

# Achieving supply chain flexibility: A case of dual sourcing

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## **ABSTRACT**

*Traditionally, dual sourcing is an important supply chain practice aiming to reduce purchasing costs in a world of growing competition. Beyond such economic benefits, dual sourcing contains the potential to increase resilience to uncertainties and disruptions by splitting the supply leading to less dependency on one supplier. One significant shift requiring managers to revise their supply chain strategies is the move from global sourcing towards diversification through regional supply chains. Despite the increased practice of dual sourcing to achieve this, it is predominated by an economic logic, and it is yet unclear how dual sourcing is practiced becoming more effective in achieving better supply chain flexibility. To this end, this study aims to examine the practice of transforming a sourcing strategy into dual sourcing in order to better understand how companies can exploit this to achieve better supply chain flexibility at the supply chain level. The study made use of a qualitative, single-case study methodology, as this research investigates a European company that adopted dual sourcing in response to a series of disruptions. Data collected through semi-structured interviews were analyzed. The findings reveal that dual sourcing achieves multiple dimensions of supply chain flexibility however needs as well certain supply chain flexibility to be practiced. The results show that dual sourcing introduces structural changes in the supply chain, thereby significantly contributing to resilience.*

## **1. INTRODUCTION**

The introduction will give an outlook on the background and literature of this paper.

### **1.1 Background**

Dual sourcing divides the supply of a particular category across multiple suppliers (Lou *et al.*, 2024). It is a sourcing structure that was originally adopted to mobilize the competitive bidding between suppliers, leading to lower purchasing costs (Ramasesh, 1991). The resulting economic advantage regarding cost and risk management is the reason that this practice has continuously made use of in supply chain management (Han *et al.*, 2023).

Besides the economic advantage, dual sourcing contributes to resilience within supply chains (Gehrig and Stenbacka, 2023). The reason is that it mitigates the risk of supply disruptions by diversifying their sources, which achieves a more robust supply chain (Lou *et al.*, 2024). This is building flexibility (Phadnis, 2024). Being flexible within the supply chain is important as disruptions will happen more frequently, and the uncertainty is rising making Europe's supply

chains more vulnerable (Hand, 2024). However, it is yet unknown how exactly dual sourcing contributes to resilience as details are rarely researched (Lou *et al.*, 2024).

A known fact is though that the adoption of dual sourcing achieves supply chain flexibility by generating structural flexibility (Christopher and Holweg, 2011). Structural flexibility as a part of supply chain flexibility involves extensive analytical preparations, in order to create a supply chain structure that aligns with the company's environmental conditions of disruptions and uncertainty (Fayezi, Zutshi and O'Loughlin, 2015). Therefore, structural flexibility involves profound and irreversible changes within the supply chain, such as implementing dual-sourcing strategies, which creates adaptability (Phadnis, 2024).

However, researchers do not only describe the achievement of adaptability through dual sourcing but also responsiveness (Sapra, 2017). Responsiveness is associated with dynamic flexibility and is known for generating agility instead of adaptability, facilitating more rapid short-term changes instead of significant long-term changes (Christopher and Holweg, 2011).

Hence it is generally known that dual sourcing achieves supply chain flexibility (Huang, Zeng and Xu, 2018). However, there are yet little details known about what kind of flexibilities are generated through dual sourcing, exempt from sourcing and delivery flexibility (Glock, 2012; Sawik, 2014). Hence, it is yet unknown how dual sourcing achieves supply chain flexibility. This paper aims to examine the practice of transforming a sourcing strategy into dual sourcing in order to better understand how companies can exploit this to achieve better flexibility at the supply chain level. To do so this paper will look into the different outcomes of dual sourcing through a single case to find evidence for the achievement of supply chain flexibility.

## **1.2 Literature Review**

The literature review will provide additional information about the research topic.

### **Dual Sourcing**

A widely used strategy to enhance resilience and flexibility is dual sourcing. Dual sourcing offers a balance between supply chain risk and material cost, as this kind of sourcing structure enhances on the one hand the competition of suppliers and on the other makes sure that a company has an alternative structure of sourcing. Dual sourcing is a practice that comes in different types, which come with different traits and challenges. (Li, Chen and Wang, 2011)

Emergency dual sourcing is one type, which entails to use a second supplier as a backup in case the other supplier is not able to deliver the product (Han *et al.*, 2023). Hence, emergency dual sourcing is mostly used when the buyer cannot fully rely on the source they already have (Huang, Zeng and Xu, 2018). Emergency dual sourcing offers more flexibility in acute cases of disruptions, however, it is a more expensive type, as for this one acute occasion the procurement cost increases through more administration (Kouki, Babai and Minner, 2018). It is also riskier as the second supplier has been yet unknown and the supply chain has not been made for dual sourcing (Huang, Zeng and Xu, 2018).

On the other hand, long-term dual sourcing encompasses building a structure that regularly splits the purchasing volumes among two suppliers (Li *et al.*, 2023). This saves purchasing costs

as the structure to source dually and choice of suppliers has been already made saving administrative costs within purchasing (Huang, Zeng and Xu, 2018).

Dual sourcing has to be prepared as the supply needs to be strategically balanced between both suppliers, involving planning the supply and suppliers (Huang, Zeng and Xu, 2018). Thereby the company needs to decide whether the new supplier does for a specific amount of time substitute the original supplier completely choosing for emergency dual sourcing or using both suppliers at the same time, splitting the supply for a long-term dual sourcing structure (Su and Liu, 2015). Hence the decision-making process has to be changed to source dually (Song *et al.*, 2014). This involves as well that the forecast and inventory management has to be adjusted to source dually as procurement will deal with a split volume (Xiong *et al.*, 2022). Additionally, new contract arrangements have to be made with the original supplier which e.g. establishes the right of the company to have another supplier (Luo *et al.*, 2015). Furthermore, as well the operations structure has to be prepared as the substitute material might be different from the original (Lu, Huang and Shen, 2011). Lastly, preparing for dual sourcing means as well to increase the company's flexibility within the delivery structure by allowing different delivery frequencies, production start times, and shipment schedules, which generally leads to lower total system costs (Glock, 2012).

Practicing dual sourcing can achieve different advantages. For example, the company has the possibility to nearshore their supply. The nearby situated source will be able to supply faster while the offshore source might offer a more stable and cheaper backup supply (Jakšič and Fransoo, 2018). Another advantage is that the supply will get more stable with dual sourcing (Han *et al.*, 2023). The reason is that dual sourcing achieves flexibility within the supply making it easier to keep a steady supply as well in times of supply disruptions (Knofius *et al.*, 2021). Also, a company obtains different types of flexibility such as sourcing and delivery flexibility (Sawik, 2014).

### Supply Chain Flexibility

Supply chain flexibility is yet defined as a capability that can react and change processes and operations in the supply chain (Vickery, Calantone and Droge, 1999). It is a capability that has multiple dimensions and can exist in different processes (Vickery, Calantone, and Droge, 1999).

The capability evolved from the term manufacturing flexibility. Upton (1994) applied flexibility to manufacturing processes and defined it as “[...] the ability to change or react with little penalty in time, effort, cost or performance” (Upton, 1994, p. 73). With globalization and the therefore rising interest in the whole supply chain, Vickery, Calatone, and Droge (1999) extended manufacturing flexibility into a framework covering the entire supply chain referred to as supply chain flexibility. Thereby, supply chain flexibility dimensions determine what supply chain flexibility consists of (Vickery, Calantone and Droge, 1999). Through the years, supply chain flexibility became well-understood from different perspectives often referred to as operational, tactical, strategic, and network level (Koste and Malhotra, 1999; Lummus, Vokurka and Duclos, 2005; Martínez Sánchez and Pérez Pérez, 2005; Stevenson and Spring, 2007). While the operational and tactical level contain short-term flexibility dimensions, the strategic and network level contain long-term flexibility dimensions (Stevenson and Spring, 2007). Within these perspectives supply chain flexibility has a different scope of use, dimensions, and goals. They are described as these:

- The operational level; is concerned with the short-term changes in operations and material flow.
- The tactical level; is concerned with the internal relationships of the supply chain, mediating between operation and strategic interests. This is leading to short-term changes.
- The strategic level; is concerned with the customer relationship, to distribute as fast as possible. These changes are long-term.
- The network level; is concerned with long-term network structures (Stevenson and Spring, 2007)

The appearance of different supply chain flexibility dimensions within these levels can vary and dimensions are chosen based on different disruptions, market demands, and supply chain contexts, which presents a significant challenge for the company (Martínez Sánchez and Pérez Pérez, 2005; Kumar, Shankar and Yadav, 2008). Hence, as seen in Table 1, supply chain flexibility dimensions can be sorted into different system levels (Stevenson and Spring, 2007).

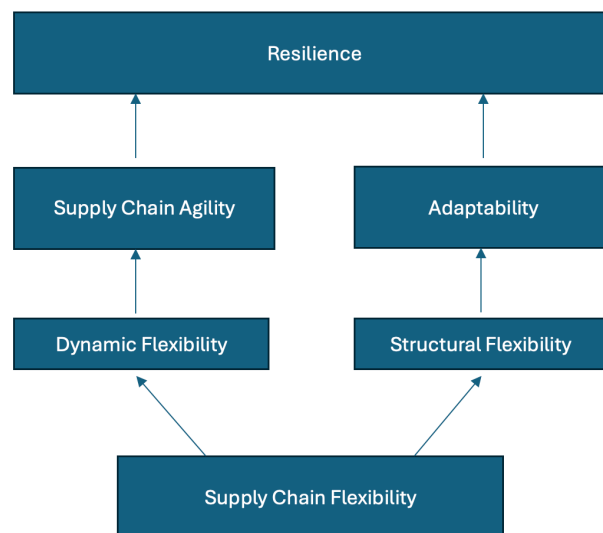
*Table 1: Supply chain flexibility dimensions sorted into the different system levels.*

Level	Dimensions	Authors
Operational level	Machine Flexibility, Labor Flexibility, Material handling Flexibility, Operation Flexibility, Automation Flexibility, Process Flexibility, Routing Flexibility, Program Flexibility, Operation system Flexibility, Stock Flexibility.	(Sethi and Sethi, 1990; Chen, Calantone and Chung, 1992; Parthasarthy and Sethi, 1993; Koste and Malhotra, 1999; Vokurka and O’Leary-Kelly, 2000; Stevenson and Spring, 2007; Manders, Caniëls and Ghijsen, 2016; Rojo <i>et al.</i> , 2018)
Tactical level	Product/modification Flexibility, Volume Flexibility, Delivery Flexibility, Production Flexibility, Postponement Strategy, Quality Flexibility, Expansion Flexibility.	(Slack, 1983; Upton, 1994; Vickery, Calantone and Droge, 1999; Vokurka and O’Leary-Kelly, 2000; Martínez Sánchez and Pérez Pérez, 2005; Kumar <i>et al.</i> , 2006; Stevenson and Spring, 2007; Malhotra and Mackelprang, 2012; Manders, Caniëls and Ghijsen, 2016, 2016).
Strategic level	New Design, Expansion, Market Flexibility, Launch Flexibility, Access Flexibility, Supply Flexibility, Sourcing Flexibility, Procurement Flexibility, Purchasing Flexibility, Transshipment Flexibility, New Product	(Vickery, Calantone and Droge, 1999; Vokurka and O’Leary-Kelly, 2000; Pujawan, 2004; Martínez Sánchez and Pérez Pérez, 2005; Stevenson and Spring, 2007; Malhotra and Mackelprang, 2012; Manders, Caniëls and

	Flexibility, Distribution Flexibility.	Ghijsen, 2016, 2016; Rojo <i>et al.</i> , 2018)
Network level	Reconfiguration Flexibility, Robustness Flexibility, Relationship Flexibility, Logistic Flexibility, Organizational Flexibility, Interorganizational Flexibility, Response Flexibility, Information System Flexibility, Spanning Flexibility.	(Lummus, Vokurka and Duclos, 2005; Stevenson and Spring, 2007; Malhotra and Mackelprang, 2012; Manders, Caniëls and Ghijsen, 2016; Rojo <i>et al.</i> , 2018)

### Dual sourcing in context to flexibility and resilience

The main capabilities to create resilience are supply chain flexibility, agility, and adaptability, which are often described as very similar to each other (Christopher and Holweg, 2017; Benzidia and Makaoui, 2020; Phadnis, 2024). Research has shown that there are short-term and long-term flexibilities referred to as dynamic and structural flexibility, building supply chain flexibility types (Figure 1). Dynamic flexibility allows for rapid adjustments like increasing production levels up or down creating agility (Phadnis, 2024). In contrast, structural flexibility involves more profound, irreversible changes, which creates adaptability (Phadnis, 2024).



*Figure 1: Possible contribution of dual sourcing to resilience.*

Looking at how dual sourcing contributes to resilience one can say that dual sourcing is referred to as a practice to achieve supply chain flexibility (Huang, Zeng and Xu, 2018). Christopher and Holweg (2011) describe dual sourcing as a practice to obtain structural flexibility. However, research in dual sourcing does as well describe the achievement of dynamic flexibilities (Sapra, 2017). Therefore, nevertheless, which of these types is obtained, dual sourcing will contribute to the achievement of supply chain flexibility to resilience.

## 2. METHODOLOGY

This paper is a conceptual study and conducted with a qualitative approach. Therefore, rich and detailed data is needed to explore dual sourcing empirically to obtain important information, which can be done best with qualitative research (Bryman and Bell, 2022). For this investigation, a single case study design will be conducted. The choice to conduct a single case study was made based on the fact that in-depth information is needed to confirm that dual sourcing achieves supply chain flexibility and how in this specific case supply chain flexibility is achieved (Yin, 2018). The phenomenon is hereby supply chain flexibility, a capability that contributes to resilience through achieving agility and adaptability (Christopher and Holweg, 2011; Phadnis, 2024).

The company participating in this research is pre-selected. It has been chosen based on its knowledge background and the information it can provide about dual sourcing and its outcomes. The choice has been made by previous pre-interview sessions to find a specific case using dual sourcing to achieve supply chain flexibility. The company has been chosen because it showcases a specific case of using emergency dual sourcing within the company, a practice that has been structurally planned by the company and regularly used. The company is based in Europe and is a highly regulated business. It is a customer and service-oriented company.

The company's use of dual sourcing is described as a strategy that was initiated during the COVID-19 pandemic, which has been continued afterwards. The decision to keep dual sourcing after the pandemic has been made in order to stay resilient through other possible disruptions. Originally, the company relied on a single supplier for certain electronic components, but the long-distance supply from Asia during the COVID-19 pandemic has become challenging due to supply problems. These problems include transportation issues and factory shutdowns, which caused the move towards dual sourcing. To mitigate these risks, they set up a secondary supply source in Europe. Reasons for the company to use dual sourcing were to mitigate risk and enhance flexibility as well as to have a nearer source for the electrical components needed.

A semi-structured interview is conducted to gather detailed data. The interview is led by an interview guide consisting of eight questions, from which the first four questions will be about the company's use of dual sourcing, especially regarding why and how they are using this practice. Two questions are about the outcome of dual sourcing, focusing on the advantages and disadvantages of dual sourcing to understand whether structural flexibility is achieved through this case of dual sourcing as a positive or negative outcome. The next question is related to challenges the company is working on right now regarding dual sourcing to understand further the long-term related outcomes of dual sourcing. The last question is a control question to ensure that the company does not want to add information that could be important for this study.

After the data collection, the data will be coded by NVIVO software. The reason is that CAQDAS software is a good way to collect, maintain, and visualize the codes of the data (Miles, Huberman and Saldaña, 2020). The variables for the coding structure are the different system levels to understand how supply chain flexibility is achieved by dual sourcing. The analysis will be variable based, comparing the results of the company with different supply chain flexibility dimensions.

### **3. RESULTS**

The following paragraphs describe the results of the interview.

#### **3.1. The adoption of dual sourcing within the company**

The company uses dual sourcing as a strategic approach to enhance its supply chain flexibility. In this company dual sourcing emerged as a response to the disruptions caused by the COVID-19 pandemic. Previously the company has been relying on a single supplier for electrical components, which became too risky during the COVID-19 pandemic. These electrical components were originally from a single supplier in Asia. Because of transportation problems and supplier shutdowns, the company started to adopt dual sourcing by adding a secondary supplier from Europe, which is closer to the company's manufacturing facility. The transformation from single to dual sourcing has been challenging, as the company works with highly regulated products.

The company describes that in order to source dually, they had to find a second source that meets certain requirements such as having a source with the right expertise, offering the right kind of quality and meeting the company's technical requirements for the products. Furthermore, in order to introduce a new supplier, the company has to undergo certain steps to approve the new components, navigating through the highly regulated nature of their industry. The approval can take up to 12 months. As well new processes had to be introduced such as having a split forecast, a split storage arrangement and changing certain technical arrangements within their products to include the new components. Additionally, the company had to create a buffer stock of the new components in order to keep up with their service arrangements in case these specific components would meet their end of life earlier than expected. As well the company had to establish and maintain new relationships with the new source. Lastly because of having two sources the company had to go down with the volume they sourced from the original supplier. This led to new negotiations with the original supplier, which increased the cost and strained the relationship they had with this supplier. However, the company has been negotiating new terms with the original supplier, which makes it possible to source dually.

The primary reason for adopting dual sourcing was to mitigate the risk of supply chain disruptions during the COVID-19 pandemic. However, a secondary reason has been to source nearer to the company's location to shorten lead times and save transportation costs. This strategy had not only an economic effect but is a more sustainable option. Therefore, after the pandemic, the company continued to work with dual sourcing to keep its sourcing possibilities flexible and to source closer to its markets. This minimizes the lead times. Thereby it should be noted that the driving factor to adopt dual sourcing was not cost but rather the availability of the components with the right quality which meets the company's regulatory standards. Another driving factor has been the supplier's competence.

#### **3.2. Outcomes of dual sourcing at an operational level**

The reduced dependency on a single supplier helps to switch suppliers to prevent production halts and keeps the supply chain running smoothly in times of supply disruptions. This increases the flexibility within the processes to meet customer demand. However, since dual sourcing

requires more buffer stocks, the company has to add storage and has increased inventory costs to become more flexible in its stock arrangements.

### **3.3. Outcomes of dual sourcing at a tactical level**

Having two suppliers allows the company to respond more flexibly to unexpected demand changes. This leads to more flexibility in volume and delivery within certain processes. As new components need to get approved and tested by R&D the company has to be flexible to modify the product in a way that it will be approved. Additionally, the company describes that the European supplier was able to support the company's quality standards, making them more flexible in quality.

### **3.4. Outcomes of dual sourcing at a strategic level**

The company described improved lead times and market responsiveness due to sourcing the products mainly locally. This is particularly beneficial as this company is looking to meet customer demand more quickly or avoid delays caused by long-distance shipping. At the same time, the company remains flexible as they can still source from another supplier in case of disruptions. Thereby, the cost to source from Europe has not been particularly higher than from Asia. By maintaining both global and local suppliers, the company ensures it has a balanced approach to risk management and efficiency, making it possible to scale its operations for new demand opportunities or challenges. However, by sourcing mainly locally the company can keep up with their sustainability goals. The company does for example describe that due to the highly regulated business, new components need to get approved and tested by R&D causing more flexibility in making changes to the product. All in all, the company describes that dual sourcing requires more coordination and effort, including managing multiple contracts, handling engineering changes, and maintaining quality checks across both suppliers. This leads according to the company to more flexibility but causes higher costs and is an administrative burden.

### **3.5. Outcomes of dual sourcing at a network level**

The company described their increasing affords to build and maintain new relationships with multiple suppliers leading to more flexibility. However, these affords are causing costs related additional administrative support in purchasing, R&D, and resources. Furthermore, introducing a second supplier strains the relationships with the original supplier and demands for more flexibility. This is mainly due to the original supplier losing volume, potentially raising prices, or being less cooperative. The company describes that due to their high-mix and low-volume production, it is for some components difficult to set up dual sourcing as splitting the volume would make it too small for suppliers to be interested in supplying. This can lead to the risk of losing business with the original supplier. Additionally purchasing managers have become more flexible in aligning their supply chain by splitting forecasts and planning the different deliveries.



## 4. DISCUSSION

With the results, it became visible that dual sourcing achieves a great amount of flexibility dimensions. Looking at the operational level, dual sourcing allows the company to switch between suppliers as needed to maintain production. In this way, dual sourcing achieves process flexibility, as it helps the company to change the processes more easily by supplying more flexible components (Chen, Calantone and Chung, 1992).

Furthermore, at a tactical level, dual sourcing achieves volume flexibility as the company describes that dual sourcing supports their demand for more or less components. This does in the end support the company in increasing or decreasing the production volume leading to volume flexibility (Martínez Sánchez and Pérez Pérez, 2005). At the same time, the possibility to change the volume helps the company to react faster to a changing delivery demand. This dimension is called delivery flexibility (Martínez Sánchez and Pérez Pérez, 2005). Dual sourcing does as well achieve quality flexibility because the company described that the European supplier is better at supporting the company's quality standards with their expertise (Slack, 1983).

Furthermore, at a strategic level, the company is able to respond faster to the target market which does achieve market flexibility (Martínez Sánchez and Pérez Pérez, 2005). Moreover, the company's use of dual sourcing achieves sourcing flexibility as it helps to find multiple suppliers for specific services or materials (Manders, Caniëls and Ghijsen, 2017). Additionally, by dual sourcing, the company strengthens its ability to adjust its supply chain according to cost fluctuations, disruptions, and market changes. This approach is aligned with the concept of procurement flexibility, as the company can respond to changing purchasing, sourcing, and supply requirements (Manders, Caniëls and Ghijsen, 2017). Dual sourcing enhances the company's ability to scale its operations or shift sourcing strategies as new opportunities or challenges arise. This aligns with expansion flexibility as the company can add long-term capacity (Vokurka and O'Leary-Kelly, 2000).

At the network level, dual sourcing reinforces relationship flexibility as the company described that they have to build and maintain new relationships (Stevenson and Spring, 2007). The company described that the new European supplier is more competent in aligning its services and quality standards with the company. This suits organizational flexibility as it enables the company to realign and redistribute skills in its supply chain (Manders, Caniëls and Ghijsen, 2017).

However, the company noticed as well that dual sourcing does not only achieve supply chain flexibility dimensions but requires a few in order to be practiced. At an operational level, one of them is stock flexibility. The reason is that dual sourcing comes with challenges, such as increased costs and complexity in managing the stock of multiple suppliers. This is reflected in the need for stock flexibility to maintain buffer inventories (Manders, Caniëls and Ghijsen, 2017). At a tactical level, new components need to get approved and tested by R&D. Hence, the company has to be flexible in order to modify the product in a way that it will be approved together with the new component. This means the company needs new design flexibility, as products have to be redesigned in order for the new electrical components to work (Malhotra and Mackelprang, 2012). Furthermore, at the network level, dual sourcing required the company as well to adapt and reconfigure its supply chain to suit changing conditions. This does correspond to reconfiguration flexibility as it describes the ability to reinvent or realign to market changes (Stevenson and Spring, 2007). Also, the company emphasized the fact they

need to manage their relationships more carefully especially as they introduced a new supplier in order not to strain the relationship with the original supplier. Hence the company has to align its supply chain entities with information systems, which corresponds to interorganizational flexibility (Stevenson and Spring, 2007).

Looking into the distribution of achieved supply chain flexibility dimensions on the different levels, it can be seen that especially dimensions on the strategic level are achieved. This shows that especially long-term flexibility dimensions are achieved, leading to structural flexibility (Stevenson and Spring, 2007; Christopher and Holweg, 2011). However, it can be seen as well that operational and tactical level dimensions are achieved, which are short-term flexibilities. Hence, they are contributing to dynamic flexibility (Stevenson and Spring, 2007; Christopher and Holweg, 2011). The contribution to dynamic flexibilities could be caused by the fact that the company practices emergency dual sourcing. Hence, the company is responsive to disruptions on a short-term level.

## **5. CONCLUSION**

In conclusion, one can say that emergency dual sourcing achieves different dimensions of supply chain flexibility across different system levels. These dimensions can be separated into dimensions of structural and dynamic flexibility. Mainly long-term dimensions have been found especially on a strategic level but as well at the network level. These belong to structural flexibility. However, as well dimensions from the operational and tactical level have been found. They belong to dynamic flexibility. The achievement of long-term and short-term dimensions contributes to resilience by leading to a more adaptable and agile supply chain. It can be as well concluded that dual sourcing does not only achieve supply chain flexibility dimensions but claims supply chain flexibility dimensions in order to be practiced. These dimensions have been distributed equally on all supply chain flexibility levels. Hence, practicing dual sourcing claims flexibility changes within the whole supply chain.

Theoretically, this paper contributes with new empirical insights into the practices of dual sourcing. Additionally, the paper contributes to a comprehensive framework of the supply chain flexibility dimensions. Practically, the paper contributes to the understanding of supply chain flexibility dimensions which can be achieved by dual sourcing. This can lead to a more determined practice of dual sourcing by being able to regulate the practice of dual sourcing. As well this paper helps to understand that while dual sourcing achieves supply chain flexibility dimensions, certain dimensions already have to be in place to source dually. Hence managers have to prepare their supply chain for dual sourcing.

Future research could be about how to achieve different flexibility outcomes of dual sourcing. As well future research could be about building resilience from dual sourcing. Additionally, it would also be interesting to investigate different types of dual sourcing strategies and compare them in terms of achieving supply chain flexibility. Finally, quantitative studies could be made to understand the effects of different dual sourcing strategies on supply chain flexibility. This could help to measure dual sourcing's exact impact on supply chain flexibility.

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