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# Geopolitical Disruptions and Supply Chain Structural Ambidexterity

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## Abstract:

**Purpose** – This paper seeks insights into how multinational enterprises restructure their global supply chains to manage the uncertainty caused by geopolitical disruptions. To answer this question, we investigate three significant geopolitical disruptions: Brexit, the US-China trade war and the Covid-19 pandemic.

**Design/methodology/approach** – The study uses an inductive theory-elaboration approach to build on Organisational Learning Theory and Dunning’s eclectic paradigm of international production. Twenty-nine expert interviews were conducted with senior supply chain executives across 14 multi-national manufacturing firms. The analysis is validated by triangulating secondary data sources, including standard operating procedures, annual reports and organizational protocols.

**Findings** – We find that, when faced with significant geopolitical disruptions, companies develop and deploy supply chain structural ambidexterity in different ways. Specifically, during Covid-19, the US-China trade-war and Brexit, companies developed and deployed three distinct types of supply chain structural ambidexterity through; (1) partitioning internal subunits, (2) reconfiguring supplier networks, and (3) creating parallel supply chains.

**Originality/value** – The findings contribute to Dunning’s eclectic paradigm by explaining how organisational ambidexterity is extended beyond firm boundaries and embedded in supply chains to mitigate uncertainty and gain exploration and exploitation benefits. During significant geopolitical disruptions, we find that managers make decisions in tight timeframes. Therefore, based on the transition time available, we propose three types of supply chain structural ambidexterity. We conclude with a managerial framework to assist firms in developing supply chain structural ambidexterity in response to geopolitical disruptions.

**Keywords:** Geopolitical disruption, ambidexterity, organizational learning theory, eclectic paradigm, supply chain design.

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## 1. Introduction

The relentless pursuit of globalisation has made Multinational Enterprises (MNEs) susceptible to geopolitical disruptions including armed conflict and tensions between nation states, which affect the normal and peaceful course of international trade (Roscoe *et al.*, 2022; Schmeisser, 2013). Recent examples of geopolitical disruptions include Covid-19, the US-China Trade-War and the United Kingdom's departure from the European Union, or Brexit (Meyer *et al.*, 2023). Vaccine nationalism and the hoarding of Personal Protective Equipment (PPE) by governments during the Covid-19 pandemic caused ruptures in global trade (Chakkol *et al.*, 2023). The trade-war between the United States and China led many multinational companies to move production facilities and suppliers from China to Vietnam and Mexico to avoid customs duties (Handfield *et al.*, 2020). Brexit prompted many UK companies to relocate production facilities and distribution hubs from the UK to the European mainland to avoid new customs documentation requirements and expensive tariffs when rules of origin requirements were not met (Moradlou *et al.*, 2021a; Roscoe *et al.*, 2020). The uncertainty that surrounded these disruptive events meant that many companies had no prior planning or mitigation strategy in place; exposing them to significant supply chain risks (van Hoek, 2020).

Geopolitical disruptions, such as the Ukraine war and disputes over the sovereignty of Taiwan (Meyer *et al.*, 2023; Chakkol *et al.*, 2023), continue unabated, leading many scholars to question companies' myopic focus on locating production in low wage economies to reduce cost and gain supply chain efficiencies (Handfield *et al.*, 2020; van Hoek, 2020). These events are forcing companies to recognize the importance of balancing efficiency and flexibility in supply chains to manage ongoing geopolitical disruption risks (Sharma *et al.*, 2020). According to organisational learning theory (March, 1991) companies can simultaneously explore for new opportunities (flexibility) and exploit old certainties (efficiency), if certain conditions are met. This is the notion of organizational ambidexterity (Birkinshaw and Gupta, 2013), which refers to an organisations' ability to achieve both efficient and flexible operations simultaneously (Adler *et al.*, 1999). Organisational ambidexterity can be extended beyond the boundaries of the firm by partitioning the supply chain, where one supply chain focuses on delivering low cost commodity items, while another concentrates on delivering customized products quickly to consumers (Roscoe and Blome, 2019). These seemingly conflicting goals can be reconciled when production and distribution facilities are located in particular countries; either close to major markets to optimize flexibility, or in low wage economies to achieve cost advantages. By possessing a 'supply chain ambidexterity' capability a company is able to pursue supply

chain exploitation (efficiency) and exploration (flexibility) outcomes simultaneously (Kristal *et al.*, 2010).

While existing studies have examined how companies structure supply chains to explore for new opportunities and exploit existing efficiencies (Aslam *et al.*, 2018; Gualandris *et al.*, 2018; Tamayo-Torres *et al.*, 2017), little research has considered how geopolitical disruptions influence supply chain ambidexterity. At the same time, the ways in which geopolitical disruptions affect global supply chain design, including the location of production and distribution facilities, remains an under researched topic. Addressing this knowledge gap is important because managers require an understanding of how to build ambidextrous supply chains to navigate today's highly uncertain geopolitical environment. This study draws on organisational learning theory and Dunning's eclectic paradigm to answer the question: *How do companies develop and deploy supply chain structural ambidexterity to effectively respond to geopolitical disruptions?* To answer this question, empirical evidence is gathered from 29 semi-structured interviews with senior executives working for multinational manufacturing companies affected by the uncertainties arising from the Covid-19 pandemic, US-China Trade-War, and Brexit. Findings from the interviews are triangulated with secondary data sources including, company websites, annual reports, and industry publications.

Our findings contribute to organisational learning theory and Dunning's eclectic paradigm by showing that different variations of supply chain ambidexterity emerge according to the transition time available to firms and the geographical dispersion of the supply base. When shorter transition times are available, companies are driven by strategic asset-seeking and efficiency-seeking motives to restructure their internal subunits. When longer transition times are available, companies are motivated by market seeking and efficiency seeking advantages to build parallel supply chains that are independently dedicated to flexibility or efficiency objectives. Finally, we find that, regardless of the transition times, companies are driven by resource seeking and efficiency seeking motives to reconfigure supplier networks to achieve exploitation and exploration benefits.

The remainder of this paper is organised as follows. The next section discusses the theoretical foundations of the paper, while Section 3 presents a justification of the research methodology. In Section 4, the key findings from the study are presented. Section 5 synthesises the research findings and extends the literature by presenting four theoretical informed propositions. The final section outlines the paper's managerial and theoretical contribution as well as its limitations, while providing potential avenues for future inquiry.

## **2. Literature Review**

## 2.1. Dunning's Eclectic Paradigm

When a firm considers where to locate its production and distribution facilities, it is confronted both with a governance (make or buy) and location decision (e.g., Tate and Bals, 2017; Gray *et al.*, 2013; Dachs *et al.*, 2019). The eclectic paradigm explains why firms select to export, license or pursue foreign direct investment (FDI) to gain access to overseas markets (Dunning, 1980). The paradigm suggests that international business decisions are prompted by *ownership*, *location*, and *internalisation* (OLI) *advantages*. Ownership advantages refer to the resource pool controlled or owned by a firm. Internalisation advantages are achieved if the firm eliminates the costs associated with transacting on international markets and decides to internalise these activities within its own managerial hierarchy. The decision on where to locate supply chain assets, such as production and distribution facilities, is based on resource availability, the strength of institutional structures, or other advantages specific to a particular geography (Dunning, 2001).

Dunning's eclectic paradigm is particularly useful in understanding how location attractiveness influences supply chain configuration decisions. Dunning (1998, 2001) argues that MNEs will engage in relocating manufacturing facilities according to four factors: (1) resource-seeking advantage including the availability of raw materials, infrastructure and local talent/qualified personnel); (2) Market-seeking advantage including access to (growing) markets, proximity to customers and government's economic policies; (3) Efficiency-seeking advantage including manufacturing related costs and government incentives and; (4) Strategic asset-seeking advantage including focusing on core competencies, intellectual property protection and synergies related to maintaining a local presence (e.g. McIvor and Bals, 2021; Moradlou *et al.*, 2021b). A location's attractiveness is relative to home country attractiveness, so either deteriorations in the host country or improvements in the home country can induce location changes. Aggregating various fragments of the literature, we developed Table 1 to provide an overview of these four factors and how they influence location change.

Table 1, Dunning's four factors for location attractiveness

| <i>Dependent variable</i> | <i>Overall OLI factors</i> | <i>Individual factors</i>   | <i>Exemplary references</i>  |
|---------------------------|----------------------------|---|--|
|                           | Resource Seeking Advantage | Availability of raw materials/natural resources/critical (knowledge intensive) assets | Moradlou <i>et al.</i> , 2021b; McIvor and Bals, 2021; Cui <i>et al.</i> , 2014; Jensen <i>et al.</i> , 2013 |
|                           |                            | Availability of infrastructure  | Moradlou <i>et al.</i> , 2021b; McIvor and Bals, 2021;   |
|                           |                            | Availability of local talent/qualified personnel                                      | Tate <i>et al.</i> , 2014; Yun, 2020   |
|                           |                            | Labour cost   | Tate <i>et al.</i> , 2014; Moradlou and Backhouse, 2016; Jensen <i>et al.</i> , 2013                         |

*Propensity for Location Change*

|  |  |   |   |
|--|--|---|---|
| Market Seeking Advantage   | Availability of transportation   | Tate <i>et al.</i> , 2014; Moradlou and Backhouse, 2016; Yun, 2020  |   |
|  | Product specialization   | Yun, 2020   |   |
|  | Local partners in the host country                                     | Moradlou <i>et al.</i> , 2021b  |   |
|  | Access to suppliers (for inputs)                                       | Moradlou <i>et al.</i> , 2021b; Pattnaik <i>et al.</i> , 2021   |   |
|  | Access to R&D  | Moradlou <i>et al.</i> , 2021b; Moghaddam <i>et al.</i> , 2014  |   |
|  | Cluster/agglomeration  | Gray <i>et al.</i> , 2013   |   |
|  | Declining demand (in current location)                                 | Moradlou <i>et al.</i> , 2021b  |   |
|  | Growth of local economy  | Ashby, 2016; Yun, 2020; Cui <i>et al.</i> , 2014  |   |
|  | Declining plant profitability (in current location)                    | Moradlou <i>et al.</i> , 2021b  |   |
|  | Access to local and international markets                              | Moradlou <i>et al.</i> , 2021b; Cui <i>et al.</i> , 2014; Moghaddam <i>et al.</i> , 2014; Jensen <i>et al.</i> , 2013   |   |
|  | Proximity to customers/closeness to major centres of demand            | Moradlou <i>et al.</i> , 2021b; Pattnaik <i>et al.</i> , 2021)  |   |
|  | Responsiveness to customer demand                                      | Moradlou <i>et al.</i> , 2017; Moradlou <i>et al.</i> , 2021b   |   |
|  | Demand volatility  | Stentoft <i>et al.</i> , 2016; Yun, 2020  |   |
|  | Global competition   | Wiesmann <i>et al.</i> , 2017; Yun, 2020  |   |
|  | Customer service   | Srai and Ané, 2016; Fratocchi <i>et al.</i> , 2016; Yun, 2020   |   |
|  | Efficiency Seeking Advantage   | Regulatory requirements   | Yun, 2020   |
|  |  | Government's economic policies (e.g. government investment in education and in general)   | Moradlou <i>et al.</i> , 2021b; McIvor and Bals, 2021 |
| Employment legislation   |  | McIvor and Bals, 2021   |   |
| Uncertain regulations  |  | Moradlou <i>et al.</i> , 2021b  |   |
| Higher stability (political, financial, regulations., etc.) of the destination country |  | Moradlou <i>et al.</i> , 2021b; Giroud and Mirza, 2015  |   |
| Lower costs of manufacturing   |  | Moradlou <i>et al.</i> , 2021b; Cui <i>et al.</i> , 2014; Jensen <i>et al.</i> , 2013   |   |
| Transportation costs   |  | McIvor and Bals, 2021; Bunyaratavej <i>et al.</i> , 2008  |   |
| Lead times   |  | Moradlou <i>et al.</i> , 2021b; McIvor and Bals, 2021   |   |
| Capital-intensive resource exploitation  |  | Moradlou <i>et al.</i> , 2021b  |   |
| Supply continuity (to avoid disruption)  |  | Moradlou <i>et al.</i> , 2021b)   |   |
| Coordination costs   |  | Moradlou and Backhouse 2016; Kinkel and Maloca, 2009; Kinkel, 2012; Yun, 2020   |   |
| Labor cost   |  | Tate <i>et al.</i> , 2014; Moradlou and Backhouse, 2016; Bunyaratavej <i>et al.</i> , 2008; Cui <i>et al.</i> , 2014; Moghaddam <i>et al.</i> , 2014; Jensen <i>et al.</i> , 2013 |   |
| Supply chain resilience  |  | Srai and Ané, 2016; Stentoft <i>et al.</i> , 2016; Wiesmann <i>et al.</i> , 2017; Yun, 2020; Pattnaik <i>et al.</i> , 2021  |   |
| Environmental concern  |  | Srai and Ané, 2016; Presley <i>et al.</i> , 2016; Yun, 2020   |   |
| Government incentives  |  | Moradlou <i>et al.</i> , 2021a, b; Bunyaratavej <i>et al.</i> , 2008; Moghaddam <i>et al.</i> , 2014  |   |
| Currency fluctuations  |  | Moradlou <i>et al.</i> , 2021a  |   |
| Taxes and import duties  |  | Moradlou <i>et al.</i> , 2021b; Moghaddam <i>et al.</i> , 2014  |   |
| Non-tariff cost such as inventory levels and border delays                             | Moradlou <i>et al.</i> , 2021b   |   |   |
| Labour productivity  | McIvo McIvor and Bals, 2021; Moghaddam <i>et al.</i> , 2014            |   |   |
| Business consolidation with other facilities   | Moradlou <i>et al.</i> , 2021b   |   |   |
| Government incentives  | Moradlou <i>et al.</i> , 2021b   |   |   |
| Focus on core activities   | Arlbjørn and Mikkelsen, 2014; Stentoft <i>et al.</i> , 2016; Yun, 2020 |   |   |

|                                   |  |  |
|-----------------------------------|--|--|
| Strategic Asset Seeking Advantage | Synergies related to maintaining a local presence (e.g. gaining localised tacit knowledge) | Moradlou <i>et al.</i> , 2021b; Moghaddam <i>et al.</i> , 2014                           |
|                                   | Innovation   | Fratocchi <i>et al.</i> , 2016; Mlody, 2016; Yun, 2020; Moghaddam <i>et al.</i> , 2014   |
|                                   | Automation and technological resources   | Srai and Ané, 2016; Stentoft <i>et al.</i> , 2016; Yun, 2020; Dachs <i>et al.</i> , 2019 |
|                                   | Intellectual property protection   | Hannibal and Knight, 2018; Yun, 2020   |
|                                   | Made-in effect   | Ancarani <i>et al.</i> , 2019; Yun, 2020   |
|                                   | CSR  | Mezzadri, 2014; Yun, 2020  |
|                                   | Reputation/image/brand   | Presley <i>et al.</i> , 2016; Yun, 2020  |

## 2.2 Geopolitical Disruptions

Tensions between nation-states have disrupted seamless global supply chains operations (Colantone and Stanig, 2019). The UK's decision to exit the European Union on June 23rd, 2016, initiated a prolonged period of uncertainty for businesses, characterized by labour shortages and shortages of goods on store shelves (Bednarski *et al.*, 2024). Concurrently, Donald Trump's election as President of the United States in the same year, advocating for 'Make America Great Again' and urging businesses to bring production back to the US, further contributed to global economic shifts. President Trump's subsequent initiation of a trade war with China, marked by the imposition of tariffs on crucial commodities, prompted numerous companies to relocate production away from China, albeit not to the US as anticipated, but rather to neighbouring countries like Vietnam, Malaysia, and Singapore (Hille, 2020). Amidst these disruptions, the global spread of COVID-19 from late 2019 exacerbated the situation, prompting many countries to adopt protectionist measures. For instance, the US Government's enactment of the Defence Production Act restricted the export of vaccines and Personal Protective Equipment (PPE), while India imposed restrictions on the export of medications for treating COVID-19 symptoms (Williams and Stacey, 2021). These interconnected events underscore the complex interplay between geopolitics, trade dynamics, and global health crises, posing significant challenges for businesses operating within increasingly volatile and uncertain environments.

The cumulative disruptions stemming from these geopolitical conflicts have compelled numerous firms to reassess the structure of their global supply chains altogether (Roscoe 2022). Understanding how to manage supply chain disruptions caused by current geopolitical events is imperative. While systematic literature reviews on supply chain risk and disruptions extensively cover events such as terrorism, natural disasters, and financial crises, they tend to overlook the impact of geopolitical events (Bednarski *et al.*, 2024). These reviews predominantly focus on how firms mitigate and avoid disruptions using innovation and risk

management techniques. Thus, there is a notable gap in comprehensive research addressing the effects of geopolitical disruptions on supply chains structures (Moradlou *et al.*, 2021; Bednarski *et al.*, 2024), in particular, examining their impact on the location of manufacturing facilities (Hansen *et al.*, 2017). Moradlou *et al.* (2021b) studied the relationship between the geopolitical tensions and Dunning's eclectic paradigm. They examined the theory within the context Brexit and found that during geopolitical disruptions, location advantage is the primary driver for moving production offshore/onshore. Moradlou *et al.* (2023a), further build on this by investigating how organisations can overcome the efficiency/flexibility trade-offs of offshored versus reshored/nearshored production during Covid-19. Yet, the challenges of building a supply chain that is both cost-efficient and flexible during geopolitical tensions can seem insurmountable. To find guidelines on how to create such a supply chain, managers can turn to organizational ambidexterity theory (March, 1991; O'Reilly and Tushman, 2013), explained as follows.

### 2.3 Organisational Learning Theory

Organisational learning theory asserts that both exploitation and exploration strategies are essential for organisational success, but compete for limited resources (March, 1991). An exploration capability refers to companies' ability to scan the business environment and introduce innovative ideas to capitalise on novel opportunities (March, 1991). On the other hand, exploitation centres around cost reduction and efficiency enhancement through the standardisation of operations, continuous improvement, and the execution of ideas (March, 1991). An organisation's ability to pursue two conflicting activities at the same time has been called organisational ambidexterity (Birkinshaw and Gupta, 2013). Organisational ambidexterity allows companies to efficiently manage day-to-day activities and be responsive enough to change if disruptions impact daily operations (Gibson and Birkinshaw, 2004; Tamayo-Torres *et al.*, 2017). Constant *et al.* (2020) distinguish between four types of organisation ambidexterity; 1) contextual ambidexterity is where the same people combine exploration and exploitation activities in their daily routines; 2) sequential ambidexterity is where exploitation and exploration activities follow a sequential cycle; 3) managerial ambidexterity refers to a manager's behavioural orientation toward combining exploitation and exploration and; 4) structural ambidexterity refers to when firms develop two discrete and self-governing organizational units. This paper is particularly interested in structural ambidexterity, where companies manage the trade-offs between conflicting strategies by creating a dual structure, with one sub-unit focusing on exploitation whilst another focuses on exploration



(Duncan, 1976). By partitioning business units, companies can benefit from the cost savings of repetitive routines (procurement, production, distribution) while utilising flexible manufacturing approaches to perform non-routine tasks (search, research, and development) (Adler *et al.*, 1999).

#### 2.4 Supply Chain Ambidexterity

The concept of organizational ambidexterity has evolved beyond companies' internal corporate boundaries to encompass the supply chain, as noted by several researchers (Blome *et al.*, 2013; Roscoe and Blome, 2019; Aslam *et al.*, 2018). Although Fisher (1997) suggests that companies should adopt efficient supply chains for functional products and responsive ones for innovative products, the idea of ambidextrous supply chains suggests they can effectively balance flexibility and efficiency trade-offs simultaneously (Rojo *et al.*, 2016). Roscoe and Blome (2019) explain that companies can apply the concepts of structural ambidexterity to the supply chain by maintaining an offshore, centralized, manufacturing facility that focuses on low-cost production, as well as a distributed manufacturing network that uses localized production facilities in major centres of demand for a flexible and quick response to consumer demands. Flexibility is enhanced by building a supply chain ambidexterity capability that extends beyond the buyer-supplier dyad, to the wider supply network (Rojo *et al.*, 2016). Efficiency is increased through enhanced buyer-supplier engagement in the development of standardized products and processes (Blome *et al.*, 2013). By exploring the external marketplace to sense forthcoming changes and by exploiting existing efficiencies in operational processes, organizations can manage the often-conflicting demands of flexible and efficient supply chains (Aslam *et al.*, 2018). This is because supply chain ambidexterity acts as an enabler across quality, speed, flexibility and cost dimensions (Tamayo-Torres *et al.*, 2017).

Despite this literature explaining how firms can gain the exploitation advantages of efficient supply chains and the exploitation benefits of flexible supply chains, little is known about how geopolitical disruptions effect the structural partitioning of supply chain assets. The following section provides a justification of the research methods used to explore this knowledge gap.

### 3. Methodology

#### 3.1 Research Design

This research uses a theory elaboration strategy, which compares key theoretical concepts to empirical evidence to arrive at novel theoretical insights (Ketokivi and Choi, 2014). Gathering

data from manufacturing firms during geopolitical disruptions allowed the supply chain ambidexterity phenomena to be studied within the context of real-life events. By doing so, the study was situationally grounded, which allowed us to reach theoretically informed propositions (Ketokivi and Choi, 2014). While the researchers were guided by *a priori* theoretical concepts, we remained open to the possibility of coming across unanticipated findings which might challenge existing theoretical constructs and allow for novel theoretical insights to be reached (Merton, 1968).

Using a replication sampling logic, we selected companies from a range of sectors, aerospace, automotive, chemical, fast moving consumer goods (FMCG), manufacturing and pharmaceutical (as shown in Table 2) such that ambidexterity and location decisions could be studied in different contexts, while accounting for sectoral differences. Companies were selected with headquarters in the UK or USA to reduce any variation in cultural norms. The companies were recruited through the authors' established company contacts and the Agile Supply Chain Research Club at Cranfield University. To be eligible to participate in our research, the firms needed to have supply chains that were disrupted by the consequences of COVID-19, US-China Trade-War, or Brexit. In many instances, supply chains suffered from the effects of more than one of these main disruptions.

Table 2, list of interviewees

| Company code | Interviewee code | Sector     | Job Role   | Years of Experience | # Times interviewed | Interviewed in Phase   |
|--------------|------------------|------------|--|---------------------|---------------------|------------------------|
| <b>AERO1</b> | AERO1a           | Aerospace  | <i>Strategic Buyer</i>                             | 15                  | 2                   | 1 and 2                |
| <b>AUTO1</b> | AUTO1a           | Automotive | <i>Director of Global Purchasing</i>               | 20                  | 2                   | 1 and 2                |
| <b>AUTO2</b> | AUTO2a           | Automotive | <i>Head of Logistics Engineering</i>               | 20                  | 3                   | 1 (once) and 2 (twice) |
| <b>CHEM1</b> | CHEM1a           | Chemical   | <i>Senior Vice President and Managing Director</i> | 33                  | 1                   | 1                      |
|              | CHEM1b           | Chemical   | <i>Logistics Manager -</i>                         | 25                  | 1                   | 2                      |
| <b>FMCG1</b> | FMCG1a           | FMCG       | <i>Head of Procurement</i>                         | 30                  | 2                   | 1 and 2                |
| <b>FMCG2</b> | FMCG2a           | FMCG       | <i>Head of International Markets</i>               | 25                  | 1                   | 1                      |
|              | FMCG2b           | FMCG       | <i>Head of Supply Chain</i>                        | 16                  | 1                   | 2                      |
| <b>FMCG3</b> | FMCG3a           | FMCG       | <i>Senior Solutions Architect -</i>                | 31                  | 1                   | 1                      |

| Company code                      | Interviewee code | Sector         | Job Role  | Years of Experience | # Times interviewed | Interviewed in Phase   |
|-----------------------------------|------------------|----------------|---|---------------------|---------------------|------------------------|
|                                   | FMCG3b           | FMCG           | <i>Physical Logistics Global Executive - Leading Supply chain transformations across EMEA</i> | 31                  | 1                   | 2                      |
|                                   | FMCG3c           | FMCG           | <i>Regional Supply Planning &amp; Logistics Director</i>                                      | 17                  | 1                   | 2                      |
| <b>FMCG4</b>                      | FMCG4a           | FMCG           | <i>Director Great Britain</i>   | 14                  | 1                   | 2                      |
| <b>MANUF1</b>                     | MANUF1a          | Manufacturing  | <i>Manufacturing Supply Chain and Logistics Operations Director - EMEA</i>                    | 26                  | 2                   | 1 and 2                |
| <b>MANUF2</b>                     | MANUF2a          | Manufacturing  | <i>Global Supply Chain Manager</i>  | 17                  | 1                   | 2                      |
| <b>MANUF3</b>                     | MANUF3a          | Manufacturing  | <i>Chief Procurement and Supply Chain Officer</i>   | 28                  | 1                   | 2                      |
| <b>PHARMA1</b>                    | PHARMA1a         | Pharmaceutical | <i>Director of Strategic Sourcing, Raw Materials, and Finished Products</i>                   | 23                  | 2                   | 1 and 2                |
|                                   | PHARMA1b         | Pharmaceutical | <i>Corporate Vice President of Supply Chain</i>   | 31                  | 2                   | 1 and 2                |
| <b>PHARMA2</b>                    | PHARMA2a         | Pharmaceutical | <i>Head of Pharma Logistics</i>   | 22                  | 3                   | 1 (twice) and 2 (once) |
| <b>PHARMA3</b>                    | PHARMA3a         | Pharmaceutical | <i>Operations Director</i>  | 37                  | 1                   | 1                      |
| <b>TOTAL NUMBER OF INTERVIEWS</b> |                  |                |   |                     | 29                  |                        |

### 3.2 Context of Study

Brexit and the US-China trade-war occurred more or less in parallel, with the pro-Brexit vote and the election of Donald Trump (who later instigated the trade-war) occurring in 2016, continuing until the end of 2020. Covid-19 emerged in late 2019 and continued to affect global supply chains until 2023. As shown by Figure 1, Brexit and US-China trade-war unfolded over about 5 years with a series of announcements on political decisions, each leading to further disruption. Companies monitored events and then had time to develop an effective response

with at least some knowledge of the changes that would be made. The emergence of Covid-19 was different, as the pandemic appeared with very little warning and had a truly global impact. Yet, at the same time, Covid-19 shares many similarities to Brexit and the US-China Trade-War, as the pandemic created long-term and continuous disruptions to global trade flows due to tensions between nation-states, including repeated border closures, import and export restrictions and the relocation of suppliers and supply chain assets.

We sought to collect interview data during this turbulent time in history. Doing so allowed us to study, in real-time, the effects of geopolitical disruptions on the location of production and distribution assets and the formation of ambidextrous supply chains. Twenty-nine interviews were conducted with senior executives working for 14 companies from January 2020 to June 2021. The data collection occurred over two phases:

- The first phase focussed on the effects of Brexit and the US-China trade-war (while considering effects of Covid-19 pandemic) and spanned from 9th January to 10th June 2020.
- The second phase spanned from 6th December 2020 to 30th June 2021 and was heavily focussed on Covid-19 (since this was the dominant risk at this time) and used different interview questions. Interviewees were asked to reflect on Brexit and the US-China Trade-War but the majority of responses were focused on the severity of the pandemic and the impact it was having on global supply chains.

Figure 1 provides the timeline of the three geopolitical disruptions in relation to the two phases of data collection.

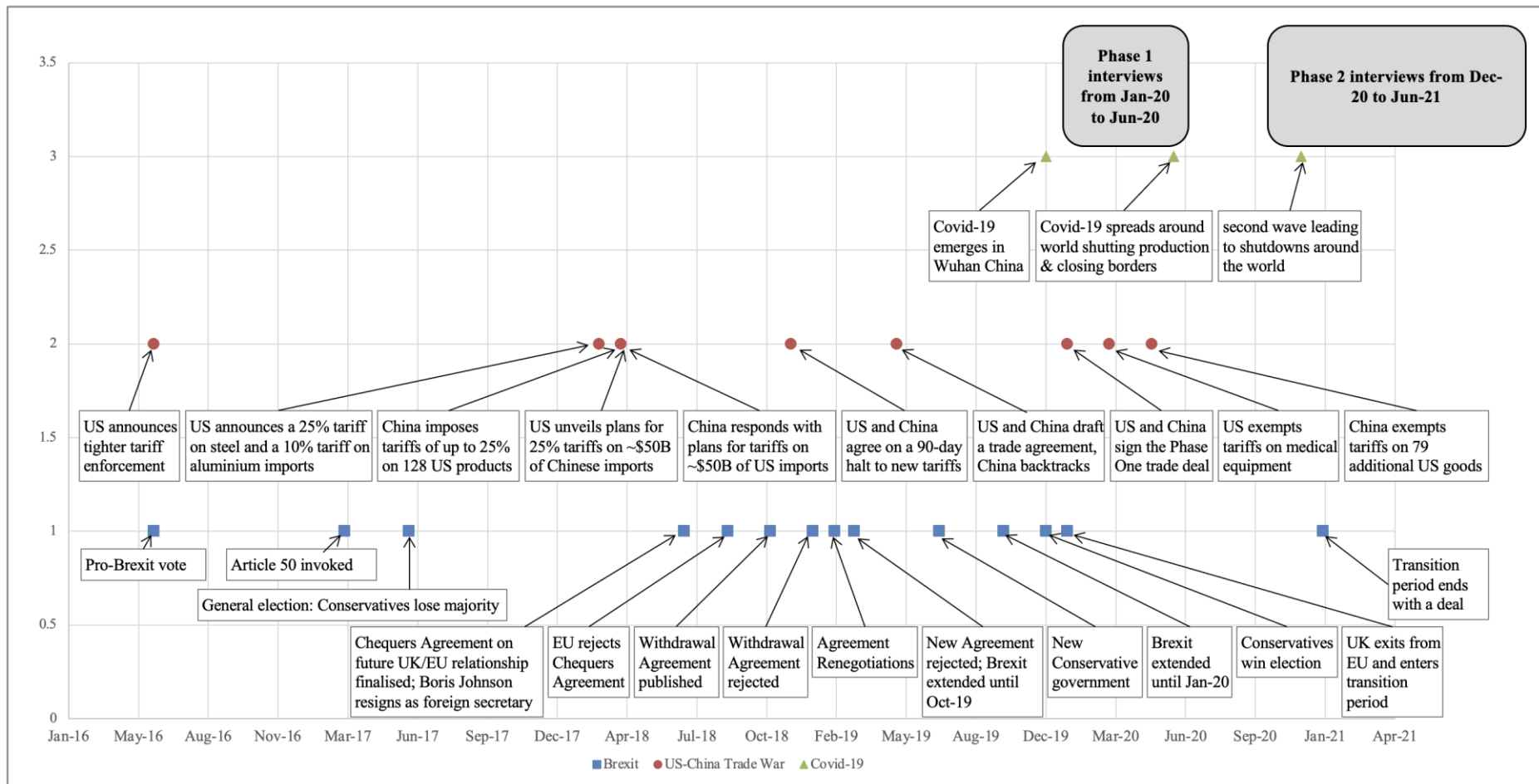


Figure 1, Timeline of Brexit, the US-China Trade-War and Covid-19 in relation to the two phases of data collection

### **3.3 Data Collection**

We used semi-structured expert interviews to gather managers' perceptions of supply chain structural ambidexterity in response to geopolitical disruptions. While semi-structured interviews typically begin with a set of standardised questions, the researcher can ask pertinent follow-up questions to delve more deeply into the subject to understand why and how something occurs (Ahlin, 2019). To ensure interviewees had the necessary expertise, we sought the opinions of senior level managers with at least 10 years' experience, involvement in supply chain management roles, and with responsibility for making location decisions at a multinational level. The final list of informants was all responsible for making strategic supply chain decisions and had an average experience of 24 years and standard deviation of 7 years (see Table 2). The minimum experience was 14 years, and the maximum was 37 years. For all but 4 companies, an interview was conducted in each data collection phase providing a longitudinal element to the data and all sectors had at least one company where this was the case. In all instances, the findings from the interviews were triangulated with secondary evidence gathered from news outlets, company websites, annual reports, and industry publications, ensuring corroboration between the interview findings and secondary sources. The interviews conducted online using Zoom/Teams platforms **by two interviewers** and lasted between 45 and 77 minutes in duration, were recorded with the permission of the interviewee and transcribed verbatim. The transcription was then checked and, in some instances, slightly edited by the informants to validate the transcript.

### **3.4 Data Analysis**

The interview transcripts were analysed using thematic analysis techniques (Braun and Clarke, 2006). The thematic analysis was based on pattern matching and explanation building logic (Braun and Clarke, 2006), where inductively derived descriptive codes from the literature were used to capture useful insights and overarching themes. The researchers followed the Gioia methodology (Gioia *et al.*, 2013) to inductively analyse the empirical evidence, including a 1<sup>st</sup> order analysis using informant-centric terms and a second order analysis using concepts, themes, and dimensions from organizational learning theory and the eclectic paradigm. An example of this pattern-matching logic is shown in Figure 2.

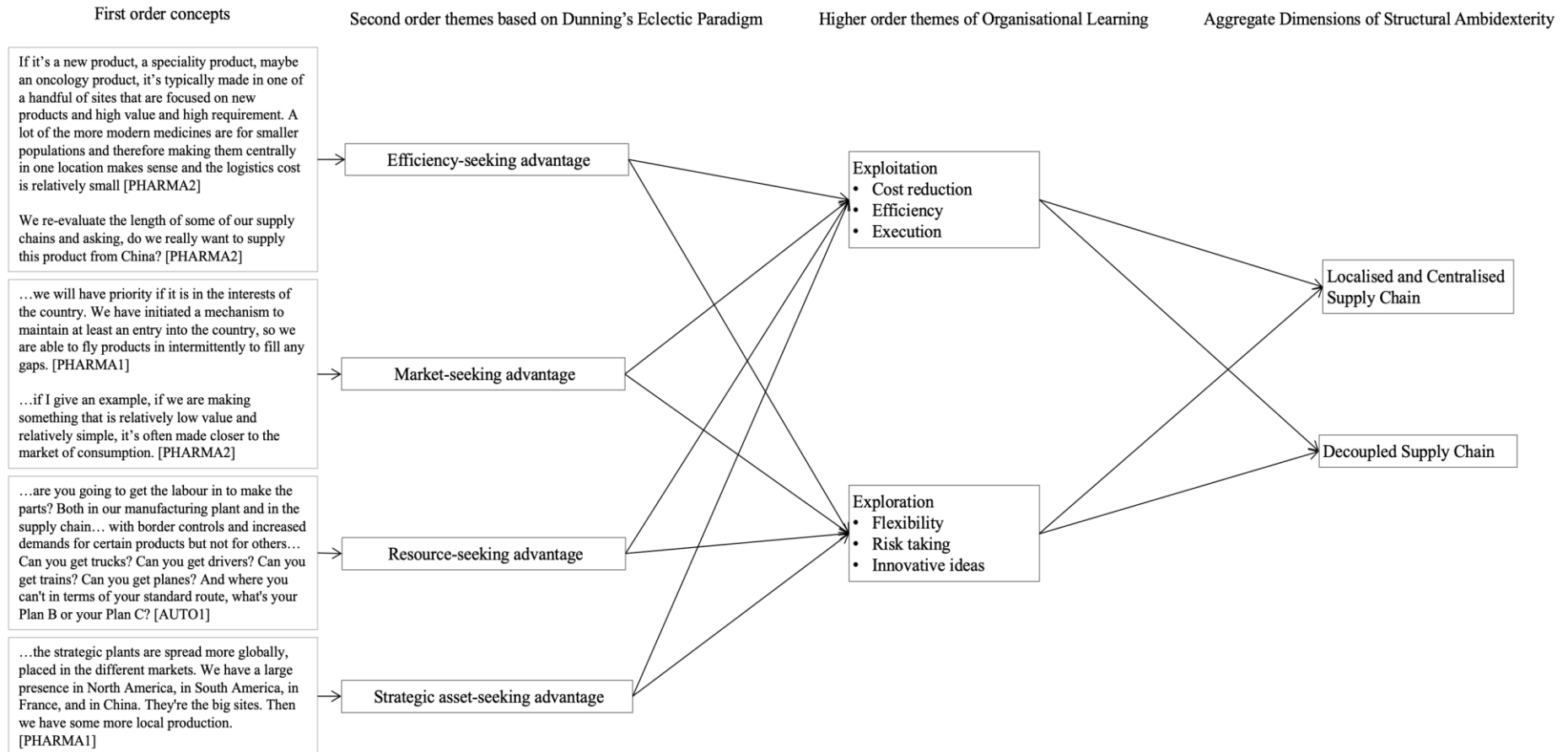


Figure 2, Data structure illustrated for supply chain ambidexterity

The coding process followed **the recommendations** by Campbell *et al.* (2013) where a sample of interview transcripts (20%) is coded independently by two researchers. After the first round of independent coding, a meeting was conducted where coding differences were discussed by the research team and the coding frame was revised, thus improving coder agreement to acceptable levels. **Then, one of the coders completed the coding of the remaining transcripts, periodically seeking feedback from the rest of the authors, on first-order codes and second-order themes. The second person initially coding the sample interviews then did a systematic review of all coding of the person who had coded all remaining interviews and developed category labels and descriptors, which were regularly affirmed with the full authoring team during that process. This approach allowed consistency of coding and subsequent aggregation, confirmed by the five authors, e.g. also across multiple interviews when a concept needed to be considered in multiple categories.** Both Excel and NVivo 12 Plus **were** used to facilitate the coding and analysis process. The coding results across the 14 companies were compared, to establish common patterns which could be used to elaborate the theories in question. The findings informed a series of propositions that explain the various supply chain reconfigurations made in response to geopolitical disruptions and how supply chain structural ambidexterity is achieved.

#### **4. Findings**

We found that the disruptions caused by Covid-19, the US-China Trade-War and Brexit required different mitigation strategies based on the severity and suddenness of the event. Brexit and the US-China trade unfolded over a relatively longer period than the Covid-19 pandemic, giving the organisations a longer transition time to react to the supply chain disruptions. Our findings suggest that companies exhibit different strategies to cope with these exogenous shocks based on these transition windows. **We developed a heat map (see Figure 3) to show the number of times that informants mentioned a particular strategy used in response to geopolitical events and then coded these strategies into exploration or exploitation activities. To do so, we used our literature review on Dunning's eclectic location advantage, see Table 1, and the exploration and exploitation to construct our coding table shown in Figure 3. In a heat map, the rows and columns are ordered so that similar rows and columns are near each other. The purpose of the heat map is to identify the areas of importance<sup>1</sup> which are further expanded in each theme. In particular, exploitation centres around cost reduction and efficiency**

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<sup>1</sup> It has to be noted that this gives an indication of which strategies have been employed and emphasized by the interviewees, but should not be over-interpreted as a full ranking of overall importance.



enhancement through the standardisation of operations, continuous improvement, and the execution of ideas and exploration refers to companies' ability to be flexible, risk taking, introduce innovative ideas to capitalise on novel opportunities.

|  | Exploitations  |            |           | Exploration |                  |             |
|--|----------------|------------|-----------|-------------|------------------|-------------|
|  | Cost reduction | Efficiency | Execution | Flexibility | Innovative ideas | Risk taking |
| <b>A : Efficiency seeking advantage</b>                |                |            |           |             |                  |             |
| B : Business consolidation                             | 0              | 1          | 2         | 1           | 0                | 0           |
| C : Capital-intensive resource use                     | 0              | 0          | 7         | 1           | 0                | 1           |
| D : Coordination costs                                 | 0              | 0          | 3         | 0           | 0                | 0           |
| E : Currency fluctuations                              | 0              | 0          | 0         | 0           | 0                | 0           |
| F : Economies of scale N                               | 0              | 3          | 0         | 0           | 0                | 0           |
| G : Environmental concerns                             | 0              | 0          | 1         | 1           | 1                | 0           |
| H : Government incentives                              | 0              | 0          | 4         | 1           | 0                | 0           |
| I : Labour costs                                       | 0              | 0          | 1         | 1           | 1                | 0           |
| J : Labour productivity                                | 0              | 0          | 1         | 0           | 0                | 0           |
| K : Lead times   | 0              | 0          | 0         | 0           | 0                | 0           |
| L : Lower costs of manufacturing                       | 5              | 7          | 4         | 3           | 0                | 0           |
| M : Non-tariff costs                                   | 1              | 0          | 10        | 7           | 5                | 11          |
| N : Supply chain resilience                            | 0              | 0          | 9         | 9           | 2                | 0           |
| O : Supply continuity                                  | 0              | 0          | 13        | 8           | 1                | 0           |
| P : Taxes and import duties                            | 2              | 0          | 12        | 9           | 4                | 7           |
| Q : Transportation costs                               | 2              | 4          | 5         | 2           | 0                | 0           |
| <b>R : Market seeking advantage</b>                    |                |            |           |             |                  |             |
| S : Access to local and international markets          | 0              | 3          | 16        | 2           | 1                | 3           |
| T : Customer service                                   | 0              | 0          | 4         | 2           | 1                | 3           |
| U : Declining demand                                   | 0              | 0          | 6         | 5           | 1                | 3           |
| V : Declining plant profitability                      | 0              | 0          | 0         | 1           | 0                | 0           |
| W : Demand volatility                                  | 0              | 0          | 11        | 4           | 0                | 0           |
| X : Employment legislation                             | 0              | 0          | 0         | 0           | 0                | 0           |
| Y : Global competition                                 | 0              | 0          | 3         | 0           | 1                | 1           |
| Z : Government's economic policies                     | 0              | 0          | 1         | 0           | 0                | 0           |
| AA : Growth of local economy                           | 0              | 0          | 0         | 0           | 0                | 0           |
| AB : Higher stability                                  | 0              | 0          | 0         | 0           | 0                | 0           |
| AC : Proximity to customers                            | 2              | 1          | 3         | 1           | 0                | 0           |
| AD : Regulatory requirements                           | 0              | 0          | 11        | 4           | 2                | 1           |
| AE : Responsiveness to demand                          | 0              | 1          | 3         | 0           | 0                | 1           |
| AF : Uncertain regulations                             | 0              | 0          | 0         | 0           | 0                | 0           |
| <b>AG : Resource seeking advantage</b>                 |                |            |           |             |                  |             |
| AH : Access to research and development                | 0              | 0          | 2         | 1           | 0                | 0           |
| AI : Access to suppliers                               | 1              | 2          | 20        | 7           | 2                | 1           |
| AJ : Availability of infrastructure                    | 0              | 0          | 2         | 0           | 0                | 0           |
| AK : Availability of local talent                      | 0              | 0          | 5         | 1           | 0                | 1           |
| AL : Availability of raw materials                     | 0              | 2          | 16        | 5           | 0                | 2           |
| AM : Availability of transportation                    | 0              | 0          | 1         | 2           | 0                | 0           |
| AN : Cluster - agglomeration                           | 0              | 0          | 0         | 0           | 0                | 0           |
| AO : Government restrictions N                         | 0              | 0          | 3         | 2           | 0                | 0           |
| AP : Last minute customisation N                       | 0              | 0          | 0         | 1           | 0                | 0           |
| AQ : Local partners in the host country                | 0              | 0          | 2         | 0           | 1                | 0           |
| AR : Product specialisation                            | 0              | 0          | 5         | 1           | 1                | 0           |
| <b>AS : Strategic asset seeking advantage</b>          |                |            |           |             |                  |             |
| AT : Automation  | 0              | 0          | 1         | 1           | 3                | 0           |
| AU : Corporate social responsibility                   | 0              | 0          | 0         | 0           | 0                | 1           |
| AV : Focus on core activities                          | 0              | 0          | 2         | 0           | 0                | 0           |
| AW : Innovation  | 0              | 0          | 1         | 1           | 1                | 0           |
| AX : IP protection                                     | 0              | 0          | 3         | 0           | 0                | 0           |
| AY : Made-in effect                                    | 0              | 0          | 3         | 1           | 0                | 0           |
| AZ : New Product Development N                         | 0              | 0          | 0         | 1           | 0                | 0           |
| BA : Reputation  | 1              | 1          | 1         | 0           | 0                | 0           |
| BB : Synergies related to maintaining a local presence | 0              | 0          | 5         | 1           | 0                | 1           |
| BC : Technology N                                      | 0              | 2          | 3         | 6           | 3                | 2           |

Figure 3, Heat-map of interview analysis

The darker the shade of red, the more times the particular strategy was discussed. The following section provides supporting evidence from the semi-structured expert interviews to explain these strategies in greater depth. We organise these key findings under the three key themes of “building parallel supply chains”, “reconfiguration of supplier networks” and “restructuring internal subunits”.

#### ***4.1 Building parallel supply chains***

Interviewees explained how Brexit, the US–China trade-war and Covid-19 triggered the reconfiguration of their supply chains. The location decision appeared to be particularly driven by market seeking and efficiency seeking advantages. For instance, in the case of Brexit and US-China trade -war, an increase in tariffs and duties together with rules of origin requirements significantly impacted manufacturing and sourcing location decisions. As Brexit and the US-China trade-war were demarcated by a series of political decision over a 5-year period, we found that changes to global supply chains happened incrementally, over a number of years. According to FMCG3, their decision on where to locate production was based on making the company more flexible and fluid in response to disruptions:

*“So you have to have the balance between; should we produce this product close to where it is being consumed or where the vendor is located if you need, so do we have to be close to a farmer or should we be close to a city where the dogs and pets are living, the market – so where to put your factory versus taking into account your network is not all about the duty you have to pay – it will entirely change your strategy around location and facility – so where we can, we will be flexible and fluid”* (FMCG3. Senior Solutions Architect - Physical Logistics)

The above quote shows how the manufacturing location decision was influenced by improving the company’s responsiveness to major supply chain disruptions. The Vice President and Managing Director at CHEM1 discussed the exploitation and exploration opportunities presented as a result of geopolitical disruptions. He explained how Brexit highlighted issues around supply chain inefficiencies and how these were addressed by localizing production:

*“What Brexit did was it shone a light on where we were inefficient in certain areas. ...we’ve found opportunities to localize products that we weren’t manufacturing in the UK ... so we started that process and bit by bit, you can see how products are moving through the localization process... So we had done 90% of that localization”* (CHEM1, Senior Vice President and Managing Director)

The preceding quotes stress that whilst geopolitical tensions prompted shockwaves throughout global supply chains, companies saw these events as an opportunity to revisit their manufacturing and sourcing locations. The majority of respondents discussed the idea of building ‘parallel supply chains’ as part of their response strategy. They explained that building a parallel supply chain is when one discrete supply chain focuses on responsiveness to demand by bringing suppliers and production facilities closer to the consumer (localization), while another focuses on efficiency by sourcing from low labour costs countries and shipping finished goods worldwide. By building these parallel supply chains, interviewees explained how their company could better manage disruptions whilst balancing the trade-offs between highly efficient and highly flexible supply chains. The following quote from the Head of Procurement at FMCG1 explains this approach:

*“It is a hybrid model - so where we can get global scale, we will manage on a global scale – where there isn’t the ability to manage that global leverage, we produce locally for local markets. If you look at something like our Turkish market, they have a lot more local manufacture and it is more bespoke because of the tariffs they have and the structures they have –”* (FMCG1, Head of Procurement)

Building parallel supply chains allowed companies to manage conflicting goals (e.g., efficiency and responsiveness), to minimize the demand and supply side impacts of geopolitical disruptions. Interviewees stressed the importance of segmenting the supply chain to achieve exploitation benefits by accessing low-cost production and exploration advantages by being responsive to demand. Companies did so by partitioning the supply chain to match product-line characteristics, with low-cost/low-margin components manufactured using centralized production facilities in low wage economies and high-margin, short-lead time items manufactured using flexible localised production. For instance, FMCG3 conducted a supply chain mapping exercise to clarify where their factory should be located to avoid new duties and tariffs. The following quote from the Head of Pharma Logistics at PHARMA2 explains the idea of product-line segmentation based on high-volume, capital-intensive items, which should not be relocated, and other low-volume, high-margin products which could be relocated.

*“It is the piece where you have got manufacturing of high volumes, high capital intensive, global supply – that is here to stay because it is making 20% of our revenue, it requires an enormous amount of talented and skilled people who are located in that geographical area, but the rest of the stuff can move – why not...”* (PHARMA2, Head of Pharma Logistics)

Pharmaceutical companies source a broad range of materials, ranging from high volume, low value items, such as packaging, to high value, low volume items such as chemicals and active pharmaceutical ingredients. PHARMA2 decided to relocate their manufacturing facilities based on the avoidance of new duties and tariffs linked to Brexit. The Head of Pharma Logistics at PHARMA2 explained that pharmaceutical companies approach localization and regionalization in different ways because the technology and patent requirements for manufacturing pharmaceutical products are very high. He explained that a number of regional sites are used to make lower value products in low-cost sources for those regions, while high value components are made in major centres of demand such as Europe and the USA. This is further supported by the Operations Director at PHARMA3 who explained that pharmaceutical manufacturing is completely entrenched at the front end (manufacture of tablets and/or drug), whereas the secondary stage of packaging and labelling is more fluid, so the site of supply is easier to move. The Corporate Vice President of Supply Chain from PHARMA1 further elaborated on this by explaining how his company simultaneously leveraged exploitation of high investment, long-term assets, and exploration of production flexibility around low value assembly:

*“For us, the barriers to our industry are that to plan and build a facility and have all the licenses in place mean we have a minimum 5 year time horizon and plus these are assets that are there for quite some time so we do not have the opportunity as say in a warehouse laboratory where you are only doing maybe low value assembly, you can move that anywhere... And there's a lot of interchangeability of the plants. So, we may fill in one facility, and then we may assemble and pack in another facility.”* (PHARMA1, Corporate Vice President of Supply Chain)

In a similar vein, CHEM1 partitioned the supply chain according to the location of key suppliers and customers. This company was forced to juggle multiple conflicting goals in their supply chain including capitalising on their existing infrastructure, while at the same time being responsive to customer demand by reducing the lead time. The Senior Vice President and Managing Director at CHEM1 explained this as follow:

*“Where you have some big infrastructure around primary manufacturing reactions, that is absolutely stuck where it is. Our blending plants are going to be where the customer is whereas our reaction plants are going to be where our suppliers are...”* (CHEM1, Director of Global Purchasing)

We summarise the above evidence with a conceptualization of parallel supply chains including localised and centralised production facilities, which facilitate both an efficient and responsive

supply chain response. Figure shows three scenarios. The scenario at the bottom shows a supply chain with decoupled production activities by splitting the supply chain into two parts, i.e. with a first part focusing on (efficient) centralized preliminary production and a latter part focusing on (responsive) localised final production. Departing from this approach, evolving toward parallel supply chains, the middle scenario shows a parallel supply chain type having localised and centralised production facilities whilst retaining a fixed supply based. Finally, the scenario on top highlights a parallel supply chain with separate supply bases, i.e. low-cost and localised suppliers, each corresponding to a specific location and priorities (responsive vs. efficient).

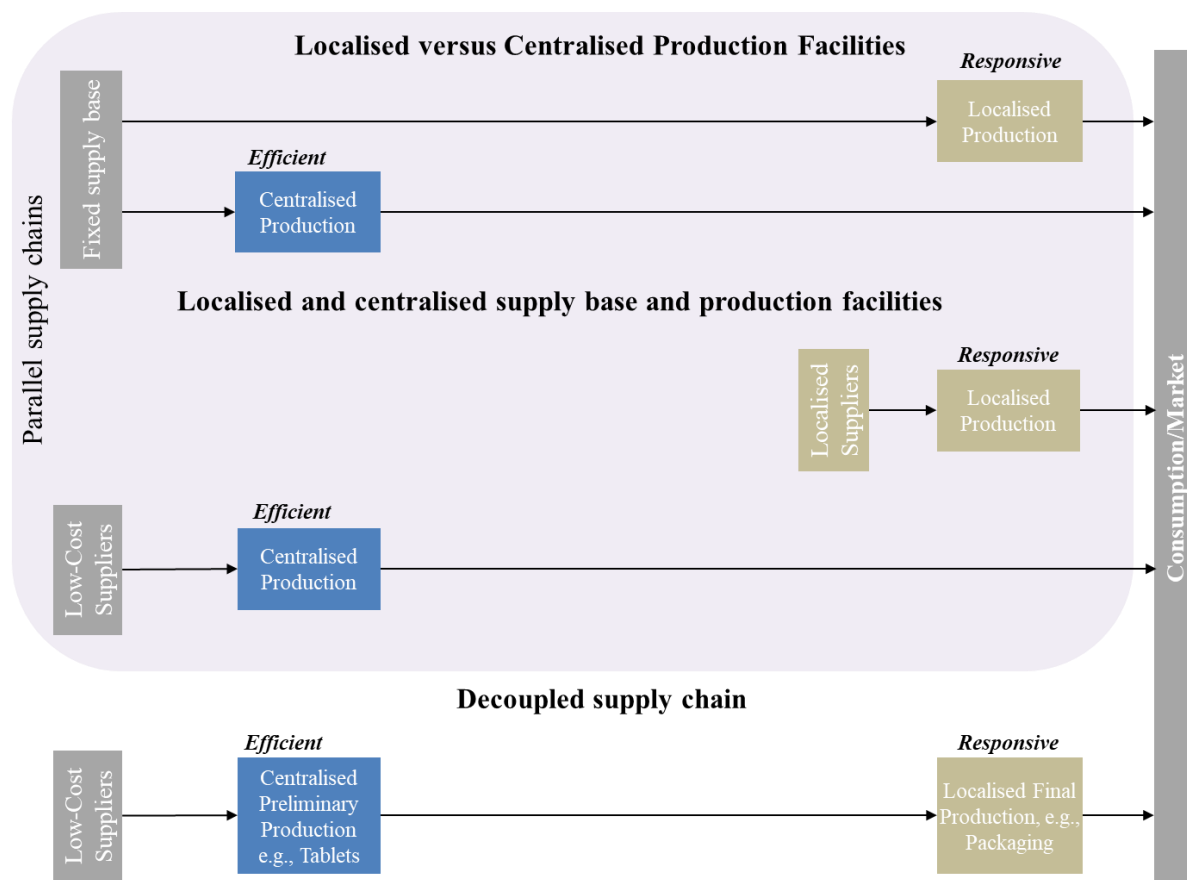


Figure 4, Localised versus centralised production facilities in evolving parallel supply chains

#### 4.2 Reconfiguration of supplier networks

Motivated by resource seeking and efficiency seeking advantages, we found that companies tried to achieve the synergistic benefits of exploration and exploitation by reconfiguring their supplier networks. To do so, various subunits in a company would explore the opportunities for sourcing raw material or components based on new criteria (e.g., lead time, flexibility, and responsiveness) in different geographical locations. Some companies initially started by exploiting their existing supplier network. For instance, FMCG2 planned to investigate their

plants based in the US, Kenya and South Africa before exploring other alternatives. The Head of International Markets at FMCG2 explains this as follows:

*“The second issue is our contingency ability in trying to increase connectivity with our wider network – i.e., we have plants in the US and Kenya and South Africa and they are not as effective or efficient as the plant in the UK, but that is probably what we will look at next before anything else and if both of these prove to be not effective enough we will explore other options.”* (FMCG2, Head of International Markets)

Meanwhile other companies strategized to diversify their supply base for certain products whilst maintaining their existing supply chains to mitigate the risks of increased costs. For instance, at CHEM1, rather than internalising the production of specialised products that were not financially worthwhile, the company explored the use of contract manufacturers to improve responsiveness by turning production on and off based on market demand signals. These contract manufacturers had location advantages according to the availability of raw materials and proximity to the customer. Similarly, AUTO1 planned to explore their sourcing options in other regions for commodity products:

*“Depending on the location and the region and the commodity and the tariffs paid today and in the case of the US/China example the future tariffs – we have and will continue to actively explore options in other regions for the same commodity...”* (AUTO1, Director of Global Purchasing)

At the same time, the Head of Logistics Engineering at AUTO2 explained how his company established new supplier relationship with non-European suppliers because they had close access to customers in emerging markets in Asia.

*“We are broadening because historically most of our products have come from Europe, so we are engaging with non-European suppliers, however the cost of logistics does significantly increase where we are looking at air freight and we don’t really have the volume to support sea containers and shipping...”* (AUTO2, Head of Logistics Engineering)

Dual sourcing was particularly evident across companies that faced challenges as suppliers either closed down or could not locate component inputs during the pandemic. For MANUF2, this initially meant that they delayed payments to suppliers and did not manage to keep up with production due to travel restrictions imposed on workers by national governments –initially the lock downs and travel restrictions in China, which then very quickly cascaded to Europe, and the USA. The following statement by the Global Supply Chain Manager at MANUF2 shows how the company increased volume, leveraging dual sourcing and switching volumes between suppliers simultaneously.

*“The other thing we have been deploying, not necessarily solely as an agility play but definitely with that in mind is this dual sourcing strategy and so not only goods finishing manufacturing is being set up in multiple sites but also sourcing being set up in multiple sites has given us that ability to grow volumes over here and so if we can’t make them, buy them over here...”* (MANUF2, Global Supply Chain Manager)

We found that during these geopolitical disruptions, different functions within the organisation came together under a very short time frame to simultaneously pursue exploration and exploitation activities. Traditionally, the exploitation activities are carried out by the operations/procurement department to achieve cost efficiencies in the operation while exploration activities are done by the commercial/marketing and research and development (R&D) departments. However, at FMCG3, data concerning item movement and the origins of items were supplied by the logistics team as well as the commercial team; data that was then used to avoid the concentration of suppliers in one geographical location. Doing so spread geographical sourcing risk, ensured business continuity and minimised the impacts of geopolitical disruptions, as described by the Senior Solutions Architect at FMCG3:

*“We still have this focus team and by limiting the impact on day to day operational activity – we have more or less asked the logistics team and the commercial team to provide that variable element only when we were unable to get that by ourselves and we have used our internal IT system to extract data to analyse items, item movement, the origins of items etc., to avoid, to disperse and dilute the concentration of the business, which was more to support growth rather than focusing on Brexit.”* (FMCG3, Senior Solutions Architect - Physical Logistics)

During the pandemic, PHARMA2 brought different functions, e.g., production, procurement, external supply, internal manufacture, and logistics together to ensure better communication and quicker decision making. In addition, FMCG3 used local suppliers for last minute co-packing of seasonal items that require final-stage customisation. Simultaneous exploration of new possibilities and the exploitation of old certainties was evident at FMCG3 as the company actively expands its operations into the Middle East and Asia as new opportunities are presented, as explained by the Regional Supply Planning and Logistics Director:

*“So we export around 20% to the Middle East and Asia and the reason for that, is the current scale in those markets does not justify local sourcing, so to be able to build a new line ....., we need a certain threshold, so what we do is we leverage existing networks, which makes more sense where we have capacity and proximity to seed businesses, nurture them, grow them, and then once they are big enough to justify local investments, we invest in local sources”* (FMCG3, Regional Supply Planning & Logistics Director)



### ***4.3 Restructuring internal subunits***

We found that the development of parallel supply chains and reconfiguration of supply networks required structural partitioning between business units within the firm, primarily due to strategic asset seeking and efficiency seeking advantages. For instance, during the pandemic, CHEM1 introduced night shifts to manufacture certain product lines, which were structurally separated from existing product lines, to meet surges in demand. This gave the company the structural flexibility to reallocate its workforce and generate spare capacity to respond to fluctuation in demand once the surge has passed. Whilst this reinforces the tendency toward exploitation (using its already existing resources), the new setup facilitated the flexible use of a temporary workforce by accessing local talent. The Senior Vice President and Managing Director at CHEM1 explains this as follows:

*“If there's surge in request then we've got a very agile supply chain that can react to that and a very good workforce to do that, but we only use that when we get these surges that we can split the skilled staff across, you may work a night shift two weeks and then get two weeks off and you're rotated, so it's working with people, what suits them, rather than enforced to work six weeks of nights, it's on a rotational basis that people respect it and work around, however it's not the norm to work night shifts.”* (CHEM1, Senior Vice President and Managing Director)

AUTO2 responded to the market downturn and shortage of components during Covid-19 by shutting down a number of production lines and temporarily re-allocating its workforce to a single production line. MANUF2 leveraged its network processing centres to create a “finished to order” strategy where late-stage product customisation took place close to major centres of demand, as explained by the Global Supply Chain Manager at MANUF2:

*“We have a network of what we call network processing centres – so the big space at port will hold stock of finished goods even if they are made further afield and we are building a ‘finished to order’ strategy where some degree of late stage product customization can be performed like product attachments on the machines or running lights or whatever so that the customer can have their short lead time option or their medium with some customization or they can order from stores”* (MANUF2, Global Supply Chain Manager)

Interviewees explained how the relocation of production and distribution facilities was due to strategic asset seeking advantage, where companies made investment in smart technologies to boost supply chain visibility. Most of the companies in our study (MANUF3, MANUF2, PHARMA1, AERO1, AUTO2, MANUF1) dedicated a team to explore the feasibility of adopting a digital solution such as “supply chain control towers”. These digital solutions were implemented to speed up the decision-making process and bring various stakeholders together to enhance end-to-end supply chain visibility.

We also found that restructuring internal subunits was not only limited to operations departments. The Head of Logistics Engineering at AUTO2 explain that during the pandemic his company fundamentally restructured their marketing approach by dedicating a new team to digital marketing through social media. This enabled the company to broaden its communication channels from traditional automotive press to other outlets such as YouTube.

*“so you're talking about purchasing over the internet, the one thing that is fundamentally changing is our marketing through digital and through social media, so where we can't get the cars to the customers or the dealers, or we can't get the customers to the dealers to see the cars, there is now the alternative of inviting influencers, YouTube kind of videos, which moves away from the traditional automotive press, and allows us to distribute videos and content more widely.”* (AUTO2, Head of Logistics Engineering)

## **5. Discussion**

The existing literature has explored how firms redeploy resources and reconfigure supply chain assets to create resilience against geopolitical disruptions (Roscoe *et al.*, 2020; Moradlou *et al.*, 2021a, b; Chakkol *et al.*, 2023). Our findings build on this body of evidence by exploring how companies build ambidextrous supply chains to overcome geopolitical disruptions. Our findings are contrary to Rothaermel and Deeds (2004) who argued that organizations tend to resolve exploration/exploitation trade-offs by engaging in only one activity at a time, also known as sequential ambidexterity (Constant *et al.*, 2020). Instead, we find that in situations of high uncertainty, organisations go through rapid decision-making processes with regards to their exploration and exploitation activities, often under very tight timelines. Unlike sequential ambidexterity, we discovered that various decisions, both in terms of the facility location and suppliers' location, were made at the immediate onset of the disruptive event to manage the efficiency and flexibility/responsiveness of production. These findings suggest that, during the early stages of geopolitical disruptions where information is rapidly changing and outcomes are highly uncertain, companies will tend towards structural ambidexterity as opposed to sequential ambidexterity to manage uncertainty.

Scholars also suggest that exploration and non-routine tasks are predominantly performed by the R&D and commercial departments, and exploitations and routine tasks are often done by the operations department (Adler *et al.*, 1999; March, 1991; Roscoe and Blome, 2019). Our findings show that in situations of high urgency and uncertainty, functions such as commercial and marketing, procurement, manufacturing, logistics and customer service all come together to support exploration and exploitation activities by sharing knowledge and responsibilities.

Scholars have long sought to understand how companies select the most suitable local, regional and global location for manufacturing facilities (McIvor, 2013; Moradlou *et al.*, 2017). Considering Dunning's four location advantages (Dunning, 2001), we investigated how companies made location decisions to achieve supply chain ambidexterity. Our empirical evidence indicates that companies engaged in exploration and exploitation by engaging in three types of supply chain structural ambidexterity. First, we identified that companies developed parallel supply chains by transitioning from a purely offshored, centralized, supply chain design to pursuing a localisation strategy (Moradlou *et al.*, 2023a). These companies appeared to be motivated by market seeking advantages, because they segmented their production lines into local, regional and global manufacturing facilities based on changing customer demand profiles, proximity to customers and product-line characteristics. The localised subunits allowed them to be more responsive toward surges in demand, whilst maintaining their global presence to ensure cost effective production in line with efficiency seeking motives. For instance, FMCG1 created both local and global supply chains to be simultaneously efficient in their management of current business demands and adaptive to changes in the environment. Similar to previous studies (Moradlou *et al.*, 2021b), our data suggests that companies localised activities such as packaging, distribution, and warehousing, while keeping high capital investment facilities unchanged. This is further supported by Theyel and Hofmann (2021), who assert that localisation enables firms to increase organizational agility and stimulate innovation by allowing them to engage in activities such as R&D, sales and marketing, leading to higher flexibility, speed and responsiveness to customer requirements. Whereas, under certain scenarios, organisations also continue to benefit from the known advantages of offshoring (Mukherjee *et al.*, 2023; Theyel and Hofmann, 2021; Kedia and Mukherjee, 2009). While this approach shares similarities to the notion of disintegrating production stages to offshored locations (see Kedia and Mukherjee, 2009), we found that companies maintained both offshored and nearshored/on-shored facilities, or parallel supply chains, particularly when responding to Brexit and US-China trade-war (Moradlou *et al.*, 2023a). In other words organisations tend to maintain their geographical disparity. These findings suggest that the reshoring decision is not primarily influenced by demand based-drivers (Grappi *et al.*, 2018) or the adoption of innovative technologies (Ancarani *et al.*, 2019) but the transition window and the geographic dispersion of production and supplier facilities. This leads us to propose that:

**Proposition 1:** Companies are driven by market seeking and efficiency seeking advantages to build parallel supply chains and maintain their geographical disparity, in response to major geopolitical events with longer transition times.

The second method of achieving supply chain structural ambidexterity was through the reconfiguration of the supplier network taking both focused and dispersed geographical positions. (Moradlou *et al.*, 2023b). Prompted by resource seeking motives, we found that companies engaged in strategies such as dual sourcing and supply base diversification to exploit the cost advantages associated with high volume, repetitive routines tasks whilst simultaneously exploring for new suppliers of non-critical components. For instance, FMCG3, AUTO2 and MANUF2 set up new subunits/divisions specifically tasked to identify new knowledge and sources of supply to diversify the concentration of suppliers and establish redundant suppliers (secondary, tertiary suppliers) in the network to absorb any surges in demand. New procurement and supplier management subunits pursued exploration activities, often using a decentralised management approach, whereas the existing subunits continued to exploit current supply chain competencies to achieve lower costs, using a more centralized decision-making approach. According to Canello *et al.* (2022, p. 1), “*local and global production networks are not two alternative paradigms of industrial organization; they can be complementary and mutually reinforce each other*”. Our findings support Canello *et al.* (2022), because many companies in our study adopted a dual sourcing strategy; increasing the global reach of their production networks while maintaining a local supply base to ensure that regional and global sourcing patterns coexist and are complimentary. Our empirical data suggests that the reconfiguration of supplier networks was pursued during all three geopolitical disruptions, regardless of the amount of available response time. This leads us to propose that:

**Proposition 2:** Companies are driven by resource seeking and efficiency seeking motives to reconfigure their supplier networks to achieve the synergistic benefits of exploitation and exploration, taking both focused and dispersed geographical positions regardless of the transition time.

We found that the third type of structural ambidexterity was developed through the restructuring of internal subunits. A case in point is, CHEM1 who introduced night shifts and trained for a multi-skilled workforce that could more easily switch between existing product lines and new product lines based on rapidly shifting demand patterns. This supports the work of Roscoe and Blome (2019) who investigate structural ambidexterity in the context of centralised versus redistributed manufacturing facilities and how employees can be switched between alignment (efficiency) and adaptability (flexibility) tasks. Another interesting finding

was that, under short response time, AUTO2 restructured their marketing function by dedicating a new team to digital marketing who used social media to explore for knowledge and ideas within their customer base. Auto2 was motivated by a strategic asset seeking advantage, establishing a new subunit to explore for innovative ways of communication with the customers but at the same time exploit existing supply chain resources (Kristal *et al.*, 2010).

We find that companies restructured their internal functions by investing in new technologies such as supply chain control towers, removing silos in decision making, and enhancing knowledge sharing/learning between employees. This was particularly the case during the sudden onset of the Covid-19 pandemic. This finding supports the work of Gastaldi *et al.* (2022) who found that companies can foster structural ambidexterity by investing in smart technologies and industry 4.0 technologies (AI, blockchain, additive manufacturing), which positively affects the capability of simultaneously pursuing exploitation and exploration strategies within different departments (e.g., Operations department to “exploit”, R&D department to “explore”). It is important to note that the organisations restructured their internal subunits whilst avoiding further geographical expansion in the short-term. Based on the above arguments, we propose the following:

**Proposition 3:** Companies are driven by strategic asset seeking and efficiency seeking motives to restructure internal subunits and maintain a focused geographic concentration during major geopolitical events with shorter transition times.

Drawing together the above four propositions, we now advance an empirically informed framework (see Figure 5) to illustrate three types of supply chain structural ambidexterity.

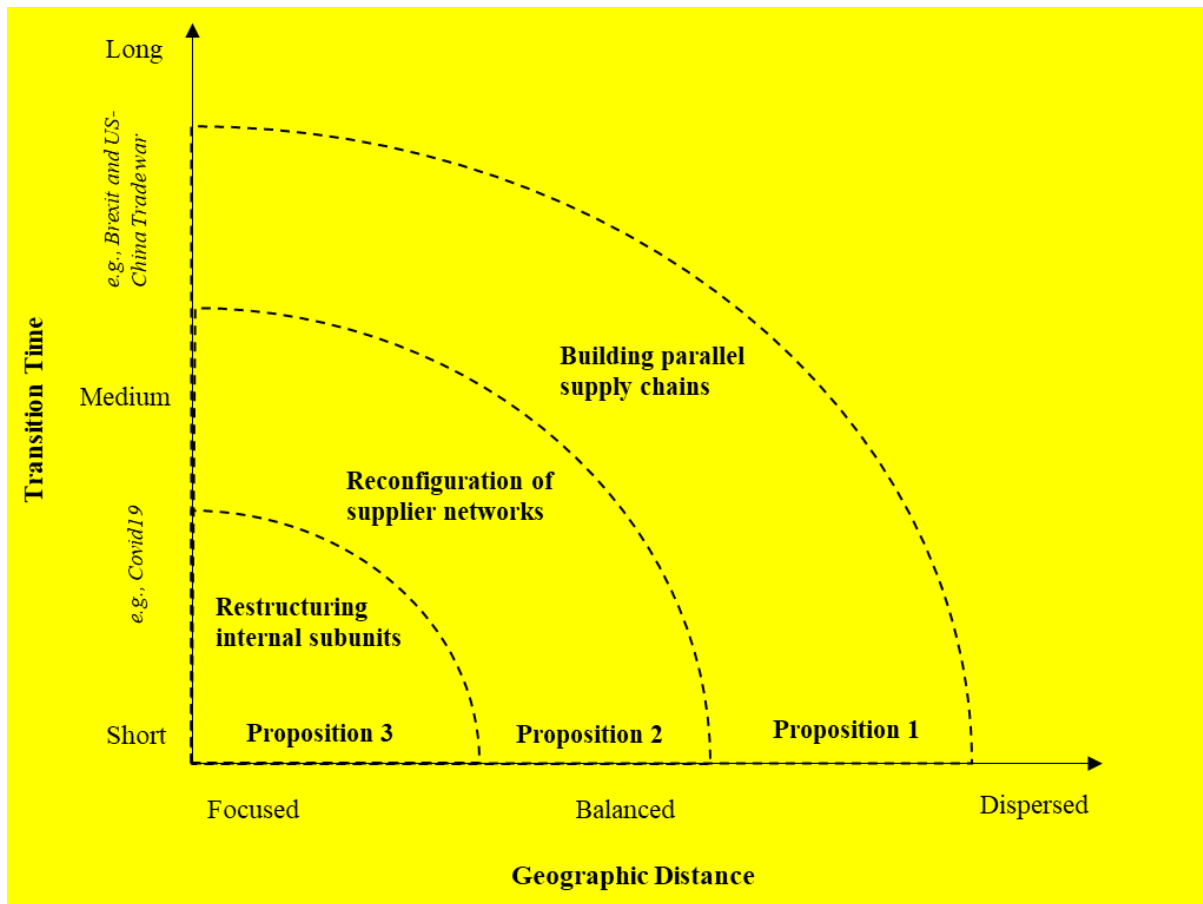


Figure 5, Three Levels of Supply Chain Structural Ambidexterity

The framework captures three strategies leveraged during various supply chain disruptions which are shown on a spectrum based on transition times and geographic dispersion. Although, these disruptions could occur at the same time, we believe more than one strategy would be required to mitigate the impacts on supply chains according to the time available.

## 6. Conclusion

### 6.1 Theoretical contributions

This paper aimed to identify how *companies develop and deploy supply chain structural ambidexterity to effectively respond to geopolitical disruptions*. We developed a series of propositions and a theoretical framework (see Figure 5). We observe that during major geopolitical disruptions, the decisions on how supply chains are structurally partitioned and how supply is reconfigured depends on the transition window available to the firm and the geographic distance of internal and supplier facilities. Our main contribution to knowledge can be summarised with structural ambidexterity configurations: (1) building parallel supply chains; (2) reconfiguration of supplier networks, and (3) restructuring internal subunits.

In situations where the response time is very short and companies need to react immediately to a peak/trough in demand (e.g., during the Covid-19 pandemic), organisations are likely to pursue both exploration and exploitation by restructuring internal subunits within a focused geographical space. Where the available transition times are longer (i.e., Brexit and the US-China trade-war), companies will build parallel supply chains using a combination of local, regional and global manufacturing facilities, resulting in a high level of geographical dispersion across the supply chain. However, where the transition times are moderate, dual sourcing and supply base diversification were favoured and led to a more balanced level of geographical dispersion.

Our findings elaborate on organizational learning theory by identifying the ways in which firms develop and deploy supply chain structural ambidexterity (Adler *et al.*, 1999; Gibson and Birkinshaw, 2004) to effectively manage geopolitical disruptions. The paper builds on the eclectic paradigm (Dunning, 2001; Dachs *et al.*, 2019; Kedia and Mukherjee, 2009), by showing that companies are typically motivated by market seeking and efficiency seeking advantages to relocate production during geopolitical disruptions. The findings contribute to the literature on reshoring/backshoring, nearshoring and offshoring in the supply chain and operations management field by suggesting these strategies can occur in parallel and are motivated by factors other than just demand based-drivers (Moradlou *et al.*, 2023a; Mukherjee *et al.*, 2023; Grappi *et al.*, 2018), the adoption of innovative technologies (Ancarani *et al.*, 2019; Dachs *et al.*, 2019) or disintegration advantages (Kedia *et al.*, 2019). Instead, we find the decision to pursue reshoring, nearshoring and/or offshoring strategies simultaneously is affected by the transition window available to the firm and the geographic distance of internal and supplier facilities.

## 6.2 Managerial implications

Given the ongoing uncertainties present in today's global supply chains, including the war in Ukraine, disputes over the sovereignty of Taiwan, and soaring inflation, managers will continue to juggle flexibility and efficiency trade-offs in the supply chain. Managers are now obliged to re-evaluate the manufacturing location decision to mitigate geopolitical disruption risks that can occur around the world, while minimizing production costs. Our propositions culminate in a managerial framework that outlines three ways in which firms develop and deploy supply chain structural ambidexterity. We encourage managers to follow the insights provided by our framework (see Figure 5) to understand the different structural ambidexterity strategies they can be pursued based on the available transition window, and the geographic distance of production and supply. Our framework instructs managers on how to embed ambidexterity in

supply chain design and continue to exploit existing efficiencies in the manufacturing process, while seeking new knowledge from suppliers' closer to home markets. Managers can achieve this outcome by establishing dual organizational structures, where certain sub-units concentrate on alignment (efficiency/exploitation) activities, while others focus on adaptation (flexibility/exploration). It is important to note that several disruptions can occur simultaneously each having different transition time. In such situations, managers are likely to pursue more than one strategy at the same time.

### *6.3 Limitations and future research directions*

The results of this study should be viewed considering its limitations. We used a qualitative research design featuring 29 interviews from 14 manufacturing MNEs. Whilst this study aims for theory elaboration and analytical generalisation, due to the small sample size of companies per industry, we do not claim the statistical generalisation of our findings. Statistical generalization could be achieved by using a large-scale survey based on a greater sample of companies to check the validity of the propositions. We call on further research to use other research methodologies, such as surveys or questionnaires, to test and validate our propositions and framework. Moreover, our study is limited to only investigating the manufacturing sector, and we call on future researchers to extend the study to the service sector. Future researchers are also encouraged to conduct replication studies with different companies in different countries to validate or refute our results. Our propositions could also be examined within the context of other geopolitical disruptions such as the war in Ukraine, ongoing disputes between Russia and the NATO alliance (Srai *et al.*, 2023), the war between Israel and Palestine and the following unrest around the Red Sea (Notteboom *et al.*, 2024), and tensions between China and Taiwan (Meyer *et al.*, 2023). Further, as this study was conducted in the context of geopolitical disruptions and Covid-19 pandemic, scholars are encouraged to investigate the SC resilience from structural ambidexterity perspectives and link it to other disruptive contexts and emerging topics such as environmental, social and economic (ESG) perspectives (Chakkol *et al.*, 2023).



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