constrained by the capacity of global logistics networks. For the less technologically advanced production of PPE such as face masks, LOIC was exposed in relation to the lower control governance structures and the power exercised by nation states for socio-economic and political reasons, i.e., restricting exports to reserve PPE supplies for their own populations and health care systems. GVC governance structures for PPE are typically less hierarchical with more external contracting by third party suppliers. With PPE in extremely high demand, both domestically and internationally, lead firms were less able to maintain control of their supply chains. Lead firm control was further compromised by nation states as export prohibitions or restrictions for Covid-19 products emerged across nearly 80 countries in April 2020.

These two examples illustrate how the COVID-19 pandemic exposed LOIC in relation to imbalances in global trade and heightened barriers within supply chains. However, the disrupted supplies of both face masks and ventilators were primarily a consequence of unprecedented demand spikes, rather than being related to disruption of production or people's movement. We therefore build on the medical supply examples from Gereffi (2020), to compare them to industries that suffered from disruption of production activities (automotive), and from interruptions of people's movement (aviation). We consider the nature of the pandemic's impact on each of these industries, including why LOIC arose for different reasons and what different mitigants may be considered in the future.

Global value chains within the automotive industry provide examples of how disruption of production activities in China and Italy exposed LOIC for MNEs in distant but connected locations. Honda, a Japanese manufacturer that operates plants in Wuhan, reduced production of automobiles in Japan in early March 2020 due to lack of parts supplies from China (Inoue and Todo, 2020). Similarly, when Italian producers of specialised components were forced to comply with national lockdown requirements, production within the German automotive industry was disrupted (Celi et al., 2020). Given automotive MNEs' reliance on distributed geographic structures, when government-imposed lockdowns forced production facility closures, MNE location advantages (L) were reversed. Similarly, the externalisation advantages (I) MNEs had accrued by coordinating highly complex information through modular governance also reversed, due to reliance on specialist suppliers with high switching costs. Options to mitigate against LOIC could include: a geographical contraction, reverting back towards a "Toyota City" model; a diversification of suppliers to reduce switching costs; or increasing inventory along the supply chain, as part of a "just-in-case" approach.

Aviation contrasts with the automotive industry as an example of LOIC being exposed through restrictions to the movement of people at a global scale. IATA estimates that the industry could face a decline in passenger revenue of USD$252 billion compared to 2019 levels.[1] In this case, the unprecedented collapse in demand and grounding of aircraft drove the impact to the aviation industry. From a global value chain perspective, MNEs operating in aviation such as British Airways and their passengers are the end users for aircraft manufacturers such as Boeing and Airbus. As volumes of flights collapsed, so too did demand for new aircraft. The impact to globally distributed production systems was evident as both Boeing and Airbus responded to the crisis by cutting approximately 15,000 jobs. In this example, LOIC for Airlines such as BA and Quantas was moderated by location advantages related to their routes (L), and by the socio-economic and political factors within those locations that determined the extent to which aircraft were grounded, and the level of support the industry and its employees received from governments. Options to mitigate against LOIC are much more limited in this case due to the industry being fundamentally reliant on international connectivity. Some resilience could be established by adjusting the balance between international and domestic routes, or by establishing robust industry insurance funds.

Table 1 summarises how the pandemic has exposed LOIC in four different GVCs, in relation to three major impacts: the disruption of production activities; interruptions of people's movement, and heightened barriers within supply chains. Common to all these impacts are the asymmetries that arose between MNE control and nation state power. GVC scholars such as Davis et al. (2018) debated the role of nation states in the appropriation of GVC rents, arguing that the balance of power between private and non-corporate actors is a contested terrain and dynamic in nature. The CoOVID-19 pandemic has revealed new dimensions to those dynamics, revealing the complex implications of power asymmetries between MNEs and the nation states within which they operate.

**Table 1** Comparison of how LOIC has been exposed in four different GVCs

| *Industry* | *Automotive* | *Aviation* | *Face masks* | *Ventilators* |
|---|---|---|---|---|
| *Impact from pandemic* | Disruption of production activities | Interruptions of people's movement | Heightened barriers within supply chains | |
| *Supply / demand dynamics* | Supply interruptions, demand decline | Demand collapse | Demand spike | Demand spike |
| *Geographic structure* | Distributed | Widely distributed | Widely distributed | Narrowly distributed (specialist suppliers) |
| *Complexity* | High tech product | Complex services | Low tech product | High tech product |
| *Key drivers* | Nation state power (L) | Nation state power (L) | Nation state power (L)<br>Supplier power (O) | Nation state power (L)<br>Subsidiary power (O). |

**Table 1** Comparison of how LOIC has been exposed in four different GVCs (continued)

| *Industry* | *Automotive* | *Aviation* | *Face masks* | *Ventilators* |
|---|---|---|---|---|
| *Key moderators* | Geographic structure (L)<br>Governance structure (I) | Geographic structure (L)<br>Socio-economic and political factors (L) | Geographic structure (L)<br>Socio-economic and political factors (L)<br>Governance structure (I) | Geographic structure (L)<br>Socio-economic and political factors (L)<br>Governance structure (I). |
| *Rationale* | Some distributed (modular) production facilities forced to temporarily close by government-imposed "lock-downs", resulting in supply chain inventory shortages. Supplier specialist input meant sourcing from alternative suppliers was challenging. | Industry business models fundamentally interrupted by collapse in demand. Impact varies with geographic span of operations. Governance structures have limited impact. | Large number of production locations are able to increase supply following demand spike, but supplier contracts overridden by governments in emergency legislation prohibiting exports. | Supply not able to meet demand spike due to constrained production capacity across limited locations. Global distribution constrained by lack of local supply and reliance on logistics providers. |
| *LOIC mitigation* | • Reduce geographic distribution of modular production facilities (revert to "Toyota city" / regional model)<br>• Increase diversification of suppliers<br>• Increase inventory along supply chain | Limited options:<br>• Mitigate international exposure by increasing domestic routes<br>• Industry insurance fund | • Vertical integration to increase control of overseas production<br>• Re-shore production to assure home country demand can be met<br>• Distribute other production facilities away from regional hubs (e.g., China) | • Re-shore production to assure home country demand can be met<br>• Reduce reliance on global logistics services by creating new (geographically distributed) specialist production hubs |

Notes: (O) denotes ownership advantage, (L) denotes location advantage and (I) denotes internalisation advantage as per OLI (Dunning, 1988).

## 5 Discussion

MNEs' very survival depends on the interdependencies between their local engagement and regional development on the one hand and their cross-border activities on the other (Cantwell et al., 2010; Cano-Kollmann et al., 2016). Given steep declines in spatial transaction costs in previous decades, international connectedness had been on the rise.

The result is that firms in core cities – MNEs as well as the network of domestic firms that they work with – increasingly start serving global value chains, creating a global ecosystem (Goerzen et al., 2013). MNEs have done so as orchestrators of global value chains, arising through their fine-slicing and geographical disaggregation of value chain activities, allowing them to undertake activities at their most efficient global locations (Scott, 1988; Dunning, 1998; Coe et al., 2008; Mudambi, 2008; Beugelsdijk et al., 2010, Kano, 2018; Asmussen et al., 2019). Yet the discussion in this paper indicates that scholars and industry practitioners alike did not adequately account for the liabilities of international connectivity that such orchestrators were introducing into the global economy. Our earlier section on the fragmentation of production and MNE performance has discussed how IB scholars sought to understand performance risks within international and inter-organisational networks using the lenses of LOF and later considering heightened transaction costs associated with increased fragmentation. However, cautionary perspectives on international connectivity such as those of Celo et al. (2018) were limited.

The widespread underestimation of LOIC points to gaps within both IB and GVC governance theory. McWilliam and Nielsen (2020) previously identified an underemphasis of lead firm's orchestrator roles within GVCs. In the earlier version of GVC theory – global commodity chain theory, lead firms are centre-stage, as "buyers" or "producers" that drive the organisation and output of the value chain. Yet, in the subsequent GVC governance theory, this orchestrating role is put aside to focus on governance as coordination across inter-firm linkages. With this shift of focus, an important component of the theory is neglected. In particular, the orchestration role of lead firms calls for specific capabilities to be developed and leveraged (Pitelis and Teece, 2018). The exclusion of such orchestration capabilities as a potential determinant of governance (alongside supplier capabilities, transaction complexity, and information codifiability) seems to be a contentious omission that IB scholars have begun to address (e.g., Kano, 2018). As part of the agenda to improve understanding of lead MNEs orchestration roles, IB scholars now also need to interrogate how LOIC's dramatic rise to prominence during the Covid-19 pandemic may reshape MNE strategy. Given the magnitude of the event, the strategic pivoting that follows the pandemic could be at the centre of a restructuring of the global economy.

During the pandemic, MNEs observed policy makers using public health and national security arguments to shut down entire sectors of the economy with no advance warning or negotiation. The GVC disruption brought about by COVID-19 means that MNEs will inevitably re-think their strategies with the aim of safeguarding themselves from such cataclysmic external events. New strategic thinking that reduces LOIC in response to the pandemic is likely to vary with industry, spanning a continuum that ranges from minimal change through to extensive reconfiguration of GVCs. The MNE strategies that emerge to mitigate LOIC can be considered in relation to the three OLI sub-paradigms of ownership, location and internalisation advantages.

First, MNEs' recognition of their vulnerability to LOIC, along with regulatory changes, may result in a more nuanced view of the location advantages (L) of host countries. MNEs are likely to consider new location strategies that redress past underestimation of the significance of power asymmetries with nation states. Three out of four possible trajectories for international production suggested by UNCTAD (2020) involve a retreat, reducing LOIC by shortening the length of GVCs to varying degrees. These trajectories are reshoring, regionalisation, and replication. Reshoring reduces

LOIC by simplifying the production process and using onshore or nearshore operations (Strange, 2020). Regionalisation limits LOIC by applying the standard model of fragmented and vertically specialised value chains at the regional or local level, reducing global exposure. Replication mitigates LOIC by distributing manufacturing close to the point of consumption, supported by new production technologies such as 3D printing, and concentrating high-value coordination activities into just a few central locations. The final trajectory, diversification, limits LOIC by increasing the length of GVCs, involving more locations and suppliers in the value chain. Such geographic diversification builds resilience through cumulative *L* advantages that reduce over-reliance on specific cities, nations or regions, at the cost of increasing redundancy and sacrificing some economies of scale.

Second, in some instances, MNEs may mitigate against LOIC through internalisation (I) or alternative GVC governance modes that improve control of externalised relationships. Verbeke (2020) suggested how MNEs pursuit of such heightened control may manifest in changes to contracting safeguards. MNEs could reduce the contracting risk component of LOIC by leveraging advanced (digital) coordination technologies to support "micro-modularity", whereby substitution of any one micro-module can occur with lower impact on the GVC. While micro-modularity is a way to lower switching costs, LOIC also arises in the context of inter-firm relationships with critical partners in the GVC, where switching is not appropriate. In these instances, LOIC can be mitigated by shifting towards more relational contracting. Reliability and trust within contractual relationships can be built over time through long-standing partnerships and reinforced through interdependence from establishing multiple GVC linkages with the same critical partners.

Third, MNEs may mitigate against LOIC by exploiting their Ownership (O) advantages. At a pragmatic level, this may involve reconsidering where strategic inventory reserves are appropriate. Such reserves mitigate against the risks from international events and may be accompanied by a re-examination of where critical logistics bottlenecks exist and what back-up plans are needed to mitigate them. However, MNEs may also opt to exploit O advantages by expanding from a narrow focus on GVC orchestration to a greater emphasis on corporate entrepreneurship. This broader role may involve engaging in new types of local supplier relations, benefiting from incumbents' skills and technologies, especially in comparatively well-developed regions. MNEs may increase funding of start-ups through corporate venturing, an "arm's-length" way of exploring new technological opportunities, through modalities such as corporate venture capital funds, sponsorship of university research, support of local incubators/accelerators and strategic alliances with start-up firms. Related to this, MNEs can also admit or even facilitate spinoffs by former employees, allowing the latter to leverage their skills and connections to the MNE, typically to mutual benefit (Klepper and Sleeper, 2005). By engaging in such corporate entrepreneurship, rather than maintaining a narrow GVC orchestration focus, MNEs can "accumulate resource bundles that provide a platform on which industry leadership can be built" (Stopford and Baden-Fuller, 1994, p.521).

Finally, we anticipate a critical LOIC mitigation strategy to be MNEs' acceleration of GVC digitalisation. While grounded in O advantages, such digitalisation impacts all three OLI sub-paradigms. Digitalisation lies at the centre of O advantages for many MNEs, manifesting in the resources and technological capabilities associated with digital infrastructure. Yet it is the integration of such capabilities and infrastructure across whole GVCs that enables many of the L and I advantages described above. For example,

accruing L advantages from reshoring production facilities to home countries with relatively high wages (such as the USA) is only possible with advanced automation of production (Strange, 2020). Similarly, increasing I advantages through micro-modularity is only viable for MNEs that can leverage advanced digitalisation tools to keep coordination (transaction) costs low. As MNEs seek to mitigate LOIC, it is likely that strategies to leverage digitalisation will accelerate, including the widespread adoption of distributed and remote working models, particularly for high-value added components to GVCs that involve knowledge-intensive services.

## 6 Conclusions

This paper discusses the consequences of COVID-19 on the strategic decisions of MNEs regarding their GVCs worldwide. It does so by combining insights from the OLI paradigm and the GVC literature to introduce LOIC as a new concept in IB. Our discussion suggests that, while we have witnessed a GVC system governed by MNEs leading to global connectivity, the COVID-19 pandemic brings about the opposite force, shaking and dismantling GVCs. The challenges of the pandemic have induced MNEs to think about how they can reduce exposure by replacing some of their dispersed activities with more local ones, either regionally or domestically. However, the effects of the pandemic do not only stimulate debate about a location- and internalisation-focussed retreat from globalisation. The discussion here has shown that the pandemic also drives consideration of how MNEs can improve resilience through enhanced ownership advantages created from growth, diversification, digitalisation, automation, distributed production, and remote working.

This study comes with a few limitations. Firstly, it is limited to discussing the coronavirus effects only through the lens of the above theories, while there is a wide spectrum of IB theories that may lay the ground for further discussion. We strongly encourage IB scholars to build on our insights regarding LOIC and expand it via other relevant theories. Secondly, more emphasis may be placed on the trajectories to international production suggested by UNCTAD to mitigate risks associated with extended GVCs, i.e., reshoring, regionalisation, replication and geographic diversification. Such strategies alter the way MNEs think about the L advantage discussed in the eclectic paradigm. Furthermore, this work may also be extended to discuss more explicitly how global disruptions to the pandemic induce MNEs to strengthen their O advantages by managing such complex GVCs in different ways. Examples include, developing new value chains that are shorter and closer to home, potentially creating more local hubs with necessary suppliers and technology experts, and advancing their technological expertise towards more digital solutions, thus potentially replacing some value chain locations (which are vulnerable to exogenous conditions and catastrophes) with cyber locations. Finally, this perspectives article develops LOIC as a new theoretical concept; future research may seek to further assess its implications for businesses via large-sample empirical analysis.

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## Note

1 https://www.iata.org/en/iata-repository/publications/economic-reports/covid-fourth-impact-assessment/