

Effects of Covid-19 Pandemic on Supply Chain Management in the Clothing Sector and Possible Solutions

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Abstract

The clothing sector is one which possesses significance in global trade. The sector has been negatively affected by the pandemic due to its labor-intensive structure and possession of a relatively long and global supply chain. At this point, the Turkish clothing sector, which is the sixth biggest clothing supplier in the world, the third biggest clothing supplier in the European Union, and comprised 10% of Turkey's general exports in 2019, should be investigated. In this context, this research aims to determine the effects of the COVID-19 pandemic on supply chain management in the Turkish clothing sector. Also, it aims to specify possible solutions against the negative effects of the COVID-19 pandemic.

In accordance with the aim of the research, a survey was conducted in clothing enterprises. 391 survey questionnaires were incorporated into the research. According to the research results, it is determined that supply chain management in the Turkish clothing sector has been negatively affected by the COVID-19 pandemic. Order disruptions and cessations have ruined employment, production, procurement and investment processes resulting in financial disruptions. The most significant possible precautions that can be taken by enterprises that can be indicated as follows: benefiting from government support, heading towards online trade and an omni-channel strategy, actualising necessary alterations in product ranges, giving essential importance to innovation, efficient use of occupational health and safety systems, shortening the supply chain as far as possible, integrating digitalisation into all processes of the supply chain, and increasing the efficiency of marketing activities.

Keywords

COVID-19 pandemic, clothing sector, supply chain management, survey method, factor analysis.

1. Introduction

According to the World Trade Organization's statistical data, global clothing export had a 2,61% share of the world's general exports in 2019 [1]. As can be seen, the clothing sector is one which possesses significance in global trade. However, the sector has been negatively affected by the pandemic due to its labor-intensive structure and working conditions.

Stores are closed due to the restrictions, therefore sharp drops have been occurred in product sales. In spite of this, retailers are encouraging consumers to shop online by providing free shipping and discounts. Nevertheless, while online shopping remains a viable option, rising unemployment, falling incomes and growing uncertainty mean that purchasing new clothing may no longer be a priority for many consumers. At the peak of the outbreak in China, shortages of raw materials and inputs caused manufacturing disruption across the world. Many enterprises

have stopped their manufacturing and closed their factories in Mexico, China and Bangladesh. These impacts have negatively affected the whole supply chain. Besides this, the decreasing production and sales amounts have negatively affected working conditions and employment. Small and medium sized enterprises, which are a vital source of employment and growth in the sector, are likely to suffer the greatest impact of this pandemic [2].

The production systems and processes which have been used in the clothing industry will be changed slightly or greatly after the pandemic. The COVID-19 pandemic will speed up the adaptation process of the clothing industry to technology (the transition process to industry 4.0) and will provide rapid and efficient production. On the other hand, consumers and buyers have shifted to online purchasing models, and this situation is causing a significant growth in e-commerce. The increasing significance of e-commerce will affect e buyers and retailers, and consequently the

number of enterprises and retailers which would like to benefit from omni-channel strategies will increase. However, the pandemic will negatively affect labour rights. Many clothing workers have lost their jobs during pandemic or they have lost their incomes due to unpaid leave [3].

On the other hand, according to the World Trade Organization, Turkey was the sixth biggest clothing exporter in the world in 2019 [4]. Besides this, it is the third biggest clothing supplier in the European Union [5]. According to the Turkish Statistical Institute, Turkey exported 17,5 billion dollars' worth of clothing in 2019. The clothing sector had a 10% share in Turkey's general exports in 2019. The sector showed a 16 billion dollar net foreign trade surplus in 2019 [6]. In addition to these, according to the annual industry and service statistics of the Turkish Statistical Institute, the sector had an approximately 14% share in the manufacturing sector in terms of employment and enterprise number in 2018 [7]. As can be seen from the data, the clothing sector continues to preserve

its significance and place both in the Turkish economy and global market. However, it is predicted that the Turkish clothing sector will be negatively affected by the COVID-19 pandemic, like its global rivals and stakeholders.

In this context, this research aims to determine the effects of the COVID-19 pandemic on the clothing sector, which possesses a significant place both in the Turkish economy and global clothing market, via supply chain management elements, which reflect the sector like a mirror. Also, it aims to specify possible solutions against the negative effects of the COVID-19 pandemic.

2. Effects of the COVID-19 Pandemic on the Clothing Supply Chain and Possible Precautions

Clothing sector is characterized with short product life cycles, high variability, unpredictable variable demand, too many inventory items, low predictiveness, instant purchases, high product range and increasing outsourcing [8,9,10,11]. Clothing supply chain is complicated [9,12]. It is full of uncertainties and unpredictability, as well as being characterised by temporal markets, short product life cycles and a high product range [12]. The clothing supply chain is a relatively long chain, which generally includes too many members [9,12].

COVID-19 has created a ripple effect in the clothing supply chain. First, disruptions occurred in raw material procurement from and clothing production in China due to the lockdown in Wuhan. Afterwards, clothing demand declined sharply as the lockdown started in Europe during the second week of March 2020. These disruptions were followed by store closures around the world. As the pandemic started to spread in South Asia, a lockdown was announced in India and Bangladesh in the last week of March 2020, bringing the clothing industry to a complete standstill. At this point, many global clothing brands and retailers in Europe and

America cancelled their approved orders or delayed their payments. The cancelled orders and delayed payments caused issues in many supplier countries. The cancelled orders affected production and the labour force and caused disruptions in the clothing supply chain. In other words, the COVID-19 pandemic created an unprecedented situation in the clothing supply chain, where demand, supply and manufacturing got completely disrupted and delinked [13,14]. Besides this, these effects on clothing consumption and imports caused an increase in unemployment in clothing exporter countries like Bangladesh, China and Vietnam [15].

As the virus and pandemic upends the global economy, the fashion industry has begun to appreciate the importance of a resilient, flexible, and dependable supply chain. This situation may create a unique opportunity for providing sustainability in fashion and bringing supply chains to own countries from the other countries [16].

The disruption risk due to lockdown is increased if a product's inputs are procured from multiple suppliers or if the suppliers are located in close geographical regions. In order to decrease this effect, enterprise management should determine which products belong to these groups. Afterwards, it can take short-term precautions by reallocating inventories between regions or by reducing dependence on products/inputs, which can cause disruptions. Besides this, enterprises should support their suppliers, which are in financial distress. Business partners in the supply chain should be supported as much as possible in order to provide business continuity, supply chain unity and social sustainability [17].

The demand for clothing products is decreased because of the pandemic. In order to get rid of this situation with the least damage, enterprises should consider supplying and stocking products based on satisfying the actual demand throughout the season instead of supplying and stocking products based on the predicted demand, which is actualised at the start of the season. This supply chain

management strategy provides greater agility in responding to potential demand disruptions. Selling online is another precaution which can be taken against demand disruptions. Strong online sales presence has provided sales continuity to enterprises after store closures [17].

3. Method of the Research

This research aims to determine the effects of the COVID-19 pandemic on supply chain management in the Turkish clothing sector, which continues to protect its significance and place both in the Turkish economy and global clothing market. Also, it aims to specify possible solutions against the negative effects of the COVID-19 pandemic.

In accordance with the aim of the research, a survey was conducted in clothing enterprises which operate throughout Turkey. These enterprises constitute the reach of the research. According to the annual industry and service statistics of the Turkish Statistical Institute [7], there were 56.603 enterprises which operate in the clothing sector by 2018. The sample size was calculated as 382 enterprises at a 95% confidence interval and with a 5% error margin.

As stated by the Turkish fashion and textile cluster project; İstanbul, İzmir, Denizli and Bursa are the provinces in which the clothing sector is clustered and intensively operates [18]. Therefore, 400 enterprises were chosen which operate in those provinces and which are registered in those provinces' chamber of industry, according to simple random sampling.

The surveys were conducted between June and November 2020 using face-to-face interviews and remote access (mail and online survey) techniques. After the repatriation and evaluation of the questionnaires sent back, 391 of them were incorporated in the research. 52% of the questionnaires were completed via the face-to-face interview technique, whereas 48% of them were done via remote access techniques. The questionnaires were answered by senior managers (production managers, marketing managers, finance

managers, human resources managers, deputy general manager) and enterprise owners.

A survey form, which consisted of 14 main and 63 sub-questions, was used as a data collection tool. The survey was ethically approved by Ege University's Ethical Board of Social and Human Sciences Scientific Research and Publication in 10.06.2020 with protocol number 612.

4. Findings of the Research and their Analysis

At the beginning of the statistical analysis, the reliability of the questionnaire was measured and the reliability co-efficient α was found as 0,885. α was calculated as 0,887 only when the statements which analyse the effects of the COVID-19 pandemic are taken into consideration. Besides this, α was found as 0,719 only when the statements which analyze the possible solutions are taken into consideration. According to this, the scale of the questionnaire and that of the statements which analyse the effects of the COVID-19 pandemic are seen to be highly reliable, whereas the scale of the statements which analyse the possible solutions is found to be quite reliable.

61% of the participating enterprises were established in 2016 or after, and 80% of them were founded as incorporated or limited company. Besides this, 83% of them possess 250 employees or less and 73% of them have a 10 million dollar annual turnover or less. According to this, most of the participating enterprises are classified as small and medium sized enterprises.

44% of the participating enterprises produce clothes from both woven and knitted fabrics. 62% of them manufacture for both their own brands and others. Only 11% of them produce for their own brands. Moreover, 71% of them mostly export to the European Union and the United Kingdom. After these countries, they substantially export to Middle East countries, Russia, Ukraine, USA and Canada. Moreover, 85% of them supply

their inputs from Turkey. China is the second country from which inputs are mostly procured. The market distribution of the participating enterprises is found to be 62% foreign and 38% domestic.

91% of the participating clothing enterprises indicate that the COVID-19 pandemic has decreased their capacity utilisation rates. The pandemic has caused a 46% decrease in capacity utilisation rates on average. This situation can be explained by the almost 50% decrease in the enterprises' production amounts in March, April and May 2020, in which the effects of the lockdown both in Turkey and the world have been mostly felt. However, 89% of the enterprises have benefited from short-time working allowance. The enterprises have used possibilities like short-time working allowance and unpaid leave due to the unemployment restriction of the government. Also, 49% of the enterprises have suspended their capacity increase investments during the pandemic.

The survey offered 35 statements which analysed the effects of the COVID-19 pandemic. All participating enterprises were required to choose their agreement levels for each of those statements. On the quinary likert scale, 'I absolutely agree' is coded as 5, 'I agree' as 4, 'I have no idea' as 3, 'I don't agree' as 2, and 'I don't agree absolutely' as 1. Firstly, the averages and standard deviations of the statements were calculated. Afterwards, the statements were evaluated with exploratory factor analysis and gathered into eight groups. The findings obtained are given in Table 1.

The pandemic has mostly affected supply chain management in the clothing sector in terms of the following elements: decrease in profitability, decrease in average order numbers, decrease in average product numbers per order, decrease in production amounts, increase in finished product inventories, increase in inventory costs, decrease in efficiency, increase in occupational health and safety precautions, increase in cash needed, and decrease in the number of inputs which are supplied from abroad.

The Turkish clothing supply chain, which is an important part of the global clothing supply chain, has inevitably been affected by all the negatives which affect the whole. During March, April and May of 2020, in which lockdowns were intensive; global clothing demand sharply declined, consumer demand altered due to the increase in homeworking, and there was a decrease in outdoor activities, despite the demand for casual and sportswear increasing. The demand for clothing products decreased or was postponed due to unemployment and unpaid leaves. As a reflection of this situation, big buyer groups and brands have cancelled or postponed their orders. Buyer groups/brands have not accepted finished orders and delayed their payments. This situation especially has affected small and medium sized enterprises which work as suppliers of these big buyers/brands. These small and medium sized enterprises have also stopped their productions and delayed their payments to their own suppliers. The decrease in sales and production amounts has caused financial bottlenecks and the need for cash has increased. The standstill of the operating and turning wheels has spread through the whole chain in waves and has gradually increased the negative effect. This situation indicates that the ripple effect, which has occurred in the global clothing supply chain [13,14,15,19], has also occurred in the Turkish clothing supply chain.

According to the findings obtained, the pandemic has negatively affected all activities (production, procurement, sales, logistics, knowledge management, inventory management etc.) in the supply chain. Participating enterprises indicated that the sector's production technologies will be updated to industry 4.0 in the medium and long term. Besides this, the online trade activities of the enterprises have increased, and even the enterprises which have never introduced online trade have reverted to online sales. In this context, the results obtained are in accordance with those of the global clothing supply chain. The International Labor Organization [3] has specified that the pandemic will speed up the adaptation process of the clothing industry to

technology (transition process to industry 4.0). Furthermore, the literature [3,17] emphasises that the significance of online trade would be increased due to the altered consumer buying behaviours.

The results of the exploratory factor analysis which refers to the statements that analyse the effects of the COVID-19 pandemic on supply chain management in the clothing sector indicate that the sample is suitable and reliable for factor analysis (Kaiser-Meyer-Olkin measure of the sampling is found to be 0,859, and the significance of Bartlett's Test of Sphericity is found to be 0,000). Principal component extraction is used for extracting factors with eigenvalues over 1, and the rotation of the factor loading

matrix is chosen as varimax. The standard loading of 27 statements are higher than 0,50 (they vary from 0,703 and 0,507), and the cumulative variance of 8 factors is found as 63,50%. The loadings (scores) of the statements within Table 1 are taken from the rotated component matrix (only six loadings are lower than 0,50). The eight factors obtained as a result of exploratory factor analysis, are renamed (Table 1).

The survey offers 16 statements which analyse the possible solutions against the negative effects of the COVID-19 pandemic. All participating enterprises are required to choose their agreement levels for each of these statements. On the quinary likert scale 'I absolutely

agree' is coded as 5, 'I agree' as 4, 'I have no idea' as 3, 'I don't agree' as 2, and 'I don't agree absolutely' as 1. Firstly, the averages and standard deviations of the statements were calculated. Afterwards, the statements were evaluated with exploratory factor analysis and gathered into three groups. The findings obtained are given in Table 2.

According to the research results, the enterprises have mostly needed employment support within the scope of possible adoptable solutions against the negative effects of the COVID-19 pandemic. This support is followed by the postponement of tax debts, easy access to financial resources, investment support, online trade support, postponement

Factors	Statements	Rotated Loadings	Average	Standard Deviation	Averages of the Factors
Effects of the pandemic on costs, inputs, production, supply, delivery and occupational health and safety	COVID-19 pandemic has caused disruptions in our planning processes.	0,806	3,54	1,208	3,43
	COVID-19 pandemic has caused an increase in our raw material costs.	0,785	3,13	1,299	
	COVID-19 pandemic has decreased our flexible/agile production ability.	0,766	3,17	1,243	
	COVID-19 pandemic has caused a decrease in our production speed.	0,746	3,41	1,261	
	COVID-19 pandemic has caused an increase in our costs.	0,743	3,24	1,320	
	COVID-19 pandemic has caused a decrease in our input numbers supplied locally.	0,729	3,23	1,247	
	COVID-19 pandemic has caused an increase in our occupational health and safety precautions.	0,678	4,03	0,940	
	COVID-19 pandemic has caused a decrease in our delivery speed.	0,469	3,69	1,090	
Effects of the pandemic on finance, sales, information flow, efficiency and R&D activities	COVID-19 pandemic has caused an increase in our enterprise's debts.	0,801	3,79	0,971	3,91
	COVID-19 pandemic has caused an increase in our enterprise's unpaid debts whose maturity has arrived.	0,739	3,69	1,114	
	COVID-19 pandemic has caused an increase in our enterprise's cash need.	0,657	3,97	0,887	
	COVID-19 pandemic has caused disruptions in information flow along our supply chain.	0,625	3,86	0,888	
	COVID-19 pandemic has caused a decrease in our profitability.	0,568	4,39	0,902	
	COVID-19 pandemic has caused disruptions in our R&D and product development activities.	0,545	3,84	0,864	
	COVID-19 pandemic has caused a decrease in our unit sales prices.	0,471	3,70	1,130	
	COVID-19 pandemic has decreased our efficiency.	0,424	4,04	0,801	

Table 1. Results of e exploratory factor analysis of the effects of the COVID-19 pandemic and descriptive statistics of the statements

Factors	Statements	Rotated Loadings	Average	Standard Deviation	Averages of the Factors
Effects of the pandemic on production, orders and inventories	COVID-19 pandemic has caused a decrease in our production amounts.	0,728	4,17	0,820	4,19
	COVID-19 pandemic has caused a decrease in our average order numbers.	0,721	4,26	0,705	
	COVID-19 pandemic has caused a decrease in our average product numbers per order.	0,711	4,22	0,769	
	COVID-19 pandemic has caused an increase in our finished product inventories.	0,474	4,11	0,935	
Effects of the pandemic on customers, suppliers and workers	COVID-19 pandemic has caused a decrease in our number of customers.	0,594	3,07	1,252	2,99
	COVID-19 pandemic has caused a breakdown in our relations with customers.	0,556	2,59	1,110	
	COVID-19 pandemic has caused a decrease in our number of workers.	0,544	2,74	1,254	
	COVID-19 pandemic has caused an increase in the number of workers who are sent on unpaid leave.	0,522	3,23	1,218	
	COVID-19 pandemic has caused a breakdown in our relations with suppliers.	0,487	2,59	1,113	
	COVID-19 pandemic has caused an increase in the number of workers who benefit from flexible working.	0,452	3,71	1,036	
Effects of the pandemic on inventories and logistics	COVID-19 pandemic has caused an increase in our inventory costs.	0,783	4,05	0,877	3,87
	COVID-19 pandemic has caused an increase in our raw material inventories.	0,605	3,84	0,994	
	COVID-19 pandemic has caused an increase in our logistics costs.	0,547	3,73	1,064	
Effects of the pandemic on the clothing market	Global clothing market will shrink after the COVID-19 pandemic.	0,823	3,72	0,909	3,73
	Domestic clothing market will shrink after the COVID-19 pandemic.	0,817	3,73	0,892	
Effects of the pandemic on rivalry and transformation	COVID-19 pandemic will canalize our production technologies to industry 4.0 in medium and long term.	0,759	3,69	0,892	3,66
	COVID-19 pandemic will provide an advantage to Turkish clothing sector in global rivalry in medium and long term.	0,552	3,62	0,943	
Effects of the pandemic on supply and online trade	COVID-19 pandemic has caused a decrease in our input numbers supplied from abroad.	0,733	3,94	0,960	3,76
	COVID-19 pandemic has caused an increase in our enterprise's online trade activities.	0,580	3,57	1,050	

Continued Table 1. Results of e exploratory factor analysis of the effects of the COVID-19 pandemic and descriptive statistics of the statements

of credit debts, and financial support, respectively.

In addition, more than 80% of the enterprises indicated that government support for employment, finance and exports which have been given during the COVID-19 pandemic, are inadequate. Moreover, they specified that sectoral cooperation, efficiency of marketing activities and utilisation of domestic supply resources should be increased and the logistics sector, relations with

suppliers and occupational health and safety systems improved.

The results of exploratory factor analysis which refers to the statements that analyse the possible solutions against the negative effects of the COVID-19 pandemic indicate that the sample is suitable and reliable for factor analysis (Kaiser-Meyer-Olkin measure of the sampling is found to be 0,824, and the significance of Bartlett's Test of Sphericity is found to be 0,000). Principal component extraction was used

for extracting factors with eigenvalues over 1, and the rotation of the factor loading matrix was chosen as the varimax. The standard loading of 11 statements is higher than 0,50 (they vary between 0,736 and 0,522), and the cumulative variance of 3 factors is found to be 56,87%. The loadings (scores) of the statements in Table 2 are taken from the rotated component matrix (only one loading is lower than 0,50). The three factors which are obtained as a result of exploratory factor analysis, are renamed (Table 2).

Factors	Statements	Rotated Loadings	Average	Standard Deviation	Averages of the Factors
Support which is expected from the government	Our enterprise needs support in terms of investment in the scope of the COVID-19 pandemic.	0,785	3,87	0,896	3,87
	Our enterprise needs easy access to financial resources in the scope of the COVID-19 pandemic.	0,783	3,99	0,775	
	Our enterprise needs a delay in repayment of credit in the scope of the COVID-19 pandemic.	0,733	3,67	1,023	
	Our enterprise needs support in terms of employment in the scope of the COVID-19 pandemic.	0,648	4,23	0,961	
	Our enterprise needs a delay in repayment of tax debts in the scope of the COVID-19 pandemic.	0,603	4,04	1,094	
	Our enterprise needs financial support in the scope of the COVID-19 pandemic.	0,596	3,59	0,977	
	Our enterprise needs support in terms of online trade in the scope of the COVID-19 pandemic.	0,440	3,71	0,965	
Adequateness of government support	Financial government supports given during the COVID-19 pandemic is sufficient for our enterprise.	0,886	2,42	0,989	2,42
	Government support in terms of exports given during the COVID-19 pandemic is sufficient for our enterprise.	0,869	2,37	0,878	
	Government supports in terms of employment given during the COVID-19 pandemic is sufficient for our enterprise.	0,825	2,48	0,994	
Precautions which can be taken by enterprises	It is revealed in the scope of the COVID-19 pandemic that, our enterprise needs to improve its relations with its suppliers.	0,720	3,93	0,788	4,00
	It is revealed in the scope of the COVID-19 pandemic that our enterprise needs to improve the efficiency of its marketing activities.	0,705	4,05	0,725	
	It is revealed in the scope of the COVID-19 pandemic that our enterprise needs to use domestic supply resources more efficiently.	0,696	4,05	0,783	
	It is revealed in the scope of the COVID-19 pandemic that our enterprise needs to improve its occupational health and safety systems.	0,650	3,85	0,844	
	It is revealed in the scope of the COVID-19 pandemic that our enterprise needs to increase its sectoral cooperation.	0,593	4,11	0,625	
	It is revealed in the scope of the COVID-19 pandemic that logistic sector should be improved more.	0,529	4,02	0,766	

Table 2. Results of the exploratory factor analysis of possible solutions and descriptive statistics of the statements

The following main hypotheses are suggested by considering the results of exploratory factor analyses:

H₁: Clothing enterprises of different sizes would be differently affected from the effects of the COVID-19 pandemic on supply chain management.

H₂: The perspectives of clothing enterprises of different sizes differ with regard to possible solutions against the negative effects of the COVID-19 pandemic.

The two main hypotheses include 22 sub-hypotheses due to 11 factors (8 factors regarding effects and 3 factors regarding possible solutions) and 2 size properties (annual turnover and number of workers). All sub-hypotheses are tested at a 95% confidence interval. According to the results obtained, 8 hypotheses are accepted, whereas 14 hypotheses are rejected.

Six sub-hypotheses belonging to first main hypothesis have been accepted (Table 3). According to the results obtained, the participating enterprises, which are classified as small and medium sized enterprises according to their annual turnovers and number of workers, have been more impacted by the effects of the pandemic on finance, sales, information flow, efficiency and R&D activities. These findings are a reflection of those in the global supply chain. According

Hypothesis 1a: Clothing enterprises that possess different turnovers would be differently impacted by the effects of the pandemic on costs, inputs, production, supply, delivery and occupational health and safety.						
Annual Turnover	N	Average	Standard Deviation	t	df	p
30.000.000 USD and below	334	-0.07758148592023344	1.0213342824758622	-4,912	97,984	0,000
30.000.001 USD and above	56	0.46271814816710755	0.708897240937753			
Hypothesis 1b: Clothing enterprises that possess different turnovers would be differently impacted by the effects of the pandemic on finance, sales, information flow, efficiency and R&D activities.						
Annual Turnover	N	Average	Standard Deviation	t	df	p
30.000.000 USD and below	334	0.15122843074731346	0.15122843074731346	7,840	388	0,000
30.000.001 USD and above	56	-0.901969569100048	1.0367451416187237			
Hypothesis 1c: Clothing enterprises that possess different turnovers would be differently impacted by the effects of the pandemic on rivalry and transformation.						
Annual turnover	N	Average	Standard Deviation	t	df	p
30.000.000 USD and below	334	-0.06288010523608423	0.968180764027263	-3,065	388	0,002
30.000.001 USD and above	56	0.37503491337236033	1.1091142177430091			
Hypothesis 1d: Clothing enterprises that possess different numbers of workers would be differently impacted by the effects of the pandemic on costs, inputs, production, supply, delivery and occupational health and safety.						
Number of Workers	N	Average	Standard Deviation	t	df	p
250 and below	325	-0.10453608919064887	1.0211657583092832	-6,156	128,986	0,000
251 and above	65	0.5226804459532454	0.6827133581910457			
Hypothesis 1e: Clothing enterprises that possess different numbers of workers would be differently impacted by the effects of the pandemic on finance, sales, information flow, efficiency and R&D activities.						
Number of Workers	N	Average	Standard Deviation	t	df	p
250 and below	325	0.14648453783951929	0.9093176197892345	5,981	81,946	0,000
251 and above	65	-0.7324226891975966	1.1128179421631939			
Hypothesis 1f: Clothing enterprises that possess different worker numbers would be differently impacted by the effects of the pandemic on rivalry and transformation.						
Number of Workers	N	Average	Standard Deviation	t	df	p
250 and below	325	-0.08196472905440755	0.9700782294648844	-3,677	388	0,000
251 and above	65	0.4098236452720386	1.0532591036816135			

Table 3. Differences between the clothing enterprises of different sizes with regard to the effects of the pandemic

to literature [2], the pandemic has more negatively affected small and medium sized clothing enterprises.

2 sub-hypotheses belonging to the second main hypothesis have been accepted (Table 4). In contrast to small and medium sized enterprises, large-scale enterprises have indicated more that the government support against the negative effects of the pandemic are adequate.

5. General Evaluation and Suggestions

The COVID-19 pandemic, which has influenced the whole world in a short time, has negatively affected world trade. At this point, the clothing sector comes into prominence, as it possesses an important

place in global trade as one of the sectors which have been significantly affected by the pandemic. Therefore, the Turkish clothing sector should be analysed due to its significance in the sector. Turkey is the sixth biggest clothing exporter in the world and the third biggest clothing exporter in the European Union. Also, it comprises 10% of its country's export by itself. Thus, as the global clothing market has been negatively affected by the pandemic, it is unavoidable that the Turkish clothing sector would be a part of this situation.

According to the research results, 91% of the participating Turkish clothing enterprises have indicated that the pandemic has decreased their capacity utilisation rates. The pandemic has caused a 46% decrease in capacity utilization

rates on average. However, 89% of them have benefited from short-time working allowance.

The pandemic has mostly affected supply chain management in the clothing sector in terms of the following elements: decrease in profitability, decrease in average order numbers, decrease in average product numbers per order, decrease in production amounts, increase in finished product inventories, increase in inventory costs, decrease in efficiency, increase in occupational health and safety precautions, increase in cash needed, and decrease in the number of inputs which are supplied from abroad.

According to the results obtained, the participating enterprises which are classified as small and medium sized

Hypothesis 2a: Clothing enterprises that possess different turnovers possess different views about the adequateness of government support.						
Annual Turnover	N	Average	Standard Deviation	t	df	p
30.000.000 USD and below	335	-0.1281101758059751	0.9139848054309022	-5,540	67,129	0,000
30.000.001 USD and above	56	0.7663733731250293	1.1489010086314577			
Hypothesis 2b: Clothing enterprises that possess different numbers of worker possess different views about the adequateness of government support.						
Number of Workers	N	Average	Standard Deviation	t	df	p
250 and below	325	-0.15804310928595117	0.8825458313466679	-6,138	80,569	0,000
251 and above	66	0.7782425836050624	1.1737459889541333			

Table 4. Differences between the clothing enterprises of different sizes with regard to possible solutions against the negative effects of the pandemic

enterprises according to their annual turnovers and numbers of workers have been more impacted by the effects of the pandemic on finance, sales, information flow, efficiency and R&D activities.

As stated by the research results, the enterprises have mostly needed employment support within the scope of possible achievable solutions against the negative effects of the COVID-19 pandemic. This support is followed by the postponement of tax debt payment, easy access to financial resources, investment support, online trade support, postponement of credit repayment, and financial support, respectively.

Furthermore, more than 80% of the enterprises have indicated that government support with respect to employment, finance and exports given during the COVID-19 pandemic are inadequate. Moreover, they have specified that sectoral cooperation, efficiency of marketing activities and utilisation of domestic supply resources should be increased, and in the logistics sector, relations with suppliers and occupational health and safety systems should be improved.

In light of the results obtained, the possible precautions which can be taken against the negative effects of the COVID-19 pandemic can be summarised as follows:

- Digitalisation should be integrated in all processes in the supply chain.
- Enterprises should adapt their technologies to industry 4.0.
- Enterprises should adopt flexible and agile production.
- Enterprises should focus on sportive and casual wear, classical and timeless design as well as medical clothing products.
- Enterprises should invest in online trade. They can establish their own online trade websites or they can join online trade platforms which sell different products of different producers.
- Enterprises should benefit from omni-channel strategies. They should integrate all their physical and online shopping platforms in order to provide a continuous and easy shopping experience to consumers.
- Enterprises should give more importance to marketing activities. They should try to find alternative markets.
- Enterprises should pay more attention to their current customers.
- Enterprises should give more importance to the efficiency of processes.
- Enterprises should give more importance to innovation as well as research and development activities.
- Enterprises should give more importance to sectoral cooperation.
- The supply chain should be shortened as much as possible. More domestic suppliers can be used.
- Enterprises should support their suppliers as much as possible and they should strategically collaborate with them. Suppliers should be regarded and treated as strategic partners.
- Enterprises should give more importance to sustainability activities. They should use more sustainable raw materials and increase their sustainable activities.
- The logistics sector should be seen as a strategic partner. Therefore, collaborations should be increased.
- Enterprises should give more importance to occupational health and safety precautions.
- Enterprises should give more importance to certification systems and standardisation.
- More importance should be given to free trade agreements.
- Enterprises should give more importance to financial stability. In this context, they should pay more attention to equity and cash flow.
- Enterprises should give more importance to cyber security. They should invest in necessary cyber security precautions.
- Enterprises should employ professional managers for supply chain management. Also, they should give more importance to institutionalisation.
- Enterprises should implement successful supply chain risk management. They should review their supply chain management strategies and constitute alternative strategies.

To sum up, it is determined that supply chain management in the Turkish clothing sector has been negatively affected by the COVID-19 pandemic. Order disruptions and cessations have disrupted employment, production, procurement and investment processes, due to which financial disruptions have occurred. The most significant possible precautions that can be taken by enterprises can be indicated as follows; benefiting from government support, moving towards

online trade and an omni-channel strategy, introducing necessary alterations in product ranges, giving essential importance to innovation, efficient use of occupational health and safety systems, shortening the supply chain as far as possible, integrating digitalisation into all processes of the supply chain, and increasing the efficiency of marketing activities. Also, it is thought that these suggested precautions are consonant with the future tendencies of the sector, because the sector is in an alteration process. After the pandemic, some

precautions or alterations which were made during the pandemic process will be permanent. Turkish clothing enterprises will use online trade and omni-channel strategies more, will produce more classic and timeless products, will shorten their supply chains, and will use domestic suppliers more. Also they will move towards different markets and will digitalise all process as far as possible. Therefore, the sector will be more digitalised, its supply chain will be simplified, and its product lines and marketing strategies will be altered.

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References

- World Trade Organization. Data portal, exports by product group and destination, <https://timeseries.wto.org/> (2020, accessed 6 December 2020).
- International Labor Organization. Sectoral brief: COVID-19 and the textiles, clothing, leather and footwear industries, https://www.ilo.org/sector/Resources/publications/WCMS_741344/lang--en/index.htm (2020, accessed 6 December 2020).
- International Labor Organization. What next for Asian garment production after COVID-19? The perspectives of industry stakeholders, https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-bangkok/documents/publication/wcms_755630.pdf (2020, accessed 6 December 2020).
- World Trade Organization. World trade statistical review 2020, https://www.wto.org/english/res_e/statis_e/wts2020_e/wts2020_e.pdf (2020, accessed 6 December 2020).
- EURATEX (The European Apparel and Textile Confederation). Facts & keyf of the European textile and clothing industry, <https://euratex.eu/wp-content/uploads/EURATEX-Facts-Key-Figures-2020-LQ.pdf> (2020, accessed 15 December 2020).
- Turkish Statistical Institute. Statistical data portal, foreign trade statistics, <https://biruni.tuik.gov.tr/disticaretapp/menu.zul> (2020, accessed 6 December 2020).
- Turkish Statistical Institute. Statistical data portal, annual industry and service statistics, <https://data.tuik.gov.tr/Kategori/GetKategori?p=sanayi-114&dil=1> (2020, accessed 6 December 2020).
- Şen A. The US fashion industry: a supply chain review. *International Journal of Production Economics* 2008; 114: 571-593.
- Bruce M, Daly L and Towers N. Lean or agile: a solution for supply chain management in the textiles and clothing industry?. *International Journal of Operations & Production Management* 2004; 24(2): 151-170.
- Jin B. Performance implications of information technology implementation in an apparel supply chain. *Supply Chain Management: An International Journal* 2006; 11(4): 309-316.
- Camargo LR, Pereira SCF and Scarpin MRS. Fast and ultra-fast fashion supply chain management: an exploratory research. *International Journal of Retail & Distribution Management* Epub ahead of print 2020. DOI: 10.1108/IJRDM-04-2019-0133.
- Lo WS, Hong TP and Jeng R. A framework of e-scm multi-agent systems in the fashion industry. *International Journal of Production Economics* 2008; 114: 594-614.
- Teodoro A and Rodriguez L. Textile and garment supply chains in times of COVID-19: challenges for developing countries, UNCTAD transport and trade facilitation newsletter no:86, <https://unctad.org/news/textile-and-garment-supply-chains-times-covid-19-challenges-developing-countries> (2020, accessed 6 December 2020).
- Majumdar A, Shaw M and Sinha SK. COVID-19 debunks the myth of socially sustainable supply chain: a case of the clothing industry in South Asian countries. *Sustainable Production and Consumption* 2020; 24: 150-155.
- Chakraborty S and Biswas MC. Impact of COVID-19 on the textile, apparel and fashion manufacturing industry supply chain: case study on a ready-made garment manufacturing industry. *Journal of Supply Chain Management, Logistics and Procurement* 2020; 3(2): 1-19.
- Hauser K. How COVID-19 is shifting fashion industry supply chains in a sustainable direction?, *Luxiders*, <https://luxiders.com/fashion-supply-chains/> (2020, accessed 6 December 2020).
- McMaster M, Nettleton C, Tom C, Xu B, Cao C and Qiao P. Risk management: rethinking fashion supply chain management for multinational corporations in light of the COVID-19 outbreak. *Journal of Risk and Financial Management* 2020; 13: 1-16.
- Atilgan T and Kanat S. Might the clustering model be able to save Turkish textile and clothing sector? In: Autex 2008, Biella, Italy June 24-26 2008, pp.1-8.
- International Labor Organization. The supply chain ripple effect: how COVID-19 is affecting garment workers and factories in Asia and the Pacific?, https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/briefingnote/wcms_758626.pdf (2020, accessed 6 December 2020).