# Effect of supply chain resilience on competitive advantage and firm performance under environmental uncertainty in the dairy industry of Iran

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**Abstract**.

The This study aims to investigate how supply chain resilience affects frim performance and competitive advantage in the face of environmental uncertainty in Iran's dairy industry. The present research is practical in terms of purpose and causal in terms of method. The method of data collection was a survey and using a questionnaire tool, whose validity and reliability were confirmed. According to Cochran's formula, where the statistical population is about 200 people, our sample is 127 people. Reliability and reliability tests such as construct validity and content validity as well as Cronbach's alpha coefficient were also used. Causal tests and structural equation models have also been used to analyze the research data. The findings demonstrate that resilient supply networks enhance both organizational performance and competitive advantage. Likewise, the association between a robust supply chain and competitive advantage as well as the relationship between a resilient supply network and organizational performance are both positively impacted by environmental uncertainty. The study adds to the body of knowledge regarding the dairy industry's competitive advantage, supply chain resilience, and firm performance.

**Key words**: Supply chain resilience, competitive advantage, firm performance, environmental uncertainty

# Table of contents

LIST OF FIGURES

**LIST OF TABLES**

# 1 INTRODUCTION

## 1.1 Background of the research

Resilience has many definitions according to recent studies but can be generally described as a system's capacity to keep functioning the same by foreseeing, adapting to, and recovering from unpredicted changes. The overt signs that include alterations to ecological systems are the main topic of this investigation. like floods, earthquakes, and socioeconomic variations. All industry as well as dairy sector, regardless of size, will undoubtedly experience a variety of interruptions and natural catastrophes, as well as financial and ecological risks. These unpredictable changes may damage a company's performance and its supply chain. Thus we should consider uncertainty as a prominent actor which effect on the competitive advantages and firm performance. (Pettit et al. 2019, 59)

Currently just a few simple, common-sense methods for building and measuring supply chain resilience and despite studies about resilience, no consent on either its explanation or how it affects other market variables. So in this case we are aiming to analyse the different aspect supply chain resilience on market and define some practical measure for resilience. There is a paucity of study on how businesses might develop resilience, notably in their particular circumstances, as resilience has primarily been studied in the setting of big businesses. (Chen et al. 2021, 9-10). When a crisis strikes, a firm may benefit from building a resilient supply chain since it not only lowers risks but also gives it a competitive edge in such a volatile market. company's performance and competitive edge can have affected by supply chain resilience variously, due to environmental risks. it is critical to consider these uncertainties and their mediating effects. (Hosseini et al. 2019, 292)

Frim performance is referring to the ability of the firm in the using the assets and resource to reaching its goals. Firm performance is achieved when we can reach our goals in financial, human resources, production, and marketing sections. Maintaining a company's performance through troubled times becomes

impossible when the supply chain is weak, as well as in the face of doubts and difficulties, keeping efficiency against competitors remains essential. Businesses who are able to respond to situations with higher flexibility and adjust more rapidly may be able to gain a competitive edge over their rivals during times of crises and interruptions. Thus it is important for any companies to find a suitable way which allow them to have acceptable performance during uncertainty and unexpected situation because inability in managing situation can lead to elimination from the market and bankruptcy of the companies. (Sabherwal et al. 2019, 459).

A business's entire performance is directly associated with how well it accomplishes its fiscal, human resources, manufacturing, and sales targets. A firm's capacity to forge a defendable position in regard to its competitors determines its competitive advantage. Competitive advantage could be developing by lowering costs, producing higher quality products, enhancing reliability, minimizing time-to-market, capturing order/shipment information, and increasing customer service. In order to maximize company performance and gain a competitive edge, assets management to create supply chain resilience is essential. (Mubarik et al. 2021, 718)

Uncertainty is one of the important features in the environments around a business and it can refer to a situation which we do not have enough information about the factors in the environments around the firm which have effects on our decision-making process. Any industry may encounter different risks including market fluctuations, environmental and economic risks. Environmental uncertainties refer to the level of unpredictability which can effect on the firm performance and include disruptions in society, technology, economy, politics, and nature such as fire striking a plant, a hurricane shutting down production, and severe climate change impacting food production. Even great companies like Apple and Amazon have suffered from these risks. Goods having a short shelf life are especially vulnerable under these situations, like dairy products as they face additional challenges in transportation, distribution, and storage. Thus it is vital to have an effective supply chain that can preserve strong performance after a disturbance and revert back to its regular operations. Environmental uncertainties are different in

each country and industry, so perceptions of that for any firm is specific. (Chen et al. 2022, 6-8)

Hitt et al., (1982, 267)believe that *"environmental uncertainty can play important role in choosing and implementing a suitable strategy for the company supply chain and that factor is considering as moderate in the relationship between supply chain management and competitive advantage"*. Due to the current environmental uncertainties and problems, Recently, a number of academics have grown curious in the layout of supply chains. (Fazli-Khalaf et al. 2017, 2122; Yavari & Zaker, 2019, 201). Despite repeated warnings about the necessity of shifting to environmentally environmentally friendly agriculture and creating more robust supply networks, implementing these changes has been challenging. More study is necessary to fully appreciate the challenges, relationships, and motivations that contribute to the development of ecologically sustainable and resilient supply chains in order to address this issue. (Kangogo et al. 2020, 5; Sultan & Gaetani 2016, 8)

While academics like Hosseini et al. (2019, 290) and Spieske and Birkel (2021, 10) have established and used the concept of supply chain resilience, its application in the dairy industry and its effect on competitive advantage in this particular sector have not yet been studied. Many researchers such as Khanna & Mishra (2014), Preston & Leng, (1987) and Latigo et al. (2019) have done studies about the dairy industry in developing countries and the effect of dairy industry on the economy. Khanna & Mishra (2014), focuses on India while examining the potential and difficulties the dairy business faces in developing nations. It emphasizes how crucial effective and sustainable production methods are to the expansion and development of the sector (Khanna & Mishra 2014, 3). Preston & Leng, (1987), explains the economics of producing dairy in impoverished nations, focusing on the function of modest and family-run farms. Additionally, it looks at how these nations may increase the productivity and sustainability of their dairy industries (Preston & Leng, 1987, 2). Latigo et al. (2019), gives a general overview of the worldwide dairy business, outlining its economic importance and current issues. The industry's ability to aid in sustainable development is also covered (Latigo et al. 2019, 67). In Iran's economy and dairy industry one of the main problems is

environmental uncertainty. In fact, the occurrence of global catastrophes like Covid-19 and the special conditions of embargo have caused the dairy industry to undergo changes in various branches such as production, distribution and consumption (Chan et al. 2022, 2). The performance of the frim is impacted by this problem. and on the other hand, on the company's competitive advantages. In fact, in an unstable and uncertain situation, the performance of the company is affected (Spieske & Birkel 2021, 10-11).

Abeysekara et al (2019, 1680) investigate how the garment industry's supply chain resilience affected competitive advantage and company performance and advocated conducting comparable study in other sectors. A further issue specific to the dairy sector is that in its quest to establish a resilient supply chain, it must also decrease costs and increase the efficiency of natural resources. Due to the low remunerability of sheep production, young farmers and large investments are not attracted to this industry. It is crucial to increase the profitability of this sector to make it more attractive to this group of farmers and investors. (Emissions and Ruminants 2020, 4)

Dairy industry is among the industry which involve complex supply chain from a farm to the ultimate costumers, during that process there are many environmental uncertainty factors can effect that supply chain and acquire competitive advantages, with considering the short life-span of dairy products, through a suitable and resilience supply chain can help the company to have better firm performance and increase the efficiency compare with competitors in market. (Ali et al. 2021, 96-97). Thus as a choice I am going to fill that gap about the resilience and its influence on competitive advantages and firm performance on the smaller firms because those features seems to be vital for the firms which are not large to be resilient against sudden changes and environmental uncertainty and equip them to capabilities to have proper performance the market and be survive in the difficult conditions. By concentrating on the dairy industry, current study aims to fill research gaps on supply chain resilience. By the use of surveys and actual data gathered from the Iranian dairy industry, I have built a thorough notion of supply chain resilience that is specific to the dairy business. The primary question of this research is how supply chain resilience affects frim performance and competitive

advantage, and how environmental uncertainty creates a mediating role between these components. (Chan et al. 2022, 3)

 In fact, Iran has been damaged due to the occurrence of two crises, i.e., Covid-19, and also the state of embargo in the field of dairy industry, then the question is, what role can resilience of the supply chain play in saving this industry. Healthy nutrition is essential for the growth, development and health of childhood, adolescence and old age and is one of the most effective and cheapest ways to reduce the burden of many diseases and factors. Adolescent nutrition is particularly important not only because of the extent of physical and behavioural changes during this period, but also because of the determining role of nutrition at this age in the type of diseases of adulthood and mortality indicators. (Khan et al. 2022, 5-7)

The importance of dairy consumption as well as the investments made in this area have made Iran able to continuously produce domestically and export to neighbouring countries, which has turned the dairy industry into one of the main industrial areas in Iran. Nevertheless, the formation of the Covid-19 crisis and also the issue of sanctions have made the resilience of the supply chain more important than ever. The main reason for addressing this issue in Iran's dairy industry is the same issue

## 1.2   Research questions

Companies with strong perception capacity may need more active investigation and interpretation to learn more and comprehend the business environment more fully. In this way, these companies can gain competitive advantage by responding faster to primary competitors, better understanding customer needs and more creativity in the development of new and final products. Therefore, understanding this dynamic environment and having a suitable competitive strategy will create a competitive advantage and the businesses achievement in the future. (Wieland & Durach 2021, 318)

Not having a strategy will put the company in a weak competitive position and eventually fail. The correct use of the competitive strategy and direction of the company will help its success in the long term. In a competitive market, the way the organization is oriented is very important for its survival and competitiveness in an uncertain business environment. Therefore, it is necessary for companies and their managers to have a correct understanding of the market environment and marketing orientation in companies, especially in the dairy industry where there is a high level of competition. (Chen et al.2021, 6; Chen, 2019, 1512)

Main and sub research questions:

How supply chain resilience effects on competitive advantage and firm performance under environmental uncertainty in the dairy industry?

How supply chain resilience effects on competitive advantage?

How supply chain resilience effects on firm performance?

How supply chain resilience effects on competitive advantage under environmental uncertainty?

How supply chain resilience effects on firm performance under environmental uncertainty? (Figure 1)
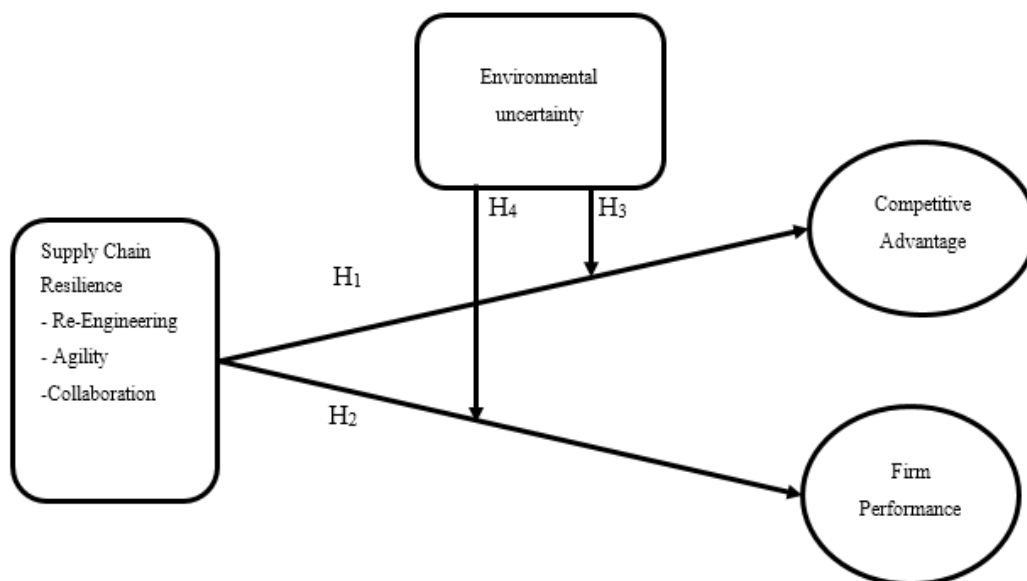


**Figure 1.** The research conceptual model

In the figure 1, conceptual model of the current research proposed. In that figure the supply chain resilience and its elements relations to competitive advantage and firm performance plus the effect of environmental uncertainty on those relations are depicted.

## 1.3   Structure of the study

Therefore, the in this study I try to help managers in the dairy industry specify strategy for continuing to be productive, resilient, and competitive in a volatile environment and situation. (Federico et al. 2020, 542). To accomplish this, I am going to design a methodology for analyzing the supply chain resilience in an Iranian dairy company and investigate the supply chain resilience implement and influence on firm performance and competitive advantage.

According to my goals in the present research, I decide to consider the supply chain resilience of an Iranian dairy company which has an assortment of dairy products and it is among the famous dairy company in Iran, also it export and has a strong market for its products in the countries around Iran. I choose that dairy industry as my case study because in the recent years Iran has face serious climate change and water shortage issues which affects the agriculture and livestock industry, as result this trend may have effect on the raw materials which dairy companies need. On the other hand, unstable economic situation in Iran which has huge effect on the company performance and productions, make that company attractive target for analyzing. addition, this research will enrich the resilience literature with providing a new context for analyzing resilience of supply chain of dairy industry under environmental uncertainty and its effect on the company competitive advantages and firm performance.  In the next chapter of this research; I am going to explore and identify; indicator of SCR in competitive advantage, characteristics of frim performance under environmental uncertainty, barriers of SCR under environmental uncertainty and environmental uncertainty's moderating impact on firm performance. Thus I am trying to analyses the effect of supply chain resilience

on competitive advantages and firm performance under the environment uncertainty in the dairy industry.

# 2   THEORETICAL FRAMEWORK

## 2.1   Environmental uncertainty

Although there is uncertainty in human daily life, the answer to the seemingly simple question *"What is uncertainty?"* seems difficult. Duncan (1972) defines uncertainty *"as the lack of sufficient information about environmental variables to make decisions about specific issues"* (Duncan, 1972, 318).  In one of the common definition, uncertainty can be considered the lack of certainty. In another definition, it is a certain activity that has a 100% probability of its occurrence, and it is impossible if the probability of its occurrence is 0%. (Kalyar et al. 2019, 374)

Uncertainty affects people's decisions and behavior in different ways. Though uncertainty at the firm level primarily affects employees working for the company, its consequences can have a harmful effect on all those making decisions in the capital market, and for this reason, attracts shareholders, management, scholars, and decision - makers' interest. The research conducted in this regard addresses the issue of Managers and investors can both be impacted by uncertainties in various ways. First off, uncertainty can influence how investors react to earnings data. Second, it may have an impact on managers' choices about financial statements and investing in businesses. (Williams 2014, 789; Kim and Kung 2017, 256)

Uncertainty is the possibility of anything unlucky event will come up later on, sometimes it is an event that can be dangerous or have unfortunate results (Haarhaus et al. 2020, 128). Similar to this thinking in decision-making and decision theories, *"uncertainty is a condition of the environment in which the decision-maker sees the assignment of any possibility to the possible consequences of an impossible event."* Likewise, risk is an environmental feature that allows a decision-maker to attribute a specific frequency to the outcomes of an occurrence. (Kalyar et al. 2019, 375). According to another researcher, *"uncertainty is a situation in which each of the actors finds it impossible to assign a clear and logical*

*possibility for the expected outcome of their decision".* (Zimmermann et al., 2020, 378-380)

Since most project variables are inherently random and dynamic and show different degrees of uncertainty over time, it is natural that the objective function of the project also has a random nature and is subject to uncertainty from various sources. In this definition, the uncertainty of the project can be called the Percentage chance that the project's functional form won't achieve the set targets. (Belderbos et al., 2019, 133)

In this discussion, we make a distinction between vulnerability and uncertainty, which are frequently confused in the literature. I define vulnerability as the unknown, and uncertainty as the impossibility of making a decision; in other words, when there are multiple viable options and no one option is unquestionably the best. The three types of vulnerability are state vulnerability, impact vulnerability, and response vulnerability. State vulnerability is the recognition of the unpredictability of the environment; the lack of capacity for anticipating consequences the types of effects that environmental changes will have in the future; and response vulnerability is the inability to know what steps to take or what the results of those steps will be. This definition of vulnerability is important to consider in the context of our master thesis, as it helps to clarify the types of risks and challenges faced by supply chains in uncertain and rapidly changing environments. (Adhikara et al., 2022, 369-370; Mumford & Zettinig, 2022)

Decision makers may lack the expertise to know how to respond to a circumstance or they may be unable to decide their preferred outcome owing to objective uncertainty, which leads to uncertainty. This sense of uncertainty is further exacerbated by isotropy, or the fact that it is not always evident which bits of information are worth paying attention to and which are not when making decisions with unclear future outcomes. (Chen & Tian, 2022, 188)

Decision-making environments can be divided into three main categories in terms of conditions and access to information: the environment under certainty, the

environment under risk and the environment under uncertainty. Ghosh and Olsen (2009, 710) define environmental uncertainty as diverse changes that result from environmental activities related to company operations and environmental uncertainty actually has a changeable and unpredictable nature. Milliken (1987, 137) states that *"environmental uncertainty represents factors including: first, the inability to predict the probability of future events"* (Duncan, 1972, 314; Pennings, 1981, 361; Pfeffer & Salancik, 1978); Second, there is insufficient data to forecast cause-and-effect connections (Duncan, 1972, 314; Lawrence & Lorch, 1967); third, inability to foresee outcomes in the future (Downey and Slocum, 1975, 564; Duncan, 1972, 314; Hickson et al. 1971, 220; Schmidt and Cummings, 1976, 564). A key notion in organizations and leadership theory is environmental uncertainty. (Dill, 1958, 423; Duncan, 1972, 316; Ghosh and Olsen, 2009,711; Lawrence and Lorsch, 1967, 1967). Thompson (1967) argues that *"environmental uncertainty is a fundamental problem facing top executives"*, due to the shifts to the outside environment and managers must deal with these changes to achieve their goals. Snyder and Glueck (1982, 18) show that companies' reaction to environmental uncertainty strongly impacts on their performance. Also, Ghosh and Olsen (2009, 712) state that although the external environment creates many restrictions in the company, managers still have the opportunity to react strategically in the conditions of uncertainty. Another way to say it is, when faced with environmental uncertainty, managers can make the most and best productivity and profitability for their shareholders by making strategic decisions. Previous studies examine how managers deal with environmental uncertainty. Iskandar (1991, 109) shows that managers react to environmental uncertainty with strategic and decentralized decisions. This means that high-level managers, when facing a more unstable external environment, hand over more responsibility to low-level managers and so-called leave their hands free to make timely decisions. Cheng and Kesner (1997, 937) show that companies allocate more resources to activities that are more effective in the foreign market under conditions of environmental uncertainty.

One of the most crucial elements in the strategy for any businesses is the natural environment (López-Gamero et al., 2011, 427). Many researchers (Fuentes-Fuentes et al., 2004, 431; Lewis and Stewart, 2003, 39) analysed and investigated various features of environmental management. Those features and aspects

involve environmental technology (Jabnoun et al., 2003, 19), investors' expectations (White and Lee, 2007, 189), the particular traits of a section (Griffin and Mahon, 1997, 11) and regulation (Könnölä & Unruh, 2007, 528). Sharma et al. (2007, 271) believed that the environmental aspect which can include all above features is environmental uncertainty. When directors realized their company environment or any of its aspects to be unanticipated, environmental uncertainty occurs (Milliken, 1987, 135). A particular institutional elements in adjusting organizational circumstances to the environment is the environmental uncertainty factor (Dwirandra & Astika, 2020, 1216). Environmental uncertainty, refers to uncontrollable and incredibly different events that happen in a certain setting or industry in the business setting. (Ko and Tan, 2012, 108).

*"Environmental uncertainty may occur in three forms: technological, competitive and market"* (Jaworski and Kohli, 2017, 56). *"Technological uncertainty is the degree of change in technology or technical innovations relative to the products being developed and produced by the company"* (Thomas, 2014, 118). Uncertainty in the market is characterized as the level of purchaser uncertainty, the evolution of purchaser demand and preferences, in addition to the evolution of rivals. (Droge et al., 2008,48), and the intensity of competition means the degree of competition that a company faces in an industry (Chai et al., 2012, 458). Uncertainty can affect the time or even cost performance of product development, and under these conditions, spending resources on market-oriented activities will be valuable (Jaworski and Kohli, 2017, 8).

Environmental uncertainty is a complicated idea that can be interpreted in a variety of ways. Environmental uncertainty, in Duncan's view (1972, 319), occurs when a corporation lacks sufficient knowledge of the activities taking place in its external environment or is unable to foresee the effects of external changes on its decision-making processes. It can be challenging for firms to properly plan and adapt to changes when there is a lack of information or predictability in the business environment. Furthermore, according to Milliken (1987, 135), environmental uncertainty is a result of decision-makers' incapacity to forecast the future precisely, which might cause them to become confused and hesitant while making crucial business decisions. Together, these definitions imply that environmental uncertainty is a complex concept with far-reaching effects on

businesses, affecting their capacity for adaptation and competitiveness in a dynamic business environment.

There are three different categories of environmental uncertainty. The first is define as ambiguity concerning the status of the environment is one sort of uncertainty that organizational managers may encounter. When administrators believe that a certain aspect of the organizational environment, or the entire environment, is unpredictability, they feel "state" uncertainty. An individual's capacity to foresee the effects of environmental disruptions on the organization is related to a second, quite different sort of environmental uncertainty. (Milliken, 1987, 136-137; Duncan, 1972, 318)

*"The second type of environmental uncertainty is the inability to accurately foresee how environmental changes will affect an organization."* (Milliken, 1987, 138). Impact uncertainty can have a large impact on enterprise selections and performance and can originate from a variety of sources, including as natural disasters, economic downturns, or political instability (Rindova & Kotha, 200, 1268). Effect uncertainty is more common in dynamic and turbulent situations, where the pace of change is high and environmental circumstances are constantly changing, according to studies by Milliken and Hennart (1990). Effect ambiguity can be a major problem for managers because it might be difficult to create effective strategies and allocate resources. Organizations can use tactics like scenario planning, which involves establishing various scenarios of prospective environmental changes and their impacts on the firm, to lessen the impact of effect uncertainty. This strategy enables firms to create backup plans for various contingencies and get ready for a variety of potential environmental change effects. (Milliken& Hennart,1990, 1253).

Response uncertainty, or a lack of knowledge or comprehension about possible response options or the anticipated results of response choices, is the third kind of environmental uncertainty (Duncan, 1972, 320; Taylor, 1984, 85). To put it another way, response uncertainty refers to the ambiguity around the efficacy of various response techniques in dealing with environmental difficulties. For businesses operating in complicated and dynamic situations, this kind of uncertainty may be

particularly difficult (Nadkarni & Herrmann, 2010, 1068). After reviewing the definitions and details regarding environmental uncertainty, the present study has chosen to adopt the definition proposed by Ghosh and Olsen (2009, 710). According to their definition, environmental uncertainty is characterized by a variety of changes that stem from environmental activities related to company operations. This definition aligns well with the prevailing circumstances in the dairy industry of Iran.

## 2.2 Supply chain resilience

Many events throughout the world (Such as the volcanic eruption in Iceland, Covid-19 pandemic and sudden wars and conflicts between countries) would make the enterprises are conscious of the limited influence they exercise over the hazards they face, but some are capable of going back to their old methods today and normal state after severe disturbances and fluctuations or even better than before. The idea of supply chain robustness expresses a multidimensional phenomenon. A comprehensive definition of resilience is: "Identifying potential resources, reducing vulnerability by facilitating collaboration among supply chain participants and executing effective approaches. (Spieske et al., 2019, 13-14)

The smallest disruption in the process of a supply chain can be likened to a fault. A fault whose gap and depth can increase moment by moment. The concept of resilience in general is the ability to overcome critical and unpredictable conditions, which depending on the conditions and frameworks of a business, can also find a specific definition and explanation (Wieland et al., 2021, 320). In the event of a warning, an organization has the ability to anticipate what is likely to occur and mitigate any negative consequences. However, if it is not possible to avert the disruption in a timely manner, and the initial response proves inadequate (particularly in instances of unanticipated events or insufficient planning), the impact of the disaster will likely be more severe and protracted. In such situations, the organization must focus on recovery efforts. Following a period of recovery, the organization's performance may increase but is often unable to reach its previous level. (Ali et al., 2021, 2-3)

*"A resilient supply chain may not be the least expensive supply chain, but it is able to overcome uncertainties and disruptions in the business environment"* (Chan et al., 2022, 24). A business may boost its supply chain resilience, which not only lowers risks but also has advantages during disasters, to obtain a competitive edge in the ever evolving market (Sheffi, 2005). A supply chain's competitive edge is not exclusively dependent on elements like cost control, good quality, little delays, and superior service. Instead, it resides in the supply chain's resilience or potential negotiate unforeseen occurrences and get through difficult situations. A supply chain's resilience is its capacity to deal with unforeseen circumstances. To stop the supply chain from veering toward unfavourable conditions, resilience must be established. (Hosseini et al., 2019, 289)

Rutner and Tomlin (2017), stated that a resilient supply chain can not only recover from disturbances rapidly but can also adapt to shifting circumstances and foresee issues in the future. Four important elements make up the framework that is suggested in the paper: anticipation, response, recovery, and adaptability. Each premise is further broken down into a number of strategies that assist businesses in creating and keeping up a resilient supply chain. With regard to the first principle, anticipation, the emphasis is on spotting potential hiccups and hazards and taking proactive steps to reduce them. Early warning systems, scenario planning, and risk assessment are examples of methods that fall under this notion. The second concept, response, is all about what an organization does right away after a disruption happens. Planning for emergency responses, resource mobilization, and communication and coordination are all examples of practices that fall under this notion. The third concept, recovery, emphasizes getting back to business as usual following a disturbance. This principle's applications include supply chain redesign, post-event analysis, and business continuity planning. The fourth and final principle, adaptation, emphasizes the need of taking advice from the previous and becoming prepared for tomorrow. The methods that fall under this tenet are collaboration, innovation, and constant improvement. They also talk about how technology might improve supply chain robustness. The authors contend that technology can enable data-driven decision-making, offer real-time visibility into

supply chain operations, and automate some procedures. (Rutner and Tomlin, 2017, 8-9-10)

Sheikhalishahi et al. (2016), argued the elements that affect supply chain resilience are identified and divided into three groups: internal factors, external factors, and contextual factors. Internal variables, such as organizational culture and risk management procedures, are those that exist within an organization and help it to be resilient. External variables include things like natural disasters and geopolitical events that are out of an organization's control. Contextual factors are the particular market or industry circumstances that could affect the robustness of the supply chain. After that, the authors provide a framework for assessing and enhancing supply chain robustness. The framework consists of four key steps: identifying risks and vulnerabilities, developing strategies for risk mitigation, putting those strategies into practice, and assessing the efficacy of the methods that have been put into practice. (Sheikhalishahi et al. 2016, 2110-2111).

Chen et al. (2018), stated that the complicated and uncertain business climate in recent years has made the idea of supply chain resilience more crucial. Supply chain resilience is described as *"the ability of a supply chain to maintain or quickly recover its functional and pecuniary efficiency in the face of disruptions caused by internal or external factors, while managing related risks"* in their proposed new definition, which also incorporates the concepts of risk management and business continuity. The article goes on to list the elements that affect supply chain resilience. They consist of the network's design, the processes' adaptability, the use of information technology, and the fostering of connections between suppliers and clients. In order to promote information sharing and foster strong connections with suppliers and consumers, the authors contend that collaboration is a key element in improving supply chain resilience. (Chen et al., 2018, 1278-1279)

Holweg et al. (2019), start out by outlining dynamic capabilities and the connection between them and supply chain resilience. The foundation for creating dynamic capabilities in the setting of supply chains is then presented. The three main phases of the framework are sensing, seizing, and transformation. Sensing entails locating environmental changes that could have an impact on the supply chain, capturing entails grasping opportunities created by these changes, and transforming entails

modifying an organization's capabilities to accommodate the new environment. The function of cooperation in creating dynamic capabilities is also covered in the study. The authors contend that cooperation among supply chain partners can assist firms in acquiring the skills required to improve supply chain resilience. They emphasize the need for leaders to promote an innovation and learning culture within their firms as they talk about the significance of leadership in the development of dynamic skills. Ultimately, they emphasize the value of dynamic skills in establishing supply chain adaptability in this research and offer a frame for their development. It focuses on the necessity for businesses to interact with supply chain partners in order to increase their resilience as well as to be proactive in anticipating and responding to environmental changes. (Holweg et al.,2019, 58-59).

Here I can mention about five effective factors in supply chain resilience. According to Jafarnejad et al (2019, 1356) supply chain resilience has five effective factors. First we can refer to speed and agility, unexpected events, such those that stray from usual planning, might happen suddenly and negatively affect things. As a result, it is crucial that the supply chain management phases of detection, response, and recovery be carried out quickly and effectively. Therefore, speed is a key indicator in estimating resilience and recovery after a crisis (Pettit et al., 2019, 61). Agility and speed increase the potency to answer faster to immediate changes. So a system with a reasonable speed in performing processes can be a resilient system (Mubarik et al., 2021, 724). Second one is flexibility, it is not necessary to do everything in a systematic platform, and the answer to a challenge must require bureaucratic processes. It is very desirable that all events proceed in a regular sequence, but it is not always possible. When we act flexible, we have better react to the changes (Modgil et al., 2021, 382). Flexibility and optimizations according to needs and conditions are another step towards making a supply chain more resilient (Min, 2019, 39). Third is the structure and knowledge, as we know, the logistics industry is one of the old industries and has a history full of ups and downs. The network and supply chains have reached here from the most traditional methods. Some countries and organizations, depending on their conditions, may still use methods and equipment that no longer have the desired efficiency (Jafarnejad et al., 2019, 1357). This issue can become a bigger crisis in special and

critical situations. So knowing the physical structure according to the needs of the day will be an important thing in resilience (Modgil et al., 2021, 382). Forth refer to integration and operational transparency, from the raw materials supply to the product leaving the factory and possibly reaching the consumer, firms needs a specific process. In addition to consolidating and preventing the occurrence of unforeseen events, coordination and integration can be a solution in the day of crisis and resolve issues more easily. (Ozdemir et al, 2022, 552). Fifth and the last one is cooperation and firm support, the coordination and integration mentioned in the previous paragraph calls for interaction and synergy of the human resources of the organization. All supply chain participants must coordinate efforts to address any disruptions because this resilient supply chain is a coherent network. (Wong et al., 2020, 193).

With respect to all above mentioned definition, resilience in this study means a condition in which an organization goes through difficulty and press but stays alive and tolerates the hardship (Chen et al., 2021, 25) and I use Abeysekara et al., (2019) and Kumar and Anbanandam, (2020) to define the supply chain resilience elements of resilience namely: re-engineering, collaboration, and agility. Re-engineering is adjusting and designing the supply chain again, collaboration is about sharing information, synergies, and joint planning between supply chain partners, while supply chain agility is referred to quickly respond to unpredicted events (Abeysekara et al., 2019, 1682; Kumar and Anbanandam, 2020, 253). The simplicity of this description and how well it fits with the goal of the current study are the reasons it was chosen. This study specifically examines the dairy industry's resiliency in Iran during a time of economic sanctions, which presents substantial difficulties. This definition therefore works well for the goals of this inquiry.

## 2.3   Firm performance

Firm performance is an overarching term that is nevertheless loosely defined. The experts' agreement on what really constitutes "firm performance" is questioned because of the absence of an uniform definition, despite the fact that this framework relies on a variety of particular characteristics specific to each company (Mikalef

and Gupta, 2021, 108). There have been numerous possible explanations of the term firm performance in studies that have used this construct. It seems to evaluate economic performance in financial and market results, profit, sales, shareholder return on investment and other financial measures (Dvouletý et al., 2021, 251). The effectiveness and efficiency of the internal systems and procedures that make up a company's operations are referred to as operational performance. It contains metrics for customer satisfaction and loyalty, employee engagement and satisfaction, and the overall health of the company's social capital, in addition to productivity, quality, cycle time, and cost control. Improvements in operational effectiveness and efficiency can have an immediate impact on the bottom line and overall profitability of the business, which demonstrates the close relationship between operational performance and firm performance. (Dangayach and Deshmukh, 2017, 6668)

Firm performance measures many tiers of structure and can be evaluated for individuals, categories, and the entire businesses. An organized review of literature of 213 studies published in peer-reviewed journals in just one three-year course (2006-09) identified that 207 different measures were used to assess performance (Zhang et al., 2019, 432). Finally, researchers of the multidimensional structure of firm performance consisting of three basic aspects; They proved financial performance, product market performance and shareholder returns (Maroufkhani et al., 2019, 231). Experts should assess and monitor company performance for a variety of causes, including; defending the appropriate use of investors' funds, a manual for managerial choice-making with reference to troublesome points, evaluate various projects, individuals, and functions while exercising control. Thus, the concept of company performance is variable depending on the use to which it is put. There are different ways to measure firm performance. Here's a look at the most prominent and effective ones: One of the clearest definitions is firm performance, which describes the company in terms of aims and process development. (Kong et al., 2020, 445-446)

In this definition, a company may evaluate its performance as effective if it can meet its set goals and improve them. The weakness of this approach is that it cannot respond to the business's internal and external settings (Ferraris et al., 2019, 1928).

Modern organizations are no longer required to fulfil the demands of their investors and employees, despite the wide range of stakeholders (Bayraktaroglu et al., 2019, 410). This evolution has created one of the most comprehensive definitions of firm performance that integrates the structures of efficiency, effectiveness and relevance. Therefore, if the desired goals are achieved to meet the demands of the stakeholders, successful firm performance is achieved (Danoshana et al., 2019, 554). We measure firm performance so we can improve it. Regardless of the objective of measuring firm performance or defining accepted terms, practitioners are always looking for ways to establish a baseline of past performance. Considering the different levels of performance evaluation, a number of useful interventions are evaluated. (Brahma et al., 2021, 5706)

There are a number of steps that must be followed in order to monitor and assess each component of the organization's performance thoroughly. In reality, there is a deliberate push to adopt a broader definition of company performance, one that acknowledges and solves the sustainability of work procedures and results. The incorporation of an assessment process of business strategy into corporate performance monitoring is another crucial element. The efficiency of accomplishing these goals is increased when firms analyze their strategic planning utilizing internal and external assessment with a chain structure of objectives, methods, and projects. (De Loecker and Goldberg, 2014, 205)

Richard et al. (2009) argued that professionals need to create a strong rationale in understanding performance goals and in choosing the criteria used to measure it. Managers should consider the level of variety in the environment, assets, decisions, and timescale for all stakeholders when determining the meaning of achievement. There is a belief that the performance becomes meaningful only in a decision-making space. It means that the internal and external decision makers of the frim must agree on the performance. (Yao et al., 2021)

Performance is often defined by efficiency and effectiveness. For example, Neely stated in 1995 that since effectiveness indicates the degree of achievement of goals and efficiency refers to how resources are economically used to achieve goals, these might be viewed as two crucial performance aspects. That is, for

particular performance components, both internal reasons (efficiency) and uncontrollable factors (effectiveness) may exist. Therefore, the effectiveness and efficiency of the operations affect performance. (Dangayach and Deshmukh, 2017, 6669)

A review of dictionaries shows the variety of meanings of the word performance. It seems logical to first provide a list of all these implicit meanings, and from their collection, a usable definition for the function can be provided

- Performance can be measured by a number or a term.
- A performance is an act that is done with a definite purpose. (for example, making value).
- The outcome of an activity is performance (quantifiable benefit is produced).
- Performance refers to the capacity to produce or arrive at an outcome (For instance, it appears that the organization's capacity to offer in the future depends on how satisfied customers are).
- Performance is the comparison of the results with several selected or imposed internal or external models or references.
- Performance is the results of comparison with expectations.
- Performance in psychology is what is revealed.
- Performance in performing arts is a performance that includes role playing or actions and the results of actions.
- Performance is a judgment by competitors (the problem here is to define who is the judge and to know under what conditions the judgment is made). (Charoensukmongkol, 2021, 3-4-5; Ma, 2000, 39-40). The term performance evaluation has many definitions. Any phenomenon or subject must first be defined in order to achieve a shared perception and understanding in order to be effectively understood. It should be mentioned that The notion of assessment should be specified in the aspect of personnel, followed by the aspect of using assets and infrastructure, and ultimately in a definite format because of the corresponding similarity. (Ibhagui et al., 2022)

Performance indicators are used to indicate performance evaluation in terms of how resources and facilities should be used. The performance assessment method truly analyses the effectiveness of management decisions on the optimal utilization of

assets and facilities, if efficiency is defined as the proportion of data to output. The success of activities is typically identical with performance review in the firm dimension. The meaning of effectiveness is the level of achievement of goals and plans, with the characteristic of being efficient in activities and operations. (Bigliardi et al., 2020)

According to mentioned explanation, firm performance in the supply chain context recommended several different evaluating scales. Most studies concentrated on financial and economic implementation, such as sale rate, profit, etc. However, other researchers asserted that using just financial performance is too limited to be a basis for classification and they mentioned that it is not reasonable to evaluate a firm's actual performance this way. (Chen, 2019, 1520; Jun and Rowley, 2014, 490) According to mentioned explanation, firm performance in this study will be evaluated according to four factors which are company profit, employee learning, customer satisfaction and the accuracy of internal processes (Acuña-Carvajal et al., 2019, 356). The reason for choosing this approach to firm performance is, its inclusivity and comprehensiveness.

## 2.4    Competitive advantage

A group of elements or skills that enable businesses to continuously outperform rivals is known as a competitive advantage. Note that the purpose of competitive advantage is to perform better than rivals, not just to be equal to the performance of other businesses; Firms with a competitive advantage must be high performers, and while such firms do not necessarily have to be the highest performers in their industry, they must consistently remain among high performers and significantly outperform the industry average. (Dagnino et al., 2021, 92)

Any topic needs to first be defined and explained in order to be understood effectively. Obviously, the more comprehensive and effective the definition is, the topic will be better understood as a result. In this context, the following definitions of competitive advantage offered by experts are provided:

*"Competitive advantage is the increase in the attractiveness of the company's offers compared to competitors from the point of view of customers."* Competitive edge is a differentiation in a company's traits or attributes that helps it to provide clients better services than rivals. A company's ability to provide customers with values that are greater than their expenses gives it a competitive advantage. (Azeem et al., 2021, 104-105)

A group of elements or skills that always allow the business to outperform its rivals make up competitive advantage. Competitive edge is a characteristic, or set of variables, that makes a company significantly more profitable than other companies in a market where there is fierce competition. A corporation must therefore consider both its internal capabilities and external situation in order to gain a competitive advantage. In addition, another important goal of competitive advantage is that companies have sustained levels of high performance. In other words, a business must not only have one or two or three good quarters or even several years, but must also have a sustainable competitive advantage in order to consistently outperform its competitors over a long period of time. Many companies have demonstrated the ability to have a good year or two, but very few have demonstrated the ability to enjoy consistently high levels of performance for many years. (Hagiu & Wright., 2020, 97-98-99)

The market's growth and rising production levels have given consumers a wide range of possibilities. As a result, offering clients competitive advantages is necessary to establish a presence in the market and prevail in the face of fierce competition. Finding and utilizing these advantages is essential for success. It's critical to comprehend what sets your goods or services apart from those of your rivals and what special appeals to buyers make them choose your offers. Gaining a competitive edge and flourishing in the marketplace depend on having this understanding. Even with a strong marketing and expensive advertising, without finding a suitable answer to this question, your chances of success will be very low. It is always the best that survive. Therefore, every business must have at least one unique feature. A feature that will guarantee its survival in the field of market competition and helps businesses always have something to say. For example, suppose that a company decides to introduce its product in the market. People are

now buying the same product from competitors. So, in order to succeed in taking market share from competitors, they must change the purchasing behaviour of consumers. It means to encourage customers to buy the product. (Singh et al., 2020, 14-15-16)

To begin with, the items need to include the characteristics that their rivals offer and that are necessary for them to satisfy the needs of their customers. After this stage, we observe two comparable goods, and the consumer is probably going to utilize the first one again given his positive experience. With this account, it is necessary for them to hear a new and attractive offer from costumers, an offer that promises a new experience. Jack Welch, CEO of General Electric, summarizes the importance of competitive advantage in one sentence. *"If you don't have a competitive advantage, don't compete at all,"* he says. The way to build a competitive advantage in a business lies in answering only one question: *"Why should the customer choose my product?".* (Papadas et al., 2019, 633-634)

Finding a simple solution to the problem of how to achieve a competitive advantage is not an easy undertaking. Rapid shifts in consumer preferences are brought on by the quick pace of modern life, the profusion of product possibilities, and presentation techniques. It is difficult to identify the best advantage and connect it with customers' preferences because of this intricacy. Nonetheless, enduring through these challenges is crucial for the existence of the firm because competitive advantage acts as its lifeblood. While it can be believed that differentiation and uniqueness are impossible in the current global market due to ongoing innovation, this is not the case. Businesses that want to gain a competitive edge must closely examine their consumers and competitors in order to pinpoint advantages that are specific to their services and absent from those of their rivals. (Kryscynski et al., 2021, 392)

For this, you must carefully analyse the following three factors. The first one is competitors, observantly track your related items and organizations. Examine their strengths and vulnerabilities to see where you can excel. Think carefully about their product, price, service, distribution and marketing, and even their sales pitch. Thus, to put it very simply, we should spend the most time with in sections where your rivals' weaknesses are, turning them become our strengths.

The only important thing is not to try to be like your competitors. For example, if a competitor's site has a creative design, do not copy the same for yourself. Instead, try to make your site better than them with a different and beautiful design, good content and easier use for people. (Saeidi et al., 2021, 73-74)

The second one is clients; A competitive edge ought not be built solely on the backs of rivals. Because in the end there are customers who must like your product or service. The values should therefore be taken into account that we create for the customer. The more valuable the benefits you want to provide to the customer, the closer you are to your goal. More importantly, these values ought to exceed the costs incurred by the client. With a client choice of a product or service knowing that the value they get from the product is greater than the money they pay. Therefore, the customer's desired values are closely tied to the competitive advantage. Therefore, the more the values we offer that are similar to or coincide with the customer's opinion, the better your business will be in one or more competitive metrics. For example, the price of your laptop is the same as that of your competitor, but the customer prefers to buy from you. Because in addition to a good and quality laptop, you also have good handling, free after-sales service and free shipping. So, you need to know who your customers are and how you can create a better experience for them. (Singjai et al., 2018, 3-4-5)

The third one is data and ability. Having a competitive advantage occasionally calls for a wealth of knowledge and abilities. particularly if would like to take a unique and original approach. No corporation has ever been able to match the success of the Apple brand because it consistently advances technology and expertise years prior to its competitors. Its expertise and professionalism serve as the foundation for all of its benefits and ideals. Hence, think about your strengths to build a competitive advantage. (Udriyah et al., 2018, 275-276-277).

According to the above explanation about competitive advantage, for the current study, we decided to choose the definition of Azeem et al., (2021, 105) about competitive advantage they argued that, benefits that the business can provide to consumers to the extent in which these benefits are greater than consumer expenses are its competitive advantage, as chosen definition because that definition clearly explains the role of the company and the effect of the company to add the value on the ultimate product to the aim that convincing the customers to prefer that products

compare with the rival products. Thus, with considering the competitive market of dairy industry, that definition meet our goals in the current study.

## 2.5   Synthesis

Overall, according to above literature I can determine and choose the definition which is suitable for the current research. Here, explain the meaning of environmental uncertainty and different view toward it, then I mention different types of that phenomenon. I explain the supply chain resilience and the effective factors related to that which ultimately help me to reach the appropriate definition and elements for the current study and designing the questioner based on those elements. After that, I explain the frim performance meaning from the point view of researchers and in the end, there are definition and explanation of competitive advantage. Thanks to those literature and definition now I can propose my research hypothesizes.

With regarding the Abeysekara et al., (2019) study, who have examined how the garment industry's supply network resilience affects firm performance and competitive advantage. The investigation, supply chain resilience has a favorable impact on business implement and competitive advantage. The study discovered, in particular, that corporation with better performance of supply chain resilience are better equipped to react to disturbances in the supply chain, lowering the detrimental influence of disruptions on their performance. The study also found that businesses with strong supply chains are better able to exploit them as a resource of competitive advantage, especially in terms of their capacity to react rapidly to changes in customer request and preferences. Overall, the study emphasizes the value of strengthening supply chain resilience as a way to boost business performance and gain an advantage in the garment sector. Thus, I can conclude these two below hypothesizes:

$H_1$: Resilient supply chain has a positive effect on competitive advantage.
$H_2$: Resilient supply chain has a positive effect on frim performance.

According to Chen, (2019) who studied the connection among supply chain agility, innovativeness, and competitive advantage. In the current research also I create a model to investigate the relationship between a firm's competitive advantage and supply chain innovation and agility, as well as the moderating effects of market instability. According to the study, a firm's innovativeness, which in turn affects its competitive advantage, is positively impacted by supply chain agility. The study also discovers that market turbulence moderates this link, so businesses who can react rapidly to market changes are better equipped to take use of their supply chain's agility and innovativeness to acquire a competitive edge. Jun and Rowley, (2014) refer to *"an emphasis on the functions of human resource management, corporate culture, risk management, and corporate strategy"*, this study investigates the connection between management systems and corporate success in South Korea. The study looks at how these management methods have changed and remained the same over time, as well as how that has affected business performance. According to the survey, there has been a change in South Korean management systems, with a drive toward more decentralized decision-making and a accentuate the risk administration and resources, and corporate culture. The study also discovers that these modifications have improved business performance, particularly in terms of strengthening strategic decision-making, lowering risks, and increasing staff commitment and motivation. Acuña-Carvajal et al., (2019) definition about frim performance which evaluated firm performance according to four factors which are company profit, employee learning, customer satisfaction and the accuracy of internal processes. As well as, sheffi, (2005) who argued that, a resilient business is one that can react swiftly to supply chain interruptions, minimizing the effects on performance and keeping a competitive edge and Hosseini et al., (2019) study, multiple quantitative models and methods such as risk assessment, vulnerability analysis, and recovery planning have been employed to examine various facets of supply chain resilience. The article also highlights the essential elements that should be taken into account when choosing an effective method for a particular supply chain setting, as well as the benefits and drawbacks of various methods. According to the study's findings, there is no one ideal way for analyzing supply chain resilience, and it may be essential to combine many methods to account for all the variables that might affect the effectiveness of the supply chain. The article

serves as a useful tool for scholars and practitioners who want to better understand supply chain resilience and create efficient supply chain risk management techniques. With considering Azeem et al., (2021) definition about competitive advantage which argue that *"competitive advantage is the values that the company can offer to customers in such a way that these values are higher than customer costs"*. Now I can propose the two other hypothesizes for the current study:

$H_3$: Environmental uncertainty has a positive effect on the relationship between resilient supply chain and competitive advantage.

$H_4$: Environmental uncertainty has a positive effect on the relationship between resilient supply chain and frim performance.

# 3    RESEARCH DESIGN

## 3.1    Research approach

In the present study, I use the quantitative method, and its main tool is the questionnaire. A systematic and thorough investigation is needed to comprehend the connection among supply chain resilience, competitive advantage, and firm performance in Iran's dairy industry under environmental uncertainty. This work is especially well suited for a quantitative research strategy since it enables researchers to gather and analyse numerical data using statistical methods, which can provide an accurate and objective assessment of the research issue.

Large sample size, statistical analysis, replication, and comparability are among the key characteristics of a quantitative study, along with objectivity and generalizability. The terms objectivity and generalizability allude to the fact that quantitative research is centred on gathering and interpreting numerical data, which can be measured and examined objectively and allows for generalizations about the population from whom the data was collected. A large sample size is essential for a quantitative study since it boosts the study's statistical power and enhances the precision of the findings. A quantitative study must include statistical analysis because it enables researchers to find patterns, connections, and trends in the data, test hypotheses, and develop conclusions supported by empirical facts. Replication and comparability, which allow for standardization of data collecting and analysis methods and enable studies to be duplicated and compared with further investigations in the same field, are crucial aspects of quantitative research that improve the validity and dependability of the findings. A quantitative study approach is particularly suitable to provide a thorough investigation of this relationship given the intricacy of the interaction between supply chain resilience, competitive advantage, and firm performance under environmental uncertainty in the Iranian dairy industry. This strategy can help recognize the main factors influencing supply chain resilience and their effects on competitive advantage and firm performance by gathering and analysing

numerical data using statistical methods. This approach can offer useful insights for managers in the dairy industry and policymakers.

## 3.2 Data collection

According to Cochran formula when the statistical population is about 200, our sample is 127. Since the managers and participants of this study are a society of 200 people, we will determine our sample as 127 (z = 1.96 (for a 95% confidence level) p = 0.5 N = 200 n = 127). for an infinite population and after sampling it will be clustered. The reason for using cluster sampling is to cover all parts of the collection.

I am going to measure the resilience using a minimum sample size of 127. Then I will evaluate the competitive advantage using elements such as quality, delivery, product innovation, price/cost, dependability, and time to market and assess firm performance by sales growth, market growth, market share, and profit. I will rely my research on information gathered through questionnaires which will be created and given to academics and industry specialists. The specialists ought to be directors and managers in related fields with a minimum of five years' appropriate industry experience and a master's or bachelor's degree in their fields of study. They will respond to inquiries on a scale from 0 to 5. The acquired data will then be analysed by computing reliability and validity measures metrics using average variance and factor-loading methods, correspondingly. Current research created a two-part questionnaire that was given out in English; the first piece asked inquiries regarding the demographics of the respondents, and the second section asked questions about the model. All of the measures were changed to fit the situation after being adapted from previous research. A five-point Likert scale with the values 1 ("completely disagree") to 5 ("absolutely agree") was used to gather the responses. (Appendix 2)

This study is managed in Iran and all the respondents are in Iran. This study was managed in October, November and December 2022. The sample in this study

were the top, middle and low managers of dairy industry in Iran. Our applicants of this study are all:

1. Interested in the topic

2. They want to participate in a scientific study

3. They are engaged in dairy industry

4. They are managers

The quantitative part of the study involves utilizing to collect data a common questionnaire (Appendix 1). The components listed throughout the second section of this paper serve as the foundation for this research questionnaire. Also, to complete the questionnaire, relevant specialized publications and research literature are consulted. The 5-point Likert scale was used in the design and implementation of the survey. The top, middle, and bottom managers of Iran's dairy business served as the primary sources of data for this study.

## 3.3   Data analysis

In the current research, 127 complete and perfect questionnaires containing personal characteristics questions and questions related to research hypotheses were collected from the sample. The questionnaires were gathered, and then they were statistically analysed. The status of the demographic indicators and the research hypotheses were then described using tables and graphs. The research hypotheses were then examined based on the findings from looking at the questions using inferential statistical techniques to reject or confirm the hypotheses. Research factors like mean, standard deviation, and variance are examined in the descriptive statistics of the study. Then, using SmartPLS 3 software, confirmatory factor analysis was utilized in inferential statistics to evaluate the questionnaire's validity and structural equation modeling (SEM) to evaluate the research hypotheses.

## 3.4   Evaluation of the research

To make sure that the research has been carried out in a transparent, ethical, and dependable manner, it is important to keep in mind a number of research integrity issues in this area. Data management is a crucial issue for research integrity. This entails making sure that data is gathered, kept, and analysed in a safe, private, and accurate manner. The current study has put tight protocols in place for data management and collecting in order to solve this problem. These protocols include processes for informed consent, safe data storage, data cleaning, and data validation tests to verify the accuracy and dependability of the data. To ensure that credit is given to the original authors and that the study is based on existing research, all sources used in the literature review and data analysis in the current study have been properly credited and referenced. Strict adherence to citation and reference guidelines has prevented plagiarism and academic misconduct. Another factor to take into account while evaluating the findings is research bias. The current study has taken steps to overcome this problem, including blinding the data collectors and guaranteeing that the analysis is carried out without prejudice or previous preconceptions. Last but not least, it's critical to take ethical issues into account when doing research. By gaining participants' informed agreement, assuring confidentiality and anonymity, and securing ethical approval from the appropriate institutional review board, ethical concerns in the current study were addressed.

For validity test, in this study both structure and content validity tests are attained and for reliability, alpha Cronbach's is used. Content validity index list: This index was designed by Lawch (Bull et al., 2019). The goal of the test and definition of terms of the substance of the inquiries being posed for the basis of each subject are explained together with expert opinions on the test's content are utilized to create this index. (Bull et al., 2019, 1028-1029)

The validity ratio is then determined by applying the formula as follows:

Table 1. Minimum acceptable value for CVR

| Number of expert | CVR value | Number of expert | CVR value | Number of expert | CVR value |
|---|---|---|---|---|---|
| 5 | 99% | 11 | 59% | 25 | 37% |
| 6 | 99% | 12 | 56% | 30 | 33% |
| 7 | 99% | 13 | 54% | 35 | 31% |
| 8 | 75% | 14 | 51% | 40 | 29% |
| 9 | 78% | 15 | 49% | | |
| 10 | 62% | 20 | 42% | | |

The main technique for testifying reliability test is alpha Cronbach's. The impacts of the retest interval, such as recollection and practice, are reduced in this approach since the test is only administered once. Instead of focusing on the reliability of test outcomes, the similarity methodology focuses the consistency and coherence of the constituents or elements of a test. If the exam responses are not two-choice and there is no right or incorrect answer, but rather a range of choices on which the subject must express an opinion, this method is utilized. If the test reliability increased after the question was removed, it meant that the question had less uniformity with the other questions and had no effect on test reliability. Conversely, if reliability increased after the question was removed, it meant that the question had no effect on test reliability. A statistical measure used to assess the validity of a test or instrument is the coefficient of variation ratio (CVR). It is the ratio of the scores' standard deviation to their mean, presented as a percentage. The CVR is used to evaluate a test's consistency or stability over time or across several populations of people. The CVR is used to evaluate the consistency of test results in the context of reliability testing. A high CVR suggests that test results are dependable and consistent, whereas a low CVR shows that test results are inconsistent and perhaps variable. Because it considers the variability of the scores relative to their mean, the CVR is particularly helpful for evaluating the reliability of tests with a wide range of results. This statistic is frequently used with other reliability metrics, like alpha Cronbach's, to provide a more thorough evaluation of test reliability. In conclusion, the CVR is a statistical

indicator that shows the consistency and stability of test results across time or across several groups of people. Its use in conjunction with other reliability metrics can assist in offering a thorough evaluation of the dependability of a test or instrument.

# 4   EMPIRICAL FINDINGS: EXPLORING THE DATA

## 4.1   Demographic characteristics

In this section, when analysing the data, descriptive statistics methods like making frequency tables and statistical diagrams are used to look at how the statistical sample is dispersed across different factors like sex, age, and educational attainment.

### 4.1.1  Examining the characteristics of the statistical population in terms of age status

In the studied group, 16.5% of subjects were less than 30 years old, 30.7% of subjects were 31 to 40 years old, 44.1% of subjects were 41 to 50 years old, 8.7% were 51 years old and older.

**Table 2.**  Frequency distribution related to the age of the respondents

| Age | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| | Less than 30 years | 21 | 16.5 | 16.5 | 16.5 |
| | 31-40 | 39 | 30.7 | 30.7 | 47.2 |
| Valid | 41-50 | 56 | 44.1 | 44.1 | 91.3 |
| | 51 years and more | 11 | 8.7 | 8.7 | 100.0 |
| | Total | 127 | 100.0 | 100.0 | |

It is critical to remember that the age distribution of professionals in any field can have a big impact on the field as a whole. For instance, an aging workforce in the dairy sector may make it more difficult to prepare for succession, attract talent, and keep it. Further investigation and data gathering would be required to determine whether the age distribution in this study is typical of the dairy

business in Iran. Though, that the study's age distribution seems to indicate that a sizable proportion of Iranian dairy sector professionals may be in their 40s and 50s. Planning and managing the industry's workforce may be affected by this demographic data.

### 4.1.2 Investigating the characteristics of the statistical population in terms of education

In the group under study, 33.9% had a bachelor's degree, 11.8% had a diploma, 26.8% had a postgraduate degree, 22.0% had a master's degree, and 5.5% had a PhD.

**Table 3.** Frequency distribution related to the education level of respondents

| Education | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Diploma | 15 | 11.8 | 11.8 | 11.8 |
| | Associate Degree | 34 | 26.8 | 26.8 | 38.6 |
| | Bachelor's degree | 43 | 33.9 | 33.9 | 72.4 |
| | Master's degree | 28 | 22.0 | 22.0 | 94.5 |
| | P.H. D | 7 | 5.5 | 5.5 | 100.0 |
| | Total | 127 | 100.0 | 100.0 | |

This shows that a sizable number of Iranian dairy business experts have a college degree. It is significant to note that this data is restricted to the study's sample of respondents and may not accurately represent the educational backgrounds of all individuals working in Iran's dairy business. Yet, it offers some information about the educational backgrounds of the study participants.

## 4.2 Inferential statistics

*"In research that tries to examine a particular model of the relationship between variables, structural equation model analysis is used. Specifically, structural equation modelling is an extension of the generic linear model that enables the researcher to simultaneously evaluate a series of regression equations."* It is a

very powerful and general method from of the multivariate regression family. (Bielby & Hauser, 1977, 139)

This approach provides a thorough method for investigating hypotheses about the relationships between observed and existing variables. The partial least squares method is among newest methods in the structural equation model. The model of structural equation can be applied in many diverse situations. This approach concentrates on the maximum standard deviation of the response variable by the independent factors rather than replicating the empirical covariance matrix. comparable to any structural equation A structural component that depicts the connection between the underlying variables and a measurement component that represents the connection between the underlying variables and their indicators make up the least squares model. (Hox & Bechger, 1998, 356-357).

In order to fit the study conceptual model and verify the hypotheses, the PLS method was employed with the aid of Smart PLS software, for the reasons given in this study.

## 4.2.1 Normality or non-normality using the Kolmogorov-Smirnov test

The normality of the variables must be confirmed before the research's hypotheses are put to the test. The Kolmogorov-Smirnov test was employed to determine if the variables under study were normally distributed. The variable is normal if the importance level is higher than 0.05%. The data is not normal if not. Hence, except for environmental uncertainty, all of the variables in the table below are non-normal. (Table 4). (Ghasemi & Zahediasl, 2012, 487)

In terms of the effects of non-normality, performing parametric tests that presume normality when the data is non-normal may result in inaccurate findings. For instance, the results of a two-sample t-test may be skewed or have poor power if the assumptions of normality and equal variances are broken. Similar to this, non-normality in regression analysis can result in biased estimates and false inferences. The precision and accuracy of confidence intervals, which are used to estimate population parameters, may also be impacted by non-normality, it is

crucial to remember. As a result, while evaluating non-normal data, it is crucial to check for normality and take relevant statistical procedures into account. (Hair et al., 2014; Tabachnick & Fidell, 2013)

**Table 4.** Kolmogorov-Smirnov test results to check the assumption of normality or non-normality

| One-Sample Kolmogorov-Smirnov Test | | Supply chain resilience | Agility | Collaboration | Re-engineering | Environmental uncertainty | Competitive advantage | Firm performance |
|---|---|---|---|---|---|---|---|---|
| N | | 127 | 127 | 127 | 127 | 127 | 127 | 127 |
| Normal Parameters[a,b] | Mean | 4.2894 | 4.3116 | 4.2992 | 4.1837 | 4.2076 | 4.3209 | 4.2170 |
| | Std. Deviation | .69037 | .64353 | .68729 | .71481 | .44989 | .66733 | .61925 |
| Most Extreme Differences | Absolute | .266 | .173 | .224 | .228 | .059 | .231 | .172 |
| | Positive | .198 | .142 | .154 | .200 | .059 | .154 | .172 |
| | Negative | -.266 | -.173 | -.224 | -.228 | -.059 | -.231 | -.152 |
| Test Statistic | | .266 | .173 | .224 | .228 | .059 | .231 | .172 |
| Asymp. Sig. (2-tailed) | | .000[c] | .000[c] | .000[c] | .000[c] | .200[c,d] | .000[c] | .000[c] |
| a. Test distribution is Normal. | | | | | | | | |
| b. Calculated from data. | | | | | | | | |
| c. Lilliefors Significance Correction. | | | | | | | | |
| d. This is a lower bound of the true significance. | | | | | | | | |

PLS modelling is conducted in two steps. Validity, reliability, and confirmatory factor analyses are looked at in the first step, and the structural model is looked at in the second stage by predicting the route for both the variables. (Ciavolino et al., 2022, 1331)

## 4.2.2 Examining the fit of the research model

There are three steps to the examination of the study's model. The research's external model is analysed in the first phase. In the second stage, it is time to

examine the internal model, and the third stage is dedicated to the examination of the general model of the research.

### 4.2.3 Evaluation of the measurement model (external model)

First, the accuracy of the internal model is checked, and then the external model of the study is examined. Reliability of the external model was evaluated using the combined reliability criteria (CR) and Cronbach's alpha coefficient.

A) Cronbach's alpha coefficient

*"Cronbach's alpha coefficient is another factor whose value varies from 0 to 1. Cronbach's alpha value higher than 0.7 is an acceptable reliability indicator"* (Cronbach, 1951, 312). In fact, in the situation of variables with a few questions, Moss et al. (1998) introduced *"the value of 0.6 as the upper limit of Cronbach's alpha coefficient"* (Moss et al. 1998, 221). For each of the parameters in the table below, the quantity of this coefficient is calculated.

**Table 5.** Cronbach's alpha coefficient

| Value | Cronbach's alpha |
|-------|------------------|
| Supply chain resilience | 0.959 |
| Environmental uncertainty | 0.866 |
| Competitive advantage | 0.916 |
| Firm performance | 0.827 |
| Total reliability | 0.964 |

The criteria for the required structure is higher than 0.7, per the tables above, indicating that the model is reliable enough.

B) composite reliability

The advantage of this criterion over Cronbach's alpha is found in the fact that the reliability of the frameworks is determined not by their absolute reliability but rather by the correlation of their structure with one another, it was developed by Werts et al. in 1974. The internal reliability appropriate for construct measures is indicated if the total reliability value for each structure is over 0.7, while the

48

absence of reliability is indicated by a value less than 0.6. It is significant to note that in structural modelling, composite reliability is a superior metric to Cronbach's alpha. Since all indicators are given the same weight in the computations for the Cronbach's alpha coefficient for each structure. Whereas variables with high capacities are more significant when calculating composite reliability. As a result, the constructions' composite reliability ratings serve as a more precise and realistic measurement than their Cronbach's alpha. (Werts et al. 1974, 183-184)

**Table 6.** Combined reliability

| Value | Combined reliability index (CR) |
|---|---|
| 0.961 | Supply chain resilience |
| 0.868 | Environmental uncertainty |
| 0.919 | Competitive advantage |
| 0.830 | Firm performance |

Considering the higher combined reliability coefficient of the variables in the above table, it shows the suitability and favourable measurement models' fit. Validity of the external model; There are two criteria in use to check the validity of the external model. The first criterion is convergent validity and the second criterion is divergent validity. *"Convergent validity is a criterion for evaluating the measurement models adequacy that looks at the level of correlation between each component and its queries (indices), the match is better the greater the correlation"*. The Average Variance Extracted (AVE) metric was first introduced by Fornell and Larcker in 1981 to measure convergent validity and stated that the value of the critical number is 0.5. The quantity of this coefficient is shown for each of the constructions in the table below. The inquiry with the smallest increasing utilization should be eliminated if the amount of variance retrieved for a factor is less than 0.5. Given that all of the AVE values in the table below are higher than 0.5, the constructs' convergent validity is deemed acceptable. (Fornell and Larcker, 1981, 382-388)

**Table 7.** The average variance extracted

| Value | Average variance extracted (AVE) |
|---|---|
| Supply chain resilience | 0.615 |
| Environmental uncertainty | 0.645 |
| Competitive advantage | 0.684 |
| Firm performance | 0.647 |

The second criteria for assessing the fit of construct measures, which addresses two problems, is divergent validity. A comparison of a structure's correlation with its measures in contrast to that structure's correlation with other structures comes first, followed by a comparison of a structure's correlation with its factors in contrast to that structure's correlation with other structures. (Zand & Rezaei 2020, 11).

Fornell and Larcker (1981) is another important method and Divergent validity is a criterion that describes how closely a structure and its indications are connected when compared to how closely that structure is related to other structures. In other words, a model with acceptable divergent validity shows that a construct interacts more with its indexes than with other constructs. When the AVE for each structure surpasses the variance of that construction and other concepts, divergent validity is acceptable. A matrix that contains the cube root of the AVE values for each construct as well as the correlation coefficient values among the constructs is used to verify this. If the numbers contained in the major diameter are higher than their underlying principles, then this model has adequate divergent validity. This matrix's primary property is that its major diameter is one. The scale factor of the variance values listed in AVE is then used to substitute the values on the major diameter of the matrix, and table 4.9 is then shown. (Fornell and Larcker, 1981, 382-388)

**Table 8.** Fornell and Larcker method

| Firm performance | Competitive advantage | Environmental uncertainty | Supply chain resilience | Value |
|:---:|:---:|:---:|:---:|:---:|
| | | | 0.431 | Supply chain resilience |
| | | 0.427 | 0.418 | Environmental uncertainty |
| | 0.419 | 0.401 | 0.411 | Competitive advantage |
| 0.401 | 0.386 | 0.395 | 0.407 | Firm performance |

As it is clear from the table taken from the method of Fornell and Larcker (1981), the success depends on the ability among the variables in this investigation, which is in the bottom and left homes of the diameter, and the AVE of the variables, that are located in the central diameter of the matrix. The important ones are better grouped. The model's divergent validity is therefore at a reasonable level and the current variables that make up the model interact more often with their indexes than with other constructs.

## 4.2.4  Fitting the outer model

Many metrics are used to verify the structural model's fit, but the most fundamental is the significant coefficients of t. The t coefficients' fit to the structural model is such that they must be greater than 1.96 in order for their significance to be confirmed at the 95% confidence level. According to the amount of the t statistic, the significant findings of the coefficients are provided. Hence, *"it may be said with 95% certainty that the independent indictors have an impact on the dependent variable if the value of the t statistic is higher than 1.96. And the path coefficient above 0.4 is approved"*. (Vinzi et al.,2010)
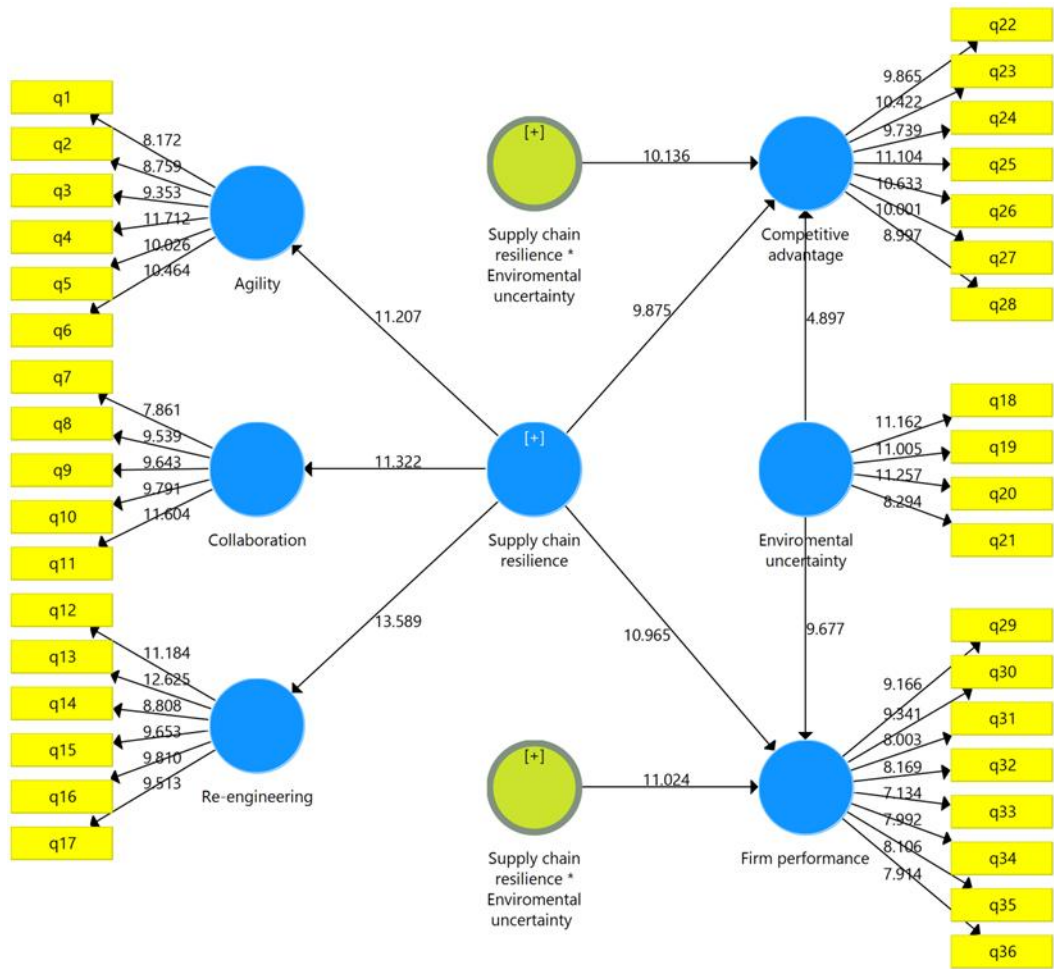
**Figure 2.** Significant of t-value of the coefficients in the conceptual model
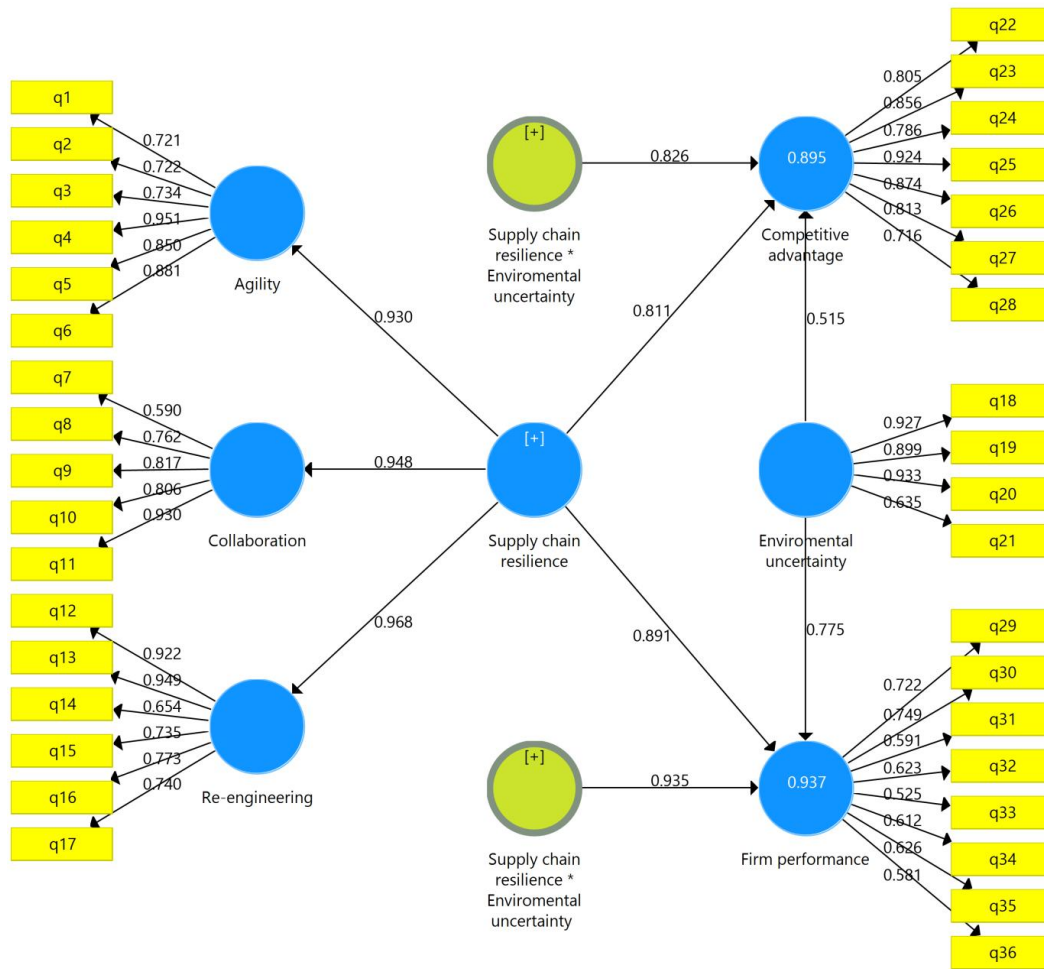
**Figure 3.** Path coefficient in the conceptual model

An external construct's impact on an output construct is determined by the R2 criterion. The crucial distinction is that the model's dependent (endogenous) structures only have an R2 value; exogenous structures have a value of 0 for this criterion. The better a model fits the data, the greater its R2 value in relation to its endogenous structures. As criteria for weak, medium, and robust values of the fit of the framed structure of the model by the R2 criterion, Chin (1998) proposes three parameters of 0.19, 0.33, and 0.67. (Chin, 1998, 299)

**Table 9.** Coefficient of determination

| Value | $R^2$ | Intensity |
|---|---|---|
| Competitive advantage | 0.895 | Strong |
| Firm performance | 0.937 | Strong |
| Average | 0.916 | Strong |

## 4.2.5 Prediction quality (Q^2)

The model's capacity for prediction is determined by this criterion. Models must be able to forecast the indicators relating to the endogenous characteristics of the model in order to have an adequate structural component. Hensler et al. (2009) described three indices of 0.02, 0.15, and 0.35 to represent the structure or associated exogenous structures' poor, medium, and strong predictive powers. It is significant to note that only the model's endogenous structures with reflected indicators are used to determine this number. (Hensler et al. 2009, 281)

**Table 10.** Prediction quality (Q^2)

| Value | $Q^2$ | Intensity |
|---|---|---|
| Competitive advantage | 0.437 | Strong |
| Firm performance | 0.445 | Strong |
| Average | 0.441 | Strong |

## 4.2.6 Fitting the general model (GOF)

*"Three values of 0.01, 0.25 and 0.36 have been introduced as weak, medium and strong values for this criterion"* (Heuchenne et al,.2011, 815).

$$GOF = \sqrt{\overline{Communality} \times \overline{R^2}} = \sqrt{0.441 \times 0.916} = 0.64$$

The model indicates a solid fit, based on the aforementioned findings.

## 4.3 Examining research hypotheses

In this part of the fourth chapter, research hypotheses are examined.

First hypothesis: resilient supply chain has a positive effect on competitive advantage.

H0: Resilient supply chain does not have a positive effect on competitive advantage.

H1: Resilient supply chain has a positive effect on competitive advantage. According to the coefficient of the path between the resilient supply chain variable and the competitive advantage which is 0.811 and also the t-statistic is 9.875. Therefore, it can be said: resilient supply chain has a positive and significant effect on competitive advantage.

Second hypothesis: resilient supply chain has a positive effect on frim performance.

H0: Resilient supply chain does not have a positive effect on frim performance.

H1: Resilient supply chain has a positive effect on frim performance. According to the path coefficient between the resilient supply chain variable and organizational performance, which is 0.891 and also the t-statistic is 10.965. Therefore, it can be said: resilient supply chain has a positive and significant impact on organizational performance.

Third hypothesis: environmental uncertainty has a positive effect on the relationship between resilient supply chain and competitive advantage

H0: The relationship between supply chain resilience and competitive advantage is not positively impacted by environmental uncertainty.

H1: Supply chain resilience and competitive advantage have a favourable link with environmental uncertainty.

As demonstrated by the path coefficient among resilient supply chain criterion and competitive advantage with the moderating effect role of environmental uncertainty, that is 0.826 and the t-statistic is 10.136, environmental uncertainty has an effect on the relationship between resilient supply chain and competitive advantage. That is encouraging and important.

Fourth hypothesis: environmental uncertainty has a positive effect on the relationship between resilient supply chain and frim performance.
H0: The relationship between a robust supply chain and frim performance is not positively impacted by environmental instability.
H1: Resilient supply chain and firm performance have a favourable link that is influenced by environmental uncertainty.
According to the coefficient of the path between the resilient supply chain variable and frim performance with the moderating role of environmental uncertainty which is 0.935 and also the t-statistic is 11.024.
The relationship between a resilient supply chain and firm performance is therefore positively and significantly impacted by environmental unpredictability.

All factor loading coefficients are greater than 0.4, which shows that this model is appropriate. In table 11, the quality indicators of the model in the partial least squares method are presented.

**Table 11.** Model quality indices and their acceptance level in partial least squares method

| Variable | Build cross-validation | Composite reliability | Mean variance extracted |
|---|---|---|---|
| | **>=0** Admission level | **> 0.7** | **> 0.5** |
| Supply chain resilience | 0.114 | 0.773 | 0.597 |
| Agility | 0.129 | 0.736 | 0.603 |
| Collaboration | 0.135 | 0.785 | 0.555 |
| Re-engineering | 0.121 | 0.711 | 0.623 |
| Environmental uncertainty | 0.101 | 0.835 | 0.588 |
| Competitive advantage | 0.86 | 0.792 | 0.662 |
| Frim performance | 0.132 | 0.801 | 0.619 |

**Table 12.** Results of research hypotheses

| Hypotheses | Path coefficient | The significance of t | Result |
|---|---|---|---|
| 1. Resilient supply chain has a positive effect on competitive advantage. | 0.811 | 9.875 | Confirmation |
| 2. Resilient supply chain has a positive effect on frim performance. | 0.891 | 10.965 | Confirmation |
| 3. Environmental uncertainty has a positive effect on the relationship between resilient supply chain and competitive advantage. | 0.826 | 10.136 | Confirmation |
| 4. Environmental uncertainty has a positive effect on the relationship between resilient supply chain and frim performance. | 0.935 | 11.024 | Confirmation |

# 5   Conclusion

## 5.1   Theoretical contribution

Supply chain resilience concept expresses a multidimensional phenomenon. A comprehensive definition of resilience is: *"Identifying potential resources, risk and implementing appropriate strategies through a coordinated approach among supply chain members in order to reduce supply chain vulnerability."* (Ponomarov & Holcomb 2009, 128)

By offering new perspectives on the connection among supply chain resilience, competitive advantage, and firm performance in the specific context of the dairy industry facing environmental uncertainty, current investigating adds to the body of previous research on supply chain resilience. This relationship is thoroughly explored in the research, which also reveals the supply chain resilience indicators linked to competitive advantage in the dairy sector. In mine research I, make a significant contribution because supply chain resilience is a crucial component of supply chain management and because it is crucial for businesses to comprehend the variables that can give them a competitive edge, in the approach of environmental uncertainty. This study confirms that at the time of warning, the organization can predict what is going to happen and reduce its consequences. If it is not possible to avoid the disruption in time, with the failure of the first and after a period of time due to the causes of delayed impact, the disaster will have a greater influence on the firm's performance. The organization must prepare itself for recovery. After the recovery period, the organization raises its performance to a level that is often lower than the previous level. (Zimmermann et al., 2020, 384). The findings of this research can aid dairy sector companies in creating strategies that will strengthen their supply chains' competitiveness and resilience, which will eventually boost firm performance. The findings of the investigation can be used by dairy sector businesses to pinpoint the precise elements that will increase their supply chains' resilience and competitiveness in the face of environmental instability. Policymakers and industry associations can also use the

study's results to create policies and initiatives that will strengthen the supply chain's resilience for the dairy industry. All things considered, the study's theoretical contributions can increase knowledge of supply chain resilience, competitive advantage, and firm performance in the particular context of the dairy business.

## 5.2   Managerial Contribution

Study findings suggest that, processes can adapt swiftly to shift and are resilient, adaptable, and flexible. The dynamic character of adaptability enables recovery of the supply chain after an error and go back to its initial condition or a better state. Such resilient supply change will directly affect the firm performance and increase the competitive advantage of the organization (Ponomarov & Holcomb 2009, 129). Another way to meet such goals is re-engineering in the organization. Re-engineering will not follow minor modifications and patching of the existing situation or extensive transformations that leave the organization's main structure and architecture intact. Re-engineering does not seek to improve the existing system and improve the work result. Re-engineering means abandoning long-standing and old methods and acquiring new methods that are necessary to produce diary industry services and goods transfer value to the customer. (Abeysekara et al., 2019, 1680).

The current study offers insightful information about the potential advantages of process reengineering for businesses, particularly in relation to the dairy industry. *The results imply that reengineering can act as a lifeboat for faltering businesses, providing a way to revive their operations and provide them a more competitive edge in the market.* The study emphasizes how important it is for both internal and external elements to play a part in motivating the choice to seek process reengineering. External variables might prompt businesses to examine their current processes and look for new techniques that better reflect these external realities. Examples of such external causes include changes in the market environment or changing consumer preferences. Process re-engineering may be

required as a result of internal variables such as strategic changes, modifications to the organizational structure, and the desire to streamline processes. *The study emphasizes how crucial gaining a competitive edge is as a major factor in organizational performance. By utilizing special abilities or advantages that are challenging for rivals to imitate, competitive advantage helps firms to surpass their rivals.* Process re-engineering gives businesses the ability to streamline their operations, increase productivity, and set themselves apart from competitors, making it a potent tool for gaining a competitive edge.

The complexity of the environment of organizations has put many challenges in the growth and development of companies and obtaining the maximum satisfaction of shareholders. In this regard, the type of decisions made by senior managers are the only tool that can guarantee the organization's optimal performance while maintaining the organization's flexibility in the face of environmental changes. For this purpose, the current research aims to examined the variables of environmental uncertainty, strategic decisions of the senior management team, the quality of decision-making and the performance of the organization, measure their relationship with each other and provide suitable solutions for the use of managers. Environmental uncertainty and intense competition have made organizations and their managers face many challenges. Managing the complexity of technology, data, tasks, activities, processes, and people in today's corporate environment is essential for organizational success. Because of this, businesses need managers who can traverse these complexities and come to wise decisions that increase the efficiency of both internal and external processes. To address environmental issues and boost productivity, management decision-making must be improved. The macro policies of an organization dictate the approaches and practices that human resources can use to make the most of the resources at their disposal. *As a result, businesses need to think about how to respond to factors that could affect the whole organization or a specific element of it. The actions of rivals involving the creation of new products, production adjustments, and innovation, combined with price strategies in manufacturing organizations, are one of the primary issues for managers.* Managers must also focus on lowering costs and raising productivity because these actions improve the organization's ability to compete. *It is crucial to*

*recognize that developing a durable competitive advantage boosts the firm's performance and competitiveness.* Due to the complexity of the environment and the fierce rivalry, a firm should consider identifying its competitive advantages as these might swiftly wane or be duplicated by rivals. In Iran's dairy sector, supply chain resilience is vital to company performance. In the dairy business, supply chain resilience and firm performance are positively correlated with re-engineering, agility, collaboration, and competitive advantage. *Thus, to increase their supply chain resilience and company performance, firms should think about implementing re-engineering, agility, cooperation, and competitive advantage. Employing these tactics can aid businesses in long-term performance improvement and competitiveness.*

## 5.3   Limitations and future research

This study has faced several limitations, I only look at the Iranian dairy business, which may limit how broadly the conclusions may be applied to other industries or settings. For instance, the dairy sector may exhibit distinctive traits that affect supply chain resilience in ways that are not typical of other sectors. The investigation was also carried out at a time when the Financial crisis has left the nation's economy in a precarious position. Since that supply chain resilience may be influenced by economic situations, this may have had an effect on the findings. Last but not least, the study does not evaluate how supply chain resilience affects other critical outcomes like customer satisfaction or financial performance. This is a crucial restriction because these results might be impacted by supply chain resilience and might provide further light on the advantages of creating a resilient supply chain.

For the future researches, the impact of supply chain resilience on other industries or circumstances may be examined in further studies to make the results more broadly applicable. This might offer a more thorough understanding of how supply chain resilience functions in various settings. Future studies could examine the effects of economic conditions on supply chain resilience in more stable economic environments. The effectiveness of the supply chain may also

affect other critical outcomes, such as customer satisfaction or financial performance, and how these results affect a firm's competitive edge. This may give a clearer picture of the benefits of creating resilient supply chains and assist in guiding supply chain management strategies across various industries.

# 6  SUMMARY

In the context of the dairy business dealing with environmental uncertainty, this study investigates linkage among competitive advantage, firm performance, and supply chain resilience. The investigation is driven by the realization that disruptions to the supply chain can significantly impact a company's performance and that a company's ability to be resilient in the face of these disruptions is essential. The study employs a combined research approach includes the gathering and analysis of both qualitative and quantitative data. To recognize the most vital indicators of supply chain resilience in the dairy industry, Industry interviews in a semi-structured approach with experts and management of dairy enterprises are conducted during the qualitative phase. In the quantitative phase, a survey of dairy companies is conducted to assess the strength of the supply chain, the competitive advantage, and company performance. The study adds a number of managerial and theoretical perspectives. A comprehensive explanation of supply chain resilience and insights into the connection between supply chain resilience, competitive advantage, and firm performance in the dairy industry facing environmental uncertainty are included in the theoretical contributions. Insights into the dairy industry's supply chain resilience indicators and the possible advantages of process reengineering for attaining a competitive edge in the market are included in the managerial contributions.

According to the current study, companies with more robust supply networks are better able to manage environmental unpredictability, which boosts their performance and competitiveness. An objective framework for investigating the connections between supply chain resilience, competitive advantage, firm performance, and environmental uncertainty is provided by the use of conceptual modelling and structural equation modelling. I also boosts the amount of current data on this subject by identifying major determinants of supply chain resilience. This can aid academics and professionals in their understanding of the elements that affect a company's capacity to manage supply chain interruptions. Additionally, the study's emphasis on the Iranian dairy industry makes a major addition to the field of supply chain knowledge resilience in growing economies.

The study provides insights by analysing the difficulties and opportunities experienced by businesses operating in this environment, which may be applicable to other markets and industries especially emerging ones. Significantly, this research offers managers who want to improve their companies' performance and competitiveness in fast-paced business contexts, useful insights. Supply chain resilience is a crucial factor for businesses operating in uncertain environments. The study offers managers in Iran's dairy industry useful information, but it also has wider ramifications for businesses in other sectors of the economy. Current study delivers insightful information about how supply chain resilience functions in the dairy industry and offers concrete suggestions for businesses looking to improve their supply network competitiveness in the face of environmental unpredictability. In brief, this study offers crucial information about the elements that contribute to supply chain resilience in ambiguous environments for managers and academics. Businesses may better handle disruptions and position themselves for success in dynamic business settings by investing in key supply chain resilience drivers.

64

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**Appendices**

**Appendix 1 Operationalization table**

| variable | Definition of variable | Indicator | Category of Data | Measure |
|---|---|---|---|---|
| Supply chain resilience | the adaptive capability of the supply chain to prepare for unexpected events, respond to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function | Supply chain resilience is positively associated with re-engineering in dairy industry in Iran | ordinal | Likert Scale |
| | | Current supply chain in dairy industry in Iran is not resilient. | | |
| | | The resilience of supply chain in dairy industry is necessary. | | |
| | | Supply chain resilience is positively associated with agility in dairy industry in Iran. | | |
| agility | Supply chain agility refers to a company's ability to quickly adjust its strategy, particularly in procurement, inventory management and delivery to meet rapidly changing supply chain requirements | Agility in supply chain will increase the efficiency of dairy industry in Iran. | ordinal | Likert Scale |
| | | Dairy industry in Iran needs agility in supply chain more than anything else. | | |
| | | Supply chain resilience is positively associated with collaboration in dairy industry in Iran. | | |
| | | Supply chain requires collaboration of different sections. | | |
| | | Without collaboration, supply chain will not have resilience at all. | | |

| variable | Definition of variable | Indicator | Category of Data | Measure |
|---|---|---|---|---|
| | | Supply chain resilience is positively associated with competitive advantage in dairy industry in Iran. | | |
| collaboration | Supply chain collaboration is about coordinating with internal departments and external partners to sustain an optimized flow through the supply chain in order to efficiently meet demand and ensure on-time, in-full delivery | Success in dairy industry in Iran needs a reengineering in competitive advantage investment. | ordinal | Likert Scale |
| | | Dairy industry in Iran now lacks enough quality for competitive advantage. | | |
| | | Supply chain resilience is positively associated with firm performance in dairy industry in Iran. | | |
| | | The more resilient supply chain will get in dairy industry in Iran, the higher performance we will observe in this section. | | |
| | | I think that currently, the overall situation of dairy industry in Iran is not satisfactory. | | |
| competitive advantage | In business, a competitive advantage is an attribute that allows an organization to outperform its competitors. | Re-engineering is positively associated with competitive advantage in dairy industry in Iran. | ordinal | Likert Scale |
| | | We need to redesign our plans for competitive advantage in dairy industry in Iran. | | |
| | | Dairy industry in Iran requires more | | |

| variable | Definition of variable | Indicator | Category of Data | Measure |
|---|---|---|---|---|
| | | efficient practical strategies in term of reengineering. | | |
| | | Re-engineering is positively associated with firm performance in dairy industry in Iran. | | |
| | | Firm performance requires reengineering in dairy industry in Iran. | | |
| | | Our current plans in dairy industry in Iran is old-fashion and requires redevelopment. | | |
| | | Agility is positively associated with competitive advantage in dairy industry in Iran. | | |
| firm performance | Firm performance is an economic category that reflects the ability of firms in using human resources and material resources to achieve the targets of the firm | We need to increase the rate of investment in competitive advantage in dairy industry in Iran. | ordinal | Likert Scale |
| | | Competitive advantage is impossible without agility in dairy industry in Iran. | | |
| | | Agility is positively associated with firm performance in dairy industry in Iran. | | |
| | | Agility increases the quality of performance among individuals in Iran. | | |
| | | To improve the quality of organizations in dairy industry in Iran we need to increase the agility of our firms. | | |

| variable | Definition of variable | Indicator | Category of Data | Measure |
|---|---|---|---|---|
| | | Collaboration is positively associated with competitive advantage in dairy industry in Iran. | | |
| | | Collaboration among different sections in dairy industry in Iran will result in a better competitive advantage in Iran. | | |
| | | If we are going to focus on our competitive advantage we need to make collaboration among different sectors. | | |
| Re-engineering | Supply chain reengineering aims to overcome the uncertainty associated with various aspects of the chain, including the changing needs and demands of customers, the quality of the information, and inherent delays that affect purchasing and ordering decisions | Collaboration is positively associated with firm performance in dairy industry in Iran. | ordinal | Likert Scale |
| | | To increase the performance of firms in Iran, we need to collaborate. | | |
| | | In lack of collaboration among different sectors involved, quality of performances in dairy industry in Iran will decline. | | |
| | | Competitive advantage is positively associated with firm performance in dairy industry in Iran. | | |
| | | The higher we focus on our competitive advantages we will have higher level of firm | | |

| variable | Definition of variable | Indicator | Category of Data | Measure |
|---|---|---|---|---|
| | | performances in dairy industry in Iran. | | |
| | | We should invest in our competitive advantages in dairy industry in order to improve our performance. | | |
| environmental uncertainty | Environmental uncertainty is defined as the uncertainty of the state of the environment, the inability to predict the impact of environmental change, and the inability to predict the consequences of response choices | Demand fluctuates drastically from week to week | ordinal | Likert Scale |
| | | Total manufacturing volume fluctuates drastically from week to week | | |
| | | Mix of products you produce changes drastically from week to week | | |
| | | Supply requirements (volume and mix) vary drastically from week to week | | |

**Appendix 2 Questionnaire**

Dear expert; Greetings and Regards The questionnaire that you have before you have been prepared to carry out a part of the research " Effect of supply chain resilience on competitive advantage and firm performance under environmental uncertainty in the dairy industry of Iran ". This questionnaire is distributed among the experts in order to measure the research variables and prepare the required data in order to perform the necessary analysis. All items were measured on a five-point Likert-type scale, from "strongly disagree" to "strongly agree". Dear experts, according to their opinion, in each of the questions, fill in the box that includes the score they want for the desired criterion.

Demographic questions

Age:

gender:

education:

Answer the questions from 1 (strongly disagree) to 5 (strongly agree).

| variable | Indicator | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Supply chain resilience | Supply chain resilience is positively associated with re-engineering in dairy industry in Iran | | | | | |
| | Current supply chain in dairy industry in Iran is not resilient. | | | | | |
| | The resilience of supply chain in dairy industry is necessary. | | | | | |
| | Supply chain resilience is positively associated with agility in dairy industry in Iran. | | | | | |
| agility | Agility in supply chain will increase the efficiency of dairy industry in Iran. | | | | | |
| | Dairy industry in Iran needs agility in supply chain more than anything else. | | | | | |
| | Supply chain resilience is positively associated with collaboration in dairy industry in Iran. | | | | | |
| | Supply chain requires collaboration of different sections. | | | | | |
| | Without collaboration, supply chain will not have resilience at all. | | | | | |
| | Supply chain resilience is positively associated with competitive advantage in dairy industry in Iran. | | | | | |

| variable | Indicator | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| collaboration | Success in dairy industry in Iran needs a reengineering in competitive advantage investment. | | | | | |
| | Dairy industry in Iran now lacks enough quality for competitive advantage. | | | | | |
| | Supply chain resilience is positively associated with firm performance in dairy industry in Iran. | | | | | |
| | The more resilient supply chain will get in dairy industry in Iran, the higher performance we will observe in this section. | | | | | |
| | I think that currently, the overall situation of dairy industry in Iran is not satisfactory. | | | | | |
| competitive advantage | Re-engineering is positively associated with competitive advantage in dairy industry in Iran. | | | | | |
| | We need to redesign our plans for competitive advantage in dairy industry in Iran. | | | | | |
| | Dairy industry in Iran requires more efficient practical strategies in term of reengineering. | | | | | |
| | Re-engineering is positively associated with firm performance in dairy industry in Iran. | | | | | |
| | Firm performance requires reengineering in dairy industry in Iran. | | | | | |
| | Our current plans in dairy industry in Iran is old-fashion and requires redevelopment. | | | | | |
| | Agility is positively associated with competitive advantage in dairy industry in Iran. | | | | | |
| firm performance | We need to increase the rate of investment in competitive advantage in dairy industry in Iran. | | | | | |
| | Competitive advantage is impossible without agility in dairy industry in Iran. | | | | | |
| | Agility is positively associated with firm performance in dairy industry in Iran. | | | | | |
| | Agility increases the quality of performance among individuals in Iran. | | | | | |
| | To improve the quality of organizations in dairy industry in Iran we need to increase the agility of our firms. | | | | | |
| | Collaboration is positively associated with competitive advantage in dairy industry in Iran. | | | | | |
| | Collaboration among different sections in dairy industry in Iran will result in a better competitive advantage in Iran. | | | | | |
| | If we are going to focus on our competitive advantage we need to make collaboration among different sectors. | | | | | |
| Re-engineering | Collaboration is positively associated with firm performance in dairy industry in Iran. | | | | | |

| variable | Indicator | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| | To increase the performance of firms in Iran, we need to collaborate. | | | | | |
| | In lack of collaboration among different sectors involved, quality of performances in dairy industry in Iran will decline. | | | | | |
| | Competitive advantage is positively associated with firm performance in dairy industry in Iran. | | | | | |
| | The higher we focus on our competitive advantages we will have higher level of firm performances in dairy industry in Iran. | | | | | |
| | We should invest in our competitive advantages in dairy industry in order to improve our performance. | | | | | |
| environmental uncertainty | Demand fluctuates drastically from week to week | | | | | |
| | Total manufacturing volume fluctuates drastically from week to week | | | | | |
| | Mix of products you produce changes drastically from week to week | | | | | |
| | Supply requirements (volume and mix) vary drastically from week to week | | | | | |

**Appendix 3 Statistics**

Reliability of Supply chain resilience

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .959 | 17 |

Reliability of Environmental uncertainty

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .866 | 4 |

Reliability of Competitive advantage

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .916 | 7 |

Reliability of Firm performance

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .827 | 8 |

Total reliability

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .964 | 36 |

**Statistics**

| | | Supply chain resilience | Agility | Collaboration | Re-engineering | Environmental uncertainty | Competitive advantage | Firm performance |
|---|---|---|---|---|---|---|---|---|
| N | Valid | 127 | 127 | 127 | 127 | 127 | 127 | 127 |
| | Missing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | 4.2894 | 4.3116 | 4.2992 | 4.1837 | 4.2076 | 4.3209 | 4.2170 |
| Median | | 4.0000 | 4.2857 | 4.3333 | 4.0000 | 4.2333 | 4.2500 | 4.0000 |
| Std. Deviation | | .69037 | .64353 | .68729 | .71481 | .44989 | .66733 | .61925 |
| Variance | | .477 | .414 | .472 | .511 | .202 | .445 | .383 |
| Skewness | | -.467 | -.572 | -.584 | -.228 | -.274 | -.610 | -.287 |
| Std. Error of Skewness | | .215 | .215 | .215 | .215 | .215 | .215 | .215 |
| Kurtosis | | -.549 | -.493 | -.722 | -1.151 | -.686 | -.268 | -.452 |
| Std. Error of Kurtosis | | .427 | .427 | .427 | .427 | .427 | .427 | .427 |
| Minimum | | 2.00 | 2.29 | 2.67 | 2.67 | 3.17 | 2.00 | 2.22 |
| Maximum | | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |

**One-Sample Statistics**

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| q1 | 127 | 4.2047 | .88496 | .07853 |
| q2 | 127 | 4.3937 | .70325 | .06240 |
| q3 | 127 | 4.1260 | .99197 | .08802 |
| q4 | 127 | 4.2913 | .74653 | .06624 |
| q5 | 127 | 4.3780 | .73386 | .06512 |
| q6 | 127 | 4.3465 | .74937 | .06650 |
| q7 | 127 | 4.4331 | .81251 | .07210 |
| q8 | 127 | 4.2283 | .86547 | .07680 |

| | | | | |
|---|---|---|---|---|
| q9 | 127 | 4.3937 | .68031 | .06037 |
| q10 | 127 | 4.1260 | .96767 | .08587 |
| q11 | 127 | 4.2520 | .75560 | .06705 |
| q12 | 127 | 4.2835 | .76530 | .06791 |
| q13 | 127 | 4.2520 | .75560 | .06705 |
| q14 | 127 | 4.3701 | .81458 | .07228 |
| q15 | 127 | 4.2835 | .85354 | .07574 |
| q16 | 127 | 4.4803 | .66488 | .05900 |
| q17 | 127 | 4.1339 | 1.01858 | .09038 |
| q18 | 127 | 4.3228 | .75469 | .06697 |
| q19 | 127 | 4.3307 | .78735 | .06987 |
| q20 | 127 | 4.2913 | .76750 | .06810 |
| q21 | 127 | 4.3386 | .84722 | .07518 |
| q22 | 127 | 4.1339 | .88517 | .07855 |
| q23 | 127 | 4.3150 | .68662 | .06093 |
| q24 | 127 | 4.1024 | .94981 | .08428 |
| q25 | 127 | 4.2205 | .77576 | .06884 |
| q26 | 127 | 4.1181 | .75187 | .06672 |
| q27 | 127 | 4.4252 | .63645 | .05648 |
| q28 | 127 | 4.3228 | .84404 | .07490 |
| q29 | 127 | 4.1181 | .91386 | .08109 |
| q30 | 127 | 4.1969 | .77705 | .06895 |
| q31 | 127 | 4.1732 | .85537 | .07590 |
| q32 | 127 | 4.3858 | .66723 | .05921 |
| q33 | 127 | 4.1260 | .99197 | .08802 |
| q34 | 127 | 4.2126 | .81289 | .07213 |
| q35 | 127 | 4.1575 | .85843 | .07617 |
| q36 | 127 | 4.2913 | .66798 | .05927 |

**One-Sample Test**

Test Value = 0

| t | df | Mean Difference | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|
| | | | Lower | Upper |

| | | | | | |
|---|---|---|---|---|---|
| q1 | 53.545 | 126 | 4.20472 | 4.0493 | 4.3601 |
| q2 | 70.408 | 126 | 4.39370 | 4.2702 | 4.5172 |
| q3 | 46.874 | 126 | 4.12598 | 3.9518 | 4.3002 |
| q4 | 64.781 | 126 | 4.29134 | 4.1602 | 4.4224 |
| q5 | 67.229 | 126 | 4.37795 | 4.2491 | 4.5068 |
| q6 | 65.364 | 126 | 4.34646 | 4.2149 | 4.4780 |
| q7 | 61.486 | 126 | 4.43307 | 4.2904 | 4.5758 |
| q8 | 55.058 | 126 | 4.22835 | 4.0764 | 4.3803 |
| q9 | 72.783 | 126 | 4.39370 | 4.2742 | 4.5132 |
| q10 | 48.051 | 126 | 4.12598 | 3.9561 | 4.2959 |
| q11 | 63.416 | 126 | 4.25197 | 4.1193 | 4.3847 |
| q12 | 63.077 | 126 | 4.28346 | 4.1491 | 4.4179 |
| q13 | 63.416 | 126 | 4.25197 | 4.1193 | 4.3847 |
| q14 | 60.458 | 126 | 4.37008 | 4.2270 | 4.5131 |

| | | | | | |
|-----|--------|-----|---------|--------|--------|
| q15 | 56.555 | 126 | 4.28346 | 4.1336 | 4.4334 |
| q16 | 75.939 | 126 | 4.48031 | 4.3636 | 4.5971 |
| q17 | 45.737 | 126 | 4.13386 | 3.9550 | 4.3127 |
| q18 | 64.551 | 126 | 4.32283 | 4.1903 | 4.4554 |
| q19 | 61.986 | 126 | 4.33071 | 4.1924 | 4.4690 |
| q20 | 63.011 | 126 | 4.29134 | 4.1566 | 4.4261 |
| q21 | 57.710 | 126 | 4.33858 | 4.1898 | 4.4874 |
| q22 | 52.630 | 126 | 4.13386 | 3.9784 | 4.2893 |
| q23 | 70.821 | 126 | 4.31496 | 4.1944 | 4.4355 |
| q24 | 48.674 | 126 | 4.10236 | 3.9356 | 4.2692 |
| q25 | 61.311 | 126 | 4.22047 | 4.0842 | 4.3567 |
| q26 | 61.725 | 126 | 4.11811 | 3.9861 | 4.2501 |
| q27 | 78.355 | 126 | 4.42520 | 4.3134 | 4.5370 |
| q28 | 57.717 | 126 | 4.32283 | 4.1746 | 4.4711 |

| | | | | | |
|---|---|---|---|---|---|
| q29 | 50.783 | 126 | 4.11811 | 3.9576 | 4.2786 |
| q30 | 60.867 | 126 | 4.19685 | 4.0604 | 4.3333 |
| q31 | 54.982 | 126 | 4.17323 | 4.0230 | 4.3234 |
| q32 | 74.076 | 126 | 4.38583 | 4.2687 | 4.5030 |
| q33 | 46.874 | 126 | 4.12598 | 3.9518 | 4.3002 |
| q34 | 58.401 | 126 | 4.21260 | 4.0699 | 4.3553 |
| q35 | 54.579 | 126 | 4.15748 | 4.0067 | 4.3082 |
| q36 | 72.399 | 126 | 4.29134 | 4.1740 | 4.4086 |

**One-Sample Statistics**

| | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|
| Supply chain resilience | 127 | 4.2894 | .69037 | .06126 |
| Agility | 127 | 4.3116 | .64353 | .05710 |
| Collaboration | 127 | 4.2992 | .68729 | .06099 |
| Re-engineering | 127 | 4.1837 | .71481 | .06343 |
| Environmental uncertainty | 127 | 4.2076 | .44989 | .03992 |

| | N | | | |
|---|---|---|---|---|
| Competitive advantage | 127 | 4.3209 | .66733 | .05922 |
| Firm performance | 127 | 4.2170 | .61925 | .05495 |

**One-Sample Test**

Test Value = 0

| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Supply chain resilience | 70.018 | 126 | .000 | 4.28937 | 4.1681 | 4.4106 |
| Agility | 75.504 | 126 | .000 | 4.31159 | 4.1986 | 4.4246 |
| Collaboration | 70.493 | 126 | .000 | 4.29921 | 4.1785 | 4.4199 |
| Re-engineering | 65.959 | 126 | .000 | 4.18373 | 4.0582 | 4.3093 |
| Environmental uncertainty | 105.397 | 126 | .000 | 4.20761 | 4.1286 | 4.2866 |
| Competitive advantage | 72.967 | 126 | .000 | 4.32087 | 4.2037 | 4.4381 |
| Firm performance | 76.742 | 126 | .000 | 4.21697 | 4.1082 | 4.3257 |

**One-Sample Kolmogorov-Smirnov Test**

| | Supply chain resilience | Agility | Collaboration | Re-engineering | Environmental uncertainty | Competitive advantage | Firm performance |
|---|---|---|---|---|---|---|---|
| N | 127 | 127 | 127 | 127 | 127 | 127 | 127 |
| Mean | 4.2894 | 4.3116 | 4.2992 | 4.1837 | 4.2076 | 4.3209 | 4.2170 |

| Normal Parameters[a,b] | Std. Deviation | .69037 | .64353 | .68729 | .71481 | .44989 | .66733 | .61925 |
|---|---|---|---|---|---|---|---|---|
| Most Extreme Differences | Absolute | .266 | .173 | .224 | .228 | .059 | .231 | .172 |
| | Positive | .198 | .142 | .154 | .200 | .059 | .154 | .172 |
| | Negative | -.266 | -.173 | -.224 | -.228 | -.059 | -.231 | -.152 |
| Test Statistic | | .266 | .173 | .224 | .228 | .059 | .231 | .172 |
| Asymp. Sig. (2-tailed) | | .000[c] | .000[c] | .000[c] | .000[c] | .200[c,d] | .000[c] | .000[c] |

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.