

When is a ‘wait-and-see’ strategy an appropriate approach for managing supply chain risk? A contextual study of Brexit

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Abstract:

This paper presents the preliminary findings from a study of the UK’s pharmaceutical and aerospace industries as they manage the supply chain risks associated with Britain’s transition out of the EU, or Brexit. We gather empirical data from 20 semi-structured interviews; data that is objectively verified using primary company documentation, policy briefs and news databases. We find that in contexts where supply chain risk has a high probability and severity, that risk will be managed over five phases. First, the firm selects a ‘wait-and-see’ strategy where tangible resource commitments are put on hold until more information is forthcoming. In the second phase, the wait-and-see strategy evolves to include intangible resource commitments in task forces and the lobbying of government. Third, the firm makes proactive tangible resource commitments to reduce the risk’s severity. When the risk event occurs (phase 4) and in its aftermath (phase 5), the firm reacts by adapting its tangible resource base to fit the outcomes of the risk event. Moreover, we argue the way in which multi-nationals and small and medium enterprises (SMEs) manage risk over these five stages will differ due to resource constraints such as limited personnel and financial capital.

Key Words: Supply Chain Risk Management, contingency theory, contingent uncertainty,

Introduction

Globe-spanning supply chains face inherently high levels of risk due to the political, financial, social and environmental uncertainty associated with operating across multiple international markets (Craighead et al. 2007; Christopher and Holweg, 2011). Risk applies to situations where we do not know the outcome of a given situation but can accurately measure the odds, while uncertainty applies to situations where we cannot know all of the information we need to set accurate odds in the first place (Knight, 2012). So while supply chain risk can be quantified according to its probability and likely severity, uncertainty has a more dubious nature. For example, pure uncertainty relates to future unpredictability and, as the future cannot be known with complete certainty, is impossible to reduce or eliminate (Figueira-de-Limos et al. 2011). Contingent uncertainty, on the other hand, is knowledge dependent and can be reduced as individuals learn more about a particular situation and develop contingency plans to effectively manage the risk context (Figueira-de-Limos et al., 2011). With these important distinctions in mind, we adopt the following definition of risk “the extent to which the firm lacks knowledge about whether potentially significant and/or disappointing outcomes of its decisions will be realized” (Clark and Liesch, 2017). Based on this understanding, one important way to manage supply chain risk is the acquisition of knowledge prior to the event.

A growing body of literature has examined the ways in which firms can manage the risks associated with globalised supply chains (Blackhurst et al., 2005; Craighead et al. 2007, Kleindorfer, 2003; Grotsch et al. 2013; Sheffi and Rice Jr, 2005; Zsidisin and Wagner, 2010; Thun and Hoenig, 2011; Ho et al. 2015; Zhu et al 2017). Within this body of literature, supply chain risk management (SCRM) strategies are generally categorized as passive, reactive or proactive (Craighead et al., 2007; Grotsch et al., 2013; Kleindorfer and Saad, 2005). Passiveness is when firms do nothing and respond haphazardly to the risk event after it has occurred (Grotsch et al., 2013). Reactive strategies rely on redundancies, in the form of surplus capacity, excess inventory and multiple sourcing arrangements to reduce the severity of the risk event (Sheffi and Rice, 2005; Thun and Hoenig, 2011). If the risk cannot be avoided, proactive firms will embed flexibility in a firm’s supply chain to allow for an agile response to the risk event (Kleindorfer and Saad, 2005; Trkman and McCormack, 2009).

Interestingly, the temporality of passive, reactive and proactive strategies becomes blurred following a more in-depth reading of the SCRM literature. For example, Grotsch et al. (2013) explains that passiveness is characterised by action aimed at reducing the impact of a risk event after it occurs (*ex post*). Yet, passiveness suggests that managers also take action *ex ante* because they choose to deliberately ignore the probability of the risk event occurring as its potential severity is considered insignificant. Reactiveness entails taking action after a risk has happened, but preparations taken in advance, such as writing action plans, are said to facilitate an easier and quicker response to the crisis (Grotsch et al., 2013; Knemeyer et al., 2009; Thun and Hoenig, 2011). Based on this understanding, reactive strategies involve preparations before the risk event (*ex ante*) as well as plans enacted after the event (*ex post*) to reduce the event’s severity. Pro-activeness relates to actions taken *ex ante* to reduce both the probability and severity of the risk (Chopra and Sodhi, 2004; Grotsch et al., 2013; Jüttner et al., 2003). Yet, even if a proactive firm makes exhaustive *ex ante* efforts to reduce the likelihood and severity of the risk, the event can still occur and the firm will need to respond.

We suggest that the ambiguity surrounding whether passive, reactive and proactive strategies involve *ex ante* or *ex post* actions, or both, is due to a lack of conceptual clarity on the role that intangible factors, such as time and knowledge acquisition, play in reducing the contingent uncertainty surrounding supply chain risks. We argue that in contexts where firms face supply chain risks with high severity and probability, that the risk will be managed over five phases. In the first phase, when the possibility of the event arises but its probability and severity is still unknown, the firm will select a ‘wait-and-see’ strategy where resource commitments are put on hold until more information can be collected. In the second phase, when the probability of the event is considered likely, the wait-and-see strategy evolves to

include intangible resource commitments made to reduce contingent uncertainty. In the third phase, when the event is highly probable, the firm will make tangible resource commitments in things like multiple-sourcing arrangements, stockpiling of inventory and new infrastructure. In the fourth phase, when the risk event occurs, the firm will evaluate the severity of the event and make further tangible resource commitments, if necessary. Phase 5 is the post-event era, when the firm adapts its resource base to fit the aftermath of the risk event. Moreover, we argue the way in which multi-national enterprises (MNEs) and small and medium enterprises (SMEs) manage risk over these five stages will differ according to resource constraints.

To build this argument, we use contingency theory as a lens to examine Britain's transition out of the European Union, or Brexit. We take a novel approach to studying SCRM by examining a risk event as it unfolds; permitting real-time insights on the strategies that companies enact to cope with supply chain risk. The UK's pharmaceutical and aerospace industries are selected as the context of study because they have complex global supply chains and significant regulatory oversight from European agencies making them particularly susceptible to the risks presented by Brexit. The interview findings are corroborated through an analysis of primary documentation including policy documents, trade association briefs and company strategy documents relating to Brexit. The findings from the primary data are further validated using secondary data sources gathered from databases including Factiva, Bloomberg, Financial Times/FT.com and ProQuest Archiver.

The remainder of the paper is split into four sections. The next sections reviews the SCRM and International Business literature to build a conceptual model of how intangible resource commitments help companies acquire knowledge about risk events to reduce contingent uncertainty. Section three provides a justification of the research design and section four applies the conceptual model to the empirical data. Section five discusses the study's findings and outlines the theoretical and managerial contributions of the paper

Literature Review

Contingency Theory and contingent uncertainty

Contingency theory asserts there is no single best way to organise and any method of organising will not be equally effective under all conditions (Galbraith, 1973). Central to contingency theory is the proposition that the structure, process, culture and technology of an organization must fit its external environment if the organisation is to survive and be effective (Schoonhoven, 1981). One external factor that significantly influences how an organisation configures its structure and processes is the amount of uncertainty present in the external environment (Galbraith, 1973). Environmental uncertainty is defined as an inability to assign probabilities as to the likelihood of future events (Knight, 2012) and is reflected by such factors as complexity, rate of change and the availability and clarity of information (Galbraith, 1973). By matching an organisation's structures and processes to the external setting, a firm achieves fit with its external environment and, in turn, reduces the degree of environmental uncertainty (Burns and Stalker, 1961; Drazin and Van de Ven, 1985; Galbraith, 1982; Hambrick, 1983; Miller, 1992; Thompson, 1967).

Since these early writings, the notion of environmental uncertainty has been further split into pure uncertainty and contingent uncertainty. Pure uncertainty refers to future events that are impossible to know and plan for (Figueira-de-Lemos et al., 2011; Jones, 2013). Contingent uncertainty implies that the more one learns, the more he or she will be able to distinguish different contingency plans or alternatives (ibid). Thus, the more alternatives that a person can identify the more knowledge that is acquired and the less ignorant the person is about the situation (Figueira-de-Lemos et al., 2011).

Knowledge about a particular risk event is gained through tangible and intangible resource commitments (Hadjikhani, 1997). Tangible commitments are those for which it is possible to calculate both the input cost and output outcome and include such things as production plants,

subsidiaries' offices, transportation vehicles or agreeing supplier contracts (Hadjikhani, 1997). For example, to reduce the amount of contingent uncertainty associated with overseas expansion, a firm may choose to hire foreign personnel or form a joint venture to gain knowledge about new markets (Figueira-de-Lemos and Hadjikhani, 2014). Intangible commitments are those for which the input costs are quantifiable, but the outcome difficult to estimate (Figueira-de-Lemos et al., 2011; Hadjikhani, 1997). The purpose of intangible resource commitments is to learn about and predict environment changes and include such things as employee education and training, buyer-supplier meetings and the relationships formed inside and outside the firm. (Figueira-de-Lemos et al., 2011; Hadjikhani, 1997). For example, instead of investing in physical assets a firm may choose to form relationships with trade bodies, governments or potential suppliers to acquire knowledge about the target market (ibid).

In stable environments, characterized by low levels of contingent uncertainty, managers are able to draw on their experience while acquiring context specific knowledge, giving them more confidence when deciding on future resource commitments (Figueira-de-Lemos and Hadjikhani, 2014; March and Shapira, 1987; Paul and Wooster, 2008; Petersen et al., 2010). However, in unstable environments, managers must compromise between knowledge and resource commitment decisions, as past knowledge cannot be entirely relied upon in volatile markets (Figueira-de-Lemos and Hadjikhani, 2014; Johanson and Johanson, 2006; Paul and Wooster, 2008; Petersen and Pedersen, 1999). In contexts such as these, when uncertainty is high and the perceived risks are considered severe, managers will be reluctant to make tangible resource commitments because there is too much at stake and tangible investments are difficult and costly to reverse (Figueira-de-Lemos and Hadjikhani, 2014). Instead, situations of high degrees of uncertainty and instability prompt managers to make intangible resource commitments to gain more knowledge about the risk context and to bring perceived uncertainty down to more tolerable levels (Figueira-de-Lemos et al., 2011; Figueira-de-Lemos and Hadjikhani, 2014; Isobe et al., 2000). Radical environmental changes might be such that firms do not hold the minimum knowledge required to understand the causes and context of the risk and, thus, without any perception about what to react to, the most appropriate approach is to 'wait-and-see' (Atkins and Anderson, 1999; Hadjikhani, 1997; Sull, 2005)

A 'wait-and-see' approach to reducing contingent uncertainty

A wait-and-see strategy is defined as a strategy resulting from a measured decision in the firm to maintain current tangible resource commitments to its business relationships – a strategy of active waiting (Clarke and Liesch, 2017 p.924; Sull, 2005). Sull (2005) argues that companies skilled in active waiting not only survive unpredictable markets, they thrive in them. He suggests that managers in turbulent markets cannot manufacture the timing of the rare golden opportunity nor can they predict with any certainty the exact nature of risk, and must actively wait for such situations to become apparent (Sull, 2005). With a wait-and-see strategy the company aligns its strategic focus to the particular market context, and reacts according to the present situation as-is, be it an opportunity or threat (Clarke and Liesch, 2017; Figueira-de-Lemos and Hadjikhani, 2014; Sull, 2005).

A wait-and-see strategy is neither proactive, as tangible resource commitments are not made in advance to reduce the probability of the risk occurring, nor is it reactive as tangible resources are not committed to reduce the risk's severity. Moreover, a wait and see strategy is not passive, as the firm does not stand idly by as the risk event occurs and then reacts haphazardly after the fact. Instead, a wait-and-see strategy is deliberate action in the form of intangible resource commitments made to acquire knowledge about the risk event in an effort to reduce contingent uncertainty. Interestingly, a review of the SCRM literature reveals little acknowledgement of the wait-and-see approach. Instead scholars in this field tend to focus on the tangible resource commitments that firms make to reduce the probability and severity of supply chain risk.

Supply Chain Risk Management

SCRM strategies can be classified as passive, reactive or proactive (Blackhurst et al., 2005; Craighead et al. 2007; Kliendorfer, 2003; Grotsch et al. 2013). Passiveness is when the firm ‘does nothing’ and then reacts chaotically and aimlessly to the disruption after it occurs (Grotsch et al., 2013). It can be argued that companies rarely choose to ‘do nothing’ in the face of a supply chain risk, but instead take the decision to deliberately ignore the risk because the probability and severity are seen as insignificant. It is not that information is missing or wrong, but that the presence of particular information is not deemed important by managers (Kutsch and Hall, 2010). This suggests that passive strategies have a limited form of intangible involvement by managers before the risk event, as they make the deliberate decision to ignore the information that is presented to them.

Reactive strategies relate to tangible actions taken by the firm after a risk event has occurred but can also include preparations made by the firm to enable a more robust response and to reduce the resulting damage (Knemeyer et al., 2009; Thun and Hoenig, 2011). Proactive SCRM strategies refer to planning ahead to minimize, or completely avoid, risks before they emerge (Grotsch et al., 2013; Knemeyer et al., 2009; Mitroff and Alpaslan, 2003; Tang and Tomlin, 2008). Proactive strategies rely on control systems to identify and assess supply chains risks and flexibility strategies if risks cannot be avoided (Chopra and Sodhi, 2004; Grotsch et al., 2013; Jüttner et al., 2003). Manuj and Mentzer (2008a,b) suggest flexibility strategies should include sharing and transferring risk to supply chain partners as well as risk avoidance strategies such as speculation and hedging. Two frameworks by Tang (2006a, b) argue reactive redundancy strategies should include strategic stock and product rollovers while proactive flexibility strategies should address demand management, information management, a flexible supply base, postponement and flexible transportation.

Interestingly, the aforementioned studies assert that tangible resource commitments should be made either in preparation for, or in response to, a risk event. What is not accounted for is situations where resource commitments are put on hold until more knowledge about the risk event can be accumulated. Similarly, limited attention is paid to the intangible resource commitments that firms make to acquire knowledge about the risk event in an effort to reduce contingent uncertainty. To address this gap, we now synthesize the discussion and advance a conceptual model that incorporates the role of contingent uncertainty and time in managing supply chain risk (see Figure 1).

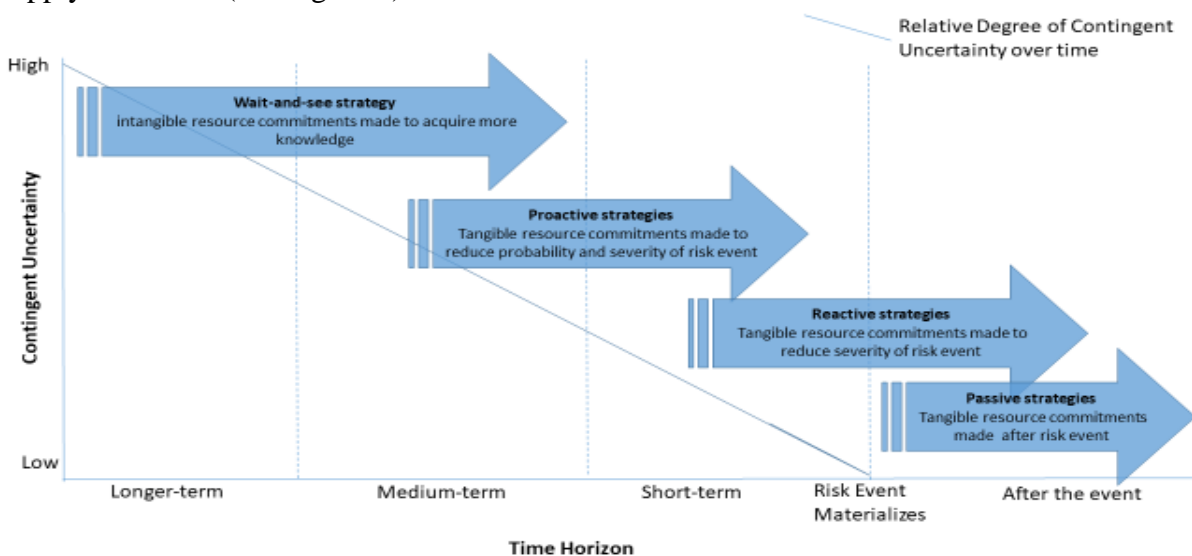


Figure 1: The role of contingent uncertainty and time in managing supply chain risks

As the research question has a ‘how’ framing and examines a contemporary phenomenon (Brexit) about which relatively little is known, we followed the advice of Yin (2014) and used a case study research design. A case study design is well suited to our investigation because it lends itself to early, exploratory investigations in which the variables are still unknown and the phenomenon (Brexit) is not at all understood (Voss et al., 2002). We choose a multiple, over a single, case design as multiple case studies offer more opportunities for in-depth data gathering and analysis (Dyer and Wilkins, 1991). Furthermore, a multiple case design permits both within – and across – case comparisons, and is often considered more robust than a single case design (Yin, 2014). We conducted 20 semi-structured interviews in total, five in the aerospace industry and 15 in the pharmaceutical industry. We selected these two industries because they are vital to the UK economy and are expected to bolster UK productivity following Brexit (Department for Business, Energy and Industrial Strategy, 2017). The connecting thread between these industries is that both are research and development intensive and highly regulated by European Agencies; with the testing, approval and production of new products taking between five and twenty years (ABPI, 2017; ADS Group, 2017). We interviewed multi-national (MNEs) firms and small and medium enterprises (SMEs) to account for firm size and resource availability when developing supply chain risk mitigation strategies. Furthermore, we interviewed experts working in trade bodies to understand the link between industry, policy makers and government during the Brexit negotiations.

Findings

This section identifies the key themes relating to how the aerospace and pharmaceutical industries have approached Brexit. The findings are presented over five sections that correspond to the five temporal phases we have identified for Brexit. Our data analysis suggests that Brexit differs from many other supply chain risks due to four primary reasons: 1) Brexit is a gradual change that is unfolding over a long period of time (3-5 years); 2) Brexit is a supply chain risk that has a high likelihood of occurrence; 3) Brexit has potentially high severity because it will affect many aspects of a company including sales, human resources, finance, regulatory affairs, operations and supply chain management and 4) Brexit has high degrees of contingent uncertainty as the details of the EU-UK relationship are being negotiated behind closed doors between government officials. As one interviewee explained:

“Brexit.. it’s seismic in its ability to completely disrupt supply chains. Because the supply chain across Europe is totally integrated.” – [PER17]

Phase 1: A change possibility arises

Interviewees went on to explain that in the lead-up to the vote many companies did not expect the result to go in favour of Britain departing the EU. The findings suggest that most companies took a wait-and-see approach before the vote and did not make any tangible or intangible resource commitments until the result was clear. We define this as phase 1 (P1): “The possibility of supply chain risk arises”. Table 1 shows that at most companies thought about and discussed the impact of Brexit, or chose to release internal and/or external communications expressing the company’s position on Brexit.

Theme	Code	Quote
	At most, companies thought about and discussed the possible implication of Brexit	“They all had started a process of thinking internally, “What does this mean for our business? We’re a global business, what could this change mean?” (PER02)
		“The company was really quick in terms of communication to the colleagues and on where the company stood: which was that it was against Brexit” (PER03)

		“It was something along the lines of, you know, "Situation normal, so it continues until we've got clarity on the situation". (PER04)
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Table 1: A change possibility arises

Phase 2: The risk event is highly likely

When the results of the vote were released to the public, there was still high degrees of contingent uncertainty because people were still unclear on whether the UK government would respect the vote as well as on the timelines for leaving the European Union. It was not until Article 50 was triggered in March 2017 that the likelihood of Brexit appeared almost certain, however the nature of the EU-UK relationship was still very much up for debate. We call this phase (P2): The risk event is highly likely. One supply chain director at a large multi-national firm explained that very quickly after the vote, his company formed a task force to evaluate the risks and prepare for Britain’s eventual departure from the EU:

“A Brexit impact assessment team was put together to manage this risk very shortly after the vote to leave, we were already building action plans, building impact assessments rather than risk management, because the risk had become an issue at that point in time.” (PER05)

In phase 2, we found that the MNEs in our study put task forces and strategies in place to deal with Brexit and began using their size and influence to engage policy makers either directly or through trade associations to shape policy (see Table 2). Similarly, the trade associations began working closely with policy makers to supply data on how Brexit would affect their industries, thereby shaping the manner in which policy was developed. However, the majority of SMEs merely extended their wait-and-see approach as the exact nature of the trading relationship with the EU was still highly uncertain at that time and SMEs wanted more information before making any tangible or intangible resource commitments (see Table 2):

Theme	Code	Quote
In Phase 2- MNEs made intangible resource commitments in task forces, strategy setting and building relationships with policy-makers to influence the direction of negotiations	Multi-nationals better able to use their influence to affect the direction of government policy	“I think most big companies saw this as a kind of, "Ok, here are the risks, here's how we might be able to mitigate them, here's what lobbying we might be able to do" (PER02)
In Phase 2- trade associations began to make intangible resource commitments in building relationships with policy-makers and their membership to influence the direction of negotiations	Trade associations provided data to policy makers to ensure the concerns of industry were understood	“During that period we, as a trade association, said, "Ok let's just make the best of it. Let's figure out what the issues are, make sure the government's aware of it, make sure that whenever Article 50's triggered, they know our issues, and they're on our side" (PER 02)
In Phase 2- SMEs have to extend their wait-and-see strategy until more information emerges as they do not have the resources to be proactive	SME’s do not have the organisational slack to proactively respond to Brexit.	“The big companies have that resource and that capacity to pull together a Brexit task force, and identify and work through, the implications. On the flipside, the SMEs, they don't have that capacity, they don't have the people.... SMEs, don't have the luxury to look at all the options and scenario plans, they just have to kind of wait and see. (PER 02)

Table 2: The risk event is highly likely

Phase 3: The nature of the risk event is specified

Phase 3 is when the nature of the risk event becomes clearer as more information is revealed. In terms of Brexit, we consider phase three to be the two year period from the triggering of Article 50 (March 2017) to the time that Britain officially leaves the EU (March 2019). Table 3 shows that in the early stages of phase 3 many companies had yet to make tangible investments in physical assets because there was still not enough information on the future UK-EU relationship.

Theme	Code	Quote
		“We've got a two-year window... for some of the hard physical assets, probably a year is the latest you could really leave it, and then we'd be looking perhaps for some of our partners like DHL and FedEx and UPS to be maybe investing in those assets.” (PER10)
		“I'm not seeing any preparations, I can't see anything obvious. You know inventory's not being built, there aren't any co-located suppliers, I'm not seeing suppliers move from one geographic area to the other. I guess that will only start happening as we get some certainty as to what's going to happen.” (PER04)
	The two-year time window is creating greater degrees of contingent uncertainty for firms, prompting them to take action early on to reduce contingent uncertainty	“I think we've gone as far as painting the extreme scenarios and something in the middle and what we might need to do if it lands on either of those or on any of those. But we're certainly deferring any kind of investment decisions at the moment.” (PER10)

Table 3: The nature of the risk event is specified

It was not until the latter half of phase 3 that companies, predominantly multi-nationals, started to make tangible resource commitments in physical assets such as new manufacturing facilities, suppliers and head-offices. Resource constraints, in the form of personnel and finance, were found to still restrict SMEs willingness to invest in tangible resources at this point (see Table 4).

Theme	Code	Quote
		“Certainly a lot of companies are actively seeking to set up legal entities in other countries if they don't already have them in member states, so that's happening.” (PER17)
		“I have spoken to suppliers who have offered to set up co-located facilities, on the basis that they've done it before and "It's not a problem, you just tell me where you want me to be". (PER04)
		I think the major players in the industry will take steps, will build a foundation for dealing with a big change. I think companies will be prudent and will not wait for the cliff edge.” (PER08)

Table 4: Tangible resource commitments made in late stages of phase 3

At the time of writing, companies were still in stage three of the Brexit process. We propose that two additional phases will follow stage 3. Phase 4 is when the actual risk event materializes. For Brexit, this will include the 20 month transition period out of the EU scheduled to run from March 2019 to Dec 2020. The final stage is Phase 5, which is the period of time after Britain has transitioned out of the EU and change has been embedded in the day-to-day working of firms. Drawing together these findings we suggest that supply chain risks with a high probability and high severity will tend to be managed by companies over five stages. Importantly, we suggest that MNEs and SMEs will take a different approach to

managing supply chain risks due to the resource constraints of smaller firms. Specifically, in phase 1 and phase 2 both types of firms will adopt a wait-and-see approach. However, in phase 2, MNE's will begin to make intangible resource commitments in task forces, strategy setting and lobbying government to influence policy. In the latter stages of phase 3, MNEs will begin to make tangible resource commitments in new facilities, infrastructure and the signing of supplier contracts. We thus argue that in the late stages of phase 3, MNEs will begin to implement proactive SCRM strategies targeted at reducing the severity of the risk event, even when contingent uncertainty is still relatively high.

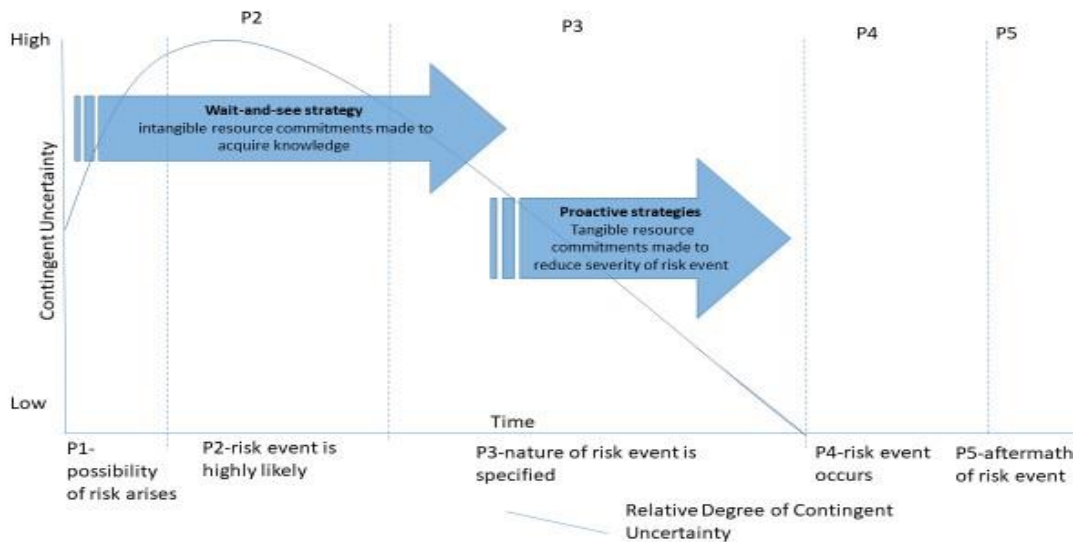


Figure 2: MNEs approach to managing supply chain risk in high probability, high severity situations

Our findings also suggest that due to resource constraints SMEs will have to prolong their wait-and-see strategy until more knowledge about the risk event can be acquired. SMEs will only adopt a proactive approach and make tangible resource commitments when they have sufficient information and contingent uncertainty is very low (see Figure 2). Situations of extreme resource constraints, such as when companies have very limited personnel and financial capital, may force SMEs to wait until the risk event materializes and subsequently adopt a reactive SCRM strategy (see figure 3)

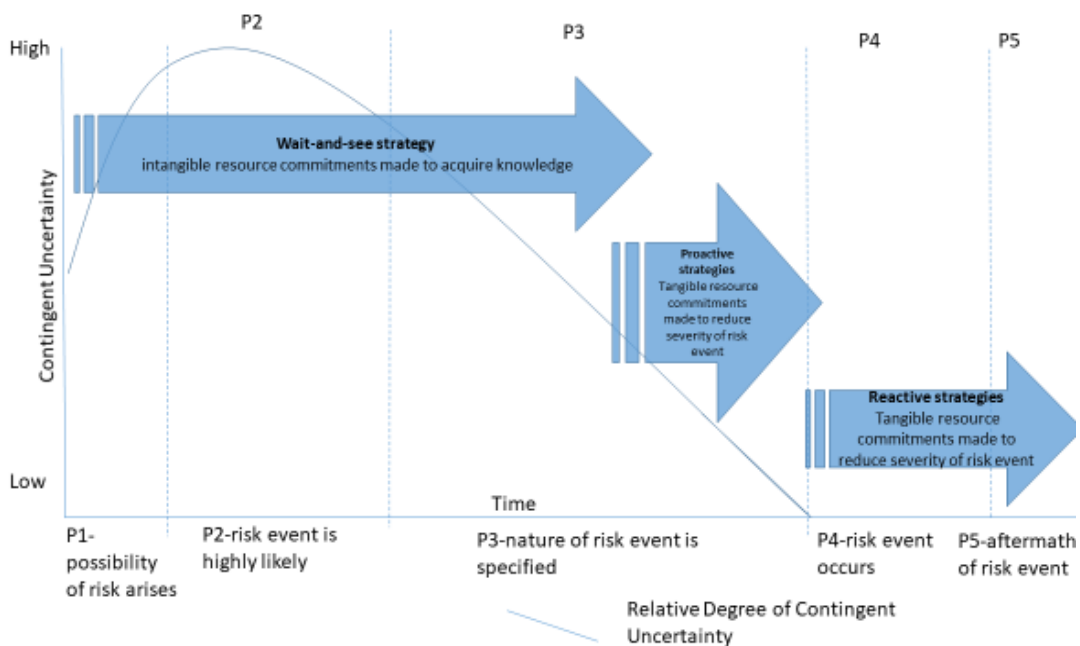


Figure 3: SMEs approach to managing supply chain risk in high probability, high severity situations

Contribution

This paper brings conceptual clarity SCRM strategies by explicating the role of time and contingent uncertainty. In the first instance, our study clearly differentiates the purpose of tangible and intangible resource commitments when managing supply chain risks. Intangible resource commitments are made to acquire knowledge and reduce contingent uncertainty, while tangible resource commitments are made to reduce the severity of the risk event. Based on this understanding, a firm can transition from a “wait-and-see” approach to a proactive strategy over time by first making intangible resource commitments to gather information and then by making tangible investments to reduce the risk’s severity. Accordingly, we argue that reactive SCRM strategies are only implemented after the event materializes and refers to the tangible resource commitments made to lessen the severity of the risk event. In situations of high probability and high severity, we argue that passive SCRM strategies are non-existent because if firms chose to deliberately ignore the risk and to react after the event they are essentially following a reactive approach. Moreover, our findings suggest that MNEs and SMEs will take a different approach to managing supply chain risks due to resource constraints. MNEs may be able to transition from a wait-and-see to a proactive approach earlier by making intangible resource commitments in things like task forces, strategy setting meetings and lobbying governments to influence the direction of policy. By acquiring more knowledge in this manner, MNEs can more quickly move to proactive strategies and tangible investments than their SME counterparts.

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