83rd Annual Meeting of the Academy of Management (AOM 2023), 4-8 August 2023, Boston, USA
Academy of Managment Proceedings, Volume 2023, Number 1
DOI:10.5465/AMPROC.2023.10890abstract

Balancing the Exploitation-Exploration Paradox During Major Geopolitical Disruptions: The Importance of Supply Chain Structural Ambidexterity

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ABSTRACT

We answer the question "How do companies develop and deploy supply chain structural ambidexterity to effectively manage geopolitical disruptions?" by investigating three significant geopolitical disruptions: Brexit, the US-China trade war, and the Covid-19 pandemic. We use an inductive theory-elaboration approach to build on Organisational Learning Theory and Dunning's eclectic paradigm of international production. We conducted 29 elite interviews with senior supply chain executives across 14 multi-national manufacturing firms and validated the analysis by triangulating secondary data sources, including standard operating procedures, annual reports, and organizational protocols. When faced with significant geopolitical disruptions, companies develop and deploy supply chain structural ambidexterity by (1) developing parallel supply chains; (2) significantly reconfiguring their supplier networks, and (3) restructuring their internal sub-units. We contribute to Organisational Learning Theory and Dunning's eclectic paradigm by empirically examining how companies reconfigure supply chains to pursue exploration and exploitation activities in response to geopolitical disruptions. During significant geopolitical disruptions, managers make decisions in tight timeframes. Therefore, we propose three types of supply chain structural ambidexterity based on the transition time available. 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.

INTRODUCTION

For decades Multinational Enterprises (MNEs) have pursued a strategy of globalisation to benefit from cost efficiencies and to sell goods in emerging markets (Tate, 2014; Moradlou and Backhouse, 2016). This relentless pursuit of globalisation has made MNEs susceptible to geopolitical disruptions, defined as disruptive events such as wars, terrorism and tensions between nation states that affect the normal and peaceful course of international trade (Roscoe *et al.*, 2022; Caldara and Iacoviello, 2022). 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.

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.*, 2022; Roscoe *et al.*, 2020). The trade war between the United States and China led many multi-national companies to move production facilities and suppliers from China to Vietnam and Mexico to avoid customs duties (Handfield *et al.*, 2020). Then, the Covid-19 pandemic emerged amplifying tensions between nation-states. Vaccine nationalism and the hoarding of Personal Protective Equipment (PPE) and medications by governments caused ruptures in global supply chains. The sudden and unpredictable nature of these disruptions meant that many companies had no prior planning or mitigation strategy in place; exposing them to significant supply chain risks (van Hoek, 2020; Ivanov, 2022).

As companies struggle to cope with these geopolitical disruptions, scholars and practitioners alike have started scrutinising some well-established operations management principles including the lean approach and just-in-time production (Sarkis, 2020). Scholars point

to the regionalisation and localisation of production as one way to ensure flexibility and responsiveness to geopolitical disruptions (Handfield *et al.*, 2020; van Hoek, 2020). These trends are likely to accelerate considering the ongoing war in Ukraine, which has severe implications for oil, gas and food supply chains. Importantly, recent geopolitical disruptions have highlighted that efficiency can no longer be the ultimate goal of a supply chain. Companies must now balance the trade-offs associated with cost minimization and flexibility maximization simultaneously (Sharma *et al.*, 2020). This fundamental shift in thinking emphasises the need for supply chain designs that do not focus solely on cost but factor in response times and flexibility considerations.

One school of thought argues that companies need to choose either a cost efficiency or flexibility based operational strategy, and if they attempt to reconcile the two opposing systems may become stuck in the middle (Markides, 2006; Porter, 1996). However, organisational learning theory (March, 1991) argues that 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; Lee and Rha, 2016), which refers to an organisations' ability to achieve both efficient and flexible operations simultaneously (Adler *et al.*, 1999). Organisational ambidexterity has since been extended to the supply chain (Roscoe and Blome, 2019) and is achieved by developing "supply chain structural ambidexterity", where a focal firm has one supply chain focused on delivering low cost commodity items, while another concentrates on delivering customized products quickly to consumers (Lee and Rha, 2016; Roscoe and Blome, 2019). To do so, supply chain assets including production and distribution facilities are located in particular countries, either close to major markets to optimize responsiveness, or in low wage economies to achieve cost advantages.

Dunning (1988) argues that these location decisions are driven by governance modes (internalisation, market-focused strategies) or location-specific advantages including resource availability, networks interconnectivity and access to legal and regulatory frameworks.

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), this has not been done in the context of geopolitical disruptions. And, in large part, these studies have concentrated on the development of certain efficiency and responsiveness capabilities, but not on how geopolitical events influence the location of supply chain assets to build an ambidextrous supply chain. Filling this gap in our collective knowledge is important because managers need an understanding of how to focus discrete supply chains on particular efficiency/effectiveness objectives to navigate today's highly uncertain geopolitical environment.

We answer the special issue call (Hillmer *et al.* 2022) to examine how companies manage the paradoxes and decision characteristics present in today's highly uncertain external business environment. Specifically, we use an organisational learning theory lens to examine the efficiency/effectiveness supply chain paradox in the context of major geopolitical disruptions. This paper aims to answer the question: *How do companies develop and deploy supply chain structural ambidexterity to effectively respond to geopolitical disruptions?* To answer this research question, empirical evidence is gathered from 29 elite interviews with senior executives working for with multinational manufacturing companies affected by the uncertainties arising from the political decision made during the Covid-19 pandemic, US-China Trade War, and Brexit. Findings from the interviews are triangulated using secondary data sources including, company websites, annual reports, and industry publications. Our findings build on

organisational learning theory and Dunning's eclectic paradigm by showing that balancing exploration and exploitation capabilities during a geopolitical disruption affects the location of supply chain assets. We identify three types of supply chain structural ambidexterity responses based on the transition time available to the focal firm. First, we propose that when longer transition times are available, companies are driven by market seeking and efficiency seeking advantages to build parallel supply chains. Second, we propose that when shorter transition times are available, companies are driven by strategic asset-seeking and efficiency-seeking motives to restructure their internal subunits. Finally, we propose that, regardless of the transition times, companies are driven by resource seeking and efficiency seeking motives and reconfigure their supplier networks to achieve the synergistic benefits of exploitation and exploration.

The remainder of this paper is organised as follows. The next section presents reviews the relevant literature on organizational and supply chain ambidexterity, and Dunning's eclectic paradigm of international production. Section 3 presents an overview of the methodology employed in the research. 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.

LITERATURE REVIEW

Exploration and Exploitation

The operational trade-offs between flexibility and efficiency have long been studied by Operations Management (OM) scholars. Some argue that manufacturing should focus on a singular performance objective (efficiency or flexibility) to gain maximum benefits, with any

attempt to reconcile both strategies leading to sub-optimal outcomes (Skinner, 1985; Hayes and Wheelwright, 1984). However, other scholars argue that companies can build capabilities that permit the simultaneous exploration of new opportunities while exploiting existing efficiencies (Adler *et al.*, 1999; Roscoe and Blome, 2019). 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 in unison has been called organisational ambidexterity (Birkinshaw and Gupta, 2013; Raisch *et al.*, 2009). Organisational ambidexterity allows companies to efficiently manage day-to-day activities and 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 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 employing 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).

Over the past years, the notion of ambidexterity has been extended past a firms' internal boundaries to its supply chain (Blome *et al.*, 2013; Roscoe and Blome, 2019; Aslam *et al.*, 2018). Supply chain ambidexterity is defined as the ability to simultaneously pursue seemingly conflicting goals of achieving both supply chain exploitation (efficiency) and exploration (flexibility) (Kristal *et al.*, 2010 p. 415). Scholars have found that managing these contradictions is possible because supply chain ambidexterity is an enabler across speed, quality, cost and flexibility dimensions (Tamayo-Torres *et al.*, 2017; Aslam *et al.*, 2018; Blome *et al.*, 2013). Despite this literature highlighting how firms can build both efficiency and flexibility capabilities to achieve supply chain ambidexterity, little is known about how supply chain structural ambidexterity influences the location of supply chain assets, particularly in response to geopolitical disruptions.

Dunning's Eclectic Paradigm

When a firm considers where to locate supply chain assets, it is confronted both with a governance (make or buy) and location decision (e.g., Tate and Bals, 2017; Foerstl *et al.*, 2016; Gray *et al.*, 2013). The eclectic paradigm explains why firms select to export, license or pursue foreign direct investment (FDI) to gain access to overseas markets (Dunning, 1988). International business decisions are prompted by *ownership*, *location,* and *internalisation* (OLI) *advantages* Ownership advantages refer to 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 is based on the resource availability, the strength of institutional structures, or other advantages specific to a particular geography.

Dunning's eclectic paradigm is particularly useful in understanding location attractiveness influences on supply chain configuration decisions. Dunning (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) (McIvor and Bals, 2021; Graf and Mudambi, 2005; Moradlou *et al.*, 2021); (2) Market-seeking advantage including access to (growing) markets, proximity to customers and government's economic policies (McIvor and Bals, 2021; Moradlou *et al.*, 2021); (3) Efficiency-seeking advantage including manufacturing related costs and government incentives (Graf and Mudambi, 2005; McIvor and Bals, 2021; Moradlou *et al.*, 2021) and; (4) Strategic asset-seeking advantage including focusing on core competencies, intellectual property protection and synergies related to maintaining a local presence (Arlbjørn and Mikkelsen, 2014; Stentoft *et al.*, 2016; Moradlou *et al.*, 2021). 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 (Baraldi *et al.*, 2018). Aggregating various fragments of the literature, we developed Figure 1 to provide an overview of these four factors and how they influence location change.

Insert Figure 1 about here

METHODOLOGY

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 kept 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 chose to study companies from a range of sectors 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. We ensured that the supply chains of all companies were impacted in some way by disruptions induced by the Covid-19 pandemic, the US-China trade war or Brexit.

Insert Table 1 about here

Context of Study

Brexit and the US-China trade war occurred more or less in parallel, beginning in 2016 and continuing into 2020. Covid-19 emerged in late 2019 and continues to affect global supply chains to the day of writing. As shown by Figure 2, 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, including repeated border closures, import and export restrictions between nation-states and the relocation of suppliers and supply chain assets.

Twenty-nine interviews were conducted with senior executives working for 14 MNE's 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. Interviewees were asked interviewees about the effects of Brexit, the US-China Trade War and the Covid-19 pandemic. We found that, at this point in time, the majority of responses were focused on the severity of the pandemic and the impact it was having on global supply chains.

Figure 2 provides the timeline of the three geopolitical disruptions in relation to the two phases of data collection.

Insert Figure 2 about here

Data Collection

Qualitative evidence was collected using elite interviewing techniques (Aberbach and Rockman, 2002). Potential interviewees included senior level managers with at least 10 years' experience and with a detailed understanding of supply chain management and location decisions at a multinational level. The final list of informants that were selected were all responsible for

making strategic supply chain decisions and had an average experience of 24 years and standard deviation of 7 years (See Table 1). 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. 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 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.

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 (2013) to inductively analyse the empirical evidence, including a 1st 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 3.

Insert Figure 3 about here

The coding process was carried out independently by two researchers and initially they each coded 20% of the transcripts (Campbell *et al.*, 2013). After the first round of independent coding, a meeting was conducted where differences were discussed with the research team, and

the coding frame was revised. As the first coder was progressing the analysis, she sought constant feedback from the rest of the author team on first order codes and second order themes. The coder gave each category a label and descriptor independently and checked affirmation of the authoring team. This approach allowed consistency of coding across multiple interviews when a concept needed to be considered in multiple categories. Both Excel and NVivo 12 Plus was 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.

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 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 4) 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. The darker the shade of blue, the more times the particular strategy was discussed. The following section provides supporting evidence from the elite 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".

Insert Figure 4 about here

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 companies considered how to improve their responsiveness to major supply chain disruptions based on the manufacturing location decision. Similarly, Senior 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 the pharmaceutical industries define localization and regionalization in different ways because the technology and patent requirements for manufacturing are very high. Therefore, several 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 dichotomies in their supply chain including capitalising on their existing infrastructure but 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, permitting both an efficient and responsive operation (Figure 5).

Insert Figure 5 about here

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 increase in cost. 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 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 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)

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)

DISCUSSION

The existing literature has explored how firms redeploy resources and reconfigure supply chain assets to create resilience against geopolitical disruptions (Roscoe *et al.*, 2022; Roscoe *et al.*, 2020;Moradlou *et al.*, 2021; Moradlou *et al.*, 2022). Our findings build on this body of evidence by exploring how companies manage the exploration/exploitation paradox within their supply chains during major geopolitical disruptions. Rothaermel and Deeds (2004) argue 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). Our findings indicate 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 balance the efficiency and flexibility/responsiveness in production.

Scholars also suggest that exploration and non-routine tasks activities are predominantly performed by the R&D and commercial departments, and exploitations and routine tasks are often done by the operations department (Gastaldi *et al.*, 2022; 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. Based on the above arguments, we propose the following:

> **Proposition 1:** During the early stages of major geopolitical disruptions, exploitation and exploration activities are pursued simultaneously, with decision-making taking place within cross-functional teams

Scholars have long sought to identify the most suitable local, regional and global location for manufacturing facilities (McIvor, 2013; Moradlou *et al.*, 2017). Considering Dunning's four location advantages (Dunning, 1988), 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 pursuing a localisation strategy. 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 while simultaneously adaptive to changes in the environment. Similar to previous studies (Moradlou *et al.*, 2021), 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 (Theyel and Hofmann, 2021). We found that companies sought to maintain both offshored and nearshored/on-shored facilities, or parallel supply chains, particularly when responding to Brexit and US-China trade war, when they had relatively longer transition times to react and adapt. This leads us to propose that:

> **Proposition 2:** Companies will be motivated by market seeking and efficiency seeking advantages to build parallel supply chains 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. 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.*, p. 1 (2022), "*local and global production networks are not two alternative paradigms of industrial organization; they can be complementary and mutually reinforce each other*" (Canello *et al.*, 2022, p. 1). Our findings support Gereffi (2020) and Canello *et al.* (2022), because we found that 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 3:** During major geopolitical disruptions, companies are driven by resource seeking and efficiency seeking motives to reconfigure their supplier networks to achieve the synergistic benefits of exploitation and exploration, 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 (see also 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"). Based on the above arguments, we propose the following:

> **Proposition 4:** During major geopolitical events with shorter transition times, companies are driven by strategic asset seeking and efficiency seeking motives to restructure internal subunits

Drawing together the above four propositions, we now advance an empirically informed framework (see Figure 6) to illustrate three types of supply chain structural ambidexterity. This framework builds on the earlier studies by Lee and Rha (2016) and Roscoe *et al.*, (2022) which examined how companies manage major disruptions through supply chain redesign. Our framework suggests that companies are likely to develop and deploy different types of structural ambidexterity, based on geographical distance and the amount of transition time available to make the change. 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 can pursue both exploration and exploitation by restructuring internal subunits within a focused geographical space. Where the transition times were longest (i.e., Brexit and the US-China trade war), companies built 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 were more immediate (Covid-19) dual sourcing and supply base diversification was favoured and led to a more balanced level of geographical dispersion. These findings are shown in Figure 6.

Insert Figure 6 about here

CONTRIBUTIONS, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has investigated how companies achieve the synergistic benefits of supply chain structural ambidexterity during major geopolitical events. Our aim was to elaborate on Organisational Learning Theory and Dunning's eclectic paradigm of international production, in the context of major geopolitical disruptions. To elaborate on organizational learning theory, we identified three ways in which firms develop and deploy supply chain structural ambidexterity to effectively manage geopolitical disruptions: (1) building parallel supply chains; (2)

reconfiguration of supplier networks, and (3), restructuring internal subunits. The paper builds on the eclectic paradigm by showing that companies will be motivated by market seeking and efficiency seeking advantages to build parallel supply chains and resource seeking and efficiency seeking motives to reconfigure their supplier networks.

Given the ongoing uncertainties present in today's global supply chains including the war in Ukraine, port closures in China and high inflation, managers will continue to juggle paradoxes and trade-offs in their supply chains. At the same time increasing competition, coupled with stakeholder pressures, allow managers little room to focus on more than one challenge at a time. 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. We encourage manages to follow the insights provided by our framework (see Figure 4) to understand the different structural ambidexterity strategies they can develop based on the available transition times, and the geographic distance of their suppliers and supply chain assets.

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. This could be achieved by examining our propositions using a large-scale survey based on a greater sample of companies. 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. 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 and tensions between China and Taiwan. Further, as this study was conducted in the context of geopolitical disruptions and Covid-19 pandemic, we also invite future researchers to examine our findings in other contexts such as environmental and financial disruptions.

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TABLE 1

List of Interviewees

Company code	Interviewee code	Sector	Job Role	Years of Experience	# times interviewed
AERO1	AERO1a	Aerospace	*Strategic Buyer*	15	2
AUTO1	AUTO1a	Automotive	*Director of Global Purchasing*	20	2
AUTO2	AUTO2a	Automotive	*Head of Logistics Engineering*	20	3
CHEM1	CHEM1a	Chemical	*Senior Vice President and Managing Director*	33	1
	CHEM1b	Chemical	*Logistics Manager -*	25	1
FMCG1	FMCG1a	FMCG	*Head of Procurement*	30	2
FMCG2	FMCG2a	FMCG	*Head of International Markets*	25	1
	FMCG2b	FMCG	*Head of Supply Chain*	16	1
FMCG3	FMCG3a	FMCG	*Senior Solutions Architect - Physical Logistics*	31	1
	FMCG3b	FMCG	*Global Executive - Leading Supply chain transformations across EMEA*	31	1
	FMCG3c	FMCG	*Regional Supply Planning & Logistics Director*	17	1
FMCG4	FMCG4a	FMCG	*Director Great Britain Manufacturing*	14	1
MANUF1	MANUF1a	Manufacturing	*Supply Chain and Logistics Operations Director - EMEA*	26	2
MANUF2	MANUF2a	Manufacturing	*Global Supply Chain Manager*	17	1
MANUF3	MANUF3a	Manufacturing	*Chief Procurement and Supply Chain Officer*	28	1
PHARMA1	PHARMA1a	Pharmaceutical	*Director of Strategic Sourcing, Raw Materials, and Finished Products*	23	2
	PHARMA1b	Pharmaceutical	*Corporate Vice President of Supply Chain*	31	2
PHARMA2	PHARMA2a	Pharmaceutical	*Head of Pharma Logistics*	22	3
PHARMA3	PHARMA3a	Pharmaceutical	*Operations Director*	37	1
TOTAL NUMBER OF ELITE INTERVIEWS					29

FIGURE 1

Location Advantage Factors Affecting the Propensity for Location Change, based on Ancarani et al., 2015; Arlbjørn and Mikkelsen, 2014; Gray et al., 2013; McIvor and Bals, 2021; McWilliam et al., 2020; Moradlou et al., 2017; Tate et al., 2014; Wagner, 2019; Moradlou et al., 2021; Moradlou and Backhouse, 2016

FIGURE 2

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

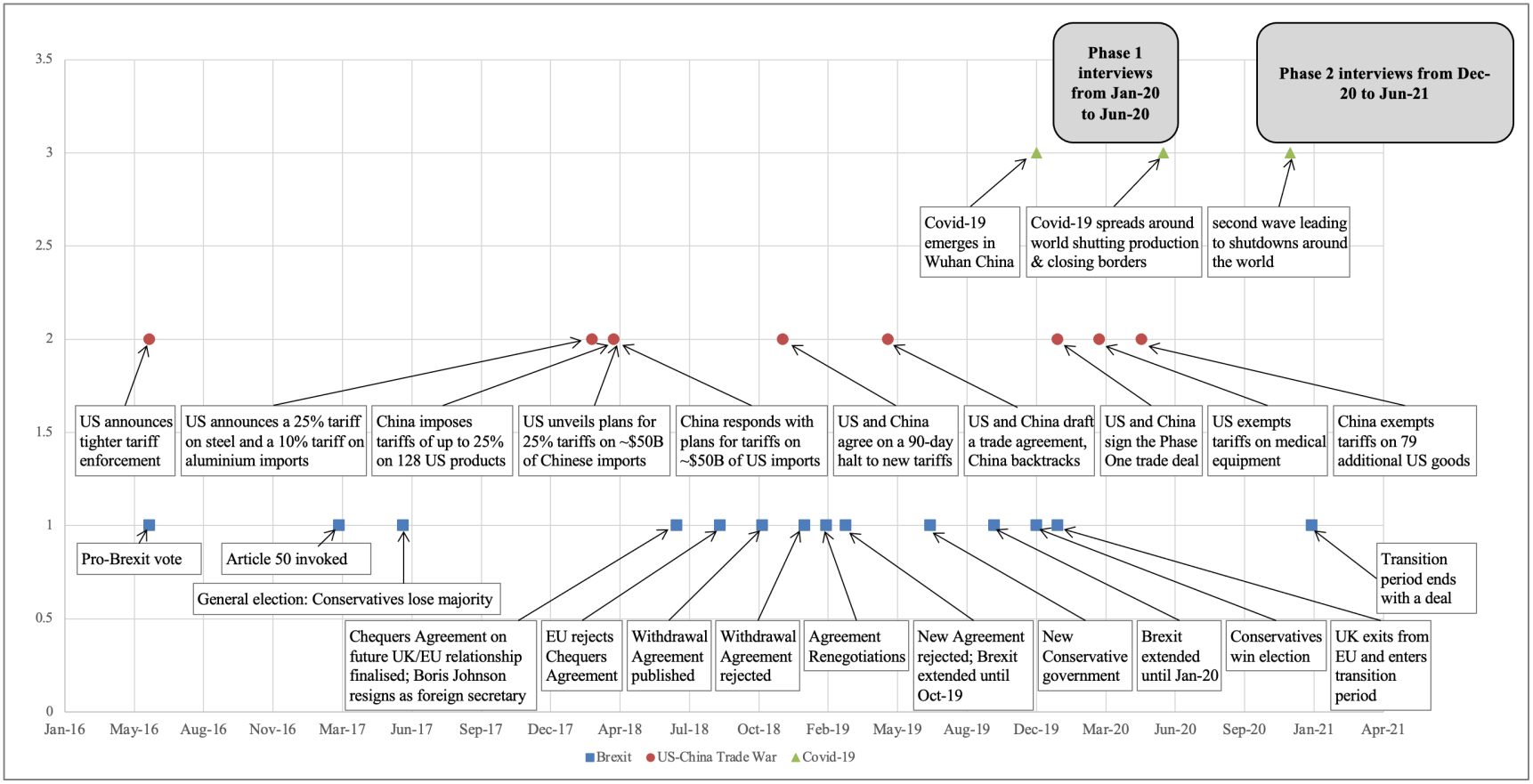


FIGURE 3

Data Structure Illustrated for Supply Chain Ambidexterity

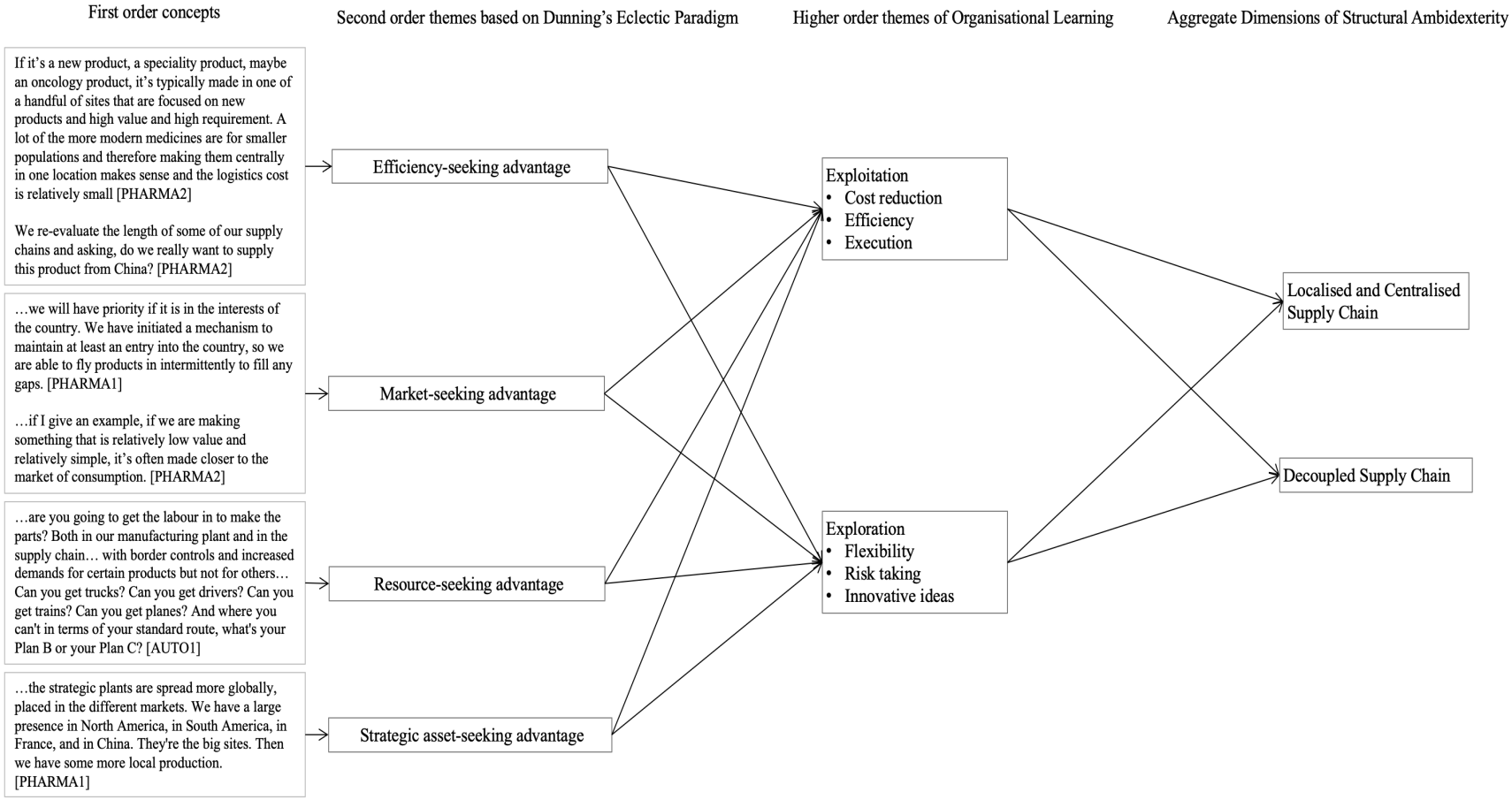


FIGURE 4

Cross-case Heat-map

	Exploitations			Exploration		
	Cost reduction	Efficiency	Execution	Flexibility	Innovative ideas	Risk taking
A : Efficiency seeking advantage						
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
R : Market seeking advantage						
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
AG : Resource seeking advantage						
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
AS : Strategic asset seeking advantage						
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 5

Localised Versus Centralised Production Facilities in Parallel Supply Chains

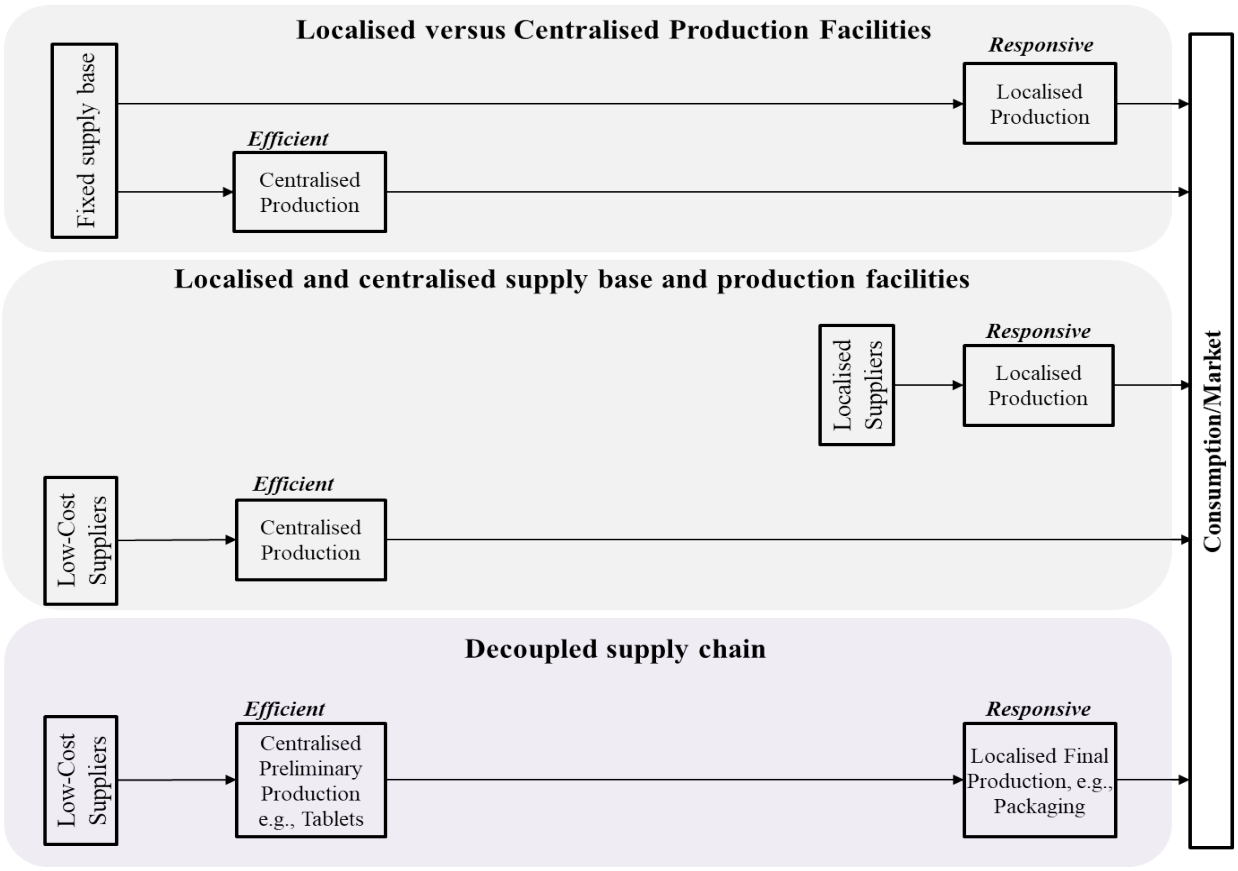
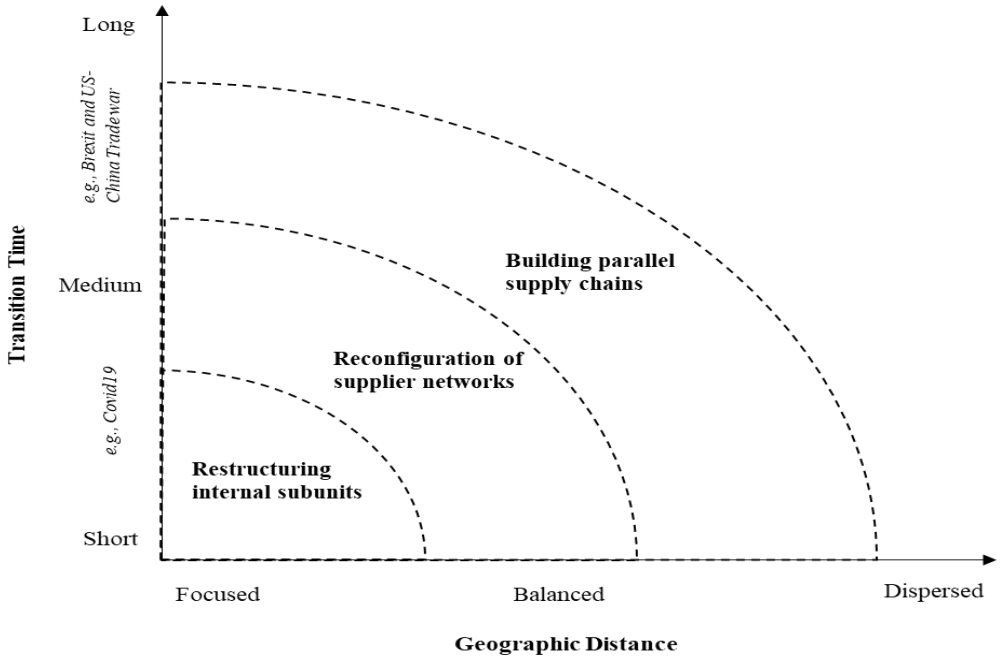


FIGURE 6

Three Levels of Supply Chain Structural Ambidexterity



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2023-07-24

Moradlou H, Skipworth H, Bals L, et al., (2023) Balancing the exploitation-exploration paradox during major geopolitical disruptions: the importance of supply chain structural ambidexterity. In: 83rd Annual Meeting of the Academy of Management (AOM 2023), 4-8 August 2023, Boston, USA. Academy of Management Proceedings, Volume 2023, number 1

https://doi.org/10.5465/AMPROC.2023.10890abstract