Location Flexibility in Global Supply Chains: The Efficiency-Imitability Tradeoff and Sustained Competitive Advantage

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> Increased volatility is the new normal for globalized and interconnected supply chains. Supply chain risk management approaches configured for more stable times now need to be updated. World Economic Forum (2013: 7)

> Many firms today are dependent on supply chain networks that were designed when the business environment was more certain, and under the assumption that the future would be more like the past. Now that those organisations are confronted with significantly changed circumstances, it may be the case conventional supply chain structures and practices are no longer fit for purpose. Christopher and Holweg (2017: 3)

1 Introduction

In March 2011, Toyota's operations were severely affected by an earthquake off the east coast of Japan and the resulting tsunami. The company had to close 12 factories in Japan. Other parts of its supply chain, including suppliers and car dealers, were also affected. Toyota's estimated daily loss was USD 62 million, and 6 months passed before its supply chain was back to full capacity. In the face of similar

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disasters, the company has since worked to improve its contingency plans to 2 weeks with the aim of reducing its recovery period. A major reason why Toyota's recovery from the disaster was so lengthy and costly was the company's inability to reconfigure its supply chain in a flexible way across the various production locations.

The Toyota example illustrates that as firms increasingly concentrate functions across multiple locations in order to benefit from location advantages related to costs, time zones, and access to talent, they also become more exposed to a variety of unanticipated risks in the external environment (Porter, 1986). In addition to the instant impact of natural disasters (Knemeyer et al., 2009), challenges in the firm's external environment may relate to political instability (Hahn et al., 2009) or a lack of adequate infrastructure (Doh et al., 2009). Moreover, firms may encounter unforeseen opportunities, such as shifting talent pools, pockets of expertise, and new provider capabilities (Ethiraj et al., 2005; Lewin et al., 2009).

While the impact of volatility and risk in the external environment on the firm has been a long-standing topic in the globalization debate, ample evidence indicates that the world of business has become more "volatile," "turbulent," and "complex" (Christopher & Holweg, 2011; McKinsey, 2021; World Economic Forum, 2013) and that firms that depend on global supply chain networks continually face changing circumstances (Christopher & Holweg, 2017). In light of this "new normal," managers of global sourcing firms view better protection of their supply chains as a priority (ORN, 2011).

In order to respond to their more volatile and risky environments (or in anticipation thereof), firms increasingly rely on *location flexibility*. In this study, we take an explorative approach in order to address two research questions. First, in order to mitigate risk and pursue opportunities in an increasingly volatile and uncertain environment, how do sourcing firms achieve location flexibility in their global supply chains? Second, how can location flexibility help firms sustain or obtain a competitive advantage in their global supply chains?

We define location flexibility in global supply chains as the firm's ability to operate from alternative locations in order to ensure a stable supply of services, raw materials, or intermediate products for their domestic or global operations, thereby meeting low-cost and high-quality expectations despite changing and uncertain external environmental conditions. Location flexibility involves the ability to temporarily or permanently move operations to other locations in order to reduce the impact of location-specific risks and to benefit from emerging location-related opportunities.

Supply chain flexibility includes not only location flexibility but also manufacturing, supplier, and governance flexibility; see Fig. 1.

Hence, while location flexibility shares some features with the three other forms of flexibility, it also complements them. Manufacturing flexibility is the ability of individual production sites to quickly adjust the capacity/volume of existing production lines or swiftly shift to new lines in response to suddenly changing supply or demand conditions (D'souza & Williams, 2000; Jain et al., 2013; Vokurka & O'Leary-Kelly, 2000). Supplier flexibility is a central issue in the strategy and management literature, especially in the debate on strategic networks (e.g., Ring &

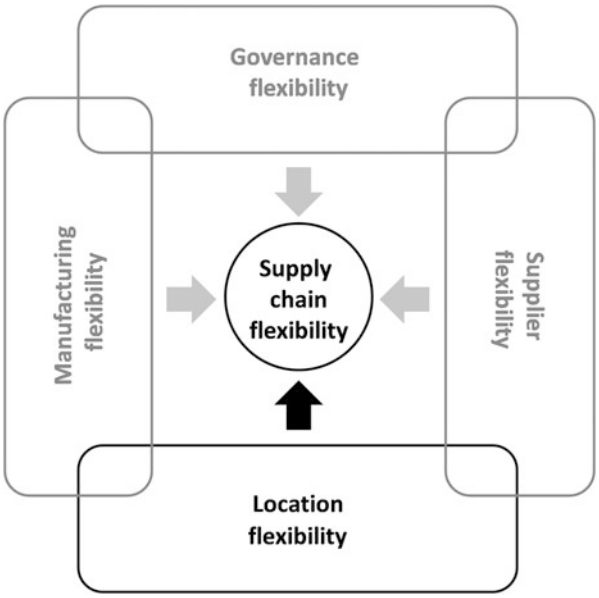

Fig. 1 Scope of the study (authors' own figure)

van de Ven, 1992) and project networks (e.g., Starkey et al., 2000), and in the supply chain literature (e.g., Wagner & Bode, 2006; Yu et al., 2009). Supplier flexibility is the ability to switch among providers if particular providers fail to deliver or if new providers with superior capabilities emerge. Governance flexibility is the ability to change delivery models (e.g., from in-house to outsourced activities) and thereby keep switching costs low if other models prove more effective (e.g., Atkinson, 1984; Eisenhardt et al., 2010; Volberda, 1996). By comparison, location flexibility has not attracted much attention. As we illustrate in Fig. 1, there is a certain overlap between location flexibility on the one hand and manufacturing and supplier flexibility on the other hand. To the extent that manufacturing sites and suppliers are replicable in different locations (countries and regions), this provides location flexibility. We will elaborate this in later sections.

We focus on location flexibility in global supply chains and apply the resource-based perspective (Barney, 1991; Hitt et al., 2016) to highlight three modes to accomplish location flexibility: (i) the use of tasks and processes that are standardized across firms and countries, (ii) the use of firm-specific resources that are replicated across countries, and (iii) the use of unique and rare resources that are mobile across countries. We propose that a firm's location flexibility is shaped by these three modes and that they can offer insights useful for a resource-based theory of location flexibility. A basic tenet of our study is that without location flexibility, firms engaged in global sourcing will struggle to sustain their competitive positions in a volatile and uncertain environment. Moreover, consistent with the resource-based perspective (Barney, 1991; Hitt et al., 2016), we also suggest that each of the three modes entails an efficiency-imitability tradeoff. We elaborate on the role this

tradeoff plays and the mechanisms that firms put in place to manage it (Adler et al., 1999).

Our chapter offers four contributions: First, we incorporate the spatial dimension. Our literature review (see the next section) suggests that location flexibility is somewhat overlooked as a source of global supply chain agility and resilience and that it can serve as a mechanism for sustaining competitive advantage in global supply chains. Second, we outline how location flexibility can be achieved in global supply chains. More specifically, we describe the three basic modes alluded to above. In this regard, we respond to calls for closer integration of international business and strategic management theories with operations management research (Hitt, 2011; Hitt et al., 2016). Third, we formulate assumptions about an essential managerial dilemma in the pursuit of location flexibility in firms' global supply chains, namely, that between cost efficiency and deployment of firm-specific resources that are difficult for competitors to imitate. Fourth, we submit propositions as to how a combined use of location-flexibility modes can sustain firms' competitive advantage in their global sourcing.

Given this background, the chapter proceeds as follows: First, we review the extant research on global supply chain flexibility. We then introduce location flexibility and its three basic modes, after which we zoom in on one particular tradeoff that challenges firms' use of the modes—the tradeoff between cost efficiency and imitability—and we outline assumptions regarding this tradeoff. Subsequently, we discuss how location flexibility can help global sourcing firms sustain their competitive positions in a volatile and uncertain environment. We propose that firms are compelled to search for balanced combinations of the modes in order to sustain their competitive advantage in global sourcing. Finally, we summarize our contributions and suggest avenues for future research.

2 Prior Flexibility Research: Insights and Limitations

The operations management literature emphasizes the importance of flexibility in dealing with supply chain disruptions, delays, supply chain agility, and supplier performance (e.g., Braunscheidel & Suresh, 2009; Chiang et al., 2012; Gligor et al., 2015; Manuj & Mentzer, 2008; Prater et al., 2001). Operations management research has highlighted flexible manufacturing and supply chain agility as sources of competitive advantage (Camison & Lopez, 2010; Gligor et al., 2015), while it has paid little attention to the spatial dimension. The operations management literature somewhat abstracts from the geographical dimension of sourcing (one exception is Mair (1994)). However, operation flexibility and routing flexibility (Parker & Wirth, 1999) imply elements of location flexibility. The operations management literature reflects ideas of the "flexible firm," as it focuses on the role of redundant structures in supplier networks. More specifically, prior research emphasizes the use of multiple suppliers rather than single sourcing in order to increase sourcing flexibility and reduce the risks of a supply failure (e.g., Sánchez & Pérez, 2005; Stecke & Kumar, 2009; Xanthopoulos et al., 2012). Hence, some studies suggest that the presence of

multiple suppliers improves performance in volatile environments (e.g., Wagner & Bode, 2006) because the use of multiple suppliers "can be an effective tool in dealing with unexpected supply breakdowns" (Yu et al., 2009: 789).

Research on flexibility has a long tradition in other literature streams outside the operations management field. The international business literature links flexibility to location factors. For example, researchers have examined the relationship between geographical diversification and the performance of multinational enterprises (MNEs) (Aaker & Mascarenhas, 1984; Allen & Pantzalis, 1996). Geographical diversification may stabilize performance not only by reducing volatility in sales and ensuring more stability in supplies but also through better exploitation of global opportunities in general (e.g., Kim & Mathur, 2008). Hence, studies on operational flexibility suggest that the scalability of production and sales (Swafford et al., 2006) helps firms manage changing location conditions, such as changing cost differentials between countries due to tax differentials (Kogut, 1985), investment incentives (Kogut, 1985), volatile exchange rates (Kogut & Kulatilaka, 1994; Rangan, 1998), or labor costs (Belderbos & Zou, 2007; Fisch & Zschoche, 2012). By the same token, several studies suggest that international network structures that provide operational flexibility improve overall MNE performance (Fisch & Zschoche, 2011; Huchzermeier & Cohen, 1996; Tang & Tikoo, 1999). However, the literature on diversification and scalability strategies remains silent about the conditions under which resources can be flexibly allocated and shifted across locations in the first place. Moreover, the conditions under which different locations allow for the ramping up of comparable scalable operations are unclear.

In the management and organization literature, the flexibility concept is typically associated with an organization's adaptive capability in the face of rapidly changing competitive environments (Eisenhardt et al., 2010; Volberda, 1996). The notion of flexibility is rooted in early discussions of organizational responses to dynamic, unpredictable, and often risky environments. For example, Burns and Stalker (1961) propose that "organic structures" are most suitable for effectively dealing with dynamic environments. Similar notions can be found in the literature on new organizational forms, according to which regular hierarchical forms are inferior to "adhocracies" (Mintzberg & McHugh, 1985), "network organizations" (Miles & Snow, 1986), and "latent organizations" (Starkey et al., 2000) when dealing with environmental contingencies. Most of these views share the notion that adaptable structures and processes along with available, "on-demand" resource pools are needed to respond to frequent changes in environmental opportunities and risks.

Based on this principle, the notion of the "flexible firm" has been developed by several scholars. In Atkinson's model of the flexible firm (1984), a distinction is made between the core and the periphery. The core is constituted by the full-time workforce, while the periphery is composed of both highly qualified experts who are hired on a contract basis and pools of redundant, less-skilled labor hired on demand. Similar notions apply to the model of project networks in project-based industries (see, e.g., Starkey et al., 2000; Windeler & Sydow, 2001) where firms rely on external labor pools and supplier networks in order to flexibly adapt to emerging project opportunities and unanticipated, project-specific challenges.

In the strategic management literature, flexible structures and processes have been linked to sustained competitive advantage. For example, several contributions have focused on incorporating dynamic capabilities and demand-side factors into theories of sustained competitive advantage (e.g., Hitt et al., 2016; Priem & Butler, 2001; Priem & Swink, 2012;Teece et al., 1997 ; Winter, 2003). In addition, strategy scholars have investigated the construct of strategic flexibility in different domains, such as product innovation (Zhou & Wu, 2010), product modularity and organizational design (e.g., Sanchez & Mahoney, 1996), foreign operation modes (Petersen et al., 2000), and in relation to financial performance (e.g., Ebben & Johnson, 2005). In strategy research, the literature on dynamic capabilities deserves mention, as flexibility is one of its central assumptions. This stream of literature, which seeks to add dynamism to resource-based theory (Allred et al., 2011; Barney, 1991; Hitt et al., 2016), investigates how the acquisition, development, and deployment of resources influence firms' sustained competitive advantage (Teece et al., 1997; Winter, 2003).

In sum, the various streams of literature, including research on operations management, offer insights into the flexible firm but tend to neglect the geographical dimension of flexibility. Across research domains, firms' flexibility has largely been treated as a matter of building adaptable and agile structures in the form of multiple supplier networks, agile manufacturing systems, external labor pools, and modular product architectures. Little attention has been paid to contingencies in the actual process of shifting resources and processes across locations in response to increasingly volatile and unpredictable environments.

3 Three Modes of Location Flexibility in Global Supply Chains

At their core, global sourcing practices concern the cost-efficient (re-)allocation of tasks and resources across national and regional borders (e.g., Kedia & Mukherjee, 2009). As we argue above, the long-term capacity of firms to engage in efficient allocation relates to the flexibility with which they can manage or anticipate location-specific risks and benefit from emerging location-related opportunities by temporarily or permanently moving operations to different locations. As our focus is on sourcing rather than market-expansion activities, we emphasize the role played by the properties of tasks and resources in supporting (or constraining) location flexibility rather than, for example, product or market features, which may also affect firms' abilities to move operations across locations, especially when such moves are motivated by market opportunities and constraints. Also, unlike prior sourcing-related research, which has emphasized agile manufacturing or flexibility in switching governance modes and/or suppliers, we focus on the ability to switch locations.

In particular, we propose the three modes of location flexibility, which we have derived from the resource-based perspective. By *modes*, we mean factors that influence the capacity of firms to increase their location flexibility. As such, firms

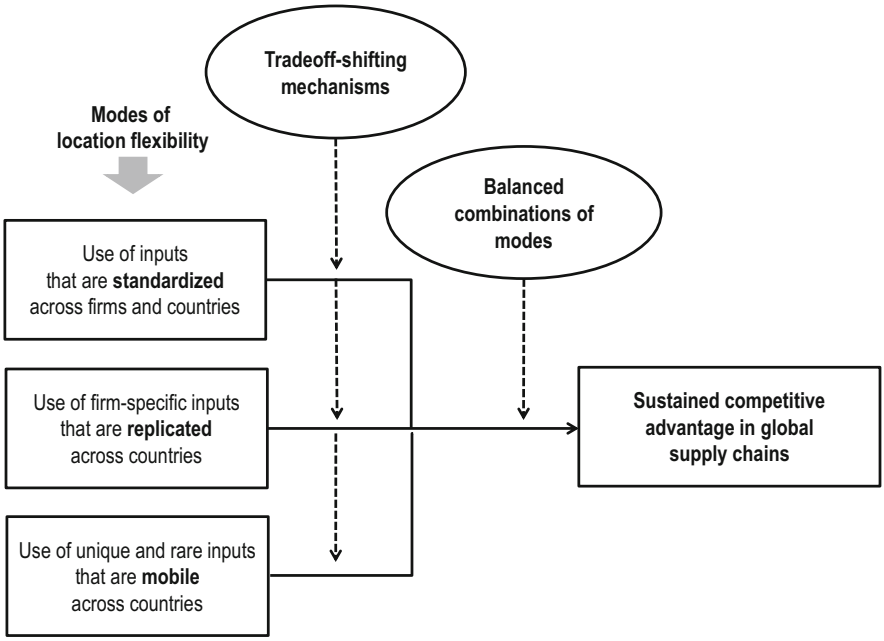

Fig. 2 Analytical model of the study (authors' own figure)

can use these modes to increase their location flexibility and, thereby, sustain their competitive advantage in global supply chains. The central elements in the three modes—tasks and firm resources—are theoretically related, as the firm's resources create the foundation for task execution. This implies that the firm's resources are translated into task execution and that the firm's ability (or inability) to translate resources into task execution influences its competitive advantage (Ray et al., 2004). From the perspective of resource-based theory (Barney, 1991; Hitt et al., 2016), therefore, we posit that the higher the degree of location flexibility mastered by the firm in its global sourcing practice, the greater the positive influence of location flexibility on the firm's competitive advantage (Fig. 2).

As illustrated in Fig. 1, we argue that the three modes have a direct influence on location flexibility as a strategy for sustaining competitive advantage in global sourcing (i.e., the outcome variable in the model). Location flexibility may also be moderated by two other factors: tradeoff-shifting mechanisms and the firm's ability to combine the three modes in a balanced way. We denote tradeoff-shifting mechanisms as organizational mechanisms that enable the ambidextrous firm to improve the use of one mode without deteriorating the other (Adler et al., 1999; O'Reilly & Tushman, 2008). On the other hand, combining modes in a balanced way entails the optimization of outcomes by introducing modes in accordance with their marginal utility for the firm.

As mentioned above, the three modes are derived from the resource-based perspective, which primarily looks inward. We recognize that various exogenous factors may influence the desirability and relevance of location flexibility. All else equal, the greater the firm's dependency on factors embedded in the local environment or the greater its reliance on critical resources residing in partner firms, the less leeway the firm has to use these modes (Andersson et al., 2002; Gulati & Sytch, 2007; Hitt et al., 2016). However, in this study, our focus is on endogenous rather than exogenous factors.

In the following, we account for the basic tenets of the three location-flexibility modes.

3.1 Provision and Use of Inputs That Are Standardized Across Firms and Countries

To a great extent, location flexibility depends on the standardization of processes related to the execution of a chain of interrelated tasks. Standardization has been a pervasive trend across industries (e.g., Brunsson et al., 2012, p. 616), where a standard can be defined as "a rule for common and voluntary use, decided by one or several people or organizations." In global supply chains, such rules typically relate to process activity and flow standards, process performance standards, and process management standards. They facilitate hand-offs, ease comparative measures of performance, and make information less "sticky," such that it is easier to communicate across distances (Kumar et al., 2009; von Hippel, 1994). In other words, standardization often runs parallel to an increasing codification of knowledge, including the specification of tasks and the processes needed to accomplish these tasks, which eases the transfer of tasks and related knowledge across locations (e.g., Cowan & Foray, 1997). Standardization reduces the need for costly coordination and makes the global distribution of tasks and processes more feasible (e.g., Apte & Mason, 1995).

The low coordination costs associated with standardization is a property shared with modularization (e.g., Baldwin, 2008; Baldwin & Clark, 2000; Frandsen, 2017). However, the two constructs differ in other respects—modularization usually implies uniformity in smaller production units ("modules"), and this uniformity is often firm specific. In contrast, standardization typically applies to industries and, thus, transcends firm boundaries. As we will discuss later, an important implication of this difference is that modularization can serve as a source of competitive advantage (Ethiraj et al., 2008), but standardization (as an industry-defined construct) can only do so for a short while, if at all. As an example of the firm specificity of modularization, the major automotive manufacturers have modular systems, called scalable product architecture or "platforms," that are proprietary to the individual corporation (e.g., Ford, Toyota, Volkswagen Group) or, in rare cases, used jointly in strategic alliances (e.g., Hyundai-Kia). However, no single platform is available to all incumbent firms. In contrast, the automotive manufacturers are developing various industry-wide standards, such as the ISO/TS 16949 that covers

quality management system requirements for the design, development, production, installation, and service of automotive-related products.

To illustrate how task standardization and the subsequent process standardization affect location flexibility, we can examine capability maturity model index (CMMI) standards. CMMI standards are frameworks for defining and measuring processes and practices in general and software-development processes in particular. They can be used by both clients and service providers. The standards were defined by Carnegie Mellon University and were first introduced in 2002. The adoption of CMMI standards at different "maturity" levels (from 1 to 5) has been important in the evolution of the global service outsourcing industry (Athreye, 2005; Ethiraj et al., 2005; Niosi & Tschang, 2009), and they have been adopted by providers in particular locations as they attempt to attract projects from global clients (see also Manning et al., 2010). CMMI adoption across service locations (e.g., India, Latin America, and Eastern Europe) allows client and provider firms to move operations to those locations. For example, recent studies indicate that clients frequently relocate particular software-development processes from initial offshore locations (e.g., India) to emerging hotspots, like Ukraine, to utilize emerging talent pools, to exploit temporary labor-cost advantages associated with second-tier locations, or in response to various operational challenges in existing locations (e.g., Manning, 2014).

Two facets of standardization are important in this regard. On the one hand, an increasing number of service providers have adopted CMMI models *across* locations, which simplifies the interface with clients and reduces switching costs in relation to both suppliers and locations. Relatedly, an increasing number of software developers and service staff are trained in CMMI processes across locations, which simplifies recruitment. On the other hand, given the resources at hand, client firms are increasingly standardizing their task requests in line with established models, such as CMMI. This eases the ramp-up of new facilities or operations in new locations. In manufacturing, a number of standards (e.g., quality control) have eased transfers of tasks and processes to new locations in a similar way. The abovementioned standard, ISO/TS 16949, exemplifies an interpretation agreed upon by major automotive manufacturers in the United States and Europe.

We argue that standardization not only facilitates the choice of alternative governance models or alternative suppliers (Baldwin, 2008; Tanriverdi et al., 2007) but also eases the flexible sourcing of tasks and processes from various locations over time. Importantly, the standardization of tasks and processes across firms on the global level has to be understood as a continuous inter-organizational learning process (Ethiraj et al., 2005). Therefore, certain pioneer MNEs may take a pivotal role in establishing standards in certain locations. Motorola played such a role in training local suppliers in CMMI adoption in India and Latin America (Manning et al., 2010; Patibandla & Petersen, 2002). Notably, however, this strategy is not without risks from the firm's perspective. Other competing standards may emerge and eventually become dominant in the industry. In that case, the lead firm assumes pioneering costs but without a return on its investment.

3.2 Provision and Use of Firm-Specific Inputs That Are Replicated Across Countries

Another modality that independently affects location flexibility is a firm's ability to replicate resources across borders, including those that are highly firm specific. The notion of replication relates to the potential *availability* of more or less firm-specific resources (e.g., human, physical, or technological) needed to carry out particular tasks across multiple locations. The ability to ensure the availability of firm resources across locations helps the firm avoid a situation in which it becomes too dependent on the specific resource composition present at one of its sites (Jensen & Petersen, 2013). The case of ECCO—a shoe manufacturer targeting the high-end market segment with eight factories located across the world—exemplifies how a value-chain disruption may prompt a company to change its global sourcing strategy. When some of the worst monsoon rains in decades hit Thailand in October 2011, the impact was severe. In the city of Ayutthaya, north of Bangkok, ECCO experienced a sudden disruption in the production process, as local dikes failed and its buildings were flooded with 2 meters of water. ECCO was able to shift part of its value-chain activities to its unit in Portugal where similar machinery was available and where local staff were able to scale up production at short notice. This specific machinery was necessary for ECCO's injection-sole technology, which is used in the manufacturing of shoes. In other words, through the replication of firm resources, ECCO managed to mitigate some of the damage. Notably, however, this was sheer luck, as ECCO had not planned to maintain a replication of resources at another factory. The incident in Thailand eventually led to a strategic change in the firm's location of value-chain activities (ECCO, 2012).

This raises a key question: Under which conditions is production substitutability possible and how? Only if the resources needed to perform tasks are readily available can switching locations become a feasible option. Importantly, resource availability stems from external factor endowments (e.g., labor pools, external expertise) that are explored and exploited through the firm's (or its partner firms') internal operations. Nevertheless, "external resource availability" at a particular location can be more or less in tune with the firm's needs. We argue that the alignment of external resource conditions with the firm's needs for resources is critical in order for firms to move operations across locations in response to location-specific risks.

The cross-border replication of resources requires a combination of firm-specific capabilities and external resource conditions. Internally, firms need to be able to establish (replicate) capabilities and relationships in new locations according to their needs. This includes political management capabilities (Oliver & Holzinger, 2008) that may help align local stakeholders with their needs. However, this typically only works if locations are willing to accommodate firms' needs by, for instance, letting firms "modify" the local environment in line with their operations. In fact, in some locations, such as Bangalore, India, universities have adopted a sponsorship model in which incoming clients have the opportunity to establish customized courses, internship programs, and other (firm-specific) recruitment channels. Similarly, many suppliers across locations invite clients to specify their needs and establish joint

client-supplier teams to train staff and monitor performance (Luo et al., 2012). Furthermore, suppliers may offer their client firms location flexibility by setting up parallel production sites in different parts of the world. As an example, India-based Bharat Forge (https://www.bharatforge.com), a world-leading supplier in forgings for the automobile industry, is pursuing a "dual-source supply model" whereby it can supply any component to a client from two distinct locations. Plants in Europe and the United States reduce supply chain risks to the major automobile manufacturers (Buckley et al., 2018, p. 38).

3.3 Provision and Use of Unique and Rare Inputs That Are Mobile Across Countries

The cross-border mobility of resources is a third location-flexibility mode in global supply chains. Here, an interesting case of mobility concerns human resources. Over time, the mobility of human resources has increased globally, as evidenced by growth in multi-cultural diaspora communities, especially those involving core economic clusters, such as Silicon Valley and Bangalore (e.g., Bresnahan et al., 2001). Resource mobility is pertinent when the resources needed for a task are only available in one or a few locations and replication is not an option. In other words, the resources are characterized by their uniqueness and rarity on a global scale. Human resource mobility is particularly important in the early and explorative phases of business processes, when new process and product innovations are introduced and knowledge is confined to a few people in the firm. Examples are scientists mastering highly specialized laboratory services or IT personnel providing extremely specialized special effects for movies. The relocation of these rare human resources does not occur in response to risks or cost considerations, such as the political persecution of individuals or wage inflation. Instead, relocation is used to maintain a high degree of causal ambiguity among outsiders (Dierickx & Cool, 1989; Lippman & Rumelt, 1982) and, thereby, protect resources that are critical (Pfeffer & Salancik, 1978; Wernerfelt, 1989) for the continued operations of the corporation as a whole. In comparison, the importance of human resource mobility may diminish at a later stage when business processes become more routinized and embedded in the wider organizational structures and practices.

We consider the importance of resource mobility for enabling firms to operate from multiple, alternative locations, especially when there are practical limits to the use of standardized or replicable tasks and resources. To some extent, resource mobility compensates for the inability to use the two other modes. The global sourcing strategy of GN Audio, a Danish firm producing audio equipment for professional and consumer use under the brand name Jabra©, shows that it is possible to exercise flexibility to switch between locations when required (annual reports and personal communication with GN Audio management). GN Audio outsources its manufacturing to a range of electronics suppliers, who are mainly located in the urban area close to Hong Kong (Dongguan and Shenzhen). If one of GN Audio's suppliers develops its own tool for the production process, GN Audio

may opt to buy that tool from the supplier. This enables GN Audio to relocate the tool to an alternative production site and to an alternative supplier.

4 Assumptions About the Efficiency-Imitability Tradeoff

We now turn our attention to some key competitive implications and tradeoffs associated with the modes. In particular, we focus on the managerial tension between cost efficiency and imitability in relation to location flexibility. Prior research suggests that flexibility is a capacity "in tension," as it increases a firm's adaptability at the cost of stability and predictability (e.g., highly flexible firms may underutilize economies of stable routines, structures, and processes; Schreyoegg & Sydow, 2010; Eisenhardt et al., 2010). Some researchers have argued that flexibility and stability are irreconcilable operational objectives in organizations (e.g., Thompson, 1967). More recently, authors have suggested that it is possible to attain both objectives at the same time (Adler et al., 1999). These authors have discussed the circumstances under which the firm may be "ambidextrous," such that it manages to explore new resources, processes, and structural configurations while simultaneously exploiting existing processes and capabilities (e.g., Eisenhardt et al., 2010; Simsek, 2009).

We contribute to this discussion but shift the focus toward another important but less understood tension—the tension between cost efficiency and imitability when establishing flexible global operational structures. By "cost efficiency," we mean the ability to keep operational costs in check through low factor costs, economies of scale and scope, and other means. By "imitability," we refer to the idea that in order to generate and maintain a competitive advantage (Barney, 1991), firms must deploy firm-specific resources and capabilities that are characterized by a high degree of inimitability.

We argue that in the context of location flexibility, these two partly contradictory considerations are particularly important. We are not the first to examine this efficiency-imitability tradeoff. In a computational experiment, Ethiraj et al. (2008) analyzed the tradeoff between performance gains through innovation achieved in modular architectures that reduce design complexity and the erosion of these gains due to imitation by competitors. In other words, modularization enhances firms' innovation aptitude but makes it easier for other firms to emulate the innovations. Although the beneficial outcome in Ethiraj et al.'s (2008) study is innovation rather than cost efficiency, innovation is driven by an instrument (i.e., modularization) that shares some properties with standardization. Modularization reduces design complexity as well as coordination costs. Hence, the cost-efficiency aspect is to some degree addressed in Ethiraj et al.'s (2008) study.

4.1 The Efficiency-Imitability Tradeoff When Using Standardized Inputs

We introduced the use of standardized tasks and processes as a potentially important mode of location flexibility. When tasks and processes are standardized beyond the boundaries of the firm and across country borders, the sourcing firm can access the resources and capabilities needed to accomplish those tasks through the market, which decreases its dependency on firm-specific resources and operations across locations. Therefore, this is an effective way to reduce relocation and switching costs. Standardization not only facilitates location flexibility but also helps the sourcing firm create efficiency gains and reduce operational risks (e.g., single location dependency, value-chain disruption, holdup risks from outsourcing partners) in global sourcing. However, while the standardization of non-critical tasks (e.g., payroll administration) may aid both flexibility and efficiency without much risk, this is not true for more critical tasks, such as those related to product development. The standardization of these tasks, including the simplification of interfaces with other processes (Baldwin, 2008), may increase location flexibility but at the risk of knowledge leakage and imitation by competitors.

Thus, the role of standardization is ambiguous. On the one hand, task and process standardization is a source and even a driver of location flexibility and contributes to the firm's competitiveness through potential cost-efficiency gains. This relates, in particular, to the execution of transactional tasks, such as back-office service activities. On the other hand, such practices are generally available to and applied by sourcing firms. As such, standardization can, at best, provide the sourcing firm with a situation of competitive parity with other incumbent firms. Even though task standardization is an effective facilitator of location flexibility and a driver of cost efficiency, the associated competitive advantage is ephemeral—other firms can easily emulate this source of cost efficiency. Hence, we present the following assumption:

Assumption 1 *Location flexibility in global supply chains achieved through the use of tasks and processes that are standardized across firms and countries is associated with low costs as well as high imitability.*

4.2 The Efficiency-Imitability Tradeoff When Using Replicated Resources

Another source of location flexibility is the presence of similar and predominantly firm-specific resources (human, physical, technological) in more than one location. Such resources may be available within the boundaries of the firm or reside with external partner firms. We focus on the availability of resources across locations, especially in situations where task and process standardization is low or absent, such as in the hiring of functionally flexible engineers in multiple locations that are able to take on tasks from other locations. Another example is machinery that is set up in

multiple locations with the capacity to duplicate the production process and, hence, buffer the risk of production disruptions in any one location.

Similar to task standardization, resource replication across locations may increase a firm's location flexibility. However, its implications for the efficiency-imitability tradeoff differ from those of task standardization. With regard to cost-efficiency implications, making similar resources available in multiple locations reduces a firm's dependency on those resources in any one location. This, in turn, lowers a firm's vulnerability to value-chain disruptions, which may be caused by various factors, including natural disasters (e.g., the Toyota and ECCO examples described earlier) or the turnover of strategically critical staff. The establishment of redundant resources in multiple locations facilitates the temporary or permanent relocation of processes among locations in case of such disruptions and, thereby, helps reduce potential costs arising from the disruptions (e.g., client-litigation costs). However, the establishment of such redundancies may involve not only considerable upfront costs (e.g., costs of acquiring talent, technology, and other equipment) and costs associated with transferring knowledge, but also running costs (e.g., owing to a need to keep a redundant pool of staff available to handle additional tasks if needed). Several case studies indicate that globally dispersed firms are willing to accept such costs to mitigate the risk of operational disruptions (e.g., Manning, 2014). Notably, the magnitude of such costs depends on the firm's ability to operate efficiently and effectively across multiple international locations. In any case, these often "invisible" costs should not be ignored, as they may be significant and influence firm performance (e.g., Stringfellow et al., 2008).

Despite the added costs of establishing and running replicated operations, firms' perception of such costs may change in the wake of the COVID-19 pandemic. Replication of operations across locations is a strategy for safeguarding against and mitigating risks of value-chain disruption—a risk that became the reality for many firms as the spread of the pandemic affected firms' international supply chains and operations with resulting delays, bottlenecks, and disruptions (e.g., Gereffi, 2020; World Economic Forum, 2020). Shortly after the outbreak of the pandemic, these disruptions spurred a debate about possible firm responses to overcome the challenges. Such responses could include a contraction of global supply chains to regional supply chains combined with a replication of operations across multiple locations and (in the case of offshore outsourcing) multiple suppliers (McKinsey, 2020; UNCTAD, 2020; World Economic Forum, 2020). However, as Verbeke (2020) points out, the international supply chain of a firm did not appear overnight. Rather, its configuration has evolved gradually over a long period, and it exists because it rests on a business case that benefits the firm. According to Verbeke (2020), it is therefore not likely to change fundamentally. Here, a strategy with replication of resources across locations presents itself as a way to maintain the international supply chain but at the same time ensure safeguarding against disruptions. In this context, the added cost of replication may seem as an acceptable price to pay.

Moreover, unlike task and process standardization, the replication of resources across locations does not necessarily make firms vulnerable to knowledge leakages

or to imitation by competitors as long as resources in the global supply chain are configured to achieve an inimitable advantage (Allred et al., 2011). The ways in which resources are utilized may be highly firm specific and deeply embedded in the firm's processes and culture, thereby supporting a high degree of interfirm causal ambiguity (King, 2007; Reed & DeFillippi, 1990), which serves as a barrier to competitor imitation. We therefore formulate the following assumption:

Assumption 2 *Location flexibility in global supply chains achieved through the use of firm-specific resources that are replicated across countries is associated with low imitability as well as high costs.*

4.3 The Efficiency-Imitability Tradeoff When Using Mobile Resources

We argued above that resource mobility between locations increases a firm's location flexibility. However, while explicit knowledge (e.g., process specifications) can be easily shared, tacit knowledge is difficult to disseminate across locations. In this regard, we focus on the mobility of *human* resources (Khadria, 2004; OECD, 2001). More specifically, we consider a situation in which the sourcing firm operates with a high degree of human resource mobility, while the availability of resources across multiple locations is limited, and task/process standardization within the firm and in the industry is low or absent. Such a situation may be evident for various types of activities, such as activities that are part of the explorative stage of an R&D process. In this case, research staff from the firm's central R&D unit would need to travel to foreign subsidiaries or visit external partners to tap into local specialized knowledge. This implies that the travelling members of the head office's staff simultaneously act as boundary spanners and system integrators. Another example would be a sourcing firm with poorly developed knowledge-transfer capabilities or a high degree of tacit knowledge. If the firm operates in a market for customized solutions, the importance of the mobility of human resources and experiential knowledge is amplified.

The costs involved in making unique and rare resources mobile across locations are high. In fact, many firms do not account for these costs, such as the costs of moving and accommodating expatriates, when setting up new locations (e.g., Peréz & Pla-Barber, 2005). Scale advantages are difficult to achieve, and the costs related to human resource mobility remain stable with little possibility of cost reductions through increased efficiency. In addition, firms may depend on the idiosyncratic knowledge embedded in individuals in order to ramp up new locations, which makes location flexibility a costly and risky endeavor when tasks and processes are not standardized and resources not replicable across locations.

However, a reliance on idiosyncratic knowledge embedded in mobile individuals who have an incentive to pursue a career in the respective firm may ensure and protect tacit knowledge flows. Competitors will find it difficult, if not impossible, to copy the ramping up of new locations by the respective firm. Therefore, increasing location flexibility through resource mobility makes firms adaptable to changes in

location conditions while protecting them from knowledge leakages. We therefore assume the following:

Assumption 3 *Location flexibility in global sourcing achieved through the use of non-replicable (*i.e.*, unique and rare) resources that are mobile across countries is associated with low imitability as well as high costs.*

In general terms of costs and imitability, the two modes—resource replication and use of mobile resources—are similar. However, this does not imply that they are mutually substitutable. If resources are unique and rare, they do not easily lend themselves to replication. On the other hand, if resources are replicable, situation-specific cost structures may determine whether mobility or replicability should be the preferred mode.

5 Location Flexibility to Sustain Competitive Advantage: Implications for Managers and Some Propositions

Our analysis of location flexibility has thus far been predominantly descriptive. Therefore, we now redirect our analysis toward a more management-oriented, prescriptive approach to sustaining competitive advantage. First, we summarize our analysis from the previous sections in a general proposition:

Proposition 1 *In a volatile global environment, firms must achieve location flexibility in order to sustain a competitive advantage in their global supply chains.*

Based on this general proposition, in the following, we discuss how global sourcing firms may shift the efficiency-imitability tradeoff in a positive direction by making either standardized inputs less imitable or firm-specific inputs less costly.

5.1 Use of Standardized Tasks and Processes to Sustain Competitive Advantage

When industry standards exist, they serve as facilitators for all firms and increase the degree of location flexibility among lead firms and follower firms (i.e., firms that do not possess agenda- and standard-setting power in an industry; see, e.g., Gereffi et al., 2005). However, for follower firms, the increase in location flexibility tends to be accompanied by adaptation costs, which must be borne in order to internalize and comply with industry standards that apply across countries. For example, a multinational shoemaker that is a lead firm in its industry is better positioned to lobby for new ILO environmental standards for leather production (e.g., tanning of rawhides). Those new international standards would impose adaptation costs on (some) competitors and their suppliers. For follower firms, there is consequently a tradeoff between the benefits of increasing location flexibility by adopting the standards and

related adaptation costs. While standardization thus enables location flexibility, it does not move the firm into a superior competitive situation but instead ensures competitive parity relative to incumbent firms. Given this background, we derive the following proposition:

Proposition 2 *Location flexibility based on standardized tasks and resources that are cost efficient is a necessary but not sufficient condition for sustaining competitive advantage in a firm's global supply chain.*

5.2 Use of Replicated and Mobile Resources to Sustain Competitive Advantage

Upfront costs, coordination costs, as well as potential costs of switching production from one location to another are major managerial considerations when replicating firm-specific resources across locations. In this context, the case of the German automotive supplier MoTeC and its resource-replication strategy is interesting (see Manning et al., 2012). MoTeC's strategy includes entering second-tier locations as a first mover, which allows it to customize the local supply of engineering talent to accommodate its needs while keeping training costs relatively low. In other words, the company's local economic power as a foreign lead firm allows it to partly externalize firm-specific training to the local university. Moreover, by duplicating this strategy across multiple locations, the firm has managed to replicate firm-specific resources at multiple locations at a relatively low cost. This implies that follower firms will face considerable adaptation costs when rolling out similar strategies, as they are less likely to customize local talent supplies for their own needs unless they adjust their demand to already established local capabilities.

Location flexibility based on resource replication may be challenged by high switching costs or the costs of holding production capacity idle. Therefore, firms may be concerned with increasing capacity and soaring switching costs. The switching of production from location A to location B typically implies the downsizing of production resources in country A, at least temporarily, in order to reduce "idle" production capacity. In practice, this usually means laying off employees in location A, which not only creates an ethical problem but also is often difficult for firms complying with local labor regulations (e.g., protection against layoffs and severance pay requirements; Ackers & Wilkinson, 2003). For this reason, we suggest that increasing location flexibility through the replication of (human) resources while adjusting production capacity is a practice firms are likely to apply when labor market regulations are "liberal" in that they allow for seamless hiring and firing. In contrast, adjusting production capacity in support of location flexibility can become costly in countries like Spain, France, and Germany, where employees enjoy high levels of protection.

These differences and the tendency of firms to relocate to "liberal" locations create not only an ethical dilemma but also important challenges for local economies trying to sustainably generate employment through "attractive" location factors. In

addition, we expect large firms to perceive this tradeoff mechanism as a risk factor in relation to their corporate social responsibility policies of being "good citizens," as it may evoke an adverse image of these firms as "footloose" MNEs.

Similar to resource replication, resource *mobility* is intrinsically associated with relatively high costs. To mitigate this problem, many firms have adopted global HR policies with various components that individually and in combination promote employee mobility without excessively high costs. The expatriation of employees in connection with long-term assignments is often associated with high failure rates because the employees and their families do not thrive in the foreign environment. Therefore, several sourcing firms have developed policies that facilitate the expatriation and repatriation of individual employees and their families. For example, studies show that firms may initiate "re-culturalization" (Wang & Yeh, 2005) or "transnationalization" processes (Papastergiadis, 2000) that aim to give the employees and their families a global mindset or, at least, help them better adapt to foreign environments.

Furthermore, studies suggest that long-term assignments are often supplemented with short stays abroad as part of more systemized international rotation schedules (Manning et al., 2013; Welch, 2003). Firms are moving toward global HR policies that include performance policies and career-development measures across different MNE units. One related method to increase employee mobility is tax-liability packages that safeguard employees against double taxation and complex income tax filing procedures. For instance, firms from the European Union can form a "European firm" in which the employees are taxable by only one European country even though they hold job assignments in several countries during the year. In this way, the employees can work across borders without ending up in complicated and delicate tax situations.

Tradeoff-shifting mechanisms in relation to both the mobility and replication of resources are primarily directed toward cost efficiency. However, as these two location-flexibility modes are not perfectly immune to imitation by competitors, tradeoff-shifting mechanisms that aim to increase inimitability may also be relevant. In the context of resource replication, there may be knowledge-spillover and leakage problems. In terms of the mobility of unique human resources, the degree of inimitability may depend on the retention of key staff members. Interfirm mobility (i.e., competitors' capacity to attract key staff members) may erode the inimitability of human capital. Consequently, some firms may develop measures to reduce interfirm mobility by either introducing competition clauses (although these may conflict with labor-market legislation in many countries) or establishing strong ties with key employees (see Demirbag et al., 2012). Retention policies may include a wide range of HRM instruments, such as career-development schemes, attractive work environments, stock options and other financial rewards, outcome-based compensation, and various benefit packages.

In the global sourcing of science and engineering in particular, staff retention is a major challenge, as it affects the financial position of the organization (Lewin et al., 2009). High attrition rates incur significant recruitment and training costs and make

it difficult to maintain quality standards. Notably, employee turnover rates in major offshoring destinations may be quite high in these areas.

Hence, we present our third proposition in relation to replicated and mobile firm-specific resources:

P3 *Location flexibility based on the replication and mobility of firm-specific resources that are difficult for competitors to imitate is a necessary but not sufficient condition for sustaining competitive advantage in a firm's global supply chain.*

5.3 Combined Use of the Three Modes to Sustain Competitive Advantage in Global Sourcing

Aside from tradeoff-shifting mechanisms, some firms have started to develop capabilities that allow them to combine the three location-flexibility modes and, thereby, increase their overall adaptive capacity. One important facilitating factor is the distinction between critical and non-critical tasks and resources (Ellram et al., 2013; Pfeffer & Salancik, 1978; Wernerfelt, 1989). When critical resources (e.g., certain machinery) or managerial or product-development skills that relate to a firm's competitiveness are involved, firms are more likely to promote resource mobility or replication than task or process standardization in order to increase location flexibility (e.g., Manning et al., 2013). Conversely, in support of location flexibility, firms may choose to adopt standard solutions for non-critical tasks and processes, such as payroll administration, IT infrastructure, and tech support. For most firms, inimitability is not crucial in relation to these non-core resources, while cost efficiency is.

Hence, one important "combinative capability" (Kogut & Zander, 1992) is to mix the different modes in a balanced way. This involves finding a combination that maximizes the cost-efficiency and inimitability properties of location flexibility. The GN Audio example mentioned earlier demonstrates not only how sourcing firms can make critical resources mobile but also how they can combine different types of components in their global sourcing activities. GN Audio distinguishes between three component types in its sourcing. *Standard* components are off-the-shelf standard components with multiple suppliers. These components made up only 11.5 percent of GN Audio's total sourcing costs in 2015. *Custom* components are modified to comply with GN Audio's specifications and are only available form a few suppliers. In terms of value, these components represented the bulk of GN Audio's sourcing (64.2 percent of total sourcing costs in 2015). *Unique* components are often intellectual property and covered by a number of patents. Usually, only one supplier is available. These components made up 24.3 percent of total sourcing costs in 2015.

The GN Audio example illustrates how location-flexibility modes hinge on the type of components that are sourced. In relation to GN Audio's custom and unique components, we see elements of replication and mobility. Furthermore, GN Audio is attempting to increase the relatively low proportion of standard components by

encouraging more competition among suppliers in the industry. Importantly, the GN Audio example points to the importance of finding the right mode *balance*. This balance is important in supply-chain competition, as firms need to identify and understand how the deployment of strategic and non-strategic resources determines their performance (Ellram et al., 2013). We translate these observations of diminishing returns to scale in the use of (costly) firm-specific resources into a principle for combining the three location-flexibility modes in a balanced way.

In summary, the principle of a balanced combination of the three location-flexibility modes prescribes the extensive use of standardized tasks and processes and sparse use of replicated or mobile firm-specific, critical resources. This leads to our fourth proposition:

P4 *Location flexibility that combines standardized, replicated, and mobile resources constitutes a necessary and sufficient condition for sustaining competitive advantage in a firm's global supply chain.*

6 Conclusion and Further Research Avenues

6.1 Conclusions and Contributions

In order to fill a gap at the intersection of international business and operations management research, we have taken a resource-based perspective (e.g., Hitt et al., 2016) to discuss location flexibility as a somewhat overlooked but important type of flexibility in today's increasingly volatile and uncertain environment for global sourcing firms. In relation to our first research question about how sourcing firms achieve location flexibility, we discussed the standardization of tasks and processes as well as the replication and mobility of resources across locations. For our second research question on how location flexibility can help firms sustain their competitive advantage, we elaborated on the efficiency-imitability tradeoff as a central managerial dilemma faced by global sourcing firms. We discussed several ways in which firms manage this tension when trying to increase their global supply chain agility across locations. We proposed that the balanced use of the three modes in combination is likely to be the most efficient and effective mechanism for helping firms sustain their competitive advantage in global sourcing. This is echoing the point made by Christopher and Holweg (2011) that flexible options on average will pay off and "(. . .) that firms that are considering flexibility in their supply chain design will be much better equipped to deal with (. . .) turbulence. We need to move away from the 'control' mindset that seeks to eradicate variability, towards building structures that can cope with turbulence, and embrace volatility as an opportunity" (Christopher & Holweg, 2011: 80).

In sum, our study opens up for new interesting research directions concerning location flexibility in global supply chains.

6.2 Avenues for Future Research

Our analysis complements prior research on manufacturing, supplier, and governance flexibility (Argyres & Liebeskind, 2002; Atkinson, 1984; Mayer, 2006; Theyel & Hofmann, 2021; Volberda, 1996; Yu et al., 2009). We argue that these types of flexibility become increasingly intertwined with location flexibility through the distribution and integration of operations across globally dispersed locations. We propose a combined and balanced use of the three location-flexibility modes as a way to sustain competitive advantages in global sourcing. Such an approach could enhance our understanding of how firms with globally dispersed operations can develop the capacity to reconfigure the spatial dimensions of their global supply chains in response to or in anticipation of volatile and uncertain environments while keeping reconfiguration costs low. Second, and consistent with the resource-based perspective, we have focused our study on firm-specific modes of location flexibility. However, as mentioned earlier, exogenous factors related to locations in which the sourcing firm operates also influence the firm's location flexibility. Therefore, we encourage future research that explores this aspect. In this regard, resource dependence theory (e.g., Hillman et al., 2009) may serve as a useful theoretical lens for investigating the influence of locally embedded resources on location flexibility. With regard to dependence on locally embedded suppliers and networks, and the resulting influence on the location flexibility of global sourcing, theories considering network perspectives (e.g., Johanson & Vahlne, 2009; Vahlne & Johanson, 2020), global value-chain governance (Gereffi et al., 2005; Pananond et al., 2020), and interfirm relations and relational resources (e.g., Dyer et al., 2018; Dyer & Singh, 1998; Kedia & Lahiri, 2007) may all offer fruitful theoretical perspectives.

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