

T.C.
MARMARA UNIVERSITY
INSTITUTE OF SOCIAL SCIENCE
DEPARTMENT OF BUSINESS ADMINISTRATION

DISCIPLINE OF DECISION SCIENCES FOR EXECUTIVES

**INVESTIGATION OF THE EFFECT OF THE COVID-19 PANDEMIC ON THE LOGISTICS
ACTIVITIES OF BUSINESSES**

ATAKAN ERSÖZ

SUPERVISOR: PROF.DR. BERİL DURMUŞ

İSTANBUL, 2023
TEZ ONAY SAYFASI PDF

GENEL BİLGİLER

İsim ve Soyadı	: Atakan ERSÖZ
Anabilim Dalı	: İşletme (İng)
Programı	: Yöneticiler için Karar Bilimleri
Tez Danışmanı	: Prof.Dr. Beril DURMUŞ
Tez Türü ve Tarihi	: Yüksek Lisans - Ocak 2023
Anahtar Kelimeler	: Lojistik, Tedarik Zinciri, Covid-19, Pandemi Etkisi

ÖZET

COVID-19 PANDEMİSİNİN İŞLETMELERİN LOJİSTİK FAALİYETLERİ ÜZERİNDEKİ ETKİSİNİN ARAŞTIRILMASI

Lojistik sektörü her ülkenin sosyal ve ekonomik kalkınmasında en önemli yere sahiptir. Firmaların üretimden müşteriye teslimine kadar tüm ticari faaliyetlerinin etkin bir şekilde izlenmesini gerektirir. Aralık 2019'da başlayan ve etkisini tüm dünyada hissettiren Covid-19 pandemisi, lojistik ve tedarik zincirini de ciddi şekilde etkilemiştir. Pandemi ile sektörde taşınması gereken malların aktarılması ve depolanması problemleri ortaya çıkmıştır. Bu tez çalışmasının amacı, Covid-19 pandemi sürecinin, Türkiye'de lojistik hizmet veren firmaları veya lojistik birimleri bulunan üretim firmaları üzerindeki etkilerini araştırmaktır. Bu kapsamda firmalardan 2020-2021 yıllarını kapsayan Covid-19 pandemisindeki etkilerine ilişkin veriler anket yoluyla elde edilmiştir. Öncelikle pilot çalışmada firmalardan elde edilen verilere Açıklayıcı Faktör Analizi (EFA) uygulanmış ve ölçeğin güvenilirlik ve geçerliliği araştırılmıştır. Oluşturulan güvenilir ve geçerli anket soruları Google platformu üzerinden Türkiye'deki firmalara gönderilmiştir. Firmalardan elde edilen veriler yardımıyla pandemi sürecinde araştırmanın hipotezleri test edilmiş ve sektörün tanımlayıcı istatistikleri ortaya konulmuştur. Ayrıca pandeminin lojistik hizmetine olan etkisi çoklu doğrusal regresyon analizi ile ortaya çıkarılmış ve korelasyon analizi ile değişkenler arasındaki ilişkiler araştırılmıştır. Araştırma sonucuna göre; çok uluslu şirketlerin pandemiden bölgesel şirketlere göre maliyet ve tedarik zinciri açısından daha fazla etkilendiği; firmaların teknolojisine ve dijitalleşmesine göre çok uluslu şirketlerin bölgesel ve yerel şirketlere göre daha fazla etkilendiği ve çalışan sayısı az olan şirketlerin, çalışan sayısı yüksek şirketlere göre pandemiden daha fazla etkilendiği belirlenmiştir.

GENERAL KNOWLEDGE

Name and Surname	: Atakan ERSÖZ
Field	: Business (Eng.)
Program	: Decision Sciences for Executives
Supervisor	: Prof. Dr. Beril DURMUŞ
Degree Awarded and Date	: Master - Ocak 2023
Keywords	: Logistic, Supply Chain, Covid-19, Pandemic Effect

ABSTRACT

INVESTIGATION OF THE EFFECT OF THE COVID-19 PANDEMIC PERIOD ON THE LOGISTICS ACTIVITIES OF THE COMPANIES (2020-2021)

The logistics sector has the most important place in the social and economic development of every country. It requires effective monitoring of all commercial activities of companies from production to delivery to the customer. The Covid-19 pandemic, which started in December 2019 and made its impact felt all over the world, also seriously affected the logistics and supply chain. With the pandemic, the problems of transferring and storing the goods that need to be transported in the sector have emerged. The aim of this thesis study is to investigate the effects of the Covid-19 pandemic process on companies providing logistics services or manufacturing companies with logistics units in Turkey. In this context, data on the effects of the Covid-19 pandemic covering the years 2020-2021 were obtained from the companies through a survey. First, Exploratory Factor Analysis (EFA) was applied to the data obtained from the companies in the pilot study and the reliability and validity of the scale were investigated. The created reliable and valid survey questions were sent to companies in Turkey via the Google platform. With the help of the data obtained from the companies, the hypotheses of the research were tested during the pandemic process and the descriptive statistics of the sector were revealed. In addition, the effect of the pandemic on the logistics service was revealed by multiple linear regression analysis and the relationships between the variables were investigated by correlation analysis. According to the results of the research; multinational companies were more affected by the pandemic than regional companies in terms of cost and supply chain; It has been determined that multinational companies are more affected than regional and local companies according to the technology and digitalization of companies, and companies with a low number of employees are more affected by the pandemic than companies with a high number of employees.

TABLE OF CONTENTS

ÖZET.....	i
ABSTRACT	ii
LIST OF FIGURES.....	iv
LIST OF TABLES	v
1. INTRODUCTION.....	1
2. THEROTICAL AND LITERATURE RESEARCH.....	4
2.1. Concepts and History of Logistics and Supply Chain Activities	4
2.2. Logistics Service Providers (LSPs) Management	6
2.3. The Effect of the World Economy and the Pandemic in the Covid-19 Pandemic Process	8
2.4. Impact of Covid-19 Pandemic on Logistics and Supply Chain.....	9
2.5. Export and Import in Logistics Sector and Supply Chain Activities in the Covid-19 Pandemic Process	13
2.6. The Impact of the Covid-19 Pandemic on Strategy and Investment in the Logistics Industry	16
2.7. The Cost Effect of the Covid-19 Pandemic in the Logistics Sector	17
2.8. The Effects of the Covid-19 Period on Technology and Digitalization in the Logistics Industry .	19
2.9. Logistics Performance Index and Turkey.....	20
3. RESEARCH METHODOLOGY	23
3.1. Model and Aim.....	23
3.2. Calculating Sample Size.....	23
3.3. Research Hypothesis	24
4. RESULTS AND DISCUSSION	26
4.1. Descriptive Statistics on Research Scale.....	26
4.2. Descriptive Statistics of Research Results	27
4.3. Exploratory Factor Analysis (EFA) Findings.....	42
4.4. Normality Test.....	44
4.5. Descriptive Statistics of the Developed Scale	44
4.6. Testing Research Hypotheses.....	47
4.6.1. Findings of Difference Between the Businesses' Management Status	47
4.6.2. Findings of Difference Between the Logistics Services Provided by the Company	47
4.6.3. Findings of Difference Between the Firm's Number of Employees.....	48
4.6.4. Findings of Difference Between the Businesses' Distribution Placements.....	49
4.6.5. Findings of Difference Between the Businesses' Market Shares.....	50
4.6.6. Findings of Difference Between the Businesses' Annual Turnover	51
4.7. Findings Related to Correlation Analysis.....	52
4.8. Multiple Linear Regression Analysis	53
5. CONCLUSION AND IMPLICATIONS	57
REFERENCES.....	61
APPENDIX A	72
The Conducted Survey (in Turkish).....	72
APPENDIX B.....	77
The Conducted Survey (in English)	77

LIST OF FIGURES

Figure 1 The Distribution of World Industrial Production and Trade.....	3
Figure 2 The Transition Process from Logistics Activities to Supply Chain Activities and Historical Development.....	6
Figure 3 The Advancement in Party Logistics.....	7
Figure 4 Real GDP Growth Distribution of the Global Economy.....	9
Figure 5 The Impact of Covid-19 on the Logistics Industry.....	11
Figure 6 Logistics Market Distribution During and Before the Covid-19 Pandemic.....	11
Figure 7 Index of Global Supply Chain Disruptions.....	12
Figure 8 Percentage Distribution of Exports by Mode of Transport.....	16
Figure 9 Freight Rate Index and Distribution in Global Container Freight.....	18
Figure 10 Research Methodology.....	25
Figure 11 Field of Activity of the Companies.....	28
Figure 12 Year of Activity of the Companies.....	31
Figure 13 Distribution of the Regions to Which Firms Export.....	31
Figure 14 The Status of the Companies.....	32
Figure 15 Logistics Services Provided by the Business.....	32
Figure 16 Market Distribution of the Firms in Turkey.....	33
Figure 17 Carrying out Innovation Activities of the Business.....	34
Figure 18 Carrying out R&D Activities of the Business.....	34
Figure 19 Having a Separate Unit for the Business's Sustainability Activities.....	35
Figure 20 The Turnover Change of the Companies During the Covid-19 Pandemic Period (2020/2021).....	35
Figure 21 Change in Business Costs After the Covid -19 Pandemic.....	36
Figure 22 Problems Faced by the Business During the Covid-19 Pandemic.....	36
Figure 23 Problems in the Business During the Covid-19 Pandemic.....	37
Figure 24 The Change of the Business's Transportation and Supply Chain Strategies at the End of the Covid -19 Pandemic Process.....	37
Figure 25 The Covid-19 Pandemic Process, the Business's Preparations to Upgrade its Technology and Improve its Ability to Work from Home.....	38
Figure 26 Storing the Business's Digital Data During the Covid-19 Pandemic Process.....	38
Figure 27 The Effects of Disruptions in the Covid-19 Process and Insufficient Capacity in Cargo Services on the Inability to Keep up with the Demand and the Decrease in Service Quality.....	39
Figure 28 The Business Makes Technological Investments to Meet the Needs of its Customers During the Covid -19 Pandemic.....	39
Figure 29 The success of the Business at the End of the Covid-19 Pandemic Period.....	40
Figure 30 Purchasing Activity for Logistics Services During the Pandemic Period.....	40
Figure 31 The State of Having a Clear Knowledge of How and What Special Effects the Recovery will have at the end of the Covid-19 Pandemic Process.....	41

LIST OF TABLES

Table 1 Percentage Share of Transportation Types in Import and Export by Years	14
Table 2 Foreign Trade Data by GTS	15
Table 3 Countries with the Highest Logistics Performance	21
Table 4 Current Situation of Turkey According to LPI Calculation Criteria	21
Table 5 Absolute and Relative Frequencies of Survey Questions.....	26
Table 6 Descriptive Statistics on the Logistics Effects of the Pandemic According to the Characteristics of the Companies	28
Table 7 Absolute and Relative Frequencies of Covid-19 Pandemic Impact by Management Status of Businesses	29
Table 8 Number of Employees in Companies.....	30
Table 9 Absolute and Relative Frequencies of Approximate Annual Turnover of the Business.....	33
Table 10 Descriptive Statistics of Scale Dimensions	41
Table 11 EFA Results of Factors.....	43
Table 12 Analysis for Data Normality	44
Table 13 Measurement Items	45
Table 14 ANOVA Test Results	47
Table 15 ANOVA Test Results.....	48
Table 16 Result of Welch and Brown-Forsythe Tests by Different Employee Groups.....	49
Table 17 ANOVA Results.....	50
Table 18 ANOVA Results.....	50
Table 19 ANOVA Results.....	51
Table 20 ANOVA Test Result of the Logistics Effects of Companies with Different Cost Changes After the Pandemic	52
Table 21 Correlation Results	53

1. INTRODUCTION

The Covid-19 epidemic, which was first seen in Wuhan city of the Republic of China in December 2019, has significantly affected health, social, economic and commercial life in the world. Covid-19 pandemic declared 30 January 2020 as international public health day (World Health Organization). In the Covid-19 epidemic, with March 2021 data, approximately 130 million people worldwide became ill and more than 2.8 million deaths occurred (Worldometer, 31 March 2020).

Compared to the serious epidemics such as SARS, MERS and H1N1 seen in the world before, the Covid-19 virus has been seen more active and has had a great impact in the world (Rizou et al., 2020; Chen et al., 2021). According to November 2022 data, a total of 17.005.537 people in Turkey have been caught with Covid-19 and a total of 101.400 people have died from this disease (Worldometer, November 2022). Due to the predictions that the Covid-19 pandemic is not over yet and that the Covid-19 disease may increase in the 2022 winter season, countries continue their preparations this year. Cases of coronavirus are increasing across China (DW, 2022). Countries need to strengthen their preparedness and resilience, as there may be different types of epidemics in the future.

Just like every country, logistics is a crucial sector in the Turkish economy. Among the service sectors in Turkey, the second-largest sector after tourism is logistics (Göze & Altay, 2014). In the Covid-19 epidemic, all types of transportation, along with freight and passenger movements, have been disrupted all over the world. When the road passenger and freight transport data in the first months of 2020 are examined, a great decrease was observed compared to 2019. With the increase in country border gate inspections, long queues have formed at the country entrance and exit, and delays have occurred in transportation. Covid-19 has also shown its effects on maritime transport. Merchant ships operating between Asia and Europe have been cancelled by 50%. Due to the pandemic in China, delays occurred in Chinese ports and affected the whole world trade. The virus has slowed down rail transport as well as other modes of transportation. The Covid-19 pandemic has had negative effects on many sectors of countries such as trade, economy, and logistics. While exports and imports contracted due to the Covid-19 epidemic, many sectors, especially the logistics sector, were adversely affected (Akçacı & Çınaroğlu, 2020).

Pandemic has affected all sectors, especially shipping/logistics activities. It is still unknown how long the effect of the pandemic process on world trade will continue. This impact on production and distribution due to disruptions in supply activities and value chains and barriers to entry and exit between countries has caused problems in all dimensions of businesses. In addition to this, significant changes are also experienced in the logistics sector due to permanent or sudden changes in trade and consumption habits. As countries are not prepared for the COVID-19 pandemic, the impact of the pandemic on countries' supply chains has been a major and expensive learning process (Shipping and Freight Resource, 2020).

Due to the pandemic of the countries, sea, air and freight transport have also been greatly affected by the components. When the impact of the epidemic on the sector was examined, it was observed that road and railway logistics were relatively less affected than air and sea routes. Road transport has been preferred for the transportation of pharmaceuticals, food and other basic production materials and their supply has become easier (MarketsandMarkets, 2022). With the pandemic, there has been a contraction in the volume of maritime transport, there have been some empty voyages on the shipping line, delayed orders and waiting at the ports have occurred. Capacity difficulties arose in air cargo due to travel restrictions. However, it has been observed that it does not create many bottlenecks in the products leaving the factory in land transportation (Wipro, 2020).

In evaluating the impact of the Covid-19 pandemic on logistics activities, it is necessary to consider the economy and trade of countries. In the SME Competitiveness Outlook research by the International Trade Centre held in 2020, serious disruptions occurred in global supply chains and global losses were experienced in production and exports due to curfews in three global supply chain centres (China, EU, and the USA). In addition, approximately 55% of SMEs have seen that Covid-19 strongly affects their business activities (ITC, 2022).

In global transportation, sea and air transport was seen to recover in the third quarter of 2021. The value/weight ratio on trade costs of imports and exports by air has grown considerably due to the Covid-19 pandemic. Trade between the EU27 and its neighbouring countries and the USA and its neighbouring countries continues to grow by road and rail. It has also been observed that the Eurasian trade in road transport has also decreased since the start of the war in Ukraine (ITF, 2022).

It has been stated that the biggest decrease in trade and production volumes since the Second World War was during the Covid-19 pandemic. From the beginning of 2020, there were decreases in world industrial production and product trade, but the sector quickly compensated and product trade continued to grow strongly in 2021 (OECD, 2022). The distribution of industrial production and trade on the world scale is given in Figure 1.

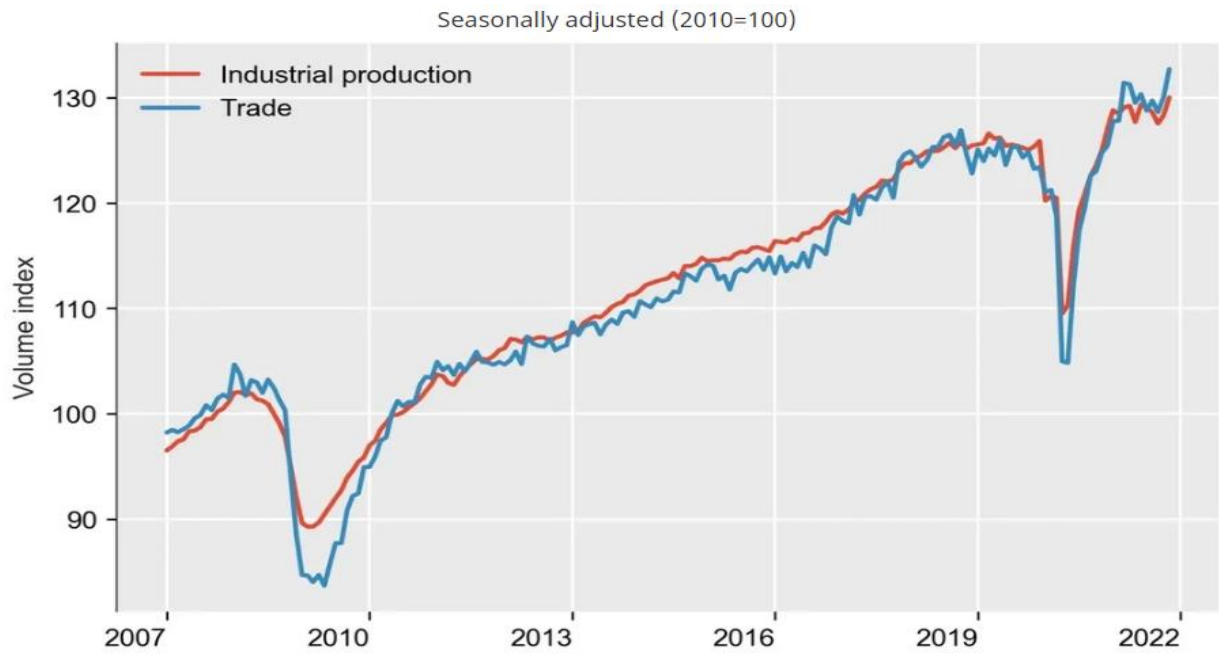


Figure 1 The Distribution of World Industrial Production and Trade

Source: OECD forecast calculation based on CPB World Trade monitor data

When the distribution is examined, it is seen that both production and trade between the years 2019-2021 decreased during the Covid-19 pandemic process.

2. THEROTICAL AND LITERATURE RESEARCH

In the literature section, it provides an overview of logistics and supply chain activities, reveals how the Covid-19 pandemic has affected this sector and some related research.

2.1. Concepts and History of Logistics and Supply Chain Activities

The concept of "Logistics" has emerged in the transportation of raw materials / inputs or consumer goods required for consumption from one place to another without deterioration since ancient times, and the concept of "Supply chain" has survived to the present day with the coordination and arrangement of materials. The concept of logistics is involved in supply chain management and refers to the transportation and storage of products. Logistics management is defined as a subset and only one component of supply chain management (Inbound logistics, 2015). Logistics is about the coordination and movement of goods (Waters, 2003). Supply chain, on the other hand, refers to many aspects such as operations and purchasing that keep a business running smoothly.

Today, businesses cannot provide competitive advantage to other businesses with only production. The importance of service quality and low-cost production of the goods produced, being able to survive in the market, and most importantly, focusing on customer satisfaction, have revealed the importance of logistics and supply chain. The products produced by the manufacturers are mostly to the customers; it is reached through a chain of companies that includes logistics firms and retailers that provide warehousing, distribution and transportation. The entire system is complex (WE, 2022).

It is known that one of the most important functions among logistics activities is storage activities. Considering the costs in the supply chain, it is known that the storage cost is higher than the other costs. When the activities taking place in a warehouse are examined, the activities of storing and handling of materials are seen. Handling activity is the transportation of loads between different points by a human/mechanical (Forklift, trans-platelet, conveyor, etc.) vehicle and includes many commercial activities such as packaging, labeling, classification of the product and so on (Science Lab, 2022)

When the history of logistics activities is examined, it is stated that the first logistics activities were seen in Chinese sources in the 5th century BC (Canitez, 2009: 36). Logistics activities started primarily in operational activities to meet the needs of the army (Food, ammunition, etc.), and logistics activities were used for storage and planning. After the military field, logistics activities were used for the supply and distribution of agricultural products in the 1900s under the name of "Transport". After the 1960s, the popularity of the sector increased under the concept of logistics because of some problems and bottlenecks in the marketing sector. After the 1980s, the logistics activities were defined as the most important indicator of increasing the efficiency of the businesses, and after 2000, the definition of logistics continued to develop by being mentioned together with the supply chain management. After the high successes of logistics activities in the military field, their success in the production sector continued. It has been defined

as a science integrated with many disciplines such as management, engineering, mathematics, marketing, political science, sociology and so on (Stock, 1997: 518). The terms supply chain and logistics management are often confused and sometimes used interchangeably. According to some, these concepts are the same and they say that supply chain management activities are the new logistics today (Michigan State University, 2022).

In general, logistics management is the provision of ordering, material handling, warehousing, inventory control, transportation and packaging services (Marketing91, 2021; Futurelearn, 2022). Logistics activities have been around since the beginning of the 20th century, but supply chain activities started in the 2000s. The concept of supply chain management is a new concept that emerged in the 1980s as the integration between all functions of businesses (For example, between sales and production) (Futurelearn, 2022). The Council of Supply Chain Management Professionals (CSCMP), on the other hand, defines logistics activities as a component of the supply chain that “implements manufacturer-to-consumer, warehousing, shipping, order fulfilment, logistics network design, inventory management, and customer requirements” (CSCMP, 2022).

Supply chain management concept is generally accepted as the coordination, integration and cooperation of organizations throughout the supply chain and covers a wide array from raw materials to final consumption (Stank et al., 2001). SCM is all activities that manage and improve the flow of goods from producer (Strategic suppliers) to consumer (End user) through production and distribution (Houlihan, 1987; Houlihan, 1988). Supply chain management consisted of transportation and logistics activities. SCM is defined as an important strategy for businesses to increase their profitability and remain competitive (Li et al., 2006). Logistics activities are known as very important components of physical distribution supply chain management. Efficient physical distribution activity of the product, which is ready to be used or consumed, from producer to consumer has turned into strategic supply chain management (Lamming, 1996; Christopher, 1996; Christopher et al., 1998). The concept of logistics management in supply chain activities includes transportation, warehousing, inventory management, vendor relations and delivery services. Also known as integrated logistics systems (Cook et al., 2011).

The transition process from logistics activities to supply chain activities and its development over the years are given in Figure 2.

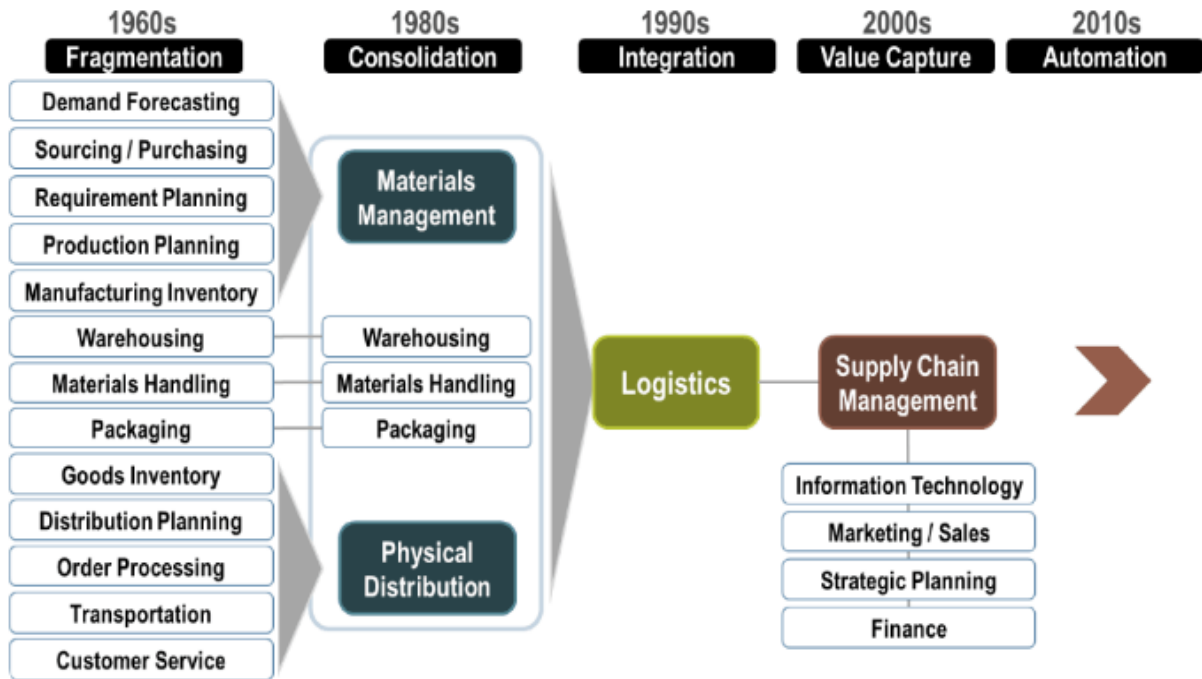


Figure 2 The Transition Process from Logistics Activities to Supply Chain Activities and Historical Development

When the chronological development of the concept of logistics activity is examined, it is defined as the 1950s as the “Transport period”, the 1960s as the “Physical distribution”, and the 1970s as the “Physical Supply, Deregulation and Logistics”. Later, the concept of “Transportation” was defined as “Deregulation, Physical Distribution” in the 1980s, “Business Logistics” in the 1990s and Supply Chain Management as the value chain after 2000. It has been defined as digital supply chain management since 2010 (Ahmed, 2022).

When the academic studies on logistics and supply chain activities during the Covid-19 pandemic process are examined, supply chain activities for medical supplies and health products are seen mostly. However, during the pandemic process, studies on food and agricultural supply chains have been identified (Swanson & Santamaria, 2021).

2.2. Logistics Service Providers (LSPs) Management

LSP can be classified in terms of service diversity (Transport, process chain development, supply, order processing, production and distribution) and functionality, coordination, strategic benefits and use of logistics investment goods (Çetindaş & Çelik, 2017). When the service diversity is considered, the businesses that provide services are called “Party (Party) Logistics-PL” and are given in Figure 3 (Kendrew Distribution, 2019).

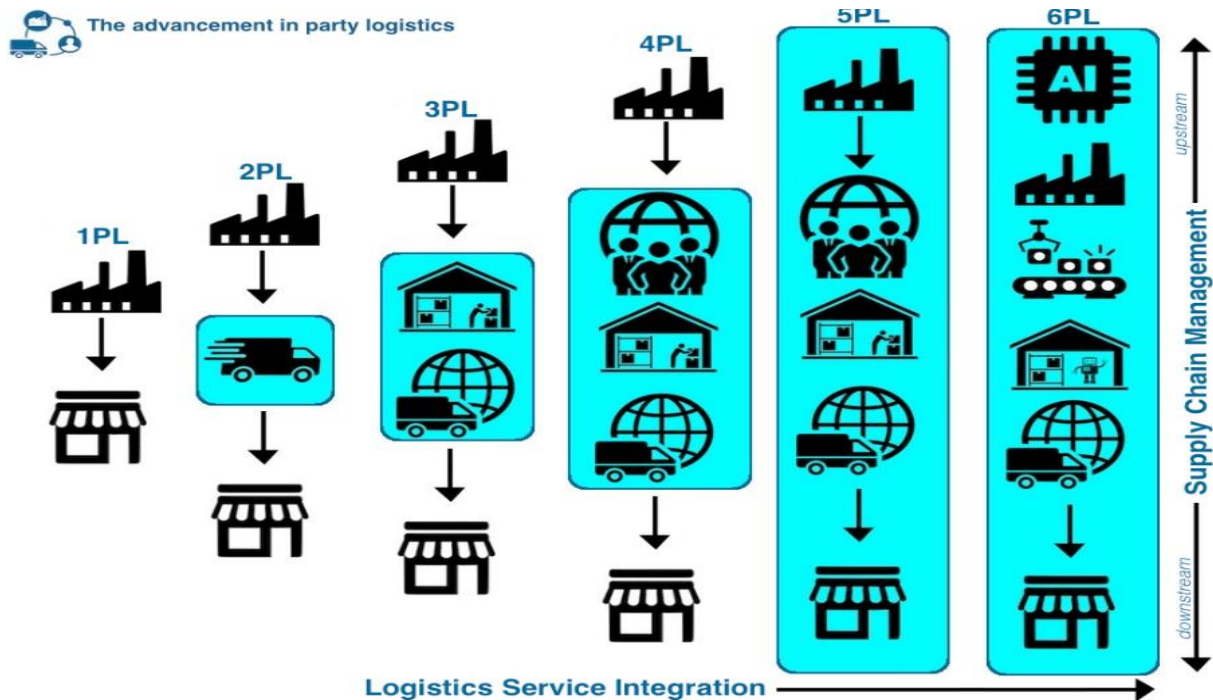


Figure 3 The Advancement in Party Logistics

When the layers related to logistics systems are examined, the first party logistics business (1PL) is the party that receives logistics service, a manufacturing business that delivers to its customers or businesses that receive cargo from a supplier and send their own cargo like a retailer. He does everything himself, from production to customer delivery (Erkan, 2014; Gruchmann, 2019).

Companies providing 2PL services are direct customers of businesses providing 1PL services. These firms are linked to a particular part of a transport chain (Truck fleet, haulage business, rail operator, etc.) and companies that own warehouse locations and warehouses. They are businesses that have assets and provide traditional transportation and warehousing services (Hompel & Heidenblut, 2006; Gruchmann, 2019).

Businesses that provide 3PL services are also known as intermediary companies. These are companies that give partial or total material management or product distribution to a different business. It can use more than one 2PL companies in its organizations, but it uses its own information system infrastructure. In summary, they are companies engaged in shipping, inventory management and packaging and labelling (Wolf, 2010).

The companies that provide 4PL services are the companies that manage the entire logistics process, regardless of which carrier or warehouse is used. Logistics companies providing 4PL services have more scope to manage the entire supply chain and operate as a single interface between at least two logistics

service providers. Although these companies provide 3PL services, they are single point of contact companies providing sourcing, strategy, project management and analytical services (Borusan, 2022).

Companies that provide 5PL services extend their services to e-business services such as Amazon. It has control systems that manage inventory levels in extended networks spanning multiple countries. However, these businesses use supply chain management in all their activities and have integrated logistics systems (Baumgarten et al., 2004; Warehouse Everywhere, 2022).

Businesses providing 6PL services are fully integrated and partially automated, monitored and managed by artificial intelligence (AI) in their processes. Through an integrated artificial intelligence system in supply chain activities, it can monitor the customer's trends, order patterns, and predict the entire supply chain and provide proactive information to the business. It can also detect abnormal data by controlling the production of goods, it can be used in driverless vehicles. Today, it is seen that it is used for product delivery with unmanned aerial vehicles (Know your project business, 2022; Ak logistic and supply chain, 2022).

2.3. The Effect of the World Economy and the Pandemic in the Covid-19 Pandemic Process

The Covid-19 pandemic has affected global businesses economically/sociologically, and the pandemic has created security vulnerabilities in global supply chain activities. As a result of a survey conducted by Fortune (2020), it was stated that 94% of 1000 businesses experienced logistics and supply chain problems due to the pandemic. During the pandemic period, some lessons have been learned in the industry, and it has been determined that flexibility and robustness in the supply chain are important in the shrinking economy (Currie et al., 2020). Despite the end of pandemic bans in all countries, it is observed that the ways of living, working, doing business and doing business are gradually changing. It is very important that the commercial activities related to the distribution of products related to transportation networks and services operate efficiently without disruption, and that the destructive effect of the Covid-19 disease in question is reduced on the economies of the countries. It was observed that the global economy shrank by 3.4% (OECD, March 2021) during the 2020 pandemic period, and working hours decreased by 8.8% compared to the previous year (ILO Monitor, January 25, 2021). The economic growth seen in countries such as the USA, China and India in 2021 turned out to be well above the economic losses in 2020. According to the SME Competitiveness report, which has the three largest economies, it is stated that the European Union, USA and China constitute a large part of the world's supply chain imports (63%) and exports (64%). According to the report, the global outage in production centres reaches approximately \$126 billion in 2020 (ITC, 2022).

In the study of Akçacı and Çınaroğlu (2020), the economic impact of the pandemic, which was effective in the world in 2020, on the countries of the world was determined, and for this purpose, an analysis of

the change in the number of passengers and freight traffic in air traffic between the years 2018-2020 was made. With this research, it has been determined how the pandemic period affects the logistics industry.

Although the operating costs of the container fleet in maritime transportation have increased during the Covid-19 pandemic, high profit margins have been achieved beyond covering costs with the increase in freight rates. In the third quarter of 2021, the profit margin increased from 8.5% to over 56% (Statista, 2022). The distribution of global real GDP ratios calculated by the OECD is given in Figure 4.

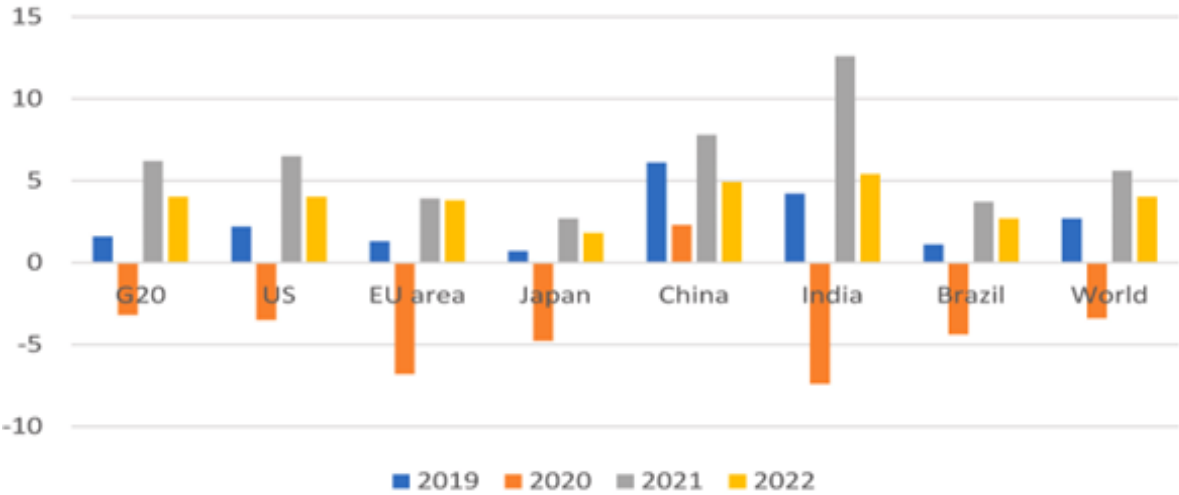


Figure 4 Real GDP Growth Distribution of the Global Economy

Source: OECD (Mart 2021).

Due to the Covid-19 epidemic, national and international economies have been affected and its costs have changed economically/socially (Fernandes, 2020; McKibbin&Fernando, 2020). It has been stated that to withstand the Covid-19 pandemic shocks, it may search in different geographical locations and region-specific, and that pier and nearby port opportunities may emerge and affect developing countries (OECD, 2020b). Global multinational companies, on the other hand, have begun to acquire some companies for economic reasons, improve their financial situation and open to new markets by re-creating the economy (Borga et al, 2020).

2.4. Impact of Covid-19 Pandemic on Logistics and Supply Chain

The logistics sector has the most important place in the social and economic development of every country. It requires effective monitoring of all commercial activities of companies from production to delivery to the customer. The Covid-19 pandemic, which started in December 2019 and made its impact felt all over the world, also seriously affected the global supply chain.

Most of the logistics and supply chain activities in the global world (86%) were significantly affected by the Covid-19 pandemic. Many supply chains worldwide have been severely affected by the Covid-19

pandemic (Van Hoek, 2020). There has been a change in the consumption behaviour of basic food, hygienic and cleaning materials due to the concerns of consumers not being in stock (Li et al., (2021). In parallel with the deterioration of the supply and demand balance, the absence or lack of the product and the decrease in the number of employees due to the lockdown measures of the governments, the supplier deliveries could not be met and demand forecasts could not be made due to the closure of factories (Spieske&Birkel, 2021).

When the effects of the COVID-19 pandemic on logistics and supply chain were investigated, studies on resilience strategies, resilience, the role of technology and the sustainability of the supply chain (Shi et al., 2020; Chowdhury et al., 2021; Sajjad, 2021) were seen.

Mishra et al. (2022) presented future research avenues at the intersection between firms' supply chain flexibility and dynamic talent outlook. The study found that the Covid-19 pandemic affected contextual variables such as firm size, industry type, leadership style, and degree of external uncertainty. Further, more descriptive studies are needed to understand the impact on organizations' ability to maintain operational excellence and improve supply chain resilience.

A survey of more than 200 production managers in the USA was conducted by Deloitte and the Manufacturers Association to investigate how disruptions in production affect the supply chain. According to the results of the survey, "Shipping delays" had the highest effect with 59%, and it was followed by; "Part shortages" (56%), "Transportation delays", "Talent shortage" (53%) and "Restricted supplier network" 50% followed (Deloitte, 2022).

Baral et al. (2021) investigated how sustainability should be increased in the supply chain of SME companies. Research data were obtained from 278 companies through questionnaires during the Covid-19 pandemic. Structural equation modelling method was used as the research method. The dimensions of the research are uncertainty, supply chain cooperation activities, supply chain positioning, supply chain management and feasibility. It has also been determined that the main way for SMEs to do business in the long run is to transform themselves.

Many operations in the transportation and logistics sector were disrupted during the Covid-19 pandemic. In 2020, a survey was conducted by Martin Placek at the Statista institution on the impact of Covid-19 on the logistics industry. According to the survey results, approximately 20% of logistics industry professionals stated that interruptions and disruptions in their supply chains occurred in 2020 due to Covid-19. In addition, approximately 11% of the participants stated that their orders were cancelled due to the Covid-19 pandemic. The distribution of the survey questions is given in Figure 5.

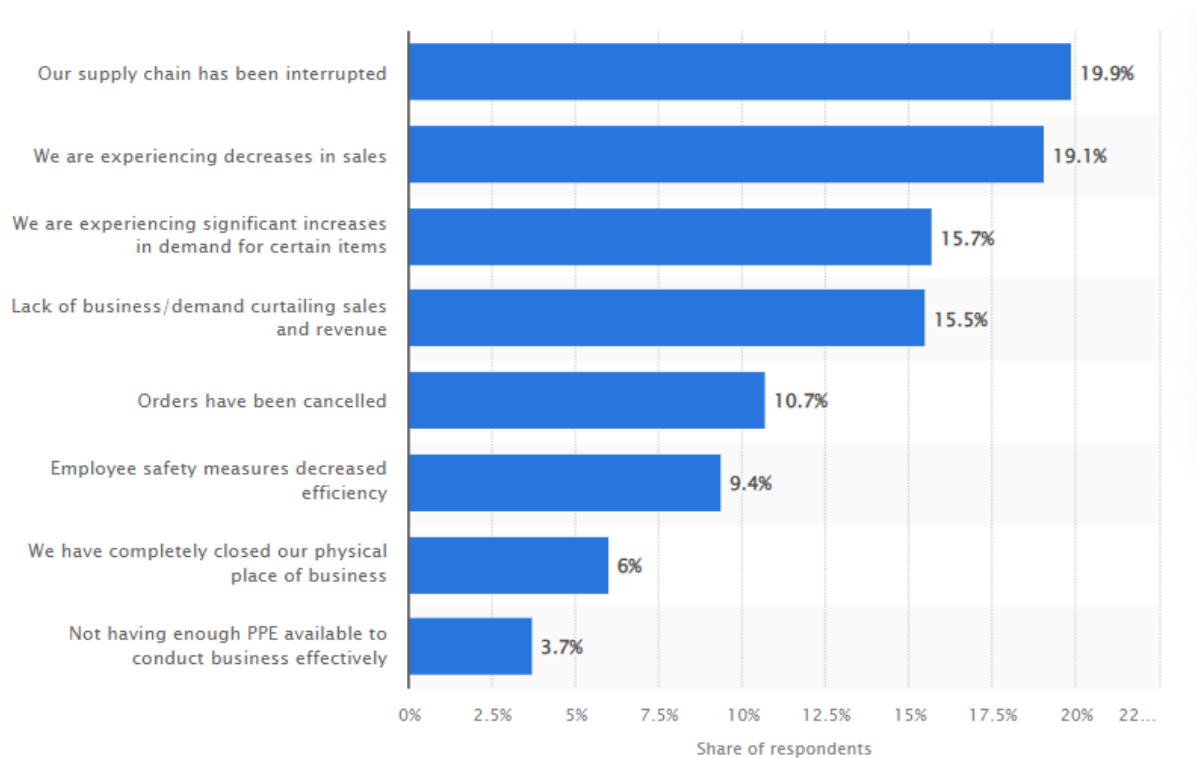


Figure 5 The Impact of Covid-19 on the Logistics Industry

Source: Statista, 2022

About 66% of respondents in the same survey stated that demand for data and predictive analytics will increase after the Covid-19 pandemic compared to pre-pandemic, and 18% stated that expected revenues will be about 15% lower than before the pandemic. When the market size of the global logistics and supply chain industry is analysed after the Covid-19 pandemic, it is estimated that the industry grew by 17.6% on an annual basis from 2020 to 2021, reaching 3.215 billion US dollars from 2.734 billion US dollars. It has been determined that the reason for this increase in the logistics and supply chain sector is the supply of basic goods, the increasing demand and distribution of personal protective materials (MarketsandMarkets, 2022). The distribution of the logistics and supply chain market before and after Covid-10 is given in Figure 6.

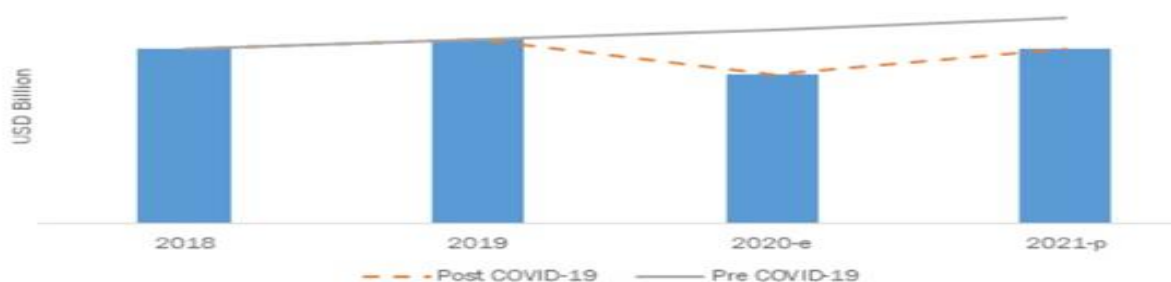


Figure 6 Logistics Market Distribution During and Before the Covid-19 Pandemic

With the COVID-19 pandemic, disruptions have occurred in the supply chain and the supply-demand balance has deteriorated. It also adversely affected the finances and operations of the business (Karmaker et al., 2020; Bui et al., 2021). However, it has been determined that the Covid-19 pandemic period has affected the global competitiveness of businesses and reduced the impact of the pandemic on supply chain management (Joshi and Sharma, 2018).

A survey was conducted with more than 300 shipping companies worldwide by shipping and freight resource to measure the impact of the Covid-19 pandemic on global logistics and supply chain. Survey respondents are C-level director/top management, middle management and carriers, logistics providers, freight forwarders/NVOs, consultants, shippers/BCOs (95.7%) and other industry professionals (4.3%). In the research, some key indicators that will guide the future course of global supply chains have been revealed. The most important result found because of the research was that the Covid-19 process affected the supply chain of the companies (9.2%) and they were willing to change their strategies (42.2%). In addition, 67.6% of the participants stated that they would invest in technology, and it was predicted that the demand for technology solutions would increase (Shipping and Freight Resource, 2020).

The impact on global supply chains during the Covid-19 pandemic has varied from country to country. According to the IMF's index of global supply chain disruptions (100=Most disrupted) data, the distribution based on the difference between different supply delivery times of different production outputs is given in Figure 7 (WE, 2022).

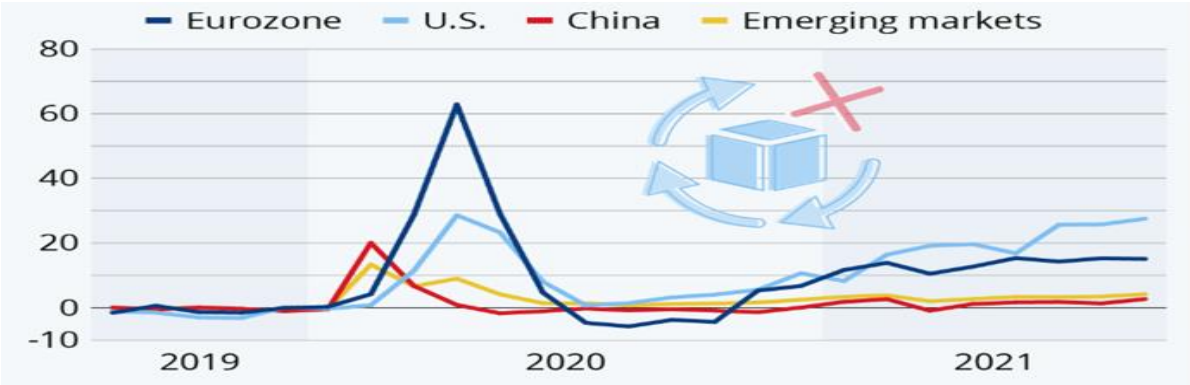


Figure 7 Index of Global Supply Chain Disruptions

Source: IMF

Azevoda's study (2020) revealed the effects of the Covid-19 pandemic on global supply chains. The research also focused on a new type of operational performance in minimizing the possible risks of post-Covid-19 companies and revealed that the greater the length of the supply chain, the more difficult it is for the business to adapt after the pandemic.

In their study, Gigi and Swetha (2020) investigated the reasons that affect and interrupt the logistics flow during the pandemic process of the logistics industry. In addition, it is aimed to know the factors affecting the sector during the pandemic period and to determine the main reason for the struggle in the timely delivery of various products. In this descriptive study, samples were collected from 90 participants. The research findings were analysed using tools such as frequency analysis, mean analysis, independent t-test, and ANOVA analysis. As a result of the research, it has been determined that the biggest impact factors affecting logistics flow are lack of workforce, lack of security measures and shipping difficulties.

Frederico et al. (2021) investigated the effect of strategic sourcing activities of companies on supply during the Covid-19 pandemic process, with the help of data obtained through surveys. As a result of the research, it has been determined that the strategic resource use of the companies in the Covid-19 pandemic has a positive effect on the supply chain.

2.5. Export and Import in Logistics Sector and Supply Chain Activities in the Covid-19 Pandemic Process

In the pandemic period in Turkey, as in many other sectors, the logistics sector has also been greatly affected. It has been observed that SMEs working primarily with China have lost more blood, especially due to the origin of the virus in China and the purchase of products/services from many suppliers based in China. In the case of SMEs with suppliers working directly with China, the business volume was more affected than SMEs working with suppliers from other countries or domestically. For this reason, they lost more blood than other SMEs on issues such as customer experience/demands and stock costs, and naturally, more problems were encountered in transfer and transportation issues. There were also various waits during the transition process from the border gates. Apart from road transport, maritime and air transport were also among the most affected. With the prolongation of the pandemic process, it has been observed that businesses remain weak in performance criteria such as administrative agility, durability and sustainability, and not only small and medium-sized businesses, but even very large companies are affected by the pandemic process. Studies show that approximately 94% of Fortune 1000 companies are affected by factors originating from Covid-19 (Butt, 2021).

All types of air, rail, road, and sea transportation are used for foreign trade activities in Turkey. Turkey's geographical and historical location provides an advantage in the transportation sector. For companies, the location of storage and distribution bases is an important strategic investment for businesses to help reach their markets to wider audiences. Turkey has been increasing its investments in transportation and communication in recent years. The investments made are aimed at establishing an international integrated transportation network, improving the maritime, railway, airway, road infrastructures, and gaining an integrated structure (Güler, 2020).

More than 80% of world trade is carried by sea, and this rate is higher in developed countries (Unctad, 2021). During the Covid-19 pandemic, the supply chain was adversely affected due to any delay or

interruption in maritime transport. Consumers have become distrustful of products coming from China and far east countries, where the pandemic started. Due to the decrease in the number of inbound cargoes and containers, there was a problem of finding empty containers in exports, and due to the loads accumulated on the export ships, it caused problems in the transportation of the goods to their addresses (Unctad Report, 2022).

When the data from 2010 to the third quarter of 2020 based on value in Turkey's international transportation activities are analyzed, it has been observed that the first three months of 2020 were affected by Covid-19. Percentage shares of transportation types in imports and exports by years are given in Table 1.

Table 1 Percentage Share of Transportation Types in Import and Export by Years

Year	Highway		Airline		Seaway		Railway	
	Import	Export	Import	Export	Import	Export	Import	Export
2010	26.75	40.88	9.54	6.84	62.16	51.41	1.55	0.88
2011	21.97	37.60	10.62	6.42	65.85	55.05	1.57	0.93
2012	20.26	33.35	12.23	14.40	66.31	51.57	1.21	0.67
2013	18.69	35.66	15.21	8.61	65.28	55.10	0.83	0.64
2014	18.23	35.29	12.07	9.01	69.11	55.11	0.59	0.59
2015	19.09	32.70	11.11	12.10	69.14	54.64	0.65	0.56
2016	19.16	31.62	12.83	12.54	67.22	55.39	0.80	0.45
2017	18.01	29.59	16.33	10.98	65.10	58.99	0.56	0.44
2018	17.88	28.00	14.40	8.25	67.09	63.31	0.62	0.44
2019	20.56	30.36	16.17	8.28	62.47	40.82	0.80	0.54
2020/3	19.60	31.79	21.22	7.55	58.10	59.86	1.07	0.80

Source: Prepared by utilizing TUIK data

According to Table 1, it is seen that maritime transport has the largest share in exports in the last 10 years. In maritime transport, imports were between 60% and 70% on value basis from 2010 to 2019, and over 60% of imports were realized in the first three periods of 2020. It has been observed that there was a regular increase in export values in maritime transport until 2018, but this increase ended in 2019. In the first three periods of 2020, the export rate was 59.86% on value basis.

Among the transportation types, road transportation ranks second in exports based on value. Road transport shows a decreasing trend in imports and exports from 2010 to 2018. In 2019 and 2020, imports reached 20% and exports 31%.

Air transport is in third place in terms of value among the transport types. While it had a share of between 10% and 16% in imports from 2010 to 2019, it increased significantly in 2020 and reached 21%. On the other hand, a downward trend is observed in exports in the last five years. Among the transportation types, railway transportation has the least share in exports based on value. Rail transport, which has lost its popularity in recent years as compared to the past, has again reached important levels with Covid-19.

Due to the Covid-19 pandemic, there has been a contraction in the world economies. It has been observed that the economy in Turkey has started to normalize only as of June 2020. According to the March 2021 bulletin of the Ministry of Commerce, Turkey's exports increased by 42.18% to 18 billion 985 million dollars and imports increased by 25.80% to 23 billion 679 million dollars during the pandemic period. Data on March 2021 Foreign Trade Statistics were compiled from the administrative records of the Ministry, and data for other periods were compiled from official foreign trade data prepared by the Ministry of Commerce and TURKSTAT. In Table 2, Foreign Trade Statistics for October and their changes compared to January of the previous year are given by million \$.

Table 2 Foreign Trade Data by GTS

Foreign Trade	Export	Import	Foreign Trade Volume	Foreign Trade Balance	Import/Export Coverage Ratio (%)	
October	2021	20.714	22.223	42.937	-1.509	93.2
	2022	21.298	29.303	50.601	-8.006	72.7
	Change	2.8	31.9	17.9	430.4	
January-October	2021	181.526	215.459	396.985	-33.933	84.3
	2022	209.450	300.553	510.003	-91.102	69.7
	Change	15.4	39.5	28.5	168.5	

Source: T.C. Ministry of Commerce October 2022 Bulletin

According to Turkey's October 2022 data, exports increased by 2.8% to 21,298 million dollars, and imports increased by 31.9% to 29,303 million dollars. In the January-October period of 2022, exports increased by 15.4% to 209 billion 450 million dollars, and imports increased by 39.5% to 300 billion 553 million dollars.

When the statistics on Turkey's logistics activities (Export data according to modes of transport) are examined, there has been maritime transport in Turkey in August 2020. Sea transportation with 7 billion 212 million dollars, land transportation with 4 billion 84 billion dollars and air transportation with 963 million dollars were the top exports. According to the import data, maritime transportation (5 billion 281 million \$) and air transportation (3 billion 123 million \$) followed by land transportation with 8 billion 982 million \$. The distribution of exports by years according to the modes of transportation in the sector is given in Figure 8 (Muhasebe News, 2020).

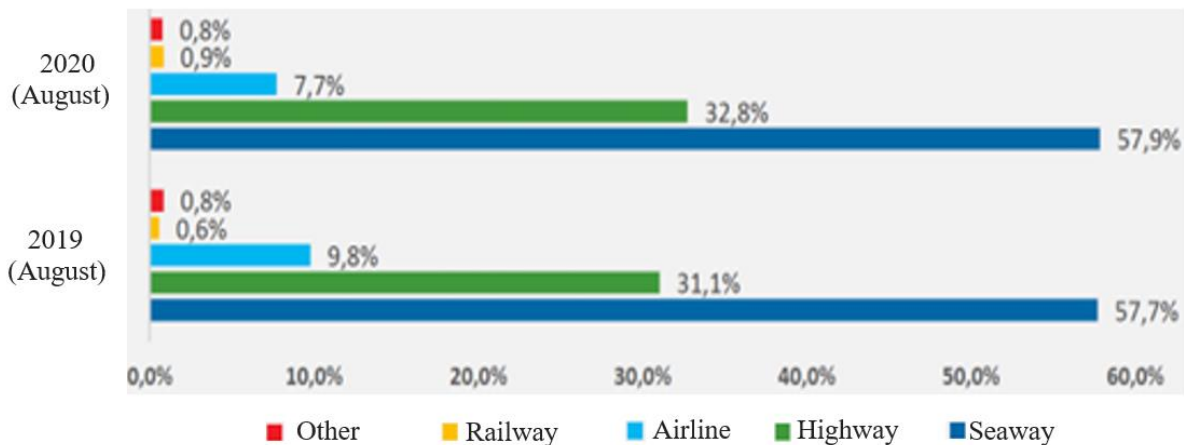


Figure 8 Percentage Distribution of Exports by Mode of Transport

When Turkey's export distribution in the Covid-19 pandemic period is examined, a decrease in the number of exports in different logistics transportation has been observed.

2.6. The Impact of the Covid-19 Pandemic on Strategy and Investment in the Logistics Industry

In terms of the sustainability logistics and transportation sector, the Covid-19 pandemic is an opportunity for companies' short, medium, and long-term strategies and improvement (Desai, 2020). The suggested solutions for evaluating fleet strategies are technological innovation, strength of cooperation, intergovernmental cooperation, public and private sector strategic, improvement-oriented strategies, methods, and policies, and designing a flexible transportation system (Perkumiene et al., 2021).

The Covid-19 pandemic, supply and demand imbalances in production, the instability of the market and the change in consumption behaviour patterns have caused a decrease in investment in the logistics sector (Perkumiene et al., 2021). Measures have emerged to reduce the impact of Covid-19 under the headings of managing supply demand by using cognitive supply chains for the Covid-19 response, meeting demands, creating new offers and ensuring security for the organization (Wipro, 2020).

Various strategic changes are also planned in the functioning of the supply chain. According to the responses McKinsey received from senior supply chain managers from different geographies and sectors, it has been revealed that 93% of companies have started studies to make their supply chains much more flexible, agile, and durable (Mckinsey, 2020). With the impact of Covid-19 (Zhu et al, 2020), businesses began to plan their resilient supply chains and strategic measures were planned to strengthen their resilience and good risk management (Magableh, 2021). Much of this strategic planning is related to dual sourcing and diversification (Kraljic, 1983; Zhu, 2020; Magableh, 2021), vertical integration of supply chains (Zhu, 2020; Hayes, 2021), distribution of production capacity (Zhu et al, 2020), importance of supply chain visibility (Magableh, 2021), localization of supply chains (Ivanov, 2020; Magableh, 2021),

flexibility in supply chains (Zhu et al., 2020; Keita et al., 2021), investment in online distribution channels (Wiengarten, 2020; Zhu et al., 2020), digital transformation of supply networks (Zhu et al., 2020; Magableh, 2021; Delke, 2021), government policies and assistance (Peters et al., 2021), and coordination measures (Finkenstadt; 2021; Peters et al., 2021).

Businesses need knowledge, skills, and competencies to implement strategic changes. For these requirements, businesses; innovation and resource utilization (Polanyi, 1966), network structure (Van Hoek, 2020), automation (Whittemore & Knafel, 2005), supplier relationship management (Boyatzis, 1982), results orientation (Li, et al., 2021), effective marketing (Chowdhury et al., 2021)), technical skills (Golan et al., 2020), effective appearance (Spieske & Birkel, 2021), organizational insight and management (Snyder, 2019). In addition, to increase supply chain flexibility, personnel should be trained in these knowledge, skills, and competencies. Only in this way can the impact of the Covid-19 pandemic on firms be strategically resilient to supply chains (Kiers et al., 2022). In the study of Alok et al., the impact of the COVID-19 outbreak on global supply chains was measured and the supply chain challenges faced by manufacturing businesses due to the pandemic were investigated. As a result of the study in which the Gray-Dematel method was applied, they suggested strategies to the companies that the shortage of labor and material was a problem.

2.7. The Cost Effect of the Covid-19 Pandemic in the Logistics Sector

The Covid-19 appears to affect global supply chains, and these effects include supply (Magableh, 2021) and demand shocks (DNB, 2020), Bullwhip effect (Zhu et al., 2020; Magableh, 2021), formation of a durable supply chain, logistical requirements, and costs. detected (Zhu et al., 2020).

It has been determined that the Covid-19 pandemic has increased the costs of logistics processes. Before the Covid-19 pandemic, transporting a 40-foot sea container in logistics service from China (The largest port Shanghai) to Europe (The largest port Rotterdam) cost about \$ 1,659, in the process of Covid-19 (Dreary, 2022) the same goods were transported increased to \$6,731. This figure is above the 10-year average (\$4,039). It has been observed that the transportation cost brought by the pandemic to the sector has increased approximately four times.

With this increase in shipping costs, goods with low added value (refrigerator, etc.) are penalized and even the transportation of goods with high added value is prohibited due to the high increase in the costs of sea transportation. In addition, while container prices were \$3,000 in the summer of 2020, they reached \$20,000 in 2022 (iBanFirst, 2021).

Global logistics companies UPS and FedEx increased their logistics costs by 5.9% in 2021 and the transportation cost increased 10 times higher than before the Covid-19 pandemic, breaking a record (Alibaba, 2022).

In June 2022, Deloitte and the Manufacturers Association investigated the impact of production cuts on the supply chain. It measured the reaction of the producers to the production cuts through a survey and took the last 18 months into account (Deloitte, 2022). The research consists of participants from more than 200 companies and production managers in the USA. In the study, it has been determined that it is not sufficient to work with the lowest cost and highest efficiency in the global supply chains of the companies. According to the participants, it was seen that shipping delays, difficulty in obtaining the product part, lack of human resources and heavy congestion in the ports had a significant impact, and transportation costs in production increased by over 77% in August 2022 compared to January 2021. In addition, the participants stated that they experienced a negative impact of up to 13% on their profits. It has been determined that the increase in transportation costs are increased fuel costs, labour costs and logistical difficulties.

The freight rate index in global container shipping from January 2019 to October 2022 in maritime transport is given in Figure 9 in dollar terms (Statista, 2022).

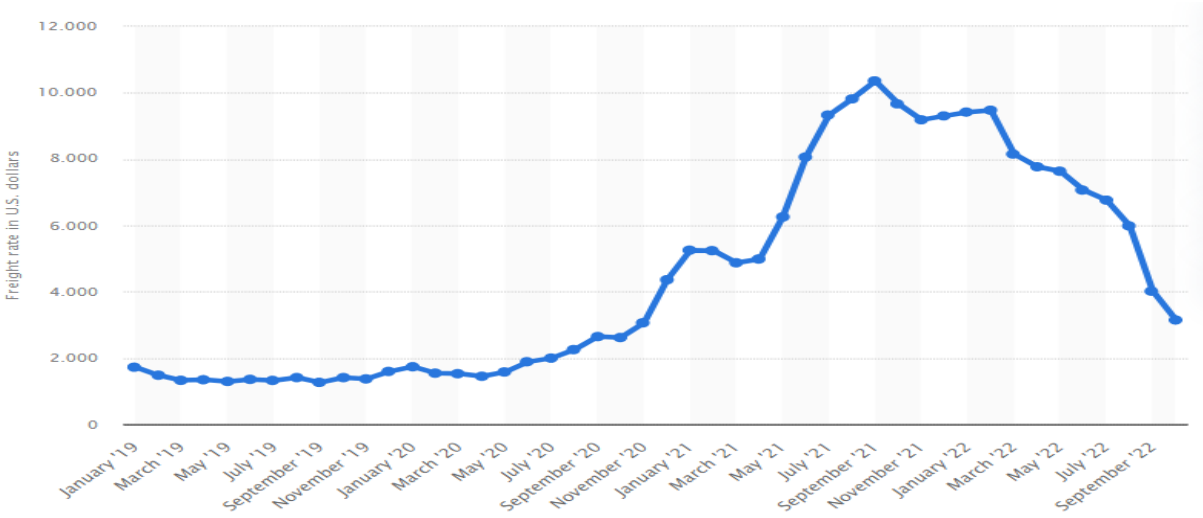


Figure 9 Freight Rate Index and Distribution in Global Container Freight

Source: Statista, 2022

Freight rates increased significantly between January 2019 and September 2022 in container shipping by sea. In container transportation, which has a complex and intercontinental transportation, it was determined that the freight index increased at a high rate of approximately 10,400 US dollars in 2021, and the global freight rate index was realized as 3,100 US dollars in September 2022 (Statista, 2022).

Nguyen research (2021) investigated the impact of the Covid-19 process on logistics companies in Vietnam. The Malmquist Efficiency Index was used as a measurement tool and the future business situations of the companies were estimated in the 2021-2024 period. Suggestions have been made on which businesses should partner to implement commercial partnerships that will help the sustainable development of logistics businesses in Vietnam. According to the results of the research, it was seen that

the partnership would be appropriate for the companies numbered 7 and 10. According to this result, partnership can use the load in the opposite direction and create better competitiveness for businesses by reducing logistics costs.

Tsai et al. (2021), how businesses are affected by the Covid-19 period and its costs are investigated. For this purpose, they evaluated the outsourcing of companies in supply and logistics activities as two stages. In the outsourcing of logistics suppliers, criteria were determined using the Delphi method and a hierarchical structure was created. The other stage was carried out with the analytical hierarchy process (AHP) and the logistics companies most suitable for the hierarchical structure were evaluated. In the research, criteria such as service time of the logistics business, compliance with quality, cost, technical competence were determined as the most important criteria.

Ozkanlısoy (2021) investigated the effects of the pandemic on logistics and supply chain. Literature developed a methodology for screening. She noted that the COVID-19 pandemic has affected many economic sectors, including manufacturing and supply chain and logistics. As a result of the research, it was concluded that the COVID-19 pandemic created a whiplash effect on logistics and supply chain activities, the international trade volume contracted and logistics costs increased. In addition, the determination of new approaches and strategies by companies, the development of the understanding of localization in purchasing activities, it has been determined that the acceleration of digital transformation in companies and the increase of supply chain flexibility are important.

2.8. The Effects of the Covid-19 Period on Technology and Digitalization in the Logistics Industry

The biggest impact of the Covid-19 period on the logistics industry is digitalization. Digital logistics has increased to minimize the negative feedback of consumers about the product and price adjustments. Realization of mobile payment with digital logistics and making sense of visibility and knowledge help make things easier (Ho et al., 2021). Predicting and monitoring customer trends with digital technologies and performing activities in a safe environment have been more effective during the epidemic period (Shihui et al., 2021). It is also possible to identify the most promising trade routes and markets.

Since consumers are at home in the Covid-19 pandemic, many businesses have used the remote working system. Cargo and third-party logistics (3PL) companies have also been observed to adapt to electronic commerce digitally (DHL, 2022). Businesses have had to reduce their investments in physical elements and move them to the internet. People who were not interested in e-commerce until the pandemic started to deal with e-commerce during the pandemic process. These developments also put an additional burden on logistics. During the pandemic process, while the burden of transportation, especially the cargo sector, doubled or tripled in Turkey, problems were experienced due to the inadequacy of logistics infrastructures. Due to the delays in the delivery of their orders, customers preferred to receive the product they would buy online from a branch close to them.

Developing technology and communication systems have caused vital changes in the logistics sector. Thanks to these developments, the sector is maintained in a much better way. Ramazan et al. study (2021), it is explained how the developing systems, machine learning, big data and other factors of the companies that lead the logistics sector can be used, and on the other hand, how logistics 4.0 can be realized with these innovations. In addition, these systems were also evaluated in the context of Covid-19, which is a global epidemic. As a result of the research, Industry 4.0 solutions (robotic systems, automations, artificial intelligence, blockchain) that will be adapted to the logistics sector are expected to lead in the coming years (Çelik, 2020).

Pilikoğlu and Sağlam (2020) examined the innovations that industry 4.0 will bring to logistics together with Covid-19 process. Also, the reasons for the increase in digitalization due to Covid-19 in the business activity flows of companies in the logistics sector were investigated. In the research, online interviews were made with industry experts and managers, qualitative research method was followed in the study. It is mentioned how Industry 4.0 technologies are integrated into logistics processes in the Covid-19 Pandemic.

Keita et al. (2021) investigated the effects of the Covid-19 pandemic on firm performance and regional supply chain of companies manufacturing in ASEAN countries and India. From November 2020 to February 2021, they conducted online surveys from 1,789 companies. As a result of the research, they concluded that the Covid-19 pandemic has restructured the supply chain of companies and that regional companies should accelerate their digital transformation.

2.9. Logistics Performance Index and Turkey

Understanding external disruptions is necessary and important in the continuous and long-term improvement of the performance of SME businesses. Their diverse dynamic collaboration, including technology, will lead to the creation of awareness and valuable knowledge through strategic planning among supply chain stakeholders (Teece, 2021; Sharma et al., 2020).

The World Bank calculates the "Logistics Performance Index (LPI)". LPI is defined as an index that aims to measure the logistics performance of countries and reveal the challenges and opportunities encountered. In the logistics performance index of the countries, a value of "1" is calculated as the lowest performance score and "5" as the highest performance score. Values between two points were divided into four groups. These; "Very good performance" between "3.25 – 5.00"; "Good performance" between "2.75 - 3.23"; The values between "2.48 -2.75" are defined as "Medium performance" and values between "1 - 2.48" are defined as "Poor performance" (WTO, 2019). In the calculation of LPI, "Efficiency status of customs procedures", "Quality and adequacy of logistics service", "Shipment tracking and monitoring", "Quality of logistics infrastructure" and "International transportation" factors were taken into consideration. Turkey's performance ranking according to LPI criteria is given in Table 3.

Table 3 Countries with the Highest Logistics Performance

Countries	Logistic Performance Index	
	Score	Ranking
Germany	4.20	1
Sweden	4.05	2
Belgium	4.04	3
Austria	4.03	4
Japan	4.03	5
Holland	4.02	6
Singapore	4.00	7
Denmark	3.99	8
United Kingdom	3.99	9
Finland	3.97	10

When the logistics performance index of Turkey is analysed in the 2018 country ranking, it is seen that it is in the 47th place among 160 countries, and it is seen that the country with the highest LPI score is Germany, followed by Sweden and Belgium.

The latest statistical data of Turkey's logistics performance index (LPI) has been seen in 2018. According to Turkey's LPI criteria, the values between 2007 and 2018 are given in Table 4.

Table 4 Current Situation of Turkey According to LPI Calculation Criteria

LPI Criteria	2007		2010		2012		2014		2016		2018	
	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score
Efficiency of Customs Procedures	33	3	46	2.82	32	3.16	34	3.23	36	3.18	58	2.71
Logistics Infrastructure Quality	39	2.94	39	3.08	25	3.62	27	3.53	31	3.49	33	3.21
International Transportation	41	3.07	44	3.15	30	3.38	48	3.18	35	3.41	53	3.06
Logistics Service Quality and Competence	30	3.29	37	3.23	26	3.52	22	3.64	36	3.31	51	3.05
Shipment and Tracking	34	3.27	56	3.09	29	3.54	19	3.77	43	3.39	42	3.23
General LPI Ranking and Score	34	3.15	39	3.22	27	3.51	30	3.5	34	3.42	47	3.15

When Turkey's logistics performance index is analysed in terms of criteria according to the country ranking of 2018, it has been observed that the efficiency of customs transactions has decreased when compared since 2007. The reason for the decrease in Turkey's LPI value is defined as the excess of foreign trade documents, increasing costs and wages, and the lack of speed of the country's bureaucracy (Akan, 2021). In the study of Adam and Alarifi (2021), they stated that epidemic crisis affecting the world, such as Covid-19, generally affect small and medium-sized businesses and companies face very different

challenges. They investigated the relational innovation-oriented practices of businesses, their performance, and their recovery from the pandemic process. They presented their research as a model in a theoretical structure. Then, they collected data from 259 randomly selected businesses and conducted a survey. The survey study was applied to business managers in Saudi Arabia. In the structural equation modelling of the research data, SmartPLS3 ready software was used. In the research, businesses using innovation practices are affected by the impact of COVID-19. It has been found that it is less affected and increases business performance.

In the study of Aunyawong et al. (2021), the effect of the Covid-19 pandemic on 250 logistics companies in Thailand was investigated. In addition, the components and performances of the sustainable supply chain have been determined. Structural equation model (SEM) was used as a method. In the study, it was determined that the organizational components of the companies affect the logistics performance and the mediation effect of the transportation applications was partially determined.

In their research conducted in Malaysia and Thailand, Srinok and Zandi (2021) identified the factors that caused the recession and performance of the Covid-19 pandemic in companies. With the SEM method, the relationship of strategic flexibility, opportunity recognition, organizational loose resources, improvisational abilities and proactive marketing elements with firm performance has been revealed. According to the results of the research, strategic flexibility, organizational laxity and proactive marketing elements have a significant and positive effect on firm performance and have a mediating effect on firm performance.

Nguyen (2022) examined the impact of the COVID-19 outbreak on the financial performance of businesses. The sample of the research includes 114 logistics companies operating in the Vietnamese stock market. Wilcoxon signed-row test was used as a method. As a result of the research, the negative effects of Covid-19 on the financial performance of businesses were revealed. He found that the leverage ratio increased, and the profit and productivity of the companies decreased during the pandemic.

3. RESEARCH METHODOLOGY

3.1. Model and Aim

The purpose of this research is to investigate the impact of the Covid-19 pandemic period on companies that provide logistics services or logistics service units and to determine the situations in the pandemic period. It is evaluated that the research will benefit from the investigation of the negative effects of the Covid-19 pandemic on the logistics sector and the positive effects, if any. It is thought that it will be beneficial for businesses to make strategic decisions in terms of minimizing negative situations and their effects. In this thesis study, the problems experienced due to the unpredictable supply and demands of the business logistics activities of the pandemic and the necessity of local and regional alternatives in product supply were revealed. In addition, in this study, decisions/decisions were determined that will enable businesses that experience interruptions and disruptions in their product supply chains due to the pandemic to be more successful in the logistics activities process.

In the research, the data were obtained from the companies through a survey within the framework of the years 2020-2021. With the help of the data obtained, the aims and hypotheses of the research were tested. In the survey, questions were created to investigate the effects of logistics service companies on the Covid-19 pandemic process. These questions were compiled from literature research. Afterwards, a focus meeting was held with logistics experts of some companies, senior managers of logistics service providers and relevant academics. In the light of the data obtained, EFA analysis was performed. IBM SPSS v26 program was used in the analysis. A pilot study was conducted with 40 companies for the reliability and validity of the thesis research survey questions. Then, the created reliable and valid survey questions were sent to the businesses via the google platform. The answers to the questionnaire created as a result of the EFA analysis were obtained from experts, senior managers and participants representing companies providing logistics services.

3.2. Calculating Sample Size

According to annual industry and service statistics, the number of companies defines the number of those active in the sectors. Based on NACE Rev.2 by the Turkish Statistical Institute, the logistics sector is defined as “Transportation and Storage” under group H. Group H includes road transport, rail transport and pipeline transport with subgroup 49, waterway transport with subgroup 50 code, air transport with subgroup 51 code, storage and supporting activities with subgroup 52 code, and subgroup code 53, includes postal and courier activities (Tanyas, 2021).

According to the KOSGEB report, the number of transportation and storage companies in 2020 is 538028 (KOSGEB, 2022). According to the research report of UTIKAD Logistics sector report, it is stated that the number of companies engaged in domestic and international transportation is 525801 in 2021, but the

number of transportation and storage companies in 2021 by TURKSTAT is 531563. (TUIK, 2022). The number of transportation and storage initiatives can be obtained from the Revenue Administration, and some differences can be seen between the results of official institutions. According to the information given by TURKSTAT officials, it is stated that the number of initiatives is due to the use of different criteria and the different sectoral scopes (TUIK, 2022).

In the study, the calculation tool of the Ethics Research Centre was used in calculating the sample size. According to the calculation tool, it seems that it is sufficient to interview 196 companies at 93% confidence level for the 531563 transportation and storage companies indicated by the TUIK statistics. If it is at the 94% confidence level, it is sufficient to interview 267 companies. According to these results, it is seen that the 250 companies from which the data were obtained in the thesis study represent the population. In addition, the automatic calculation tool of the Australian Bureau of Statistics was used to calculate the sample size. Since the number of transportation and storage companies in Turkey in 2021 is 531563, it is seen that the results obtained from 249 companies at 94% confidence level will represent the main population. An online survey prepared via Google survey was used to collect data from participants. The online questionnaire can be prepared free of charge and easily (Bryman & Bell, 2014). The survey created by the Google platform was sent to businesses (Manager, etc.) via an email with a link. Responses were received from the participants between 30 September and 31 November 2022.

3.3. Research Hypothesis

The following hypotheses were set to be tested:

H₁: There are differences in terms of management status according to the activities of the businesses.

H₂: There are differences in the activities of the businesses in terms of the logistics service groups offered by the companies.

H₃: There are differences in terms of number of employees according to the activities of the businesses.

H₄: There are differences in terms of different distribution placements according to the activities of businesses.

H₅: There are differences in terms of market share according to the activities of businesses.

H₆: There are differences in terms of annual turnover according to the activities of businesses.

H₇: There are differences in terms of the change in company costs of businesses after the Covid -19 pandemic.

H₈: There is a positive relationship between strategy&investments and cost, supply chain, SC process management and digitalization&technology in the pandemic process of businesses.

H₉: There is a positive relationship between the costs of businesses in the pandemic process and strategy & investment, supply chain, SC process management and digitalization & technology.

A conceptual model has been created regarding the impact of the pandemic process on the logistics sector. All processes of the thesis research are given in Figure 10 of the conceptual model below.

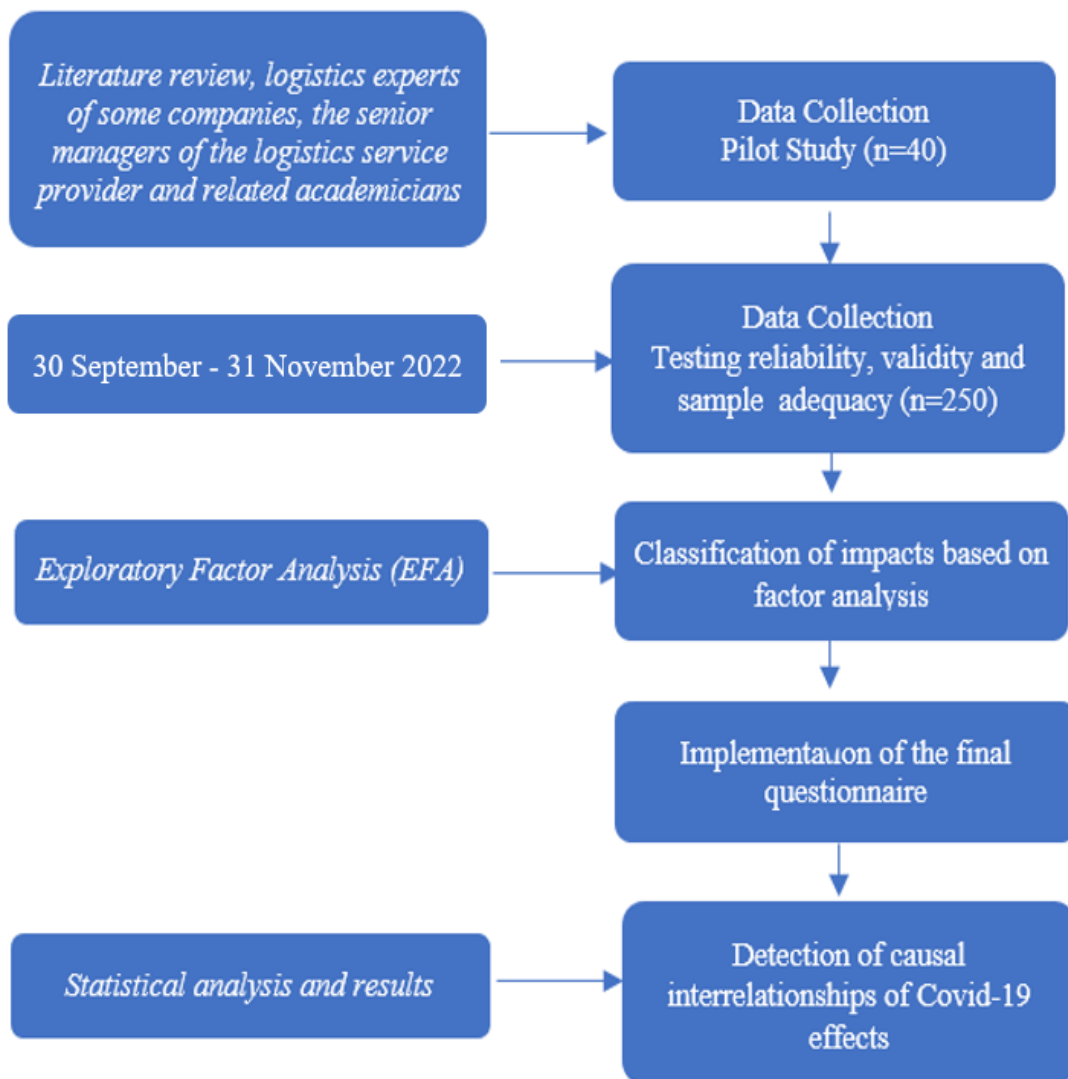


Figure 10 Research Methodology

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics on Research Scale

The scale for the impact of the Covid-19 Pandemic on the logistics sector is measured with 22 items. The scales used in the research are on a 5-point Likert scale ranging from “1=Strongly Disagree” to “5=Strongly Agree”. The absolute (n) and relative (5) frequencies of the responses to the survey questions are given in Table 5.

Table 5 Absolute and Relative Frequencies of Survey Questions

Items	I strongly disagree		Disagree		I partially Agree		Agree		I strongly Agree		Mean ± SD
	n	%	n	%	n	%	n	%	n	%	
Q1 The Covid-19 outbreak has adversely affected our company's strategic resource use.	22	9.0	47	19.2	86	35.1	66	26.9	24	9.8	3.09 ± 1.09
Q2 Covid-19 has adversely affected our company's new investment and growth plans.	38	15.6	73	29.9	55	22.5	54	22.1	24	9.8	2.81 ± 1.13
Q3 The Covid-19 pandemic has directed our company to new markets.	19	7.8	65	26.5	68	27.8	66	26.9	27	11.0	3.07 ± 1.13
Q4 The Covid-19 outbreak has increased our company's logistics costs.	13	5.3	22	9.0	40	16.3	91	37.1	79	32.2	3.82 ± 1.14
Q5 The Covid-19 pandemic process has increased the transportation costs of our company.	18	7.4	22	9.0	43	17.6	85	34.8	76	31.1	3.73 ± 1.20
Q6 The Covid-19 pandemic process has increased our company's storage costs.	19	7.9	29	12.0	55	22.7	78	32.2	61	25.2	3.55 ± 1.21
Q7 The Covid-19 pandemic process has increased our company's transfer costs.	14	5.8	28	11.5	49	20.2	92	37.9	60	24.7	3.64 ± 1.14
Q8 The Covid-19 pandemic process has increased the stock costs of our company.	15	6.1	33	13.4	55	22.4	83	33.7	60	24.4	3.57 ± 1.71
Q9 The Covid-19 pandemic has shifted our company from a holistic supply chain to a fragmented supply chain.	29	11.8	92	37.6	70	28.6	44	18.0	10	4.1	2.64 ± 1.35
Q10 During the Covid-19 pandemic process, our company's distribution structure has been disrupted and has caused delays.	14	5.7	59	24.0	75	30.5	69	28.0	29	11.8	3.16 ± 1.09
Q11 During the Covid-19 pandemic process, our company's lean, flexible and durable structure has been transformed into a complex and layered logistics network structure.	19	7.8	73	30.0	70	28.8	64	26.3	17	7.0	2.95 ± 1.07
Q12 During the Covid-19 pandemic, our company had problems in the continuity of logistics operations and caused customer losses.	31	12.8	62	25.5	84	34.6	52	21.4	14	5.8	2.82 ± 1.09
Q13 The Covid-19 outbreak has reduced our company's commercial activities.	11	21.2	17	32.7	10	19.2	11	21.2	3	5.8	2.58 ± 1.21
Q14 During the Covid-19, our company's service delivery was adversely affected (mode shift, cargo type change, freight consolidation, etc.).	23	9.5	56	23.1	60	24.8	76	31.4	27	11.2	3.11 ± 1.17

Q15	During the Covid-19 pandemic process, our company's resource shortage has led to a global, local and regional search for resources.	16	6.5	49	20.0	69	28.2	80	32.7	31	12.7	3.25 ± 1.11
Q16	The Covid-19 outbreak has led to multiple procurement planning by expanding our supplier portfolio instead of working with a single supplier.	14	5.7	36	14.7	72	29.4	76	31.0	47	19.2	3.43 ± 1.12
Q17	During the covid-19 pandemic process, our company has increased the time to respond to our customers' problems, needs and suggestions.	13	5.3	49	20.1	80	32.8	79	32.4	23	9.4	3.20 ± 1.13
Q18	During the Covid-19 pandemic, it adversely affected the customs and border procedures.	17	7.0	29	11.9	60	24.7	87	35.8	50	20.6	3.51 ± 1.15
Q19	During the Covid-19 pandemic, the problems experienced in our company's shipment and supply chain adversely affected the company's performance.	15	7,9	44	23,2	54	28,4	55	28,9	22	11,6	3.13 ± 1.14
Q20	The Covid-19 pandemic process has increased the speed of our company's digitalization (Automation, assembly /robot systems, artificial intelligence, etc.).	21	8.6	62	25.4	60	24.6	69	28.3	32	13.1	3.12 ± 1.18
Q21	The Covid-19 pandemic process has facilitated the integration of the data used in our company and the acquisition	1	1.9	9	17.3	13	25.0	21	40.4	8	15.4	3,50 ± 1.02
Q22	The Covid-19 pandemic process has increased our company's digital transformation, automation and similar technological investments.	21	8.6	53	21.8	60	24.7	72	29.6	37	15.2	3.20 ± 1.19
Overall Mean and Standard Deviation											3.22 ± 1.17	

According to the logistics service scale data during the pandemic process, the general average was determined to be 3.22 ± 1.17 . In other words, the respondents answered within the range of partially agree. It has been determined that responding in the range of “Partially agree” in each statement of the scale has “Partly the effect” of the pandemic on the logistics sector, and it has more effect in some parts. It has been determined that the Covid-19 pandemic has an impact on logistics, transfer and transportation costs and negatively affects customs and border transactions. In addition, it has been seen that the Covid-19 pandemic has facilitated the digitalization and integration of the data that companies have.

4.2. Descriptive Statistics of Research Results

In this section, there are descriptive statistics and supporting graphics for the demographic characteristics of the companies participating in the survey. Afterwards, predetermined hypotheses were tested. The findings belonging to the fields of activity of the logistics service companies in which the research was conducted are as shown in Figure 11.

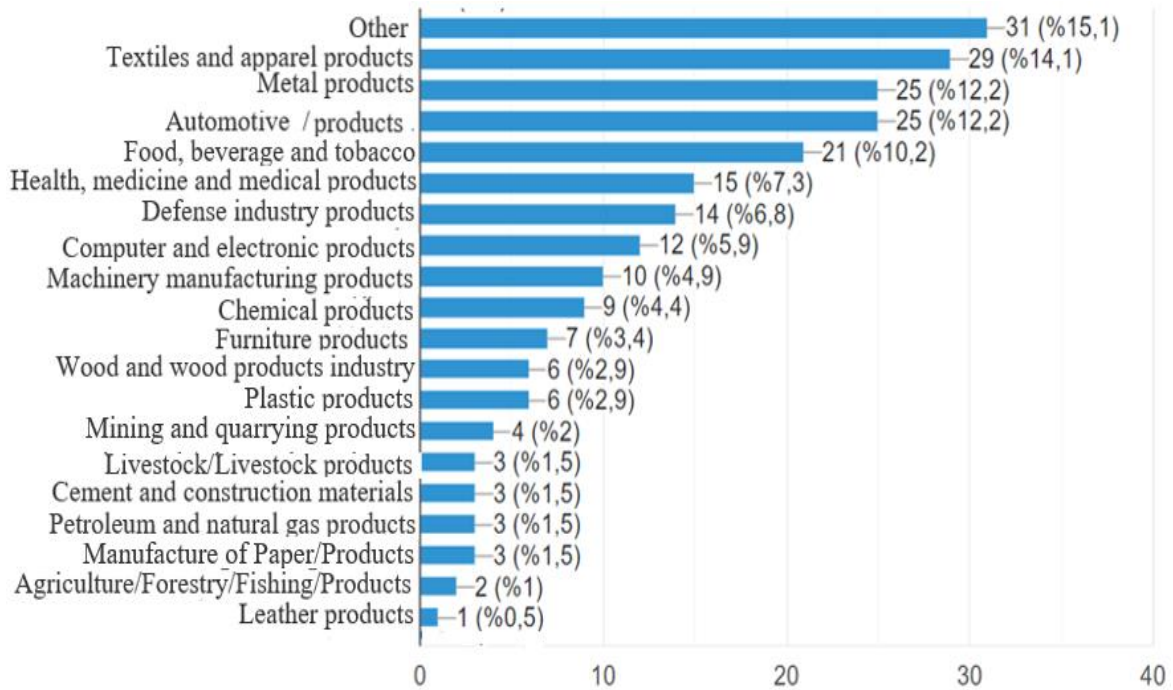


Figure 11 Field of Activity of the Companies

It is not seen that the highest participation in the research is the textile and ready-made clothing sector. The rate of companies that do not want to provide sector information is 30%. The findings regarding the number of employees of the companies within the scope of the research are given in Table 6. According to Table 6, 23 of the companies within the scope of the research are between 0-9, 33 are between 10-49, 59 are between 50-249, 35 are between 250-499, 25 are between 500-999 and 72 are between 1000 and over. The descriptive statistics of the logistics effects of the pandemic according to the characteristics of the companies in the study are given in Table 6.

Table 6 Descriptive Statistics on the Logistics Effects of the Pandemic According to the Characteristics of the Companies

	Variables	Mean	SD
Company	Multinational	3.40	.64
	National	3.16	.69
	Regional	3.16	.80
	Local	3.20	.88
Number of employees in the firm	1-9	3.03	.98
	10-49	3.32	.55
	50-249	3.38	.66
	250-499	2.96	.86
	500-999	3.15	.73
	1000 +	3.32	.59

Firm's	There are multiple distribution locations in the same/different cities in Turkey.	3.31	.77
	There is only one distribution place in Turkey.	3.16	.74
Approximate annual turnover of the company	It has a distribution place abroad.	3.24	.64
	More than 1 Billion €	3.43	.69
	50 Million – Less than 1 Billion €	3.15	.69
	Less than 10-50 Million €	3.22	.84
	Less than 2-10 Million €	3.20	.70
	Less than € 2 Million	3.29	.64
	I am not knowledgeable about this.	3.25	.79
Market share of the company in Turkey	%10 and below	3.28	.78
	%11 - 29	3.26	.79
	%30- 49	3.11	.85
	%50 - 79	3.36	.69
	80% and above	3.11	.74
	I am not knowledgeable about this.	3.19	.66
	I do not want to share information about this.	3.33	.64

When the effects of the pandemic on the logistics services of the companies were examined, it was seen that the effect level of all variables was at the level of "I partially agree". However, it has been determined that the companies with the highest impact level approximately at the level of "I agree" are international companies, there are companies with 50-249 and 1000+ employees, there are companies with multiple distribution locations and distribution abroad, and the market shares of the companies are high (50-79%). The results regarding the Covid-19 Pandemic Impact according to the management status of the businesses are given in Table 7.

Table 7 Absolute and Relative Frequencies of Covid-19 Pandemic Impact by Management Status of Businesses

		Multinational		National		Regional		Local		Total
		n	%	n	%	n	%	n	%	
No one in the logistics services market has clear information about how and what specific effects the recovery will have at the end of the Covid -19 pandemic process.	Yes	40	16.0	60	24.0	14	5.6	28	11.2	56.8
	No	16	6.4	16	6.4	3	1.2	7	2.8	16.8
	No idea	24	9.6	20	8.0	6	2.4	13	5.2	25.2
	Total	80	32.0	96	38.8	23	9.2	48	20.0	100.0
At the end of the Covid-19 pandemic process, the company has been successful.	Yes	71	28.4	83	33.2	17	6.8	37	14.8	83.2
	No	3	1.2	9	3.6	2	0.8	7	2.8	8.4
	No idea	6	2.4	5	2.0	4	1.6	5	2.0	8.0
	Total	80	32.0	97	38.8	23	9.2	49	20.0	100.0

During the Covid -19 pandemic, the company has made technological investments to meet the needs of its customers.	Yes	59	23.6	56	22.4	8	3.2	20	8.0	57.2
	No	12	4.8	30	12.0	11	4.4	21	8.4	29.6
	No idea	9	3.6	11	4.4	4	1.6	8	3.2	12.8
	Total	80	32.0	97	38.8	23	9.2	49	32.0	100.0
During the Covid-19 pandemic, disruptions and blockages in cargo transportation activities and insufficient capacity in cargo services have led to the inability to keep up with the demand and a decrease in service quality.	Yes	53	21.2	60	24.0	17	6.8	26	10.4	62.4
	No	19	7.6	26	10.4	2	0.8	12	4.8	23.6
	No idea	8	3.2	11	4.4	4	1.6	11	4.4	13.6
	Total	80	32.0	97	39.0	23	9.2	49	19.6	100.0
At the end of the Covid -19 pandemic process, our company has made changes in its supply chains	Yes	51	20.4	44	17.6	11	4.4	20	8.0	50.4
	No	17	6.8	43	17.2	9	3.6	18	7.2	34.8
	No idea	12	4.8	10	4.0	3	1.2	11	4.4	14.5
	Total	80	32.0	97	39.0	23	9.2	49	19.6	100.0

It has been observed that most of the businesses do not have a clear knowledge of how and what specific effects the recovery will have at the end of the Covid -19 pandemic process (56.8%). It has been determined that the disruptions and congestions in cargo transportation activities during the Covid-19 pandemic process, as well as the lack of capacity in cargo services, caused the inability to keep up with the demand and the decrease in service quality (62.4%). However, at the end of the Covid -19 pandemic process, it was observed that most of the companies made changes in their supply chains (50.4) and that the companies were successful at the end of the pandemic (83.2%). The absolute and relative frequencies of the number of employees in the businesses participating in the survey are given in Table 8.

Table 8 Number of Employees in Companies

		n	%	Cumulative %
Valid	1-9	23	9.2	9.2
	10-49	33	13.2	22.4
	50-249	59	23.6	46.0
	250-499	35	14.0	60.0
	500-999	25	10.0	70.0
	1000 +	72	28.8	98.8
	Total	247	98.8	100.0
Missing		3	1.2	
Total		250	100.0	

It has been seen that 28.8% of the businesses participating in the research are businesses with 1000+ employees and 23.6% are businesses with 50-249 employees. It has been seen that 28.8% of the businesses participating in the research are businesses with 1000+ employees and 23.6% are businesses with 50-249 employees. It has been determined that the minimum number of employees participating in the survey covers 9.2% of the companies with 1-9 employees. The results of the years of activity of the surveyed companies are given in Figure 12.

When the regions to which the companies export are investigated, it has been determined that the most exports are made to Europe, North America and the Middle East. According to results, 55 of the companies participating in the research export to Europe, 26 to Europe, North America, Middle East, Africa, Asia, Oceania, Oceania, 14 to Europe, Middle East, 11 to Europe, Asia, and 9 to Asia. The status of the companies participating in the research is given in Figure 14.

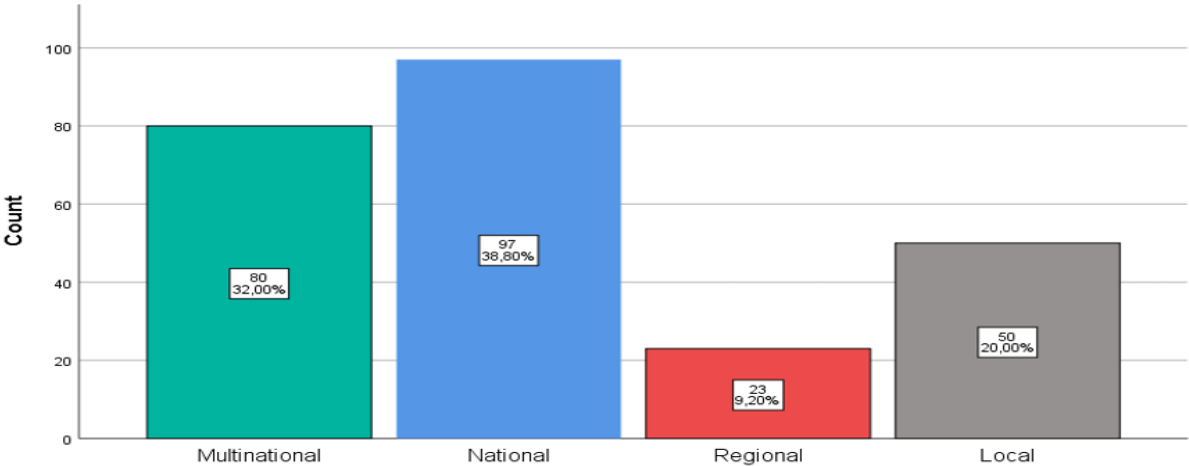


Figure 14 The Status of the Companies

Companies participating in the research consist of local (20%), regional (9.20%), national (38.80%) and international businesses (32 %). The service types of the companies are given in Figure 15.

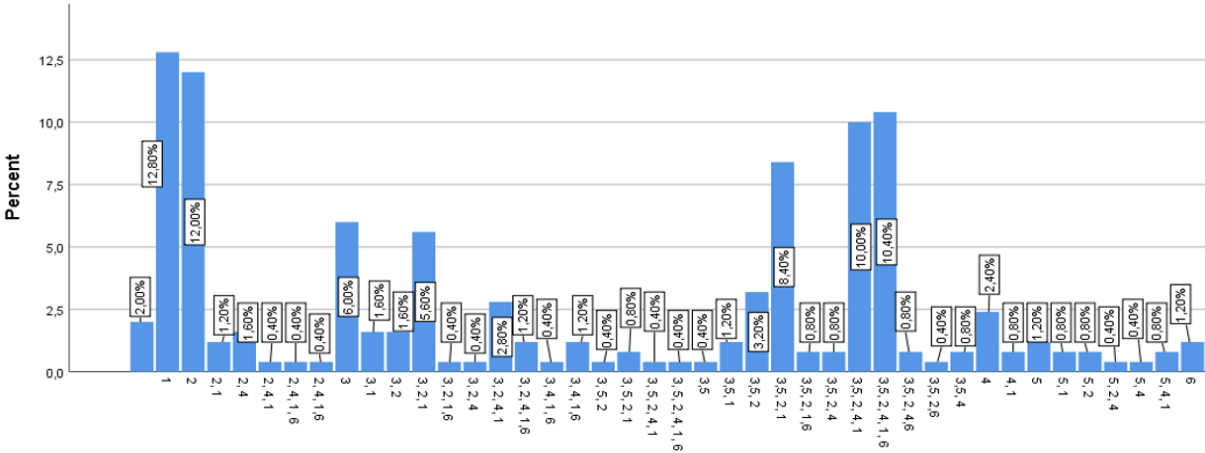


Figure 15 Logistics Services Provided by the Business

¹ Supply Chain Services; ² Distribution-Transportation Services; ³ Storage Services; ⁴ Customs Clearance Services; ⁵ Handling Services; ⁶ Insurance Services

As a service type, the companies provided the most supply chain services (12.8%), followed by distribution and transportation (12%) and all logistics activities (10.4%), respectively.

The approximate annual turnover of the companies is given in Table 9.

Table 9 Absolute and Relative Frequencies of Approximate Annual Turnover of the Business

	n	%	Cumulative %
Valid	3	1.2	1.2
More than 1 Billion €	25	10.0	11.2
50 Million – Less than 1 Billion €	52	20.8	32.0
Less than 10-50 Million €	28	11.2	43.2
Less than 2-10 Million €	85	34.0	77.2
Less than € 2 Million	19	7.6	84.8
I am not knowledgeable about this.	38	15.2	100.0
Total	250	100.0	

When the approximate annual turnover of the companies is examined, it is mostly between less than 2-10 Million € and this is followed by 50 Million – less than 1 Billion €. The market distribution of the firms is given in Figure 16.

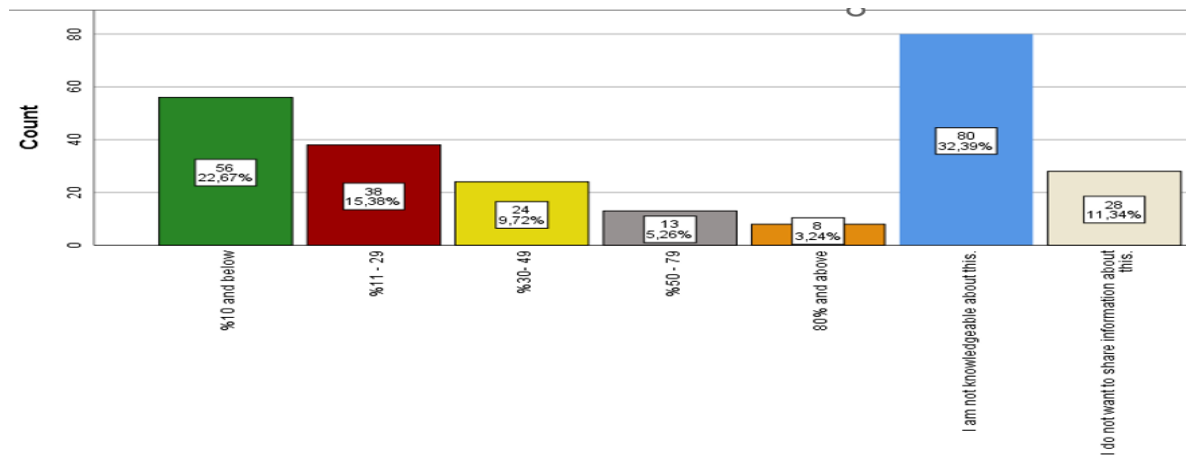


Figure 16 Market Distribution of the Firms in Turkey

When the market shares of the companies are examined, it is seen that the participants do not have knowledge about this issue with the highest rate (32.39%). It has been determined that this is 22.67% with a market share of 10% and below, 15.38% with a market share of 11-29%, respectively.

The innovation activity status of the business is given in Figure 17.

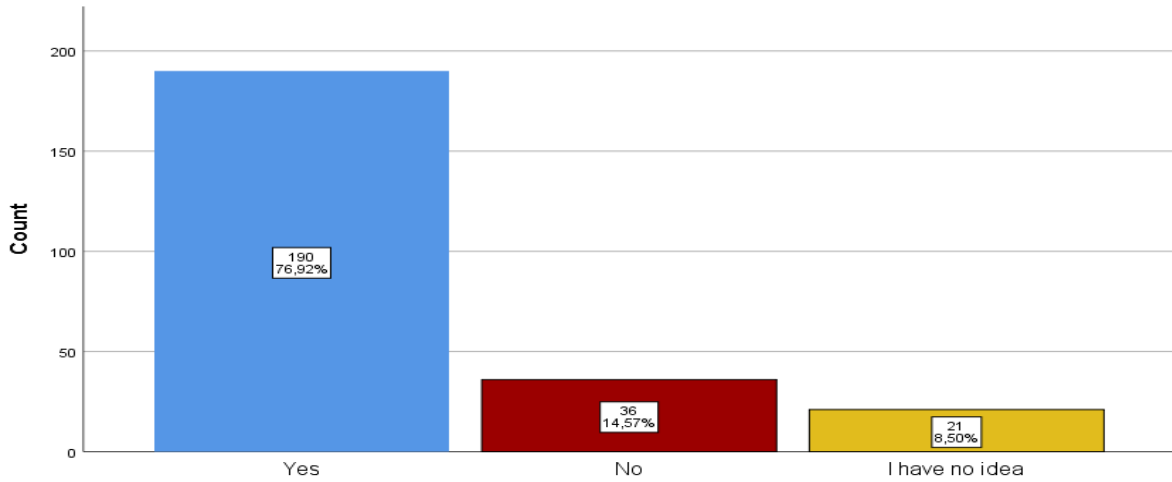


Figure 17 Carrying out Innovation Activities of the Business

The companies participating in the research carry out 76.92% innovation activities. The rate of companies that do not carry out innovation activities is 14.57% and 8.5% does not have any information on this subject. The R&D activity status of the business is given in Figure 18.

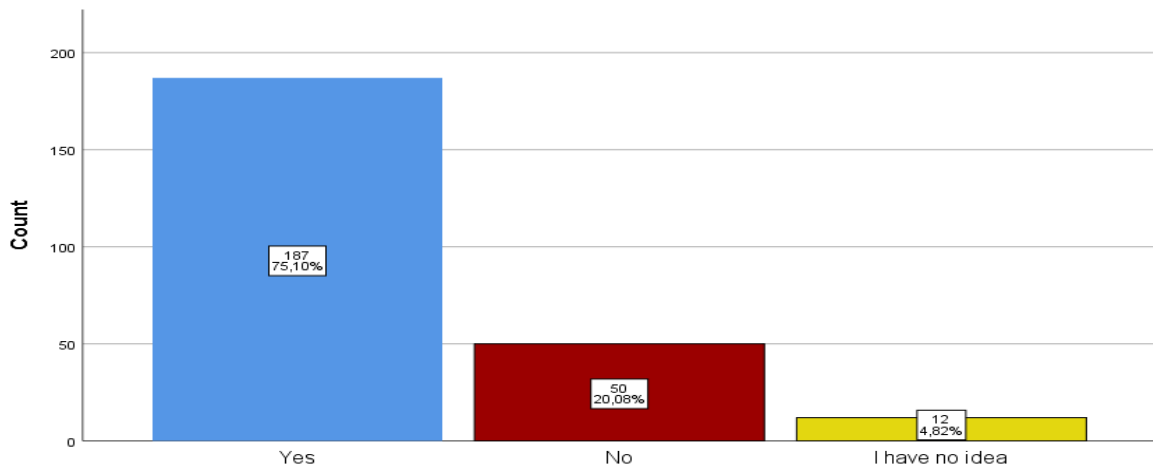


Figure 18 Carrying out R&D Activities of the Business

The companies participating in the research carry out 75.10% R&D activities. The rate of companies that do not carry out R&D activities is 20.08% and 4.82% does not have any information on this subject.

The distribution regarding the existence of a separate unit for the sustainability activities of the business is given in Figure 19.

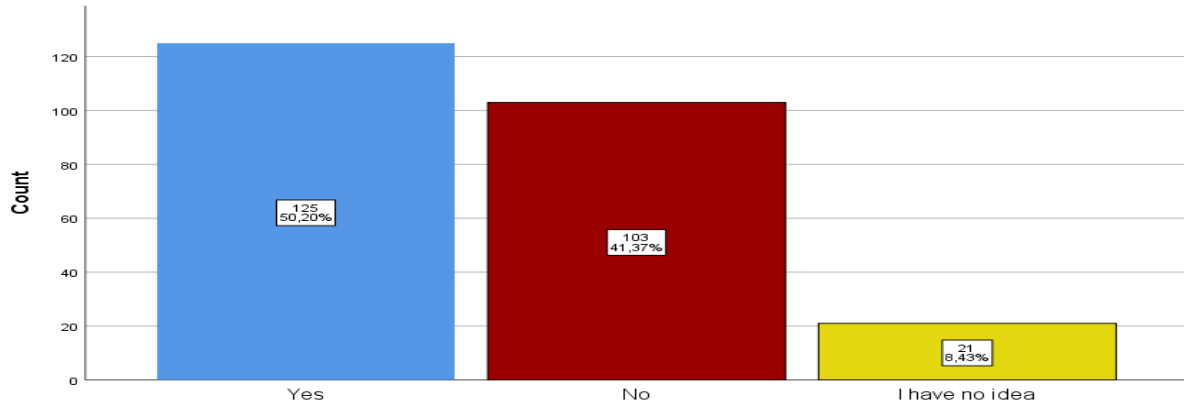


Figure 19 Having a Separate Unit for the Business's Sustainability Activities

The companies participating in the research carry out 50.20% sustainability activities. The rate of companies that do not carry out sustainability activities is 41.37% and 8.43% does not have any information on this subject.

The turnover change of the companies during the Covid-19 pandemic process (2020/2021) is given in Figure 20.

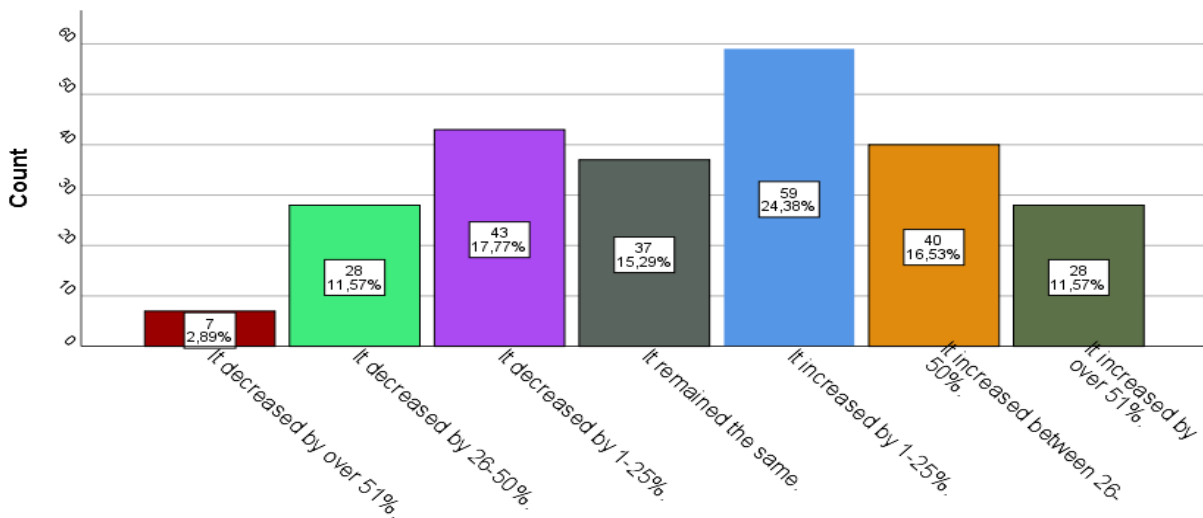


Figure 20 The Turnover Change of the Companies During the Covid-19 Pandemic Period (2020/2021)

It has been determined that the turnover change of the companies during the Covid-19 process (2020/2021) has increased by 24.38%. This was followed by 17.77% (Decreased by 1-25%) and 16.53% (Increased 26-50) respectively. The change in Business costs after the Covid -19 pandemic is given in Figure 21.

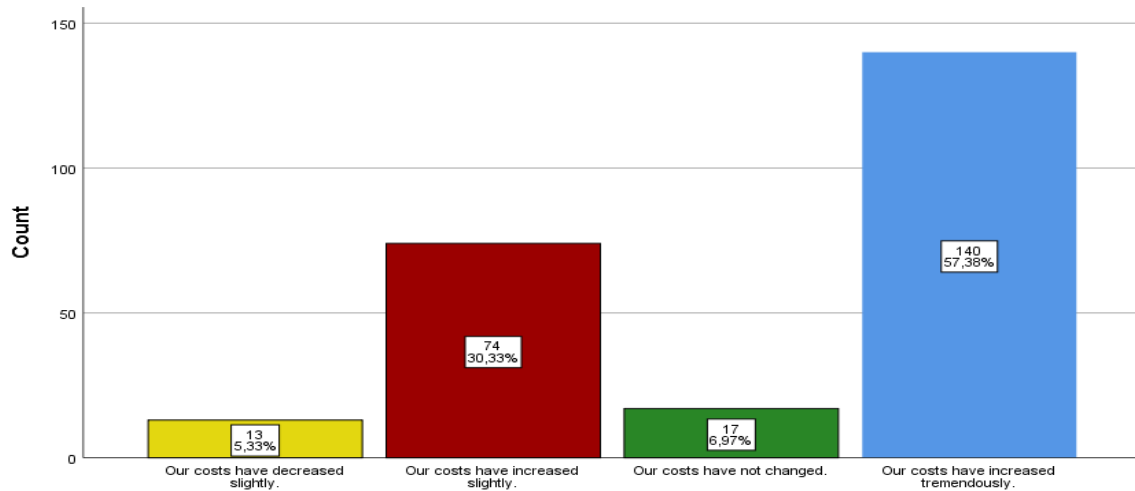


Figure 21 Change in Business Costs After the Covid -19 Pandemic

When the change in Business costs after the Covid -19 epidemic was examined, it was seen that the costs increased tremendously by 57.38%. This was followed by increased slightly with 30.33% and not changed with 6.97, respectively. The problems faced by the business during the Covid-19 Pandemic process are given in Figure 22.

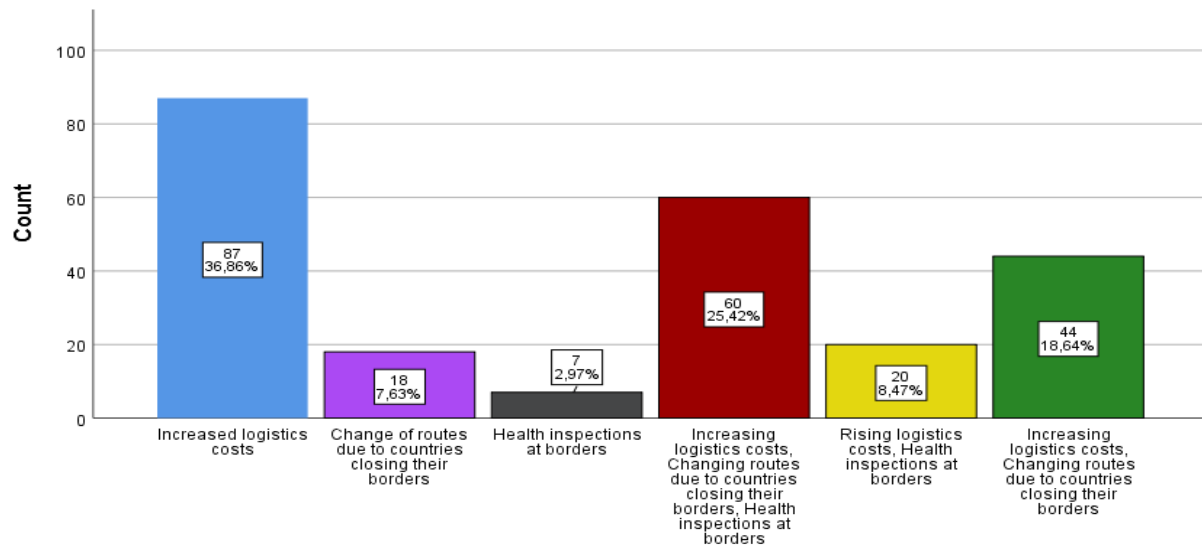


Figure 22 Problems Faced by the Business During the Covid-19 Pandemic

The supply chain issues that the business faced during the Covid-19 pandemic is costs (increased logistic cost) with 36.86% of the largest problems in which you are examined. This was followed by cost, changing routes and health inspections at borders problem with 25.42% and cost, changing routes with 18.64%, respectively.

The problems experienced in the business during the Covid-19 pandemic are given in Figure 23.

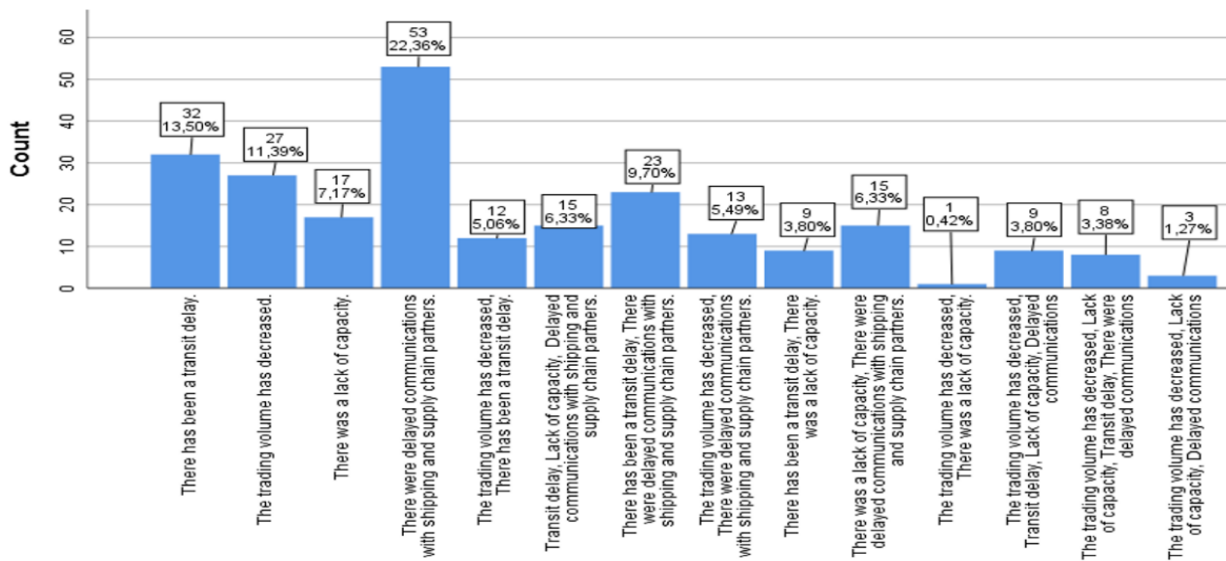


Figure 23 Problems in the Business During the Covid-19 Pandemic

When the problems experienced in the business during the Covid-19 epidemic are examined, the most experienced problem is delayed communications with shipping and supply chain partners with 22.36%. This was followed by transit delay and a decrease in trade volume.

The change in the transportation and supply chain strategies of the business at the end of the Covid -19 pandemic process is given in Figure 24.

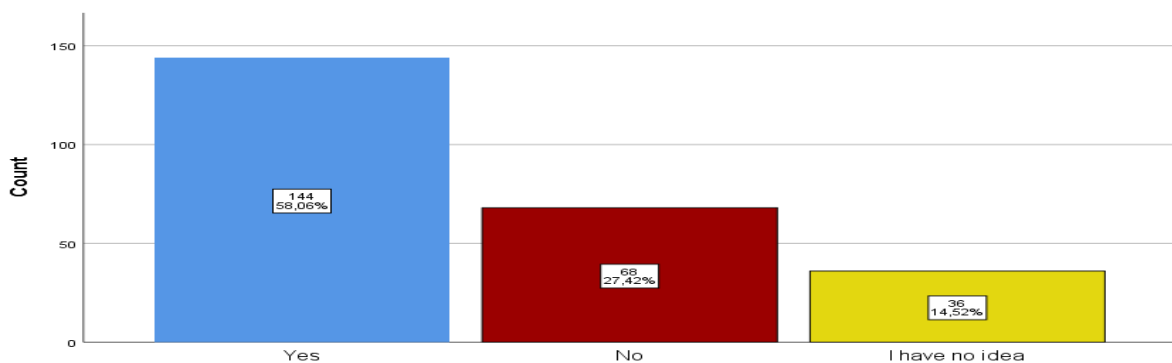


Figure 24 The Change of the Business's Transportation and Supply Chain Strategies at the end of the Covid -19 Pandemic Process

When the change in the transportation and supply chain strategies of the business at the end of the Covid -19 pandemic process was examined, it was determined that it changed with 58.06%, did not change with 27.42% and was no idea with 14.52%. The distribution of working from home during the pandemic process is given in Figure 25.

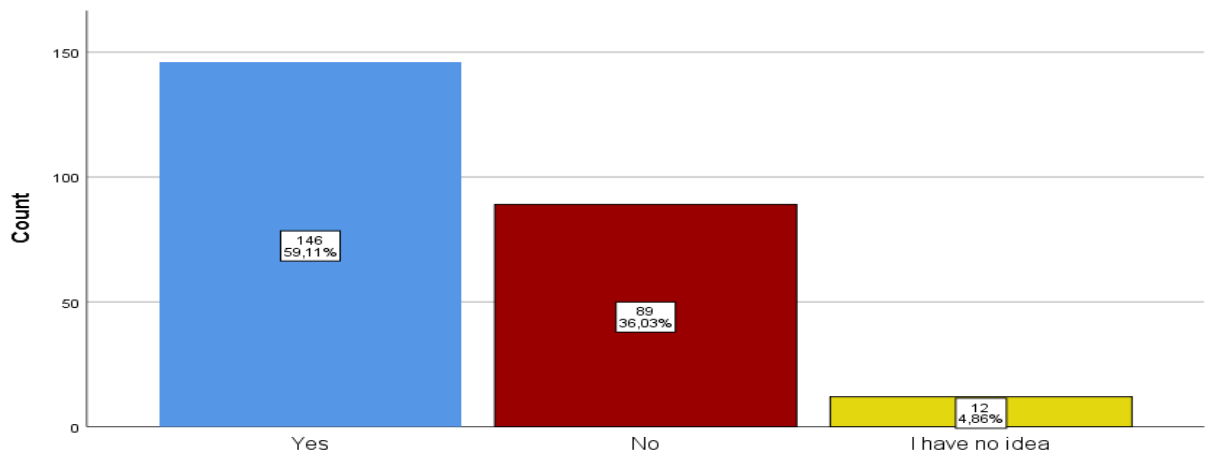


Figure 25 The Covid-19 Pandemic Process, the Business's Preparations to Upgrade its Technology and Improve its Ability to Work from Home

The Covid-19 pandemic process has been examined as the Business prepares to upgrade its technology and improve its ability to work from home. It was determined that preparations were made with 59.11% and not with 36.03%. 4.86 % of the participants stated that they had no idea.

The storage of the Business's digital data during the Covid-19 pandemic is given in Figure 26.

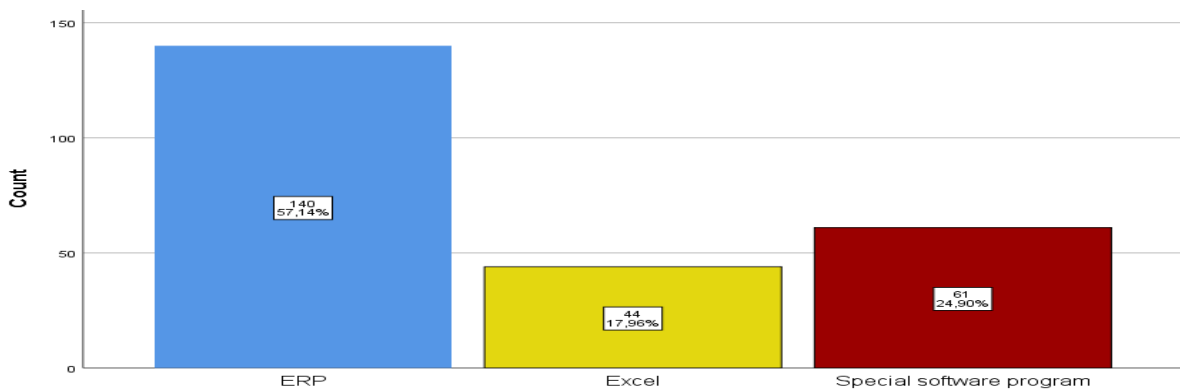


Figure 26 Storing the Business's Digital Data During the Covid-19 Pandemic Process

When the digital data storage of the business was examined during the Covid-19 pandemic process, it was determined that they used ERP with 57.14%, special software program with 24.90% and excel with 17.96%.

The disruptions and congestions experienced in cargo transportation activities during the Covid-19 pandemic, as well as the insufficient capacity in cargo services, caused the inability to keep up with the demand and the decrease in service quality. The answer to this problem is given in Figure 27.

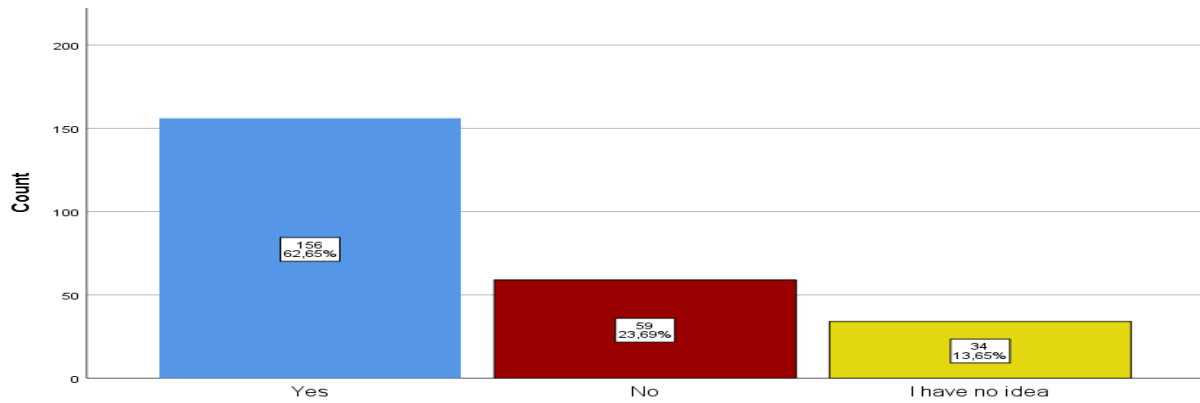


Figure 27 The Effects of Disruptions in the Covid-19 Process and Insufficient Capacity in Cargo Services on the Inability to Keep up with the Demand and the Decrease in Service Quality

When the effects of the disruptions in the Covid-19 process and the lack of capacity in cargo services, the inability to keep up with the demand and the decrease in service quality, were examined, it was found that it was affected by 62.65% and not by 23.69%.

The distribution of the Business's technological investments to meet the needs of its customers during the Covid -19 pandemic is given in Figure 28.

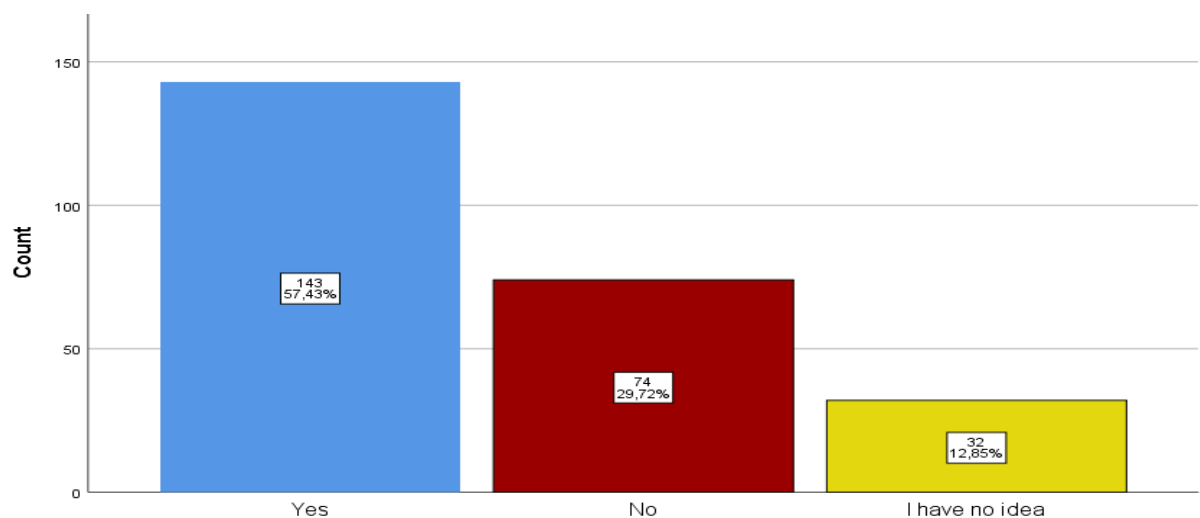


Figure 28 The Business Makes Technological Investments to Meet the Needs of its Customers During the Covid -19 Pandemic.

When the Business was examined to make technological investments to meet the needs of its customers during the Covid -19 epidemic, it was determined that 57.43% were made and 29.72% were not. 12.85% of the participants stated that they had no idea. The distribution of the Business's success at the end of the Covid-19 pandemic process is given in Figure 29.

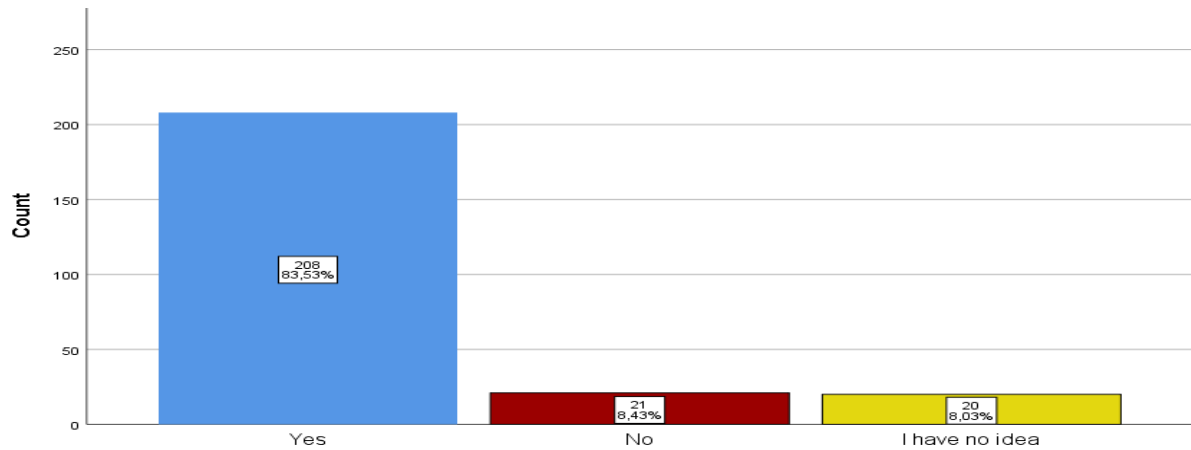


Figure 29 The success of the Business at the End of the Covid-19 Pandemic Period

When the success of the Business at the end of the Covid-19 pandemic process is examined, it has been determined that it has achieved 83.53% success and not 8.43% success. 8.03% of the participants stated that they had no idea. The distribution of purchasing activity for logistics services during the pandemic period is given in Figure 30.

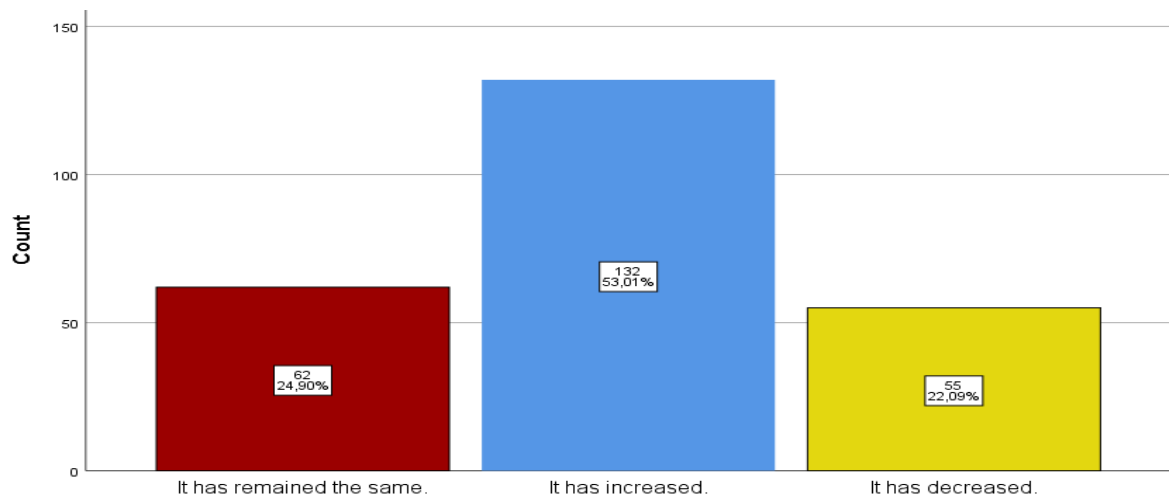


Figure 30 Purchasing Activity for Logistics Services During the Pandemic Period

When the distribution of purchasing activity for logistics services was examined during the pandemic period, it was found that it increased by 53.01%, remained the same by 24.90% and decreased by 22.09%. The situation of having clear information about how and what special effects the recovery will have at the end of the Covid-19 pandemic process is given in Figure 31.

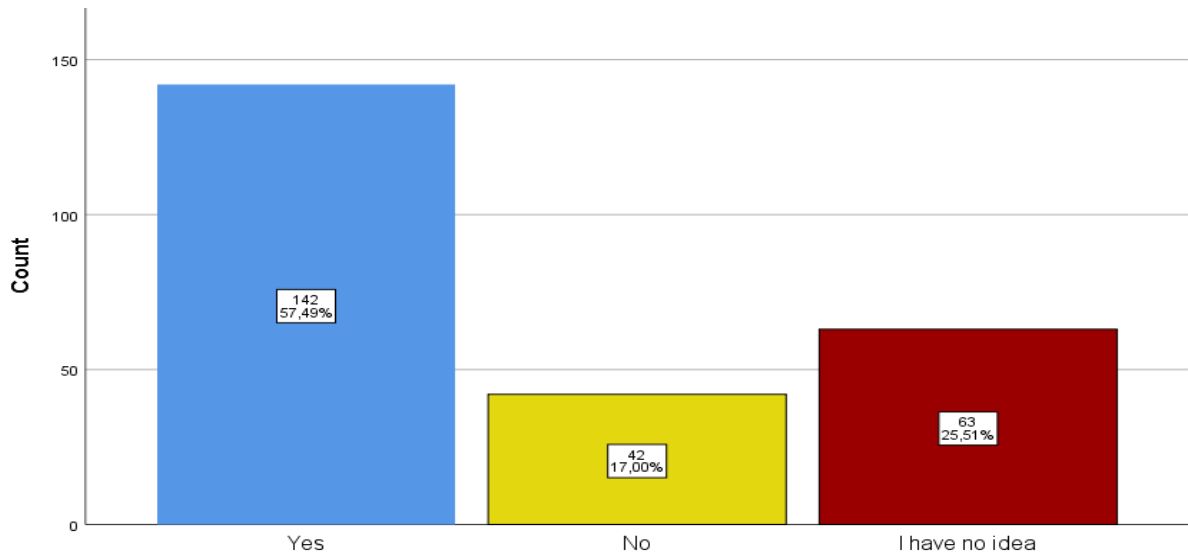


Figure 31 The State of Having a Clear Knowledge of How and What Special Effects the Recovery will have at the end of the Covid-19 Pandemic Process

The situation of having a clear knowledge of how and what special effects the recovery will have at the end of the Covid-19 pandemic process has been examined. 57.49% of the participants stated that they had clear information, 17.00% did not have clear information and 25.51% stated that they had no idea.

Descriptive statistics according to the dimensions of the scale are given in Table 10.

Table 10 Descriptive Statistics of Scale Dimensions

	N	Mean	SD
Strategy and Investment	248	2.98	0.85
Cost	247	3.65	1.05
Supply Chain	246	2.87	0.84
Supply Chain Process	249	3.30	0.80
Management			
Technology Digitalization	249	3.19	1.06
Valid N	245		

It has been determined that the Covid-19 process has the greatest effect on the increase in costs in logistics services (3.65 ± 1.05), and then on the supply chain management (3.30 ± 0.80). It partially affected the business's strategy and investments (2.98 ± 0.85).

4.3. Exploratory Factor Analysis (EFA) Findings

Survey data of 250 companies were used to measure the impact of the Covid-19 pandemic on the logistics business or logistics service unit business activities. It was measured with a total of 22 questions, 3 for the effect of the pandemic on the strategy and investment of the businesses, 3 for the effect on the cost, 5 for the supply chain activity, 6 for the supply chain management and process, and 5 for the effect of technology & digitalization. The companies participating in the research were asked to answer the questions in the range from 1: I strongly disagree to 5 = I strongly agree.

Factor analysis was performed to determine the sub-dimensions of the logistic effect scale. Kaiser-Meyer-Olkin (KMO) sample adequacy test and Bartlett sphericity test were applied to test the suitability of the data set for factor analysis. Since the KMO value was above 0.50 and the Bartlett test was significant at 0.05 significance level, the data set was found suitable for factor analysis (KMO=0.891, χ^2 Bartlett test (231) = 2257.987; p=0.000). Bartlett's test of sphericity should be meaningful and Kaiser-Mayer Olkin (KMO) value should be greater than 0.50, preferably greater than 0.60 (Hair et al., 2010; Tabachnick&Fidell, 2013). Bartlett's test of Sphericity is significant and KMO value is greater than 0.60. Also, it has been determined that the results of Bartlett's test of sphericity (Bartlett, 1954) are significantly different from zero. If the value is higher, it means that the correlation between pairs of variables is explained by other variables.

The questions were analyzed using the logistic effect scale principal component analysis and the Varimax rotation method. In the factor analysis, five factors with eigenvalues of 1 and above were obtained by removing the questions with a sampling adequacy measure below 0.50, the only one under the factor, with close factor weights, and with factor weights below 0.50. Alpha values above 0.7 for five main factors are appropriate (Radhakrishna, 2007; Hair et al., 2010). When the reliability analysis of the factors was made, it was determined that one factor was below the reliability level of 0.70 when the reliability level was made for all factors. Cronbach's Alpha coefficient (DeVon et al., 2007) was calculated for each sub-dimension. Since this single factor below 0.70 will not be used, 3 questions under this factor were removed from the analysis and a final factor analysis was performed. As a result of this factor analysis, five factors consisting of 22 questions were obtained. Mvududu and Sink (2013) stated that the acceptable number of items for each factor is between 4 and 10.

Between variables looking at the Pearson correlation coefficients, since Determinant = 0.001 > 0.000000173, there is no multicollinearity problem (Field, 2006). The degree and direction of the relationships emerge with the correlation between the variables used in the research. The hypothesis that the correlation coefficient is between - or + 0.3 and 1.0 is accepted (Ratner, 2009). Correlations between PCA and data are expected to be high.

The anti-image is calculated to measure correlations between variables in the matrix. By looking at the anti-image diagonal matrix in the analysis results, the diagonal elements should be greater than $p > 0.5$ for

the adequacy of the samples (Sarstedt & Mooi, 2014). When the anti-image matrix of the research is examined, it shows that there is a correlation between the variables. Anti-image correlation matrix is greater than 0.75. This result shows that there is sufficient internal consistency between the variables and that we continue the factor analysis.

The total variance explained was found to be 75.835%. Factors are named as “Strategy & Investment”, “Cost”, “Supply Chain”, “Supply Chain Management and Process” and “Technology & Digitalization” respectively.

As a result of the factor and reliability analyzes made on the question groups regarding the effect of the in the study, new variables were determined in the Covid-19 pandemic related to logistics business or logistics service unit business activities. A new variable was defined regarding the effect of the pandemic on logistics, and the average method, which is one of the total value calculation methods, was used in the calculation of this variable. As a result of the EFA analysis, it can be said that the scale is reliable and valid. The factor analysis result table is given in Table 11.

Table 11 EFA Results of Factors

Factor Name	Factor Item	Factor Loading	% Variance	Reliability
Strategy& Investment	Q1	0.535	20.065	0.788
	Q2	0.848		
	Q3	0.861		
Cost	Q4	0.802	17.619	0.952
	Q5	0.838		
	Q6	0.859		
	Q7	0.811		
	Q8	0.716		
Supply Chain	Q9	0.770	13.953	0.845
	Q10	0.671		
	Q11	0.775		
	Q12	0.558		
	Q13	0.533		
Supply Chain Process Management	Q14	0.579	13.551	0.900
	Q15	0.709		
	Q16	0.833		
	Q17	0.696		
	Q18	0.685		
	Q19	0.615		
Technology& Digitalization	Q20	0.912	10.647	0.948
	Q21	0.920		
	Q22	0.873		
Total % Variance			75.835	
Kaiser-Meyer-Olkin (KMO) Parameter				0.891
Bartlett's Test			Approx. Chi-Square Value	2257.9
			Sd	23
			p (p<0.05)	0.00

4.4. Normality Test

The data obtained in the study were normalized and according to the number of groups in the variable. To test whether the data are normally distributed, the kurtosis and skewness values of the variables were checked.

The skewness values for the normal distribution of the data, it was stated that it should be between -3 and +3, and the kurtosis values should be between -10 and +10 (Brown, 2006). Hair et al. According to (2010) stated that it should have skewness between -2 and +2 and kurtosis between -7 and +7. However, Tabachnick and Fidell (2013) generally stated that skewness and kurtosis values for sample sizes over 200 do not affect deviations from normality. According to the literature, skewness and kurtosis values should not exceed 3 and 10.

As can be seen in Table 12, the kurtosis and skew values are within the specified limits.

Table 12 Analysis for Data Normality

		Strategy		Supply	SCP	Technology	
		Investment	Cost	Chain	Management	Digitalization	Overall
N	Valid	248	247	246	249	249	250
	Missing	2	3	4	1	1	0
Std. Error of Mean		.054	.067	.054	.051	.067	.043
Skewness		-.064	-.681	.058	-.190	-.101	-.501
Std. Error of Skewness		.155	.155	.155	.154	.154	.154
Kurtosis		-.404	-.219	-.461	-.512	-.865	.326
Std. Error of Kurtosis		.308	.309	.309	.307	.307	.307

Therefore, it can be said that the data meet the normality assumption.

4.5. Descriptive Statistics of the Developed Scale

The descriptive statistics of the scale regarding the impact of the Covid-19 Pandemic on businesses are given in Table 13.

Table 13 Measurement Items

Factor	Item	Measurement	Mean	SD
Strategy and Investment	Q1	The Covid-19 pandemic has adversely affected our business's <i>strategic resource use</i> .	3.09	1.10
	Q2	Covid-19 has adversely affected our business's <i>new investment and growth plans</i> .	2.81	1.23
	Q3	The Covid-19 pandemic has directed our business to <i>new markets</i> .	3.07	1.13
Total			2.98	1.15
Cost	Q4	The Covid-19 pandemic has increased our business's <i>logistics costs</i> .	3.82	1.14
	Q5	The Covid-19 pandemic process has increased the <i>transportation costs</i> of our business.	3.73	1.20
	Q6	The Covid-19 pandemic process has increased our business's <i>storage costs</i> .	3.55	1.21
	Q7	The Covid-19 pandemic process has increased our business's <i>transfer costs</i> .	3.64	1.14
	Q8	The Covid-19 pandemic process has increased the <i>stock costs</i> of our business.	3.57	1.17
Total			3.66	1.17
Supply Chain	Q9	The Covid-19 pandemic has shifted our business from a holistic supply chain to a fragmented supply chain.	2.65	1.04
	Q10	During the Covid-19 pandemic process, our business's distribution structure has been disrupted and has <i>caused delays</i> .	3.16	1.09
	Q11	During the Covid-19 pandemic process, our business's lean, flexible and durable structure has been transformed into a complex and layered <i>logistics network structure</i> .	2.95	1.08
	Q12	During the Covid-19 pandemic, our business had problems in the continuity of logistics operations and <i>caused customer losses</i> .	2.82	1.09
	Q13	The Covid-19 pandemic has reduced our business's <i>commercial activities</i> .	2.58	1.21
Total			2.83	1.10

	Q14	During the Covid-19 pandemic, our business's <i>service delivery</i> was adversely affected (Cargo type change etc.).	3.12	1.17
Supply Chain Process Management	Q15	During the Covid-19 pandemic process, our business's <i>resource shortage</i> has led to a global, local and regional search for resources.	3.25	1.11
	Q16	The Covid-19 pandemic has led to <i>multiple procurement planning</i> by expanding our supplier portfolio instead of working with a single supplier.	3.43	1.13
	Q17	During the covid-19 pandemic process, our business has increased the <i>time to respond</i> to our customers' problems, needs and suggestions.	3.20	1.04
	Q18	During the Covid-19 pandemic, it adversely affected the <i>customs and border procedures</i> .	3.51	1.15
	Q19	During the Covid-19 pandemic, the problems experienced in our business's shipment and supply chain adversely affected the <i>business's performance</i> .	3.13	1.14
		Total	3.32	1.11
Technology and Digitalization	Q20	The Covid-19 pandemic process has increased the speed of our <i>business's digitalization</i> (Automation, assembly/robot systems, artificial intelligence, etc.).	3.12	1.18
	Q21	The Covid-19 pandemic process has facilitated the integration of the data used in our business and the acquisition of <i>digital results</i> .	3.50	1.02
	Q22	The Covid-19 pandemic process has increased our business's digital transformation, automation and similar <i>technological investments</i> .	3.21	1.20
			Total	3.28

According to the descriptive statistics results, the Covid-19 pandemic process increased the logistics costs of the companies (3.82 ± 1.14), increased the inventory costs (3.57 ± 1.17), increased the transfer costs (3.64 ± 1.14), negatively affected the customs and border transactions (3.51 ± 1.15), customer losses (2.82 ± 1.09) and investment and growth plans (2.81 ± 1.23) were partially affected.

4.6. Testing Research Hypotheses

Since the data were normally distributed, mean comparison tests (Hypothesis) were investigated with the help of parametric statistics techniques. In this part of the research, the dimensions of the scale belonging to the participating companies were examined and it was investigated whether there was a significant difference according to the characteristics of the business.

4.6.1. Findings of Difference Between the Businesses' Management Status

In order to test whether the dependent variable differs according to the management status, Analysis of Variance (ANOVA) was performed and statistically analyzed between the management status groups of the businesses at the 95% confidence interval. The research hypothesis for this measurement is as follows:

H₁: There are differences in terms of management status according to the activities of the businesses.

The ANOVA test result for hypothesis testing is given in Table 14.

Table 14 ANOVA Test Results

		n	Mean	F value	p value
Activities of the Businesses	Multinational	80	3.4026	1.858	0.137
	National	97	3.161		
	Regional	23	3.156		
	Local	50	3.198		

*p<0.05

Within the scope of the research, it was tested whether the logistics effects of the pandemic of the companies with different businesses' management status were equal or not by ANOVA analysis of variance. As a result of ANOVA analysis, it was found that there was no statistically significant difference between management status groups ($p=0.137>0.05$).

4.6.2. Findings of Difference Between the Logistics Services Provided by the Company

Whether the dependent variable differs according to the logistics service groups provided by the company was statistically analyzed with the ANOVA test at the 95% confidence interval. The research hypothesis for this measurement is as follows:

H₂: There are differences in the activities of the businesses in terms of the logistics service groups offered by the companies.

The ANOVA test result for hypothesis testing is given in Table 15.

Table 15 ANOVA Test Results

	n	Mean	F value	p value
Activities of the Businesses	Supply chain services	32	3.03	1.516
	Distribution-transportation services	30	3.38	
	Storage services	15	3.20	
	Customs clearance services	7	3.80	
	Handling services	3	2.65	
	Insurance Services	3	2.63	

*p<0.05

Within the scope of the research, whether the logistics effects of the pandemic of companies with different logistics services are equal or not was tested with ANOVA analysis of variance. As a result of ANOVA analysis, it was found that there was no statistically significant difference between different logistics service groups ($p=0.183>0.05$).

4.6.3. Findings of Difference Between the Firm's Number of Employees

The effect of the Covid-19 pandemic was investigated according to the number of employees of the business. The research hypothesis for this measurement is as follows:

H₃: There are differences in terms of number of employees according to the activities of the businesses.

When the companies with different employee numbers were tested whether the effect of the pandemic was equal, it was determined by the Levene test that the groups did not have equal variance. In this case, the prerequisite of the ANOVA test could not be met, and Welch and Brown-Forsythe tests were performed instead of the Anova test. When the equal variance assumption is not met, the Welch and Brown - Forsythe tests can be used instead of the ANOVA test based on the F statistic. Welch test is more powerful than Brown - Forsythe test. The results are given in Table 16.

Tablo 16 Result of Welch and Brown-Forsythe Tests by Different Employee Groups

	n	Mean	Welch	Brown-Forsythe
Activities of the Businesses 1-9	23	3.026	F value 84.807	131.751
10-49	33	3.316	P value 0.127	0.070
50-249	59	3.380		
250-499	35	2.956		
500-999	25	3.150		
1000 +	72	3.320		

Tamhane Results		Mean		
		Difference	Std. Error	p
1-9	10-49	-.286	.189	.658
	50-249	-.335	.171	.372
	250-499	.074	.187	.999
	500-999	-.102	.202	.996
	1000 +	-.289	.167	.513
10-49	1-9	.286	.189	.658
	50-249	-.048	.152	1.000
	250-499	.361	.169	.275
	500-999	.184	.185	.919
	1000 +	-.003	.147	1.000
50-249	1-9	.335	.171	.372
	10-49	.048	.152	1.000
	250-499	.424	.149	.069*
	500-999	.233	.166	.728
	1000 +	.045	.122	.999
250-499	1-9	-.074	.187	.999
	10-49	-.361	.169	.275
	50-249	-.424	.149	.069*
	500-999	-.177	.183	.927
	1000 +	-.364	.144	.119
500-999	1-9	.102	.202	.996
	10-49	-.184	.185	.919
	50-249	-.233	.166	.728
	250-499	.177	.183	.927
	1000 +	-.187	.162	.858
1000 +	1-9	.289	.167	.513
	10-49	.003	.147	1.000
	50-249	-.045	.122	.999
	250-499	.364	.144	.119
	500-999	.187	.162	.858

*p<0.10

4.6.4. Findings of Difference Between the Businesses' Distribution Placements

In this section, the effect of the Covid-19 pandemic according to the distribution location of the business was investigated by ANOVA test.

The research hypothesis for this measurement is as follows:

H₄: There are differences in terms of different distribution placements according to the activities of businesses.

The ANOVA test result for hypothesis testing is given in Table 17.

Table 17 ANOVA Results

		n	Mean	F value	p value
Activities of the Businesses	There are multiple distribution placements in the same/different cities in Turkey.	82	3.306	0.902	0.407
	There is only one distribution place in Turkey.	99	3.16		
	It has a distribution place abroad.	63	3.23		

*p<0.05

Within the scope of the research, it was tested with one-way analysis of variance whether the logistics effects of the pandemic are equal according to the different distribution locations of the businesses. As a result of one-way analysis of variance, it was found that there was no statistically significant difference between different distribution locations of the businesses (p=0.407>0.05).

4.6.5. Findings of Difference Between the Businesses' Market Shares

The effect of the Covid-19 pandemic according to the market share of the companies in Turkey was investigated with the ANOVA test. The research hypothesis for this measurement is as follows:

H₅: There are differences in terms of market share according to the activities of businesses.

There were 80 business representatives who did not know about this subject and 28 business representatives who did not want to share information on this subject. The results of the other businesses that provided information are given in Table 18.

Table 18 ANOVA Results

		n	Mean	F value	p value
Activities of the Businesses	Market Share				
	% 10 and below	56	3.28	0.393	0.883
	% 11 - 29	38	3.26		
	% 30- 49	24	3.11		
	% 50 - 79	13	3.36		
	80% and above	8	3.11		

*p<0.05

Within the scope of the research, it was tested with one-way analysis of variance whether the logistics effects of the pandemic are equal according to the different market share of the businesses. As a result of

ANOVA test, it was found that there was no statistically significant difference between different market share of the businesses ($p=0.883>0.05$).

Logistics services of businesses with a market share of 50-79% and 10% or less were more affected by the pandemic than other market shares. Businesses with 10% or less market share; It has been seen that there are businesses that include all activities of the supply chain and provide distribution and transportation services. In addition, it has been determined that the costs of these companies have increased too much during the pandemic, and that the number of employees is up to 250 small businesses.

4.6.6. Findings of Difference Between the Businesses' Annual Turnover

The effect of the Covid-19 pandemic according to the approximate turnover of the companies in Turkey was investigated with the ANOVA test. The research hypothesis for this measurement is as follows:

H₆: There are differences in terms of annual turnover according to the activities of businesses.

ANOVA test results are given in Table 19.

Table 19 ANOVA Results

	Market Share	n	Mean	F value	p value
Activities of the Businesses	More than 1 Billion €	25	3.434	0.573	0.720
	50 Million – Less than 1 Billion €	52	3.153		
	Less than 10-50 Million €	28	3.217		
	Less than 2-10 Million €	85	3.200		
	Less than € 2 Million	19	3.288		
	I am not knowledgeable about this.	38	3.251		

* $p<0.05$

Whether there is a difference in terms of annual turnover according to the activities of the businesses was investigated with the ANOVA test and it was determined that there was no statistical difference ($p= 0.720>0.05$).

4.6.7 Findings of Difference Between the Change in Company Costs After the Covid -19 Pandemic

Within the scope of the research, whether the logistic effects of different cost changes of the companies after the pandemic are equal or not was tested by analysis of variance. The research hypothesis for this measurement is as follows:

H₇: There are differences in terms of the change in company costs of businesses after the Covid -19 pandemic.

Within the scope of the research, when we wanted to test whether the logistics effects of companies with different cost changes after the pandemic process were equal, a statistically significant difference was found between the groups as a result of the ANOVA test. ANOVA test results are given in Table 20.

Table 20 ANOVA Test Result of the Logistics Effects of Companies with Different Cost Changes After the Pandemic

Cost Changes		n	Mean	F value	p value	
Activities of the Businesses	Decreased slightly	13	2.859	10.904	0.00*	
	Increased slightly	74	3.054			
	Didn't changed	17	2.718			
	Increased tremendously	140	3.449			
Scheffe Results				Mean Difference	Std. Error	p
Decreased slightly	Increased slightly		-.1952	.2048	.823	
			.1406	.2509	.957	
		Increased tremendously	-.5901	.1975	.032*	
Increased slightly	Decreased slightly		.1952	.2048	.823	
			.3357	.1832	.342	
		Increased tremendously	-.3949	.0979	.001*	
Didn't changed	Decreased slightly		-.1406	.2509	.957	
			-.3357	.1832	.342	
		Increased tremendously	-.7306	.1749	.001*	
Increased tremendously	Decreased slightly		.5902	.1975	.032*	
			.3949	.0979	.001*	
		Didn't changed	.7306	.1749	.001*	

* p<0.05

Within the scope of the research, when we wanted to test whether the logistics effects of the companies with different company cost changes after the pandemic process were equal, the Levene test found that the variances of the groups were equal (Levene p=0.685>0.05).

As a result of the Scheffe test, it has been determined that companies whose firm costs have changed tremendously after the pandemic have more logistics effects than firms whose firm costs have not changed after the pandemic ($\mu_{\text{Tremendously}}=3.449$; $\mu_{\text{Didn't change}}=2.718$). Similarly, a statistically significant difference was found between the other groups ($\mu_{\text{Tremendously}}=3.449$; $\mu_{\text{Decreased}}=2.859$; $\mu_{\text{Tremendously}}=3.449$; $\mu_{\text{Increased}}=3.054$).

4.7. Findings Related to Correlation Analysis

Relationships between variables were measured by correlation analysis and the findings are presented in Table 21. According to the results of the correlation analysis, a positive and significant relationship was found between all variables at the 0.05 significance level.

Table 21 Correlation Results

		Correlations				
		S&I	C	SC	SCPM	T&D
S&I	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	248				
C	Pearson Correlation	.512	1			
	Sig. (2-tailed)	.000**				
	N	247	247			
SC	Pearson Correlation	.632	.429	1		
	Sig. (2-tailed)	.000**	.000**			
	N	246	246	246		
SCPM	Pearson Correlation	.513	.539	.600	1	
	Sig. (2-tailed)	.000**	.000**	.000**		
	N	247	246	246	249	
T&D	Pearson Correlation	.284	.361	.228	.251	1
	Sig. (2-tailed)	.000**	.000**	.000**	.000**	
	N	247	246	245	248	249

**Correlation is significant at the 0.01 level (2-tailed).

The highest relationship among the variables was found between the firm's strategy & investment and the supply chain. The correlation between both variables was positive and high ($p < 0.05$; $r = 0.632$). A positive and high relationship was also found between supply chain and supply chain management and process ($p < 0.05$; $r = 0.600$). The highest relationship between the logistics cost variable and supply chain management and process were found ($p < 0.05$; $r = 0.539$), and a positive and moderate relationship was found between cost and T&D ($p < 0.05$; $r = 0.361$).

4.8. Multiple Linear Regression Analysis

4.8.1. The Effect of the Pandemic on the Strategy & Investment of Companies

In the Covid-19 pandemic, companies' strategy & investments are expected to have an impact on cost, supply chain and process management, and digitalization. Regression analysis was performed to test the accuracy of this expectation. Figure 32 shows the model to be measured.

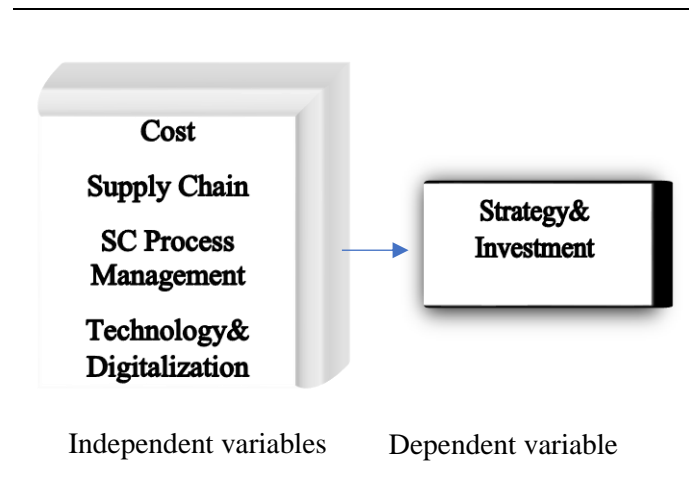


Figure 32 Research Model

Regression analysis was applied to see the effect of sub-dimensions “Cost”, “Supply Chain”, “SC Process Management” and “Technology&Digitalization” obtained because of factor analysis on “Strategy&Investment” of businesses during the pandemic process. Regression analysis results are given in Table 22.

Table 22 Regression Analysis Results

Dependent variable: Strategy&Investment

<i>Independent variables</i>	Beta	t value	p value
Cost	0.174	3.699	0.000*
Supply chain	0.446	7.552	0.000*
SC Process management	0.138	2.034	0.043*
Technology&Digitalization	0.052	1.313	0.190

R= 0.690; R²=0.476; F value= 54.610; p value= 0.000

* p<0.05

As a result of the multiple linear regression analysis, it was determined that the technology & digitalization dimension did not affect the strategy & management of the businesses in the pandemic. It was found that other sub-dimensions were explained at a moderate level (R= 0.690; R²=0.476; F (4) = 54.610; p value= 0.000). The most descriptive of the sub-dimensions is the supply chain dimension (β=0.446). This dimension was followed by cost and SC process management, respectively (β=0.174; β=0.138).

It is statistically significant that the model obtained is used to explain the effects of logistics services in the pandemic, since the problem of multicollinearity and covariance with the multiple linear regression assumptions is not encountered and the error terms are normally distributed.

The hypothesis established in the research is given below.

H₈: There is a positive relationship between “Strategy&Investments”, “Cost”, “Supply chain”, “SC process management” and “Digitalization&Technology” in the pandemic process of businesses.

As a result of the hypothesis, it has been determined that there is a positive relationship between “Strategy&Investments”, “Cost”, “Supply chain”, “SC process management” and “Digitalization&Technology” in the pandemic process of businesses ($p=0.00<0.05$).

4.8.2. The Effect of the Pandemic on the Cost of Companies

The costs of companies in the Covid-19 pandemic are expected to have an impact on “Strategy&Investment”, “Supply chain”, “Process management” and “Digitalization&Technology”. Regression analysis was performed to test the accuracy of this expectation. Figure 33 shows the model to be measured.

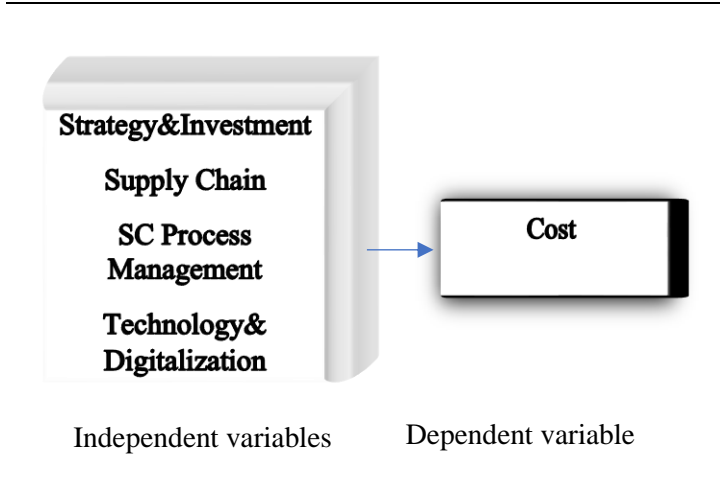


Figure 33 Research Model

Regression analysis was applied to see the effects of “Strategy&Investment”, “Supply chain”, “Process management” and “Digitalization&Technology” sub-dimensions obtained because of factor analysis on the costs of businesses during the pandemic process. Regression analysis results are given in Table 23.

Table 23 Regression Analysis Results

Dependent variable: Cost

<i>Independent variables</i>	Beta	t value	p value
Strategy&Investment	0.310	3.699	0.000*
Supply chain	0.023	0.267	0.790
SC process management	0.461	5.327	0.000*
Technology&Digitalization	0.188	3.699	0.000*

R= 0.625; R²=0.390; F value= 38.379; p value= 0.000

As a result of the multiple linear regression analysis, it was determined that the size of the supply chain did not affect the cost of the businesses in the pandemic. Other sub-dimensions were described as moderate (R= 0.625; R²=0.390; F(4) = 38.379; p value= 0.000). The most descriptive of the sub-dimensions is the supply chain process management dimension. This dimension was followed by Strategy&Investment and Technology&Digitalization, respectively ($\beta=0.461$; $\beta=0.310$).

It is statistically significant that the model obtained is used to explain the effects of logistics services in the pandemic, since the problem of multicollinearity and covariance with the multiple linear regression assumptions is not encountered and the error terms are normally distributed.

The hypothesis established in the research is given below.

H₉: There is a positive relationship between the “Costs of businesses” in the pandemic process and “Strategy & Investment”, “Supply chain”, “SC process management” and “Digitalization & Technology”.

It has been determined that there is a positive relationship between the “Costs of the businesses in the pandemic process and strategy & investment, supply chain, SC process management and digitalization & technology (p=0.00<0.05).

5. CONCLUSION AND IMPLICATIONS

It has been observed that communicable diseases such as H1N1, H5N1, MERS, SARS, Ebola, Covid-19 appear in the world every two years in recent years, and this situation will necessitate the development of international cooperation and coordination in the logistics sector in the future. Due to possible pandemics in the future, global initiative needs to increase, and countries need to strengthen their preparedness and resilience.

The Covid-19 pandemic has improved the coordination of businesses in emergencies. It has increased its coordination at regional, national, and international levels. Keeping efficient supply chains and goods moving has become important. The importance of the data-based decision-making process has increased and evidence-based approaches have begun to be adopted in decision-making. In particular, the collection of data on companies in the digital environment and the digitalization of supply processes have made the logistics industry safer and more efficient. In addition, communication traffic with all sectors has increased.

The thesis research makes an important contribution to the literature in terms of investigating the impact of the COVID-19 pandemic on the businesses providing logistics and supply chain management services in Turkey. In the study, first, a scale was developed for a comprehensive examination of the effects of the pandemic on the logistics sector. With this study, it has been evaluated that it will help the companies in the sector, public and private decision makers to develop policies for the effects of Covid-19.

The purpose of this research is to investigate the impact of the Covid-19 pandemic on logistics service companies and to reveal the situations encountered during the pandemic process. In the research, data were obtained from companies providing logistics services through a questionnaire, which is one of the quantitative data collection tools. The obtained scale was first applied to a small number of companies with a pilot study, and reliability and validity tests were conducted with EFA. The scale obtained because of the pilot study was sent electronically to all companies in Turkey. With EFA analysis, it was determined that the scale was reliable and valid.

When the descriptive statistics of the companies participating in the research were examined, it was seen that companies representing almost all sectors in their fields of activity participated in the survey. It has been determined that the companies are mostly international companies, there are more companies with 50-249 and 1000+ employees, the companies have more than one distribution location and companies that distribute abroad, and there are companies with a high market share.

When the logistics services of the companies were examined during the pandemic process, it was seen that the general average was at the level of "Partially agree". However, it was determined that the level of participation in some questions was at the level of "Agree" and "Strongly agree". It was determined that the Covid-19 pandemic affected logistics, transfer and transportation costs and negatively affected

customs and border operations. It has been seen that the Covid-19 pandemic has facilitated the digitization and integration of data owned by companies.

It has been determined that most of the businesses do not have clear information about how and what the specific effects of the recovery will be at the end of the Covid -19 pandemic process. In addition, it was determined that the lack of capacity in cargo services, as well as the disruption and congestion in cargo transportation activities during the Covid-19 pandemic process, caused the inability to keep up with the demand and the decrease in service quality. However, at the end of the Covid -19 pandemic process, it was seen that most companies made changes in their supply chains and logistics companies were successful at the end of the pandemic. In addition, it has been determined that the biggest effect of cost increase in businesses is logistics services and supply chain management.

In the study, the effects of the covid-19 pandemic were examined by statistical hypothesis tests. According to the results of the hypothesis test, it was observed that multinational companies were more affected by the pandemic than regional companies in terms of cost and supply chain. It was determined that multinational companies were affected more than regional and local companies according to the technology and digitalization of companies during the pandemic process. In terms of technology and digitalization of companies, it was determined that companies with a low number of employees were more affected by the pandemic than companies with a high number of employees.

One of the results found in this study is that the epidemic has disrupted the operations of the companies' supply chains. Similar results are also seen in the literature (Alok et al., 2022). In addition, it was seen that the pandemic process "Partially affected" the strategy & investments of the companies. Results in parallel with the results of Sodhi and Alok's study were found, and it is recommended that companies reconsider their strategies so that the supply chain can continue without interruption (Sodhi et al., 2021, Alok et al., 2022). The lean, flexible and durable structure of the business during the pandemic process, and its transformation into a complex and layered logistics network structure were found at the level of partially agree in the research. In the literature studies, it has been seen that the flexibility of the business reduces the effect of the pandemic (Ozkanlısoy, 2021; Kähkönen& Patrucco, 2022). When the effect of the pandemic on the companies according to their market shares was examined, it was determined that there was no significant effect on all variables. However, in terms of T&D, it has been determined that companies that carry out innovation and R&D activities are more affected by the pandemic than companies that do not.

Another effect of the pandemic on companies is that they prefer multi-supply planning by expanding their supplier portfolio instead of working with a single supplier. In the study, it was seen that companies responded between "Partially agree" and "Agree". In literature studies, it has been seen that the Covid-19 pandemic has directed companies to more than one supplier (Sreenivasan & Suresh, 2022; Seyedmohsen & Dmitry, 2022).

It has been determined that the transfer and stock costs of logistics companies increase the company's storage costs during the pandemic process. Similar results were seen in the literature studies and it was concluded that the pandemic increased the logistics costs (Ozkanlısoy, 2021; IFC, 2022; PWC, 2022).

In the Covid-19 pandemic, it has been observed that companies with more than one distribution location in the same/different cities in Turkey in terms of technology & digitalization are more affected by the Covid-19 pandemic than companies that distribute abroad. One of the most important factors in increasing resilience in the sector is the digitalization of companies' supply chain operations. There are similar results that the digitization of the industry improves performance (Hotlan et al., 2021; Ozkanlısoy; Keita et al., 2021). In order to strengthen the supply chain in Turkey, companies' digital investments should be encouraged by the government and SMEs. It has been determined that the Covid-19 pandemic process facilitates the data integration of companies and the acquisition of digital results. These results are supported by studies in the literature (Grzelakowski, 2022; Lachvajderová et al., 2022). As a result of the research, it was determined that the performance of the companies was negatively affected due to the problems experienced in the shipment and supply chain during the pandemic process, and it was seen that the companies partially agreed with this result (Guilherme et al., 2021; Nguyen, 2022; Appiah, 2022).

In the Covid-19 pandemic, companies' strategy & investments are expected to have an impact on cost, supply chain and process management, and digitalization. Regression analysis was applied to see the effect of sub-dimensions cost, supply chain, SC process management and technology&digitalization obtained as a result of factor analysis on strategy&investment of businesses during the pandemic process. As a result of the multiple linear regression analysis, it was determined that the technology & digitalization dimension did not affect the strategy & management of the businesses in the pandemic. It was seen that other sub-dimensions (Cost, supply chain, SC process management) explained the strategy & management of the businesses at a moderate level. The most descriptive of the sub-dimensions is the supply chain dimension. This dimension was followed by cost and SC process management, respectively. In addition, as a result of the hypothesis, it has been determined that there is a positive relationship between strategy & investments and cost, supply chain, SC process management and digitalization & technology in the pandemic process of businesses.

The costs of companies in the Covid-19 pandemic are expected to have an impact on strategy and investment, supply chain and process management, and digitization. Regression analysis was performed to test the accuracy of this expectation. As a result of the multiple linear regression analysis, it was determined that the size of the supply chain did not affect the cost of the businesses in the pandemic. Other sub-dimensions were described as moderate. The most descriptive of the sub-dimensions is the supply chain process management dimension. This dimension was followed by strategy&investment and technology&digitalization, respectively. It has been determined that there is a positive relationship between the costs of the businesses in the pandemic process and strategy & investment, supply chain, SC process management and digitalization & technology.

In order to increase operational efficiency in logistics and supply chain with the effect of Covid-19, companies need to adapt to Industry 4.0 digital transformation and provide technological infrastructure and system integrations. It will enable the businesses to adapt to the sudden changes in the sector with digitalization, to analyse the current situation easily by analysing all the processes of the companies, to make reliable predictions for future situations, and to reveal strategies and roadmap/s.

The factors that emerged with the thesis research and that companies that provide logistics services should consider for the future are the implementation of new approaches in their supply chains, the emphasis on the strategies and investments of the businesses, the increase in the understanding of localization and a better understanding of digital transformation, and the digitalization dimension of the businesses should be seen as a necessity.

In addition, one of the most important criteria for the pandemic to create awareness in companies providing logistics services is the need to increase supply chain flexibility. In addition, other important factors for companies providing logistics services to compete globally are that they need to take the necessary measures to create durable supply chains, digitize their production and warehouses, and have a plan that can reduce risks. The pandemic has required companies to make them more agile and visible. Firms should aim to terminate disruptive suppliers, change their purchasing strategy, and find alternative suppliers that focus as much on local sourcing as possible.

In the future, with Industry 4.0 and 5.0, the digital transformation of companies, interoperability, logistics and supply chain management will gain more importance thanks to digitalization, and their applicability and effectiveness in real life will increase. Especially in this field, organizational theory, data science, statistics, mathematics, computer science and software and hardware engineering and future interdisciplinary studies will be very important and high added value.

REFERENCES

- Adam N.A & Alarifi G. (2021), "Innovation Practices for Survival of Small and Medium Companies (SMEs) In The COVID-19 Times: The Role of External Support", *J Innov. Entrep.* 2021;10(1):15.
- Ahmed M. (25 March 2022), "History and Evolution of Supply Chain and Logistics", https://www.linkedin.com/pulse/history-evolution-supply-chain-logistics-dr-muddassir-ahmed-ph-d/?trk=pulse-article_more-articles_related-content-card adresinden alındı.
- Ak Logistic and Supply Chain (21 May 2022), "1PL, 2PL, 3PL, 4PL, 5PL, 6PL-The Advancement of Party Logistics", <https://aklogisticsandsupplychain.com/2020/03/02/1pl-2pl-3pl-4pl-5pl-6pl-the-advancement-of-party-logistics/> adresinden alındı.
- Akan, Ü. (2021), *Türkiye’de Dış Ticaret ve Lojistik Faktörü*, Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü.
- Akçacı, T. & Çınaroğlu, M. S. (2020), "Yeni Koronavirüs (Covid-19) Salgınına Lojistik ve Ticarete Etkisi", *Gaziantep University Journal of Social Sciences*, Cilt 19 Covid-19 Özel Sayısı, 447-456.
- Alibaba (April 26, 2022), "How Sellers Cope with High Logistics Costs During the Pandemic", <https://seller.alibaba.com/businessblogs/px001uhk1-how-sellers-cope-with-high-logistics-cost-during-the-pandemic> adresinden alındı.
- Alok R., Abheek A.M., Sousa A., Jabbour, S., K. Srivastava (2022), "Supply Chain Management During and Post-COVID-19 Pandemic: Mitigation Strategies and Practical Lessons Learned, *Journal of Business Research*, Volume 142, Pages 1125-1139.
- Appiah, K.O., Addai, B., Ekuban, W. (2022), "Management Research and the Impact of COVID-19 on Performance: A Bibliometric Review and Suggestions for Future Research. *Futur. Bus. J.*, 8, 41.
- Aunyawong, W., Wararatchai, P., Shaharudin, M., Hirunpat, A., Rodpangwan, S. (2021), "The Mediating Role of Transportation Practices During the COVID-19 Crisis in Thailand", *The Open Transportation Journal*, Volume 15, Pages 170-181.
- Australian Bureau of Statistics (03 October 2022), "Sample Size Calculator", <https://www.abs.gov.au/websitedbs/D3310114.nsf/home/Sample+Size+Calculator> adresinden alındı.
- Baral, M.M., Singh, R.K. and Kazançoğlu, Y. (2021), "Analysis of Factors Impacting Survivability of Sustainable Supply Chain During Covid-19 Pandemic: An Empirical Study in The Context of SMEs", *International Journal of Logistics Management*, <https://doi.org/10.1108/IJLM-04-2021-0198>.
- Bartlett, M. S. (1954). A Note on the Multiplying Factors for Various Chi-Square Approximations in Factor Analysis. *Journal of the Royal Statistical Society*, 16(2), 296-298
- Baumgarten, H., Darkow, I.L. and Zadek, H. (2004), "Supply Chain Steuerung und Services", (1st ed.). Berlin Heidelberg: Springer-Verlag.
- Borga, M., P. (2020), Ibarlucea F. and Sztajerowska, M, (2020), "Drivers of Divestment Decisions of Multinational Companies - A Cross-Country Firm-Level Perspective", *OECD Working*

- Papers on International Investment”, No. 2019/03, OECD Publishing, Paris, <https://doi.org/10.1787/5a376df4-en>.
- Borusan Lojistik (02 September 2022), (2022), “PL, 2PL, 3PL ve 4PL Nedir?”, <https://www.etasimacilik.com/blog/22 adresinden alındı>.
- Boyatzis, R.E. (1982), “The Competent Manager: A Model for Effective Performance”, John Wiley & Sons, Ltd.: New York, NY, USA, 1982.
- Brown, T. A. (2006), “Confirmatory Factor Analysis for Applied Research”, Guilford Press.
- Bryman, A., & Bell, E. (2014), “Research Methodology: Business and Management Contexts”, Oxford University Press Southern Africa.
- Bui, T.D., Tsai, F.M., Tseng, M.L., Tan, R.R., Yu, K.D.S. and Lim, M.K. (2021), “Sustainable Supply Chain Management Towards Disruption and Organizational Ambidexterity: A Data-Driven Analysis”, *Sustainable Production and Consumption*, Vol. 26, pp.373–410.
- Chen, J., Wang, H., Zhong, R.Y. (2021), “A Supply Chain Disruption Recovery Strategy Considering Product Change Under COVID-19”, *J. Manuf. Syst.* 2021, 60, 920–927.
- Christopher, M. (1996), “Networks and Logistics: Managing Supply Chain Relationships”, *Asia-Australia Marketing Journal*, 4(1), 19–24.
- Christopher, M. (1998), “Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service (Second Edition)”, *International Journal of Logistics Research and Applications*, 2:1, 103-104.
- Chowdhury, P., Paul, S.K., Kaisar, S., Moktadir, M.A. (2021), “COVID-19 Pandemic Related Supply Chain Studies: A Systematic Review”, *Transp. Res. Part E Logist. Transp. Rev.* 148, 26.
- Cook, L., D., Heiser, S., Sengupta, K. (2011), “The Moderating Effect of Supply Chain Role on the Relationship Between Supply Chain Practices and Performance”, *International Journal of Physical Distribution and Logistics Management*, Vol. 41, No. 2, pp. 104-134.
- Council of Supply Chain Management Professionals (26 October 2022) “CSCMP Supply Chain Management Definitions and Glossary”, https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx adresinden alındı.
- Currie, C.S.M., Fowler, J.W., Kotiadis, K., Monks, T., Onggo, B.S., Robertson, D.A. & Tako, A.A. (2020), “How Simulation Modelling can Help Reduce the Impact of COVID-19”, *Journal of Simulation* 14 (2): 83–97.
- Çelik, R. (2020), “Lojistik Sektöründe Kullanılan Yeni Bilişim Sistemleri: Lojistik 4.0 Örneği”, *Balkan ve Yakın Doğu Sosyal Bilimler Dergisi*, 2020: 06 (04).
- Çetindaş, A.& Çelik, M. (2017), “İmalat İşletmelerinin Tedarikçi Entegrasyonları ile Lojistik Performansları Arasındaki İlişki Üzerine Çevresel Belirsizliğin Düzenleyici Rolü”, *Toros Üniversitesi, İSBF Sosyal Bilimler Dergisi*, Cilt 4, Sayı 7, Aralık 2017.

- Del Rio-Chanona, R.M., Mealy, P., Pichler, A., Lafond, F., Farmer, J.D. (2020), “Supply and Demand Shocks in the COVID-19 Pandemic: An Industry and Occupation Perspective”, *Oxf. Rev. Econ. Policy*, 36, S94–S137.
- DHL (17 September 2022), “Third-Party Route to High-Tech Asset Recovery”, <https://www.dhl.com/global-en/home/our-divisions/supply-chain/thought-leadership/articles/technology/third-party-high-tech-asset-recovery.html> adresinden alındı.
- DNB, (19 October 2021), “Supply and Demand Shocks Due to the Coronavirus Pandemic Contribute Equally to Contraction in Production”, <https://www.dnb.nl/en/actueel/dnb/dnbulletin-2020/supply-and-demand-shocks-due-to-the-coronavirus-pandemic-contribute-equally-to-contraction-in-production/> adresinden alındı.
- Deloitte (21 September 2022), “Meeting the Challenge of Supply Chain Disruption”, <https://www2.deloitte.com/us/en/insights/industry/manufacturing/realigning-global-supply-chain-management-networks.html> adresinden alındı.
- Delke, V., Karttunen, E., Kelly, S., Stek, K., Tkáč, M. (29 March–1 April 2021), “Exploring Industry 4.0 Professional Roles and Skills within Purchasing and Supply Management”, In Proceedings of IPSERA, Online Conference.
- DeVon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., Lazzara, D. J., Savoy, S. M., & Kostas-Polston, E. (2007), “A Psychometric Toolbox for Testing Validity and Reliability”, *Journal of Nursing Scholarship*, 39(2), 155–164.
- Drewry (01 December, 2022), “World Container Index”, <https://www.drewry.co.uk/supply-chain-advisors/supply-chain-expertise/world-container-index-assessed-by-drewry> adresinden alındı.
- DW (Kasım 2022), “Çin'de Hükümetin Sıfır Covid Politikasına Öfke Artıyor”. <https://www.dw.com/tr/%25C3%25A7inde-h%25C3%25BCK%25C3%25BCmetin-s%25C4%25B1f%25C4%25B1r-covid-politikas%25C4%25B1na-%25C3%25B6fke-art%25C4%25B1yor/a-63889005&cd=3&hl=tr&ct=clnk&gl=tr> adresinden alındı.
- Durmuş B. (2021), “Lecturer Notes”, Marmara University.
- Durmuş, B., Yurtkoru, E. S. ve Çinko, M. (2011), “Sosyal Bilimlerde SPSS’le Veri Analizi, İstanbul: Beta Yayıncılık.
- Erkan, B. (2014), “The Importance and Determinants of Logistics Performance of Selected Countries”, *Journal of Emerging Issues in Economics, Finance and Banking an Online International Monthly Journal*, Vol. 3 Issue 6.
- Etik Araştırma Merkezinin (01 October 2022), “Bilgi Merkezi: Örneklem Büyüklüğü Belirlenmesi”, <http://etikarastirma.com/tr/icerik/bilgi-merkezi/10> adresinden alındı.
- Fernandes, N. (2020), Economic Effects of Coronavirus Pandemic (COVID-19) on the World Economy. SSRN Electronic Journal.
- Field, A. (2006), “Research Methods II: Reliability Analysis”, Sage Publications, London.

- Finkenstadt, D.J., Handfield, R. Blurry (2021), “Vision: Supply Chain Visibility for Personal Protective Equipment During COVID-19”, *J. Purch. Supply Management* 2021, 27.
- Frederico, G.& Kumar, V.& Garza-Reyes, J. (2021), “Impact of the Strategic Sourcing Process on the Supply Chain Response to the COVID-19 Effects”, *Business Process Management Journal*. 10.1108/BPMJ-01-2021-0050.
- Fortune (2020), “94% of the Fortune 1000 are Seeing Coronavirus Supply Chain Disruptions: Report”. Retrieved March 30, 2020, from <https://fortune.com/2020/02/21/fortune-1000-coronavirus-china-supply-chain-impact/>. (Accessed Date: 09.09.2020).
- Futurelearn (14 October 2022), “The Five Elements of Logistics”, <https://www.futurelearn.com/info/courses/principles-global-management-logistics-assets/0/steps/65243> adresinde alındı.
- Gigi, G.&Swetha S. (2020), “Pandemic Impact: Challenges Faced by Entrepreneurs of Logistics Industry”, *Journal of Contemporary Issues in Business and Government* Vol. 26, No. 2, 2020.
- Golan, M.S., Jernegan, L.H., Linkov, I. (2020), “Trends and Applications of Resilience Analytics in Supply Chain Modelling: Systematic Literature Review in the Context of the COVID-19 Pandemic”, *Environ. Syst. Decis.* 40, 21.
- Göze, S., & Altay, B. (2014), “Türkiye’de Lojistik Hizmetlerindeki Gelişimin Dış Ticaret Üzerine Etkileri”, Yayınlanmamış Yüksek Lisans Tezi. Afyon Kocatepe Üniversitesi, Sosyal Bilimler Enstitüsü, Afyonkarahisar, 2014.
- Grzelakowski A.S. (2022), “The Covid 19 Pandemic – Challenges for Maritime Transport and Global Logistics Supply Chains”, *TransNav the International Journal on Marine Navigation and Safety of Sea Transportation*, Vol. 16, No. 1, pp. 71-77.
- Gruchmann, T. (2019), “Advanced Green Logistics Strategies and Technologies”, In *Operations, Logistics and Supply Chain Management*; Zijm, H., Klumpp, M., Regattieri, A., Heragu, S., Eds.; Springer: Cham, Switzerland, pp. 663–686.
- Guilherme, F. & Kumar, V.& Reyes, G., Arturo, J. & Roberto, M.&Kumar, A. (2021), “Performance Measurement in Supply Chains During Disruptions: Lessons from COVID-19 Pandemic”, *Special Issue - Call for Papers for International Journal of Quality & Reliability Management*.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Prentice-Hall.
- Hayes, A., (14 September 2022), “Vertical Integration”, <https://www.investopedia.com/terms/v/verticalintegration.asp> adresinden alındı.
- Ho, S., Xing, W., Wu, W., & Lee, C. C. (2021). The impact of COVID-19 on Freight Transport: Evidence from China. *MethodsX*, 8, 101200.
- Hompel, M. and Heidenblut, V. (2006), “Taschenlexikon Logistik. Abkürzungen, Definitionen und Erläuterungen der wichtigsten Begriffe aus Materialfluss und Logistik”, Berlin, Heidelberg: Springer.

- Hotlan, S., Jiwa, Z., Tarigan, H., and Jie, F. (2021), "Supply Chain Integration Enables Resilience, Flexibility, and Innovation to Improve Business Performance in COVID-19 Era", *Sustainability* 13, No. 9: 4669.
- Houlihan J.B. (1987), "International Supply Chain Management", *International Journal of Physical Distribution and Materials Management*, 17 (2), pp. 51-66.
- Houlihan, J. B. (1988), "International Supply Chains: A New Approach", *Management Decision: Quarterly Review of Management Technology*, 26 (3), pp. 13-19.
- ILO Monitor (25 Ocak 2021), "COVID-19 and the World of Work", Cenevre. https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_767028.pdf adresinden alındı.
- Inbound Logistic (08 October 2022), "What is the Difference Between Logistics and Supply Chain?", <https://www.inboundlogistics.com/articles/good-question/> adresinden alındı.
- International Trade Center (ITC) (2020). COVID-19: The great lockdown and its impact on small business. SME Competitiveness Outlook. Retrieved from: <http://www.intracen.org/covid19/>.
- International Trade Forum (ITF) (19 October 2022), "Trade Recovery in 2021 Impeded by Omicron Virus and Ukraine War", <https://www.itf-oecd.org/trade-recovery-omicron-ukraine-war> adresinden alındı.
- International Finance Cooperation (IFC)(19 October 2022), "The Impact of Covid-19 on Logistics" https://www.ifc.org/wps/wcm/connect/2d6ec419-41df-46c9-8b7b-96384cd36ab3/IFC-Covid19-Logistics-final_web.pdf?MOD=AJPERES&CVID=naqOED5
- Ivanov, D. (2020), "Predicting the Impacts of Epidemic Pandemics on Global Supply Chains: A Simulation-Based Analysis on the Coronavirus Pandemic (COVID-19/SARS-CoV-2) Case", *Transp. Res. Part E Logist. Transp. Rev.*, 136.
- iBanFirst, (14 October 2021), "The Impact of Covid-19 on Logistics and Supply Chains", <https://blog.ibanfirst.com/en/impacts-of-covid-on-supply-chains> adresinden alındı.
- Joshi, S. and Sharma, M. (2018), "Blending Green with Lean-Incorporating Best of the Breed Practices to Formulate an Optimum Global Supply Chain Management Framework: Issues And Concerns", in *Operations and Service Management: Concepts, Methodologies, Tools, and Applications*, pp.230–249, IGI Global.
- Kähkönen, A.K.& Patrucco, A.S. (2022), "A Purchasing and Supply Management View of Supply Resilience for Better Crisis Response", *Journal of Purchasing and Supply Management*, Volume 28, Issue 5, 100803.
- Kaiser, H.F. (1958), "The Varimax Criterion for Analytic Rotation in Factor Analysis", *Psychometrika*, 23, 187-200.
- Karmaker, C. L., Ahmed, T., Ahmed, S., Ali, S. M., Moktadir, M.A. and Kabir, G. (2021). "Improving Supply Chain Sustainability in the Context of Covid-19 Pandemic in an Emerging Economy:

- Exploring Drivers Using an Integrated Model”, *Sustainable Production and Consumption*, Vol. 26, pp.411–427.
- Keita O., Yasuyuki T.& Masahito A., Fukunari K., Shapiro U., (2021), "The Impact of COVID-19 on Business Activities and Supply Chains in the ASEAN Member States and India", Working Papers DP-2021-17, Economic Research Institute for ASEAN and East Asia (ERIA).
- Kiers, J.; Seinhorst, J., Zwanenburg, M., Stek, K., (2022), “Which Strategies and Corresponding Competences are Needed to Improve Supply Chain Resilience: A Covid-19 Based Review”, *Logistics* 2022, 6, 12.
- Know Your Project Company (April 19, 2022), “Party Logistics 1PL, 2PL, 3PL, 4PL, 5PL and 6PL”, <https://knowyourproject.com/party-logistics-1pl-2pl-3pl-4pl-5pl-and-6pl/> adresinden alındı.
- KOSGEB, (03 September 2022), “Türkiye’deki KOBİlere İlişkin Bazı İstatistiki Göstergeler”, https://webdosya.kosgeb.gov.tr/Content/Upload/Dosya/Mevzuat/2022/T%C3%BCrkiye_KOB%C4%B0lerine_%C4%B0li%C5%9Fkin_Baz%C4%B1_%C4%B0statistiki_G%C3%B6stergeler_Eyl%C3%BCl_2022.pdf adresinden alındı.
- Kraljic, P. (1983), “Purchasing must Become Supply Management”, *Harv. Bus. Rev.* 1983, 61, 109–117.
- Kuo, M.A., (18 October 2022), “Covid: Impact on Global Shipping and China’s Economy”, <https://thediplomat.com/2020/03/covid-19-impact-on-global-shipping-and-chinas-economy/> adresinden alındı.
- Lachvajderová, L., Kádárová, J., Kopec, J., & Rybárová, D. (2022), “Postpandemic Innovative Trends In Logistics”, *Distribution and Supply Chain. Advanced Logistic Systems - Theory and Practice*, 16(1), 19–30.
- Lamming, R. (1996), “Squaring Lean Supply with Supply Chain Management”, *International Journal of Operations and Production Management*, 16 (2) (1996), pp. 183-196.
- Li, X., Zhou, Y., Wong, Y.D., Wang, X., Yuen, K.F. (2021), “What Influences Panic Buying Behaviour? A Model Based on Dual-System Theory and Stimulus-Organism-Response Framework”, *Int. J. Disaster Risk Reduct.* 64, 102484.
- Li, S., Bhanu R., T. S. Ragu, and Subba R. (2006), “The Impact of Supply Chain Management Practices on Competitive Advantage and Organizational Performance”, *Omega* 34: 107–24.
- Magableh, G.M. (2021), “Supply Chains and the Covid-19 Pandemic: A Comprehensive Framework”, *Eur. Manag. Rev.*, 18, 363–382.
- MarketsandMarkets (2022). “Covid-19 Impact on Logistic & Supply Chain Industry Market”, <https://www.marketsandmarkets.com/Market-Reports/covid-19-impact-on-logistics-supply-chain-industry-market-244593137.html> adresinden alındı.
- Marketing91 (January 6, 2021), “6 Logistics Activities or 6 Functions of Logistics in an Organization”, <https://www.marketing91.com/logistics-activities/> adresinden alındı.
- McKibbin, W. J., & Fernando, R. (2020), “The Global Macroeconomic Impacts Of COVID-19: Seven Scenarios”, *SSRN Electronic Journal*.

- Mckinsey (October 13, 2020), "Companies have Only Partly Addressed the Weaknesses in Global Supply Chains Exposed by The Coronavirus Pandemic. In the Face of New Challenges, Finishing The Job is Even More Urgent", <https://www.mckinsey.com/capabilities/operations/our-insights/how-covid-19-is-reshaping-supply-chains> adresinden alındı.
- Michigan State University (August 26, 2022), "Is Logistics the Same as Supply Chain Management?", <https://www.michiganstateuniversityonline.com/resources/supply-chain/is-logistics-the-same-as-supply-chain-management/> adresinden alındı.
- Mishra, R., Singh, R., Rana, N. (2022), "Developing Environmental Collaboration among Supply Chain Partners for Sustainable Consumption & Production: Insights from an Auto Sector Supply Chain", *Journal of Cleaner Production*, Volume 338.
- Muhasebe News, (2020), "GTS Kapsamında Taşıma Şekillerine göre İhracat ve İthalat" <https://www.muhasabenews.com/2020-yili-agustos-ayinda-dis-ticarette-en-cok-kullanilan-tasima-sekli-deniz-yolu-tasimaciligi-oldu/> adresinden alındı.
- Mvududu, N. H., & Sink, C. A. (2013), "Factor Analysis in Counseling Research and Practice", *Counseling Outcome Research and Evaluation*, 4(2), 75–98.
- Nguyen, H.K. (2021), "Application of Mathematical Models to Assess the Impact of the COVID-19 Pandemic on Logistics Businesses and Recovery Solutions for Sustainable Development", *Mathematics* 9, no. 16: 1977.
- Nguyen, H. T. X. (2022), "The Effect of COVID-19 Pandemic on Financial Performance of Firms: Empirical Evidence from Vietnamese Logistics Companies", *Journal of Asian Finance Economics and Business*, 9(2):177-183, 2022.
- OECD (2020), "FDI Flows During the COVID-19 Crisis: What Can Happen in the Short and Longer Run?", <https://www.oecd.org/coronavirus/policy-responses/investment-promotion-agencies-in-the-time-of-covid-19-50f79678/> adresinden alındı.
- OECD (10 March 2022), "International Trade During The COVID-19 Pandemic: Big Shifts and Uncertainty", <https://www.oecd.org/coronavirus/policy-responses/international-trade-during-the-covid-19-pandemic-big-shifts-and-uncertainty-d1131663/> adresinden alındı.
- Ozkanlısoy, O. (2021), "The Covid-19 Outbreak's Effects and New Inclinations in Terms of Logistics and Supply Chain Activities: A Conceptual Framework", *Journal of Management Marketing and Logistics*, 8 (2) , 76-88 .
- Perkumiene, D., Osamede, A., Andriukaitienė R. and Beriozovas, O., (2021), "The impact of COVID-19 on the Transportation and Logistics Industry", *Problems and Perspectives in Management*, 19(4), 458-469.
- Peters, E.; Uenk, N., Oortwijn, A., Knight, L., Ahaus, K., Van Raaij, E., Bosman, L., Telgen, J. (2021), "Supply Strategies and their Consequences in the Netherlands", *Material Supply Strategy in a Crisis*; PPRC, Ed.; PPRC, University of Twente: Enschede, The Netherlands; Erasmus University Rotterdam: Rotterdam, Netherlands.

- Pilikoğlu, A., & Sağlam, M. (2020), "Covid-19 Pandemi Sürecinde ve Endüstri 4.0 Çerçevesinde Tedarik Zinciri Uygulamalarının Değerlendirilmesi: Lojistik Sektöründe Bir Uygulama", İstanbul Ticaret Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi, İstanbul, 2020.
- Polanyi, M. (1966), "The Tacit Dimension", Doubleday & Company, Inc.: Garden City, NY, USA, 1966; p. 104.
- Radhakrishna, R. B. (2007). Tips for Developing and Testing Questionnaires/Instruments. *Journal of Extension*, 45(1), 1-4.
- Ratner, B. (2009), "The Correlation Coefficient: Its Values Range Between +1/-1, or do They?", *Journal of Targeting, Measurement and Analysis for Marketing*, 17(2), 139-142.
- Rizou, M., Galanakis, I.M., Aldawoud, T.M.S., Galanakis, C.M (2020), "Safety of Foods, Food Supply Chain and Environment within the COVID-19 Pandemic", *Trends Food Sci. Technol.*, 102, 293–299.
- Sajjad, A. (2021), "The COVID-19 Pandemic, Social Sustainability and Global Supply Chain Resilience: A Review", *Corp. Gov.*, 21, 12.
- Sarstedt, M., & Mooi, E. (2014), "A Concise Guide to Market Research", the Process, Data, and Methods Third Edition. Springer Press.
- Seric, A., Görg, H., Möhle, H. (2020), "Managing COVID-19: How the Pandemic Disrupts Global Value Chains", <https://www.ifw-kiel.de/experts/ifw/holger-goerg/managing-covid-19-how-the-pandemic-disrupts-global-value-chains-14075/> adresinden alındı.
- Science Lab. (2022). "Malzeme Gözetimi ve Elleçleme", <https://www.gozetim.com/gozetim/denetim-hizmetleri/malzeme-gozetimi-ve-ellecleme/> adresinden alındı.
- Seyedmohsen H.& Dmitry I. (2022), "A Multi-Layer Bayesian Network Method for Supply Chain Disruption Modelling in the Wake of the COVID-19 Pandemic", *International Journal of Production Research*, 60:17, 5258-5276.
- Sharma, M., Luthra, S., Joshi, S. and Kumar, A. (2020), "Developing a Framework for Enhancing Survivability of Sustainable Supply Chains During and Post-COVID-19 Pandemic", *International Journal of Logistics Research and Applications*, pp.1–21.
- Shi, X., Liu, W., Zhang, J. (2021), "Present and Future Trends of Supply Chain Management in the Presence Of COVID-19: A Structured Literature Review, *Int. J. Logist. Res. Appl*, 10, 30.
- Shihui, X., Saad, R., Yong, H., Kamran, J., Tasawar, J., & Artene, A. E. (2021), "Effect of COVID-19 Pandemic on Service Sector Sustainability and Growth", *Frontiers in Psychology*, 12.
- Shipping and Freight Resource (2020). "42% will Change Supply Chain Strategies Post COVID-19 – Impact Survey", <https://www.shippingandfreightresource.com/supply-chain-strategies-post-covid-19-impact-survey/> adresinden alındı.
- Snyder, H. (2019), "Literature review as a research methodology: An overview and guidelines", *J. Bus. Res.*, 104, 333–339.

- Sodhi M.S., Tang C.S., Willenson E.T. (2021), "Research Opportunities in Preparing Supply Chains of Essential Goods for Future pandemics. *International Journal of Production Research*. 2021:1–16.
- Spieske, A.&Birkel, H. (2021), "Improving Supply Chain Resilience Through Industry 4.0: A Systematic Literature Review Under the Impressions of the COVID-19 Pandemic", *Comput. Ind. Eng.*,158, 107452.
- Sreenivasan, A. & Suresh, M. (2022), "Modeling the Enablers of Sourcing Risks Faced by startups in COVID-19 Era", *Journal of Global Operations and Strategic Sourcing*, Vol. 15 No. 2, pp. 151-171.
- Srinok, R. & Zandi, G. (2021), "Covid-19 Recession and Firm Performance – What Are the Determining Factors", *Global Journal of Entrepreneurship and Management*, 2(2):1-16.
- Stank, T., Keller, S., Daugherty, P., (2001), "Supply Chain Collaboration and Logistical Service Performance", *Journal of Business Logistics*, 22(1):29-48.
- Statista (2022), "Global Container Freight Rate Index from January 2019 to October 2022". <https://www.statista.com/statistics/1250636/global-container-freight-index/> adresinden alındı.
- Statista (2022), "How Have Your Operations been Affected by COVID-19?", <https://www.statista.com/statistics/1225523/impact-of-covid-on-supply-chain-operations/> adresinden alındı.
- Swanson D., & Santamaria, L. (2021), "Pandemic Supply Chain Research: A Structured Literature Review and Bibliometric Network Analysis", *Logistics* 5(1), 1–22.
- Tabachnick, B. G. & Fidell, L. S. (2013), "Using Multivariate Statistics", (Sixth Edition), USA: Pearson Education Limited.
- Tanyas, M. (6 Kasım 2021), "Türkiye Lojistik Sektörünün 2022’de Yüzde 7 Büyümesi Öngörülüyor", <https://www.ekovitrin.com/kasim-2021/prof-dr-mehmet-tanyas-yazdi-turkiye-lojistik-sektoru-nun-2022de-h356801.html> adresinden alındı.
- T.C. Ticaret Bakanlığı (2021). "Dış Ticaret, Ticaret, Esnaf ve Kooperatiflere İlişkin Geçici İdari Veriler", <https://ticaret.gov.tr/data/606585d513b87618d84fa6c8/2021%20Mart%20Ay%C4%B1%20Veri%20Bu%CC%88lteni.pdf> adresinden alındı.
- T.C. Ticaret Bakanlığı (2022). "Dış Ticaret Veri Bülteni", https://ticaret.gov.tr/data/63621f1313b876d2209cb0dd/Ayl%C4%B1k%20D%C4%B1%20C5%9F%20Ticaret%20Veri%20B%C3%BClteni_Ekim%202022_1.pdf adresinden alındı.
- Teece, D.J. (2021), "Strengthening Dynamic Capabilities in Domestic Firms", *Kindai Management Review*, Vol. 9, pp.9–21.
- Tsai, Cheng-An, Tien-Hwa Ho, Jyh-Shyan Lin, Chien-Chih Tu, and Che-Wei Chang. 2021. "Model for Evaluating Outsourcing Logistics Companies in the COVID-19 Pandemic" *Logistics* 5, no. 3: 64.
- TÜİK (29 Ağustos 2022), "Yıllık Sanayi ve Hizmet İstatistikleri, 2021", <https://data.tuik.gov.tr/Bulten/Index?p=Yillik-Sanayi-ve-Hizmet-Istatistikleri-2021-45836> adresinden alındı.

- UNCTAD (2021), “Review of Maritime Transport 2021”, <https://unctad.org/webflyer/review-maritime-transport-2021> adresinden alındı.
- UNCTAD Report (12–14 July 2022), “Sustainable and Resilient Transport and Trade Facilitation in Times of Pandemic and Beyond: Key Challenges and Opportunities”, https://unctad.org/system/files/non-official-document/Cimem9_2022_p25_Yamen.pdf adresinden alındı.
- UTİKAD (2021), “Lojistik Sektör Raporu”, https://www.utikad.org.tr/images/HizmetRapor/utikad_lojistiksektoruraporu2021-1654.pdf
- Van Hoek, R. (2020), “Research Opportunities for a More Resilient Post-COVID-19 Supply Chain-Closing the Gap Between Research Findings and Industry Practice”, *Int. J. Oper. Prod. Manag.*, 40, 14.
- Wall Street Journal, (2022), “Shipping and Logistics Costs are Expected to Keep Rising in 2022”, <https://www.wsj.com/articles/shipping-and-logistics-costs-are-expected-to-keep-rising-in-2022-11639918804> adresinden alındı.
- Warehouseanywhere (August 22, 2018), “3PL vs. 4PL Logistics: Best Definition, Explanation and Comparison”, <https://www.warehouseanywhere.com/resources/3pl-vs-4pl-logistics-definition-and-comparison/> adresinden alındı.
- Waters, C. D. J. (2003), “Logistics: An Introduction to Supply Chain Management”, Basingstoke: Palgrave Macmillan.
- Whittemore, R.&Knafl, K. (2005), “The Integrative Review: Updated methodology”, *J. Adv. Nurs.* 2005, 52, 546–553.
- Wipro (2020), “4 strategies Transportation and Logistics Firms Must Prioritize in Post Covid-19 World”, <https://www.wipro.com/travel-and-transportation/4-strategies-transportation-and-logistics-firms-must-prioritize-in-post-covid-19-world/> adresinden alındı.
- Wiengarten, F.; Lam, H.K.S.; Fan, D. Value Creation Through Expanding the Online Distribution Channel. *Ind. Manag. Data Syst.* 2020, 120, 714–729.
- Wing S.R.T., Stoller, C., Woon Y.D.L. (2020), “Issues on the Logistics Challenges in the Pandemic Period”, *Journal of Critical Reviews*; 7(8):776-780, 2020.
- Wolf, C.&Seuring, S. (2010), “Environmental Impacts as Buying Criteria for Third Party Logistical Services”, *Int. J. Phys. Distrib. Logist. Manag.* 2010, 40, 84–102.
- World Economic Forum (WE) (2022), “The Big Challenges for Supply Chains in 2022”, <https://www.weforum.org/agenda/2022/01/challenges-supply-chains-covid19-2022> adresinden alındı.
- Worldometer (2021), “Coronavirüs”, <https://www.worldometers.info/coronavirus/> (2020) adresinden alındı.
- Worldometer (Kasım, 2022), “Coronavirüs”, <https://www.worldometers.info/coronavirus/#countries> adresinden alındı.

- Zhiwei C., Xin F., Jianwei W., Yongjie Q., Ying J, Zhiyou L. (2022), “How does COVID-19 Pandemic Impact Cities' Logistics Performance? An Evidence from China's Highway Freight Transport”, *Transport Policy*, Volume 120, 2022, Pages 11-22.
- Zhu, G., Chou, M.C., Tsai, C.W., (2020), “Lessons Learned from the COVID-19 Pandemic Exposing the Shortcomings of Current Supply Chain Operations: A Long-Term Prescriptive Offering”, *Sustainability*, 12, 5858.

APPENDIX A

The Conducted Survey (in Turkish)

COVID-19 PANDEMİ SÜRECİNİN İŞLETMELERİN LOJİSTİK FAALİYETLERİ ÜZERİNDEKİ ETKİSİNİN ARAŞTIRILMASINA İLİŞKİN ANKET FORMU

Değerli Katılımcı;

Elinizdeki anket formu, Marmara Üniversitesi Sosyal Bilimler Enstitüsü Yöneticiler için Karar Bilimlerinde yapılan yüksek lisans bitirme tezine veri elde etmek amacıyla hazırlanmıştır. Bu anketin amacı, Covid-19 pandemi sürecinde lojistik hizmet veren firmaların veya lojistik hizmeti bulunan üretim yapan firmaların karşılaştıkları durumların belirlenmesi ve pandeminin işletmeler üzerindeki etkisinin ölçülmesidir. Ankete vereceğiniz cevaplar tez çalışması dışında, başka hiçbir amaç için kesinlikle kullanılmayacaktır. Çalışmamıza katılımınız ve kattığınız değer için şimdiden teşekkür ederiz.

Tez Danışmanı

Prof. Dr. Beril DURMUŞ

Tez Öğrencisi

Atakan ERSÖZ

SOSYO-EKONOMİK VE DEMOGRAFİK BİLGİLER

(01 OCAK 2020 – 31 ARALIK 2021 Covid-19 Pandemi sürecine ilişkin değerlendirmeler)

Firmanız	<input type="checkbox"/> Çok uluslu <input type="checkbox"/> Ulusal <input type="checkbox"/> Bölgesel <input type="checkbox"/> Yerel
Firmanız Çin ile doğrudan/dolaylı faaliyetleri	<input type="checkbox"/> Doğrudan <input type="checkbox"/> Dolaylı <input type="checkbox"/> Hiçbir faaliyeti yoktur.
Firmanızda verilen lojistik hizmetleri (Çoklu seçim)	<input type="checkbox"/> Depolama hizmetleri <input type="checkbox"/> Gümrükleme hizmetleri <input type="checkbox"/> Elleçleme hizmetleri <input type="checkbox"/> Tedarik zinciri hizmetleri <input type="checkbox"/> Dağıtım-taşıma hizmetleri <input type="checkbox"/> Sigorta hizmetleri
Firmanız kaç yıldır faaliyet gösteriyor?
Firmanızda çalışan sayısı	<input type="checkbox"/> 1-9 <input type="checkbox"/> 10-49 <input type="checkbox"/> 50- 249 <input type="checkbox"/> 250-499 <input type="checkbox"/> 500 -999 <input type="checkbox"/> 1000 ve üstü
Firmanızın (Çoklu seçim):	<input type="checkbox"/> Türkiye’de tek bir dağıtım yeri vardır.

	<input type="checkbox"/> Türkiye’de aynı/farklı şehirlerde birden fazla dağıtım yeri vardır. <input type="checkbox"/> Yurtdışında dağıtım yeri vardır.
Firmanızın lojistik dağıtımının bulunduğu coğrafi bölge/leri (Çoklu seçim) işaretleyiniz.	<input type="checkbox"/> Marmara <input type="checkbox"/> Karadeniz <input type="checkbox"/> Ege <input type="checkbox"/> İç Anadolu <input type="checkbox"/> Akdeniz <input type="checkbox"/> Doğu Anadolu <input type="checkbox"/> Güneydoğu Anadolu
Firmanızın yurt dışındaki lojistik faaliyetini (Çoklu seçim) işaretleyiniz.	<input type="checkbox"/> Avrupa <input type="checkbox"/> Kuzey Amerika <input type="checkbox"/> Güney Amerika <input type="checkbox"/> Ortadoğu <input type="checkbox"/> Afrika <input type="checkbox"/> Asya <input type="checkbox"/> Okyanusya
Firmanızın yaklaşık yıllık cirosunu işaretleyiniz.	<input type="checkbox"/> 1 Milyar €’dan fazla (büyük- yaklaşık ilk 30) <input type="checkbox"/> 50 Milyon – 1 Milyar €’dan az (büyük) <input type="checkbox"/> 10-50 Milyon €’dan az (orta) <input type="checkbox"/> 2-10 Milyon €’dan az (küçük) <input type="checkbox"/> 2 Milyon €’dan az (mikro) <input type="checkbox"/> Bu konuda bilgi sahibi değilim. <input type="checkbox"/> Bu konuda bilgi paylaşmak istemiyorum.
Firmanızın ülkemizde yaklaşık olarak pazar payı oranına ilişkin aralığı işaretleyiniz.	<input type="checkbox"/> %80 ve üstü <input type="checkbox"/> %50 - 79 arasında <input type="checkbox"/> %30- 49 arasında <input type="checkbox"/> %11 - 29 arasında <input type="checkbox"/> %10 ve altı <input type="checkbox"/> Bu konuda bilgi sahibi değilim. <input type="checkbox"/> Bu konuda bilgi paylaşmak istemiyorum.
Firmanızda inovasyon faaliyetleri yürütülüyor mu?	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Firmanızda Ar-Ge faaliyetleri yürütülüyor mu?	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Firmanızın sürdürülebilirlik faaliyetlerinize yönelik ayrı bir biriminiz var mı?	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Covid-19 sürecinde ciro değişiminiz (2020/2021)	<input type="checkbox"/> % 51 üzerinde azaldı. <input type="checkbox"/> % 26-50 arasında azaldı. <input type="checkbox"/> % 1-25 arasında azaldı. <input type="checkbox"/> Aynı kaldı. <input type="checkbox"/> % 51 üzerinde arttı. <input type="checkbox"/> % 26-50 arasında arttı. <input type="checkbox"/> % 1-25 arasında arttı.
Covid -19 salgını sonrası firma maliyetlerindeki değişiminiz	<input type="checkbox"/> Maliyetlerimiz çok yüksek seviyede artış gösterdi. <input type="checkbox"/> Maliyetlerimiz az da olsa artış gösterdi. <input type="checkbox"/> Maliyetlerimiz değişmedi. <input type="checkbox"/> Maliyetlerimiz az da olsa düşüş gösterdi. <input type="checkbox"/> Maliyetlerimiz çok yüksek seviyede düşüş gösterdi.

Covid-19 sürecinde firmanızın yaşadığı sorunlar (Çoklu seçim)	<input type="checkbox"/> Tahsilat problemi <input type="checkbox"/> İşletme maliyetlerindeki artış <input type="checkbox"/> Talepteki daralma <input type="checkbox"/> Personel bulmada sıkıntı <input type="checkbox"/> Düşük öngörülebilirlik <input type="checkbox"/> Finansman bulmadaki sıkıntılar <input type="checkbox"/> Teknolojik altyapıdaki yetersizlik
Firmanızın Covid-19 pandemi sürecinde karşılaştığı tedarik zinciriyle problemleri (Çoklu seçim)	<input type="checkbox"/> Sınırlarını kapatan ülkeler nedeniyle güzergâhların değişmesi <input type="checkbox"/> Artan lojistik maliyetleri <input type="checkbox"/> Sınırlardaki sağlık denetimleri
Covid-19 pandemi sürecinde firmamızda	<input type="checkbox"/> Ticaret hacmi düşmüştür. <input type="checkbox"/> Transit gecikme yaşanmıştır. <input type="checkbox"/> Kapasite yetersizliği yaşanmıştır. <input type="checkbox"/> Sevkiyat ve tedarik zinciri ortaklarıyla iletişim konusunda gecikmeli iletişimler yaşanmıştır.
Covid -19 pandemi süreci sonunda firmamızın nakliye ve tedarik zinciri stratejileri değişmiştir.	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Covid -19 pandemi süreci sonunda firmamız tedarik zincirlerinde değişiklik yapmıştır.	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Covid-19 pandemi süreci firmamızın teknolojisini yükseltmesi ve evden çalışma yeteneğinin geliştirilmesine yönelik hazırlık yapmıştır.	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Covid-19 pandemi süreci firmamız dijital verilerin tutulmasında hangi veri tabanını kullanmıştır.	<input type="checkbox"/> ERP (Kurumsal kaynak planlaması) <input type="checkbox"/> Dağıtım modülü (Özel yazılım programı) <input type="checkbox"/> Microsoft Excel
Covid-19 pandemi sürecinde yük taşıma faaliyetlerinde aksama ve tıkanmalar ve kargo hizmetlerinde ise kapasite yetersizliği, talebe yetişememe ve hizmet kalitesinde düşüşe yol açmıştır.	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Covid -19 pandemi sürecinde firmamız müşterilerimizin gereksinimlerini karşılamak için teknolojik yatırım yapmıştır.	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Covid-19 pandemi süreci sonunda firmamız başarılı olmuştur.	<input type="checkbox"/> Evet <input type="checkbox"/> Hayır <input type="checkbox"/> Hiçbir bilğim yok
Pandemi döneminde lojistik hizmetler için satın alma faaliyeti	<input type="checkbox"/> Azalmıştır. <input type="checkbox"/> Artmıştır. <input type="checkbox"/> Aynı kalmıştır.

Covid -19 pandemi süreci sonunda lojistik hizmetler piyasasında hiç kimse toparlanmanın nasıl ve spesifik etkilerinin ne olacağını hakkında net bir bilgiye sahip değildir.	[] Evet [] Hayır [] Hiçbir bilgim yok
---	--

(01 OCAK 2020 – 31 ARALIK 2021 COVID-19 PANDEMİ SÜRECİNE İLİŞKİN DEĞERLENDİRMELER)			Kesinlikle	Katılmıyorum	Kısmen katılıyorum	Katılıyorum	Kesinlikle
Firmanızın alt başlıklarda verilen ifadeleri firmanıza uygunluğu açısından 1 ile 5 arasında değerlendiriniz.							
1: Kesinlikle Katılmıyorum. - 5: Kesinlikle Katılıyorum.			(1)	(2)	(3)	(4)	(5)
Strateji ve Yatırım	1	Covid-19 salgını, firmamızın <i>stratejik kaynak kullanımını</i> olumsuz etkilemiştir.					
	2	Covid-19 firmamızın <i>yeni yatırım ve büyüme planlarını</i> olumsuz etkilemiştir.					
	3	Covid-19 pandemisi firmamızı <i>yeni pazarlara</i> yöneltmiştir.					
Maliyet	4	Covid-19 salgını firmamızın <i>lojistik maliyetlerini</i> artırmıştır.					
	5	Covid-19 pandemi süreci, firmamızın <i>taşımacılık maliyetlerini</i> artırmıştır.					
	6	Covid-19 pandemi süreci, firmamızın <i>depolama maliyetlerini</i> artırmıştır.					
	7	Covid-19 pandemi süreci, firmamızın <i>aktarma maliyetlerini</i> artırmıştır.					
Tedarik Zinciri	8	Covid-19 pandemi süreci, firmamızın <i>stok maliyetlerini</i> artırmıştır.					
	9	Covid-19 salgını firmamızı <i>bütünsel tedarik zincirinden, parçalı bir tedarik zincirine</i> kaydırmıştır.					
	10	Covid-19 pandemi sürecinde firmamızın <i>dağıtım yapısını sekteye uğratmış ve ertelemelere</i> neden olmuştur.					
	11	Covid-19 pandemi sürecinde, firmamızın <i>yalın, esnek ve dayanıklı yapısını, karmaşık ve katmanlı lojistik ağ yapılı</i> bir yapıya dönüştürmüştür.					
	12	Covid-19 pandemi sürecinde firmamızın <i>lojistik operasyonlarının devamlılığında sorun yaşamasına ve müşteri kayıplarına</i> neden olmuştur.					
	13	Covid-19 salgını firmamızın <i>ticari faaliyetlerini</i> azaltmıştır.					

Tedarik Zinciri Süreç Yönetimi	14	Covid-19 pandemi sürecinde <i>firmamızın hizmet sunumunu olumsuz</i> (Mod kayması, kargo tipi değişimi, navlun konsolidasyonu vb.) etkilemiştir.					
	15	Covid-19 pandemi sürecinde firmamızın kaynak sıkıntısında <i>küresel, yerel ve bölgesel kaynak aramasına</i> yol açmıştır.					
	16	Covid-19 salgını, firmamızın <i>tek bir tedarikçi</i> ile çalışmak yerine, tedarikçi portföyünü genişleterek <i>çoklu tedarik planlamasına</i> yol açmıştır.					
	17	Covid-19 pandemi sürecinde firmamız <i>müşterimizin sorunlarına, ihtiyaçlarına ve önerilerine cevap verme süresini</i> artmıştır.					
	18	Covid-19 pandemi sürecinde <i>gümrük ve sınır işlemleri süreçlerini olumsuz</i> etkilemiştir.					
	19	Covid-19 pandemi sürecinde firmamızın <i>sevkiyat ve tedarik zincirinde yaşanan problemler</i> firma performansını <i>olumsuz</i> etkilemiştir.					
Teknoloji ve Dijitalleşme	20	Covid-19 pandemi süreci, firmamızın <i>dijitalleşme</i> (Otomasyon, montaj/robot sistemleri, yapay zekâ vb.) <i>hızını</i> artırmıştır.					
	21	Covid-19 pandemi süreci, firmamızda kullanılan verilerin <i>entegrasyonunu ve dijital sonuçların elde edilmesini kolaylaştırmıştır.</i>					
	22	Covid-19 pandemi süreci firmamızın <i>dijital dönüşüm</i> ile <i>otomasyon</i> ve benzeri <i>teknolojik yatırımlarını</i> artırmıştır.					

Katkılarınız için çok teşekkür ederiz.

APPENDIX B

The Conducted Survey (in English)

SURVEY FORM ON INVESTIGATION OF THE EFFECT OF THE COVID-19 PANDEMIC PROCESS ON THE LOGISTICS ACTIVITIES OF THE COMPANIES

Dear Participant,

The questionnaire in your hand has been prepared to obtain data for the graduate thesis in Decision Sciences for Executives of Marmara University Institute of Social Sciences. The purpose of this survey is to determine the situations faced by companies providing logistics services or manufacturing companies with logistics services during the Covid-19 pandemic process and to measure the impact of the pandemic on businesses. Your answers to the questionnaire will not be used for any purpose other than thesis work. Thank you in advance for your participation in our work and the value you add.

Supervisor

Prof. Dr. Beril DURMUŞ

Student

Atakan ERSÖZ

SOCIO-ECONOMIC AND DEMOGRAPHIC INFORMATION

(01 JANUARY 2020 – 31 DECEMBER 2021 Evaluations on the Covid-19 Pandemic process)

Your company	<input type="checkbox"/> Multinational <input type="checkbox"/> National <input type="checkbox"/> Regional <input type="checkbox"/> Local
Your company's direct/indirect activities with China	<input type="checkbox"/> Directly <input type="checkbox"/> Indirect <input type="checkbox"/> It has no activity.
Logistics services provided in your company (Multiple selection)	<input type="checkbox"/> Storage services <input type="checkbox"/> Customs clearance services <input type="checkbox"/> Handling services <input type="checkbox"/> Supply chain services <input type="checkbox"/> Distribution-transportation services <input type="checkbox"/> Insurance services
How many years has your company been operating?
Number of employees in your company	<input type="checkbox"/> 1-9 <input type="checkbox"/> 10-49 <input type="checkbox"/> 50- 249 <input type="checkbox"/> 250-499 <input type="checkbox"/> 500 -999 <input type="checkbox"/> 1000 and above

Your company (Multi-choice):	<input type="checkbox"/> There is only one distribution place in Turkey. OD <input type="checkbox"/> There are multiple distribution locations in the same/different cities in Turkey. MDL <input type="checkbox"/> It has a distribution place abroad. DA
Mark the geographical region(s) where your company has logistics distribution (Multi-selection).	<input type="checkbox"/> Marmara <input type="checkbox"/> Black Sea <input type="checkbox"/> Aegean <input type="checkbox"/> Central Anatolia <input type="checkbox"/> Mediterrenian <input type="checkbox"/> Eastern Anatolia <input type="checkbox"/> Southeastern Anatolia
Please tick the logistics activity of your company abroad (Multi-selection).	<input type="checkbox"/> Europe <input type="checkbox"/> North America <input type="checkbox"/> South America <input type="checkbox"/> Middle East <input type="checkbox"/> Africa <input type="checkbox"/> Asia <input type="checkbox"/> Oceania
Please mark the approximate annual turnover of your company.	<input type="checkbox"/> More than €1 Billion (Big - about top 30) <input type="checkbox"/> 50 Million – Less than 1 Billion € (Big) <input type="checkbox"/> Less than 10-50 Million € (Medium) <input type="checkbox"/> Less than 2-10 Million € (Small) <input type="checkbox"/> Less than € 2 Million (Micro) <input type="checkbox"/> I have no idea <input type="checkbox"/> I do not want to share information about this.
Please mark the range regarding the approximate market share rate of your company in our country.	<input type="checkbox"/> 80% and above <input type="checkbox"/> Between 50 - 79% <input type="checkbox"/> Between 30-49% <input type="checkbox"/> Between 11 - 29% <input type="checkbox"/> 10% and below <input type="checkbox"/> I have no idea <input type="checkbox"/> I do not want to share information about this.
Does your company carry out innovation activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
Does your company carry out R&D activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
Does your company have a separate unit for your sustainability activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
Your turnover change during the Covid-19 process (2020/2021)	<input type="checkbox"/> It decreased by over 51%. <input type="checkbox"/> It decreased by 26-50%. <input type="checkbox"/> It decreased by 1-25%. <input type="checkbox"/> It remained the same. <input type="checkbox"/> It increased by over 51%.

	<input type="checkbox"/> It increased between 26-50%. <input type="checkbox"/> It increased by 1-25%.
Your change in company costs after the Covid -19 pandemic	<input type="checkbox"/> Our costs have increased tremendously. <input type="checkbox"/> Our costs have increased slightly. <input type="checkbox"/> Our costs have not changed. <input type="checkbox"/> Our costs have decreased slightly. <input type="checkbox"/> Our costs have dropped tremendously.
Problems experienced by your company during the Covid-19 process (Multiple selection)	<input type="checkbox"/> Money collection problem <input type="checkbox"/> Increase in operating costs <input type="checkbox"/> Contraction in demand <input type="checkbox"/> Trouble finding staff <input type="checkbox"/> Low predictability <input type="checkbox"/> Difficulties finding financing <input type="checkbox"/> Inadequate technological infrastructure
Problems with the supply chain your company encountered during the Covid-19 pandemic (Multi-selection)	<input type="checkbox"/> Change of routes due to countries closing their borders <input type="checkbox"/> Increased logistics costs <input type="checkbox"/> Health inspections at borders
In our company during the Covid-19 pandemic	<input type="checkbox"/> The trading volume has decreased. <input type="checkbox"/> There has been a transit delay. <input type="checkbox"/> There was a lack of capacity. <input type="checkbox"/> There were delayed communications with shipping and supply chain partners.
At the end of the Covid -19 pandemic process, our company's transportation and supply chain strategies have changed.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
At the end of the Covid -19 pandemic process, our company has made changes in its supply chains.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
The Covid-19 pandemic process has made preparations for our company to upgrade its technology and improve its ability to work from home.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
Which database did our company use to keep digital data during the Covid-19 pandemic process?	<input type="checkbox"/> ERP (Enterprise resource planning) <input type="checkbox"/> Distribution module (Special software program) <input type="checkbox"/> Microsoft Excel

During the Covid-19 pandemic, disruptions and blockages in cargo transportation activities and insufficient capacity in cargo services have led to the inability to keep up with the demand and a decrease in service quality.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
During the Covid -19 pandemic, our company has made technological investments to meet the needs of our customers.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
At the end of the covid-19 pandemic process, our company has been successful.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea
Purchasing activity for logistics services during the pandemic period	<input type="checkbox"/> It has decreased. <input type="checkbox"/> It has increased. <input type="checkbox"/> It has remained the same.
No one in the logistics services market has clear information about how and what the specific effects of the recovery will be at the end of the Covid -19 pandemic process.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> I have no idea

<u>(01 JANUARY 2020 – 31 DECEMBER 2021 EVALUATIONS ON THE COVID-19 PANDEMIC PROCESS)</u>			Strongly disagree	Disagree	partially agree	Agree	Strongly agree
Evaluate the statements given in the sub-headings of your company between 1 and 5 in terms of their suitability for your company.							
<i>1: Strongly disagree. - 5: Strongly agree.</i>			(1)	(2)	(3)	(4)	(5)
Strategy and Investment	1	The Covid-19 pandemic has adversely affected our company's strategic resource use.					
	2	Covid-19 has adversely affected our company's new investment and growth plans.					
	3	The Covid-19 pandemic has directed our company to new markets.					
Cost	4	The Covid-19 pandemic has increased our company's logistics costs.					
	5	The Covid-19 pandemic process has increased the transportation costs of our company.					
	6	The Covid-19 pandemic process has increased our company's storage costs.					
	7	The Covid-19 pandemic process has increased our company's transfer costs.					

	8	The Covid-19 pandemic process has increased the stock costs of our company.					
Supply Chain	9	The Covid-19 pandemic has shifted our company from a holistic supply chain to a fragmented supply chain.					
	10	During the Covid-19 pandemic process, our company's distribution structure has been disrupted and has caused delays.					
	11	During the Covid-19 pandemic process, our company's lean, flexible and durable structure has been transformed into a complex and layered logistics network structure.					
	12	The Covid-19 pandemic has reduced our company's commercial activities.					
Supply Chain Process Management	13	During the Covid-19 pandemic, our company's service delivery was adversely affected (mode shift, cargo type change, freight consolidation, etc.).					
	14	During the Covid-19 pandemic process, our company's resource shortage has led to a global, local and regional search for resources.					
	15	The Covid-19 pandemic has led to multiple procurement planning by expanding our supplier portfolio instead of working with a single supplier.					
	16	During the covid-19 pandemic process, our company has increased the time to respond to our customers' problems, needs and suggestions.					
	17	During the Covid-19 pandemic, it adversely affected the customs and border procedures.					
	18	During the Covid-19 pandemic, the problems experienced in our company's shipment and supply chain adversely affected the company's performance.					
Technology and Digitalization	19	The Covid-19 pandemic process has increased the speed of our company's digitalization (Automation, assembly/robot systems, artificial intelligence, etc.).					
	20	The Covid-19 pandemic process has increased our company's digital transformation, automation and similar technological investments.					

Thank you very much for your contribution.