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EXPLORING IMPACTS OF COVID-19 PANDEMIC ON TURKISH TEXTILE SUPPLY CHAINS

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ABSTRACT

Turkish textile producers faced significant challenges during and after the COVID-19 pandemic. This study delves into the effects of the pandemic on Turkish textile supply chains through comprehensive surveys and interviews with selected companies in the industry. We employed a mixed research methodology. Our survey focused on understanding the changes and trends in Turkey's textile supply chains, particularly in relation to the disruptions caused by the pandemic in sourcing, manufacturing, and delivery processes. We distributed online survey to 110 textile apparel and clothing firms via email, and 39 of them responded. We also conducted in-depth interviews with five of these companies participated in the survey phase, despite all responders had been invited. Our study revealed that the pandemic had a detrimental impact on Turkish textile supply chains, in general. Specifically, production activities were severely disrupted due to problems in procuring raw materials and intermediate supplies, resulting from the decreased performance of suppliers during the pandemic. Additionally, textile companies faced significant financial difficulties, with their total revenues deteriorating due to disruptions in the payment collection process and price increases. Distribution channels were also critically disrupted, and border crossings became more challenging. Interestingly, most Turkish textile companies did not switch their main suppliers because of the pandemic.

Keywords: Supply chain, textile, COVID-19 pandemic, Turkey.

COVID-19 PANDEMİSİNİN TÜRK TEKSTİL TEDARİK ZİNCİRLERİ ÜZERİNDEKİ ETKİLERİNİN TAHLİLİ

ÖZ

Türk tekstil üreticileri Covid-19 salgını sırasında ve sonrasında önemli zorluklarla karşı karşıya kalmıştır. Bu çalışma, sektördeki seçilmiş firmalarla yapılan kapsamlı anketler ve birebir mülakatlar aracılığıyla salgının Türk tekstil tedarik zincirleri üzerindeki etkilerini araştırmaktadır. Çalışmamızda karma bir araştırma metodolojisi kullanılmıştır. Anketimiz Türkiye tekstil tedarik zincirlerinde, özellikle de salgının kaynak bulma, üretim ve teslimat süreçleri üzerinde neden olduğu aksamalarla ilgili değişiklikleri ve eğilimleri anlamaya odaklanmıştır. Çevrimiçi anket toplamda 110 tekstil ve hazır giyim firmasına e-posta yoluyla ulaştırılmış ve 39'undan cevap alınmıştır. Anketi cevaplandıran tüm firmalar mğlakat sürecine davet edilmesine karşın, anketi cevaplandıran beş firmayla derinlemesine mülakatlar gerçekleştirilmiştir. Çalışmamız, salgının bir bütün olarak Türk tekstil tedarik zincirlerini olumsuz etkilediğini ortaya koymaktadır. Özellikle pandemi döneminde tedarikçilerin üretimlerinin aksaması sonucu hammadde ve ara malzeme temininde yaşanan sorunlar nedeniyle üretim faaliyetlerinin ciddi şekilde aksamalar yaşandığı anlaşılmaktadır. Ayrıca tekstil firmaları, ödeme ve tahsilat süreçlerindeki gecikmeler ve fiyat artışları nedeniyle muhtelif mali zorluklarla karşı karşıya kalmışlardır. Dağıtım kanalları da önemli ölçüde kesintiye uğramış ve sınır geçişleri daha meşakkatli hale gelmiştir. İlginçtir ki çoğu Türk tekstil şirketinin pandemi nedeniyle ana tedarikçilerini değiştirmediği saptanmıştır.

Anahtar Kelimeler: Tedarik zinciri, tekstil, COVID-19 salgını, Türkiye.

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INTRODUCTION

The COVID-19 pandemic will be long remembered for its human cost and disruption to the global economies. The pandemic pushed most of the economies into recession while others were strained by financial and business-related difficulties due to the continuous fight against the virus.

The pandemic ignited structural changes in trade relations, shifts in the global value chains (GVCs) and rise in regionalization. Additionally, various supply and demand shocks occurred including falls in manufacturing and trade activities. The outbreak also displayed the necessity of changes in technological and digital infrastructures, legal frameworks, financing methods, and tax systems which impacted the supply chain ecosystem more than ever, and these continue to be significant determinants in the formation of the supply chains as of today. For instance, on the logistics front, pandemic showed that more effective use of containers is required in all layers of transportation. To achieve more sustainable and efficient supply chains, it appears effective collaborative activities among the members of the GVCs will remain the key factor.

As the pandemic pushed the world into trouble, the priorities for the business world during and after the COVID-19 evolved into a better adaptation to digitalization, local financing, quality of education, technology clusters, and aligning with incentive mechanisms and innovation systems.

Not only the companies but also the developing countries also felt the negative impacts of the pandemic severely, more on a macro level. Being one of emerging economies, Turkey was also hit hard and is currently trying to pull off. Despite adverse effects, Turkish economy managed to grow by a moderate 1.8% in 2020 (and 11% in 2021) during peak times of the pandemic, according to the Turkish Statistical Institute (Turkstat), which shows resilience of Turkish economy.

To combat the pandemic, Turkey implemented various incentives to develop e-business and trade framework in 2020 and 2021 in addition to the existing support mechanisms for traders, startups, and service providers. Turkish businesses could be able to position themselves in a better position partly thanks to these additional incentives and support mechanisms, coupled with Turkey's advantageous geographical position, sourcing and manufacturing capabilities, free trade agreements (FTA), which helped transform Turkish businesses.

After the pandemic died out, automotive industry, iron and steel sector, and apparel and textiles sector continue to be the engines of Turkish manufacturing for employment generation and value-added creation. Despite being the dominant players in terms of production and employment in Turkey for a significant period, these industries have been facing difficulties in global sourcing and price competition in recent years. The challenges have only intensified with the outbreak of the COVID-19 pandemic.

With this in mind, our objective is to examine the effects of the pandemic on the supply chains of the Turkish textile industry. We have conducted extensive surveys and semi-structured interviews with various textile and apparel companies to understand the impact on Turkish textile producers. It is worth noting that there are limited studies available that specifically investigate the supply chain-related consequences of the outbreak on the Turkish textile and apparel sectors.

In this framework, our aim is to shed light on whether Turkish textile companies' sourcing capabilities, production processes, relationships with supply chain partners, digitalization efforts, and logistical strength have helped them mitigate the challenges posed by the pandemic. To achieve this, we have relied on various sources, including government statistics and records from exporter and manufacturing associations, as well as in-depth surveys and interviews with selected Turkish textile and apparel producers.

It is worth mentioning that we solely focused on Turkish textile sector for our analysis, being a significant part of Turkish manufacturing and was heavily affected by the pandemic. In this paper, we seek to address following research questions:

RQ1: How did the COVID-19 pandemic affect supply chains in Turkey?

RQ2: In what ways did the outbreak change supply chain operations of Turkish textile industry?

RQ3: How were the companies' sourcing capabilities, operational procedures, relations with the supply chain partners, digitalization efforts and distribution network influenced by the pandemic?

RQ4: How did Turkish textile and apparel companies deal with the challenges they have faced during the pandemic?

For the sake of our study, we used a mixed research methodology, i.e., the quantitative results of fixed-point surveys and qualitative results obtained from semi structured interviews are used to capture the effects on the supply chain processes of the companies under consideration. We think the findings of this study could help to improve decision-making process associated with the policy determination when companies will face with similar supply chain disruptions in the future.

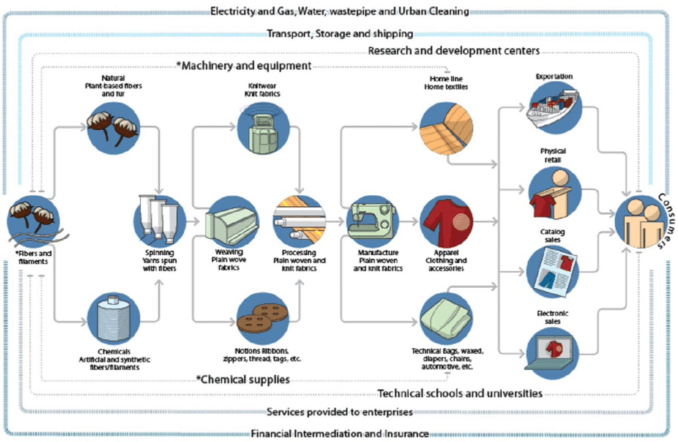
The article is organized as follows: Section 1 provides the background and literature review, Section 2 specifies the methodology, Section 3 elucidates findings and implications, and last section draws conclusions.

I. LITERATURE REVIEW

The supply chain concept is used to depict how the flow of products and goods are realized from production to the final sale process. The management of the chains is investigated using different perspectives. For example, Harland (1997) conducted an analysis on the management of chains, specifically focusing on the manufacturing organization and its relationship with management, firms' networks, and the overall chain itself. Rich & Hines (1997) provided insights into both internal and external perspectives of supply chain management. Stuart (1997) and Dossenbach (1999) discussed the approaches related to the management process and emphasized the systematic relationship between stakeholders in shaping the chains. Interestingly, the competition in the supply chain is not limited to individual companies but extends to the supply chains themselves, as highlighted by O'Marah (2001).

Textiles supply chains, in particular, are known for their complexity and distinctiveness compared to other industries. Jones (2002) pointed out that these chains are longer and involve multiple parties, as depicted in Figure 1. Pricing strategies play a crucial role in the textiles sector, as profits tend to be smaller compared to leading industries such as electronics or aviation. Effective management of supply chains in the textiles and clothing sector requires attention, agility, and detailed planning to reduce lead times. This has been further emphasized during and after the pandemic, where the ability to respond quickly has proven to be essential for successful chain management.

FIGURE 1 | Textile and Clothing Supply Chain



Source: Amaral et. al (2018).

Small and medium-sized enterprises (SMEs) are the backbones of the textile manufacturing in most of the regions in the world. Despite this, SMEs face major constraints like limited financial resources, lack of personnel and time, little or no experience, and limited confidence in implementing new systems (Storey, 1994). As the industry is volatile and not easy to predict with shorter product cycles, this caused successful supply chain management to be extremely important while it was globalization which shaped the industry, as a result of the lower labor costs in underdeveloped or developing countries, firms tend to either source from overseas or manufacture abroad (Jones, 2002).

Prior to the outbreak, it was widely acknowledged that textiles supply chains were already facing significant pressure. Scholars such as Fan & Stevenson and Lechler et al. (2019) highlighted that the world had been experiencing disruptions in supply chains due to factors like globalization, complex supply networks, and external influences such as natural disasters and political interventions. Additionally, following the pandemic, the vulnerability of supply chains became a crucial concern alongside globalization, according to other scholars (Govindan et al. 2020; Pournader et al. 2020). To exemplify this, numerous textiles companies encountered challenges in maintaining and enhancing their supply chains throughout the course of the pandemic. Ivanov (2020) pointed out that suppliers were unable to fulfill their delivery obligations, while hygiene requirements led to the closure of plants, resulting in decreased manufacturing activities. Furthermore, consumer demand became highly unpredictable. These disruptions caused significant underperformance by companies, raising concerns about their financial sustainability.

During the pandemic, supply chain resilience emerged as a major issue. It became evident that the ability to recover from supply chain disruptions or outperform the original supply chain performance was crucial (Hohenstein et al. 2015; Sheffi & Rice, 2005). In the best-case scenario, firms could gain competitive advantages by successfully recovering from the outbreak (Dubey et al., 2021). Mishra et al. (2021) and Golan et al. (2020) underlined the importance of resilience frameworks and analytics in addressing disruptions caused by the pandemic, highlighting the need for operational excellence and the challenges faced by various supply chains, including pharmaceutical and medical supply chains. Shen & Sun (2021) and Ivanov (2021) discussed case studies and frameworks for strengthening supply chain resilience post-COVID-19, addressing the severe disruptions caused by the pandemic and the necessity for adaptive strategies to enhance supply chain operations. Additionally, Ozdemir et al. (2022) and Sodhi et al. (2021) focused on the challenges faced by supply chains during the pandemic and stress the need for preparedness for future crises, highlighting the importance of resilience and robustness in supply chain management. Cherrafi et al. (2022) and Bag et al. (2021) explored the role of digital technologies, big data analytics, and circular economy practices in enhancing supply chain resilience post-COVID-19, discussing how technological advancements can support sustainable and resilient supply chain management practices.

One seminal study which examined the textile supply chains during the outbreak, was by Teodoro & Rodrigues (2020). For their analysis, Teodoro et al. (2020) highlighted that the production of garment and textile products shifted away from the Asian region at the onset of the pandemic, enabling countries closer to retailers to diversify their supply chain risk. Additionally, the authors emphasized in their research that shorter value chains leading to new business models would impact the trade and transportation of textile products. In order to assess the overall effects of the pandemic on the textile, apparel, and fashion manufacturing sectors, Chakraborty & Biswas (2020) conducted a text analysis based on academic journals, researchers' viewpoints, and official statements to quantify the extent of supply chain disruptions. They conducted a case study to determine if supply chain disruptions led to increased production costs in the Bangladeshi ready-made garment (RMG) industry, which was indeed confirmed. Another notable study by Majumdar et al. (2020) underscored that the pandemic exposed the fragility of clothing supply chains in South Asian countries, as numerous textile workers were laid off during the crisis due to a lack of social sustainability.

Taqi et al. (2020) delved into the impacts of the pandemic on RMG supply chains in Bangladesh and proposed strategies to address the challenges. They introduced a methodology involving literature review, expert insights, and the grey-based diagram matrix. Their results suggested that enhancing manufacturing flexibility, utilizing diverse suppliers, and establishing backup suppliers could assist RMG companies in mitigating the effects of the COVID-19 pandemic on their supply chains. Furthermore, Kaur (2021) examined the obstacles encountered by textile companies in Punjab, India during the pandemic based on data collected from 123 entrepreneurs. Factor analysis and regression analysis were employed to present the findings, revealing that these challenges significantly affected the working capital of the sector. Castañeda-Navarrete et al. (2021) conducted an analysis and provided visual representations of the disruptions that occurred in the global apparel value chain as a result of the outbreak. The researchers delved into the impact of the pandemic on developing countries. In order to accomplish this, they examined various reports on the outbreak prepared by different stakeholders, including the media. The findings of this study unveiled the significant disruptions in the global apparel value chain, which were caused by reduced manufacturing activities, decreased demand, and diminished job security and safety.

Moreover, Agrawal & Pal (2019) and Badhwar et al. (2023) discussed traceability within textile supply chains, highlighting the importance of transparency and information flow. Furthermore, the literature delved into technological advancements and their impact on supply chain management in the textile industry. Badhwar et al. (2023) explored the potential of blockchain technology for traceability and transparency in the fashion and textile supply chain.

Just like India, Bangladesh and Egypt, Turkey has a well-established textiles supply chain which helped Turkish economy to grow in the recent decades. Neidik & Gereffi (2006) explained how Turkey achieved its export and manufacturing success in textiles industry in late 80s-90s and searched for the ways country cooperated into global GVCs including strategies that Turkey followed.

On the textiles front, Turkey continued to remain one of top 5 biggest textiles exporters in the world despite the outlook was not bright during the pandemic. (Statista, 2023) Turkish textiles and ready wear industry exports plummeted by 4% in 2020 to $26.7 billion while the exports of textile and ready wear sub industries surged by 10.6% to $1.17 billion in 2020 when compared to the previous year. The supply chain management related problems like high container prices and worldwide raw materials shortage were among the most significant issues for the Turkish textile industry in 2020 and 2021. Additionally, the domestic factors like spike in interest rates for loans and uncertainty over the Turkish Lira (TL) caused problems for the finance.

A thorough review of the literature on the Turkish textile supply chain highlights several key themes and areas of focus. Koksal et al. (2017) and Shen et al. (2017) emphasized the importance of sustainable practices in the textile industry, particularly in social issues and overall sustainability. Koksal et al. (2017) specifically underscored the necessity for social sustainable supply chain management in the textile and apparel sector. This is further supported by (Oelze, 2017), who emphasized the significance of implementing sustainable supply chain management practices in the textile industry. Additionally, the literature explored specific challenges and barriers within the Turkish textile supply chain, in addition to pandemic. Kazancoglu et al. (2020) and Shaw et al. (2022) focused on barriers to sustainability and circular supply chains in the textile industry, shedding light on the obstacles that need to be addressed for improved sustainability practices.

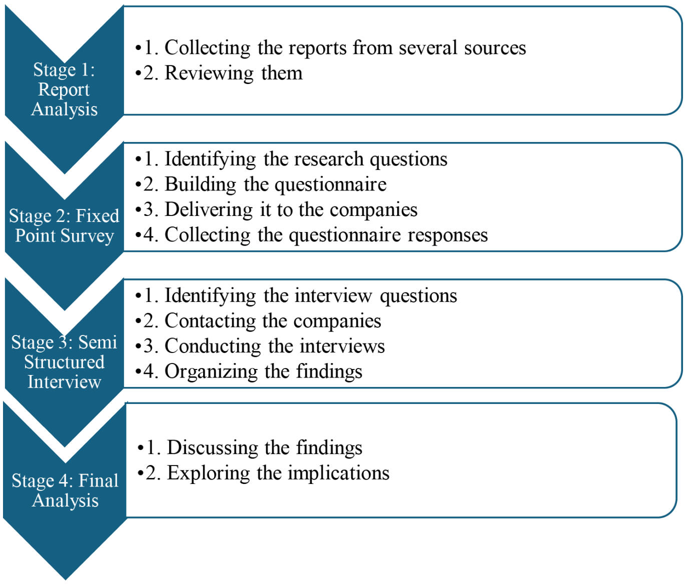
It appears Turkish textile supply chain continues to feel the critical need for sustainable practices, social responsibility, transparency, and technological innovation to overcome barriers and enhance the overall efficiency and effectiveness of the textiles supply while there is a heightened focus on resilience, sustainability, and agility within supply chains to mitigate future disruptions post-pandemic. We believe that our study sheds light on the performance of Turkish textiles supply chain during the pandemic. Our article is one of the first ones examining mentioned topic offering insights.

II. METHODOLOGY

In this study, a mixed research methodology is used that integrates four distinct stages as displayed in Figure 2. The study follows a fixed-point survey in a case study. First, industry reports are analyzed in Stage 1 to reveal the characteristics of Turkish textiles supply chains. An exploratory survey is conducted in Stage 2 followed by a semi-structured interview in Stage 3. Stage 4 involves the final analysis of findings. Our survey methodology studies the sampling of individual units from a population and associated techniques of survey data collection, such as questionnaire construction, while results of fixed-point surveys and qualitative results obtained from semi structured interviews are used to capture the effects on the supply chain processes of the companies under consideration. The reason why we selected this analysis methodology was to understand population's (Turkish textiles firms operating within Turkish supply chain) disposition by analyzing opinions by the individual firms that are selected through sampling of individual units from the population.

As underlined by Gioia et. al (2013), different sources can be consulted to triangulate the information regarding the level of supply chain integration, as it served as the foundation for developing an inductive theory. This approach is considered appropriate for understanding the evolution of supply chain practices. In other words, Gioia et. al utilized various sources to gather data and enhance the reliability of their study, as demonstrated in this analysis.

FIGURE 2 | The Proposed Methodology



A. STAGE 1: INDUSTRY REPORT ANALYSIS

First, we used export, sales and production figures gathered from various institutions for an overview of the sector. The statistics were compiled from sources such as Turkstat, Ministry of Trade of Turkey, and trade associations such as Istanbul Textiles and Ready-Made Exporter's Association (ITKIB), and Istanbul Textile and Raw Materials Exporters Union (ITHIB).

B. STAGE 2: EXPLARATORY SURVEY

Woodside & Wilson (2003) argue that a significant portion of management studies focus on decision-making processes at both the group and individual levels. They suggest that the most used research methodology in this field involves sending surveys by mail, which consist of closed-ended questions covering 10-20 research constructs. According to them, the prevailing research paradigm assumes that measuring research constructs on fixed point scales enables practitioners and researchers to develop a well-founded understanding of the study's processes.

Woodside (2010) emphasizes that designs such as fixed-point surveys can be highly valuable in examining customers' evaluations of service delivery or their satisfaction with the overall service-product experience. Yomere et al. (1999) indicate that these surveys are useful for studying large or small populations and predicting fundamental characteristics.

In our study, we have developed a fixed-point survey with the aim of comprehending the trends and changes in the textile supply chains in Turkey. Our survey includes 20 questions related to the impacts of disruptions caused by the COVID-19 pandemic on sourcing, manufacturing, and delivery within the textile supply chain. The evaluation of supply chain performance in our survey is based on factors such as supplier, customer, cost, time, and reliability.

To gather data, we distributed online survey to 110 textile apparel and clothing firms via email, and 39 of them responded. We also conducted in-depth interviews with five of these companies participated in the survey phase, despite all responders had been invited to the interview phase. We got in touch with the Ministry of Trade of Turkey to receive a list of prominent textile apparel and clothing firms operating in Turkey. The participation rate into our surveys were 35.4%.

The respondents consisted of 11 socks producers, 8 shirt producers, 1 panty hose producer, 8 ready-made clothing manufacturers, 1 underclothes and baby dress manufacturer, 4 knitted outwear producers, 2 combed cotton fabric producers, and 4 jeans and t-shirt manufacturers. We collected survey responses between November 20, 2021, and January 30, 2022[1].It is important noting that the reason why we selected investigating mentioned data for our analysis is that other leading studies also employ a similar methodology for textiles supply chain analysis.

Our set of the participants from the textiles sector were quite diverse. Among the respondents, 64% were male and 48% of them were between 36 and 45 years old. 56% of the respondents had a university degree while 23% of them had graduate degrees. The respondents were mostly high-level personnel such as general directors, foreign trade directors, marketing managers and firm owners.

C. STAGE 3: SEMI STRUCTURED INTERVIEW

According to Kallio et al. (2016), semi-structured interviews offer flexibility and aid researchers in gathering qualitative data that is well-grounded. These interviews involve conversations where the researcher can ask a set of questions, thereby enhancing their understanding of the subject being studied. This approach allows the researcher to determine the scope of the interview and guide the conversation (Fylan, 2005). In our study, we utilized the interview findings to support and validate the results obtained from surveys.

Following the surveys, we conducted five semi-structured interviews with representatives who were part of the exploratory survey mentioned earlier. These interviews were conducted over the phone. During the interviews, we asked open-ended questions, with a focus on comprehending the cognitive reactions and underlying motivations behind the organizations' decisions regarding supply chain management. The interviews lasted approximately 15-20 minutes and were conducted using an interview guide that covered specific areas of discussion. However, participants were also encouraged to share their perspectives on other relevant issues that were not explicitly mentioned in the guide. The questions were categorized into eight areas of investigation[2].We also had follow-up meetings with informants to reaffirm information and to complete missing data. We held the interviews with five respondents of the survey for the textiles sector, between February 10, 2022, and March 25, 2022. Our interview questions were based on questions by Shetu et al. (2023) and Saleheen et al. (2018). It is important noting that the reason why we selected investigating mentioned data for our analysis is that other leading studies also employ a similar methodology for textiles supply chain analysis.

III. RESULTS AND DISCUSSIONS

Turkish textile industry experienced a downturn during and after the pandemic. Amid drastic changes in the global supply chains, Turkey focused on differentiating itself with its sophisticated production infrastructure and geographical proximity to the major markets. Despite this, slow recoveries in the global economies, decrease in purchasing power, high inflation, and increased controls in transportation and difficulties in reaching raw materials put pressure on Turkish textile supply chains. After the normalization process started in Turkey as of June 2021, the sector felt the relief as the economic activities slowly got back to normality but some of the impacts were not temporary such as surges in raw material prices.

Prior to the outbreak of the pandemic, the Turkish textile and clothing sector faced criticism for its inability to compete with countries in the Far East, particularly China, in terms of labor costs. However, the sector made efforts to address this issue through flexible manufacturing, product development, innovation, and branding. To protect domestic producers, the Ministry of Trade of Turkey implemented additional tariffs on

[1] Complete list of the organizations and the positions of the interviewees are available upon request.
[2] Complete set of questions of the survey and semi-structured interviews are available upon request.

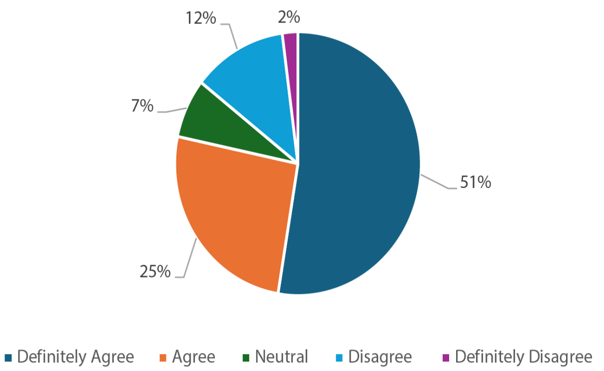
textile goods, ensuring that the sector remained safeguarded against unfair trade practices from Far East countries. Interestingly, during the pandemic, the Turkish apparel production industry experienced growth by vertically integrating its manufacturing capabilities. This involved activities such as cultivating its own cotton and raw materials, as well as operating its own farming production.

Our research focuses on examining the significant changes that occurred in Turkey's textiles and apparel supply chains during and after the pandemic. In other words, we aim to explore whether Turkish textile companies' sourcing capabilities, production procedures, relationships with supply chain partners, digitalization efforts, and logistical strength helped mitigate the negative impacts of the challenges brought about by the pandemic.

The findings of our study are manifold. First, our survey results demonstrated that 76% of the participants think pandemic created problems over their supply chain processes. Interestingly, 65% percent of these firms consider that they have been able to manage the problems and risks by pandemic in a good way. The analysis revealed that most of Turkish firms (63%) indicated that their stocks increased during the pandemic, as expected. Besides, almost 70% of Turkish producers noted that they had difficulties in reaching the raw materials during the outbreak period and we are of the opinion that producing own raw materials has been significant for production sustainability following the pandemic.

According to the results of our semi structured interviews, one representative described major problems that his firm faced during the pandemic and how they solved it as follows: "The production times got longer, most companies worked with missing personnel. The production of the suppliers has slowed down or stopped due to the increase in COVID cases from time to time. To solve these problems, we tried to support our suppliers and placed orders of urgencies when required." Other representatives underscored that they also asked for time extensions from their customers for deliveries or sent products by plane, when necessary.

FIGURE 3 | Survey Results for the Question: "Pandemic Created Problems over Our Supply Chain Processes."



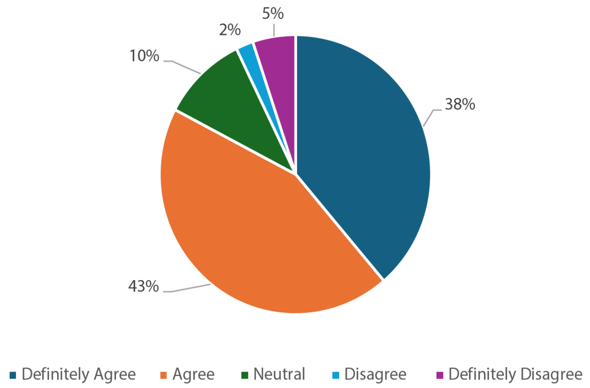
In addition to this, -on the contrary to the expectations-, it appears the outbreak did not cause Turkish textile and clothing firms to change their main suppliers. In this respect, 68% of the participants expressed that their communication with the supply chain partners were not affected negatively during the pandemic. 25% of the participants agreed with mentioned clause, and indicated that pandemic deteriorated their supply chains.

The companies which responded to the semi structured interviews noted that some main suppliers, were delayed in providing supplies but there was no serious halt as the suppliers tried to their best to keep the business alive.

The customer portfolios were not affected adversely by and large, although 35% of the firms experienced some slight changes in the portfolios. Our results suggest that almost none of the firms experienced severe shifts in the numbers and range of their customers, although 71% of the respondents stressed that their performance on deliveries to the customers were unfavorably affected during the pandemic. 70% of the companies think that the outbreak negatively affected fulfilling the orders on time as there were no changes in the quality of their products. As per the semi structured interviews, customers continued to prefer working with the same companies because they were aware of the difficulties during the pandemic and trusted their relations with the producers before the pandemic.

An interviewee made it clear that the pandemic did not lead to a fall in the total number of their customers, on the contrary, they widened their portfolio thanks to diversified exports as they meticulously carried out strict health procedures to continue their production. Some representatives underscored that they tried to be transparent to their customers and they had an excellent supplier and customer network in which they had mutual trust.

FIGURE 4 | Survey Results for the Question "Pandemic Caused Our Total Operating Incomes to Decrease."



As displayed in Figure 4, total operating incomes of the participant companies plummeted during the pandemic as 81% of the companies agreed with the deterioration in their total revenues while 38% of the participant firms strongly agreed with the change. (Figure 4). The semi structured interviews suggested that there had been some order cancellations which affected their total income levels. Some customers reduced or temporarily suspended their orders, which caused companies to put their products on sale. Obviously, companies experienced cancellations and delays in payments too. It is interesting to reveal that merely 5% of the participants definitely disagreed with mentioned clause, and indicated that no incomes diminished due to the outbreak.

60% of the respondents specified to some extent that their knowledge management infrastructures were strong enough to fight against the difficulties during the outbreak while 35% of the companies marked that their infrastructures experiences neither positive nor negative impacts. Besides, 61% of the companies stressed that their production technologies infrastructures helped them to deal with problems emerged. The interviews unveiled that companies continued to communicate with some of their customers online and attended fairs digitally thanks to their strong Information Technologies (IT) infrastructure. One interviewee mentioned that they have showrooms very close to their customers which accelerated their communication with the customers.

More than half of the respondents (63%) highlighted that their stocks experienced a surge during the pandemic, while only 12% of these firms disagreed with the stock increases. Regarding the overall stock rises, our semi-structured interviews revealed the following information: The stocks initially increased due to a temporary halt in planned orders. Customers requested producers not to send orders as their stores were closed during the pandemic, resulting in a backlog of ready-made products in warehouses. To address this issue, producers continued purchasing from raw material suppliers and rented additional warehouses for their ready-made products, including sub-supplier warehouses.

Another factor contributing to the stock surges was that customers with active orders preferred to slow down shipments or reduce the number of orders placed, considering their own economic challenges. Interestingly, a majority of Turkish textiles producers/traders faced difficulties with their distribution channels during the pandemic. 43% of respondents reported no changes in their distribution channels, while 22% emphasized that no changes occurred, and 33% noted slight changes in their distribution channels.

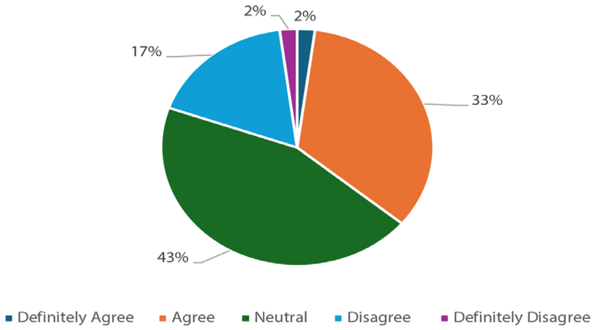
On the contrary, a significant portion of the respondents (55%) faced challenges in their distribution activities. In contrast, only 17%

of the participants did not encounter any difficulties in this regard. The Turkish textiles industry also experienced significant setbacks in terms of logistics during the outbreak. Approximately 65% of the participants reported disruptions in these processes, while only 12% were unaffected. The majority of the surveyed firms (77%) expressed that they encountered problems during border crossings.

In regard to distribution channels and logistics, the semi-structured interviews revealed that there was a shortage of containers, particularly in sea shipments. This led to difficulties in finding land vehicles to operate from logistics companies, as these vehicles were unable to return to Turkey from abroad due to border closures. Producers also highlighted that delivery times were extended due to the slowdown in distribution channels.

Figure 5 demonstrates that only 2% of the respondents strongly agreed with the notion of increasing collaboration with local suppliers. Nearly half of the participants remained neutral on this question, and only 33% of the surveyed firms actually started working with local sources.

FIGURE 5 | Survey Results for the Question "Pandemic Led Us to Work More with the Local Suppliers."



70% of the companies had a rough time in reaching the raw materials during the pandemic and only 9% of the companies emphasized that they did not experience difficulties in procurement processes. Apparently, the pandemic caused impediments in mentioned processes as 75% of the firms experienced problems.

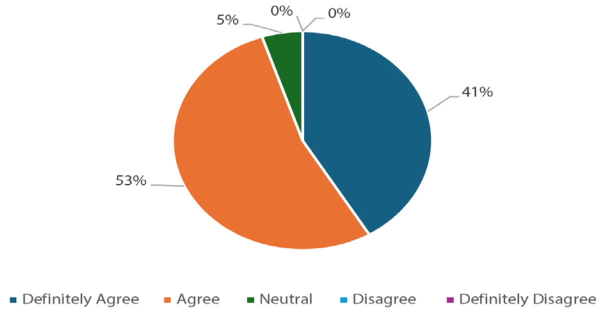
Semi structured interviews demonstrated that the major reason why producers struggled with procuring raw materials and intermediate goods were the lack of personnel employed by the raw material producers during the pandemic as they were unable to meet demands. Respondent companies indicated that some of the materials (labels, fabrics, etc.) were purchased from Asia but the imports were severely halted in the early stages of the pandemic. Some of these companies preferred to produce these materials in Turkey as they totally canceled the orders from abroad.

An important finding of our survey was that 95% of the companies mentioned that the pandemic ignited their production costs to increase, as depicted in Figure 6. In addition to this, 74% of the companies joined the survey stated that their freight costs surged in this period. 92% of the respondents underlined those interruptions occurred in their production processes. No one disagreed with this clause showing the clear negative impact of outbreak over the production costs.

90% of the representatives expressed that their production times largely extended due to the outbreak. These findings clearly show how the pandemic impacted the production phase of the textile industry in Turkey negatively. Among the respondents, 55% of them said that the interruptions mainly took place due to problems in reaching raw materials.

Our semi structured interviews exposed that producer companies had to revise their prices due to increases in costs of raw material and transportation, which were heavily based on foreign currencies. They added that there were significant surges in mentioned costs because of the depreciation of TL during the outbreak. Besides, finding a land vehicle for transportation was tough which triggered the transportation costs to soar. According to the respondents to the semi structured surveys, the interruptions were linked to the lack of personnel and unplanned quarantine processes of employees and/or their family members.

FIGURE 6 | Survey Results for the Question "Pandemic Caused Our Production Costs to Increase."



Another crucial finding was that vast majority of the participants (88%) consider that the outbreak negatively affected the performance of their suppliers, from various perspectives.

We found out that that the pandemic also caused problems on firm's financial wellbeing. 35% of the respondents strongly claimed that their average period of payments extended due to outbreak, and 30% of them acceded this standpoint. Merely 12% of the firms underlined that they did not have such issues. Another striking indication was that 82% of the participants identified that payment collection periods increased notably during the outbreak. On another note, 47% of the companies which joined the survey had to change their company structures due to the outbreak while 28% did not experience such changes.

Taking into account that Turkish textile industry played important role in global trade with the capability to meet the high standard and a broad range of products, and Turkish production and export of the textiles industry shifted from low value-added commodities to high value-added manufactured items and fashionable goods in the recent years, it seems that outbreak affected Turkish textiles and clothing supply chains negatively, particularly overall production.

According to the results of our surveys and interviews, as highlighted above, the production activities were disrupted mainly due to problems stemming from procurement processes of raw materials and intermediate goods as the performance of the suppliers reduced during the outbreak. Since the consumer portfolios mostly changed, the firms struggled financially as their incomes deteriorated since the payment collections were interrupted and the total demand shrank.

Distribution channels were affected because of the pandemic, and border crossings became harder. As opposed to the popular opinion, only one third of the respondents emphasized that they changed their suppliers and started working with local suppliers. In addition to this, out findings show the pandemic caused some Turkish companies to change their main suppliers. In order to capture and compare the results of surveys, below is a summary chart showing major findings:

TABLE 1 | Summary of Survey Results

Summarized Results
76% of the participants consider that the pandemic created problems over their supply chain processes.
65% percent of these representatives indicated that the companies were able to manage the problems and risks decently.
68% of the participants expressed that their communication with the supply chain partners were not affected negatively during or after the outbreak.
35% of the firms experienced some slight shifts in their customer portfolios.
71% of the respondents stressed that their companies' performance regarding on-time deliveries to the customers were affected negatively.
81% of the companies agreed with the deterioration in their total income.
60% of the respondents stated to some extent that their knowledge management infrastructures were well structured to fight against the difficulties.
61% of the companies stressed that their production technologies infrastructures helped them to deal with problems during or after the outbreak.
63% of the participant companies underlined that their inventories increased during the pandemic.
43% percent did not experience any changes in their distribution channels
55% of the respondents struggled to perform distribution activities.
Nearly 70% of the companies had troubles in reaching the raw materials during the pandemic.
95% of the respondents mentioned that the pandemic ignited their production costs to lift.
35% of the respondents strongly claimed that their average period of payments extended.
47% of the representatives underlined that the companies had to make changes in their company structures due to the outbreak
2% of the respondents strongly agreed with the idea that they started working more with local suppliers.

Based on our findings, Turkey's sourcing capabilities, robust knowledge management, and production technologies infrastructure have played a significant role in addressing the challenges posed by the pandemic. While local manufacturers managed to navigate through the difficulties with the help of digital infrastructures and online tools such as ERP systems, there is a growing need for further digital transformation, especially among Turkish companies in the sector, particularly SMEs, who still lack the necessary capabilities in digital communication and design technologies. One of the obstacles hindering the achievement of this goal could be the financial constraints associated with the digitalization process, which have imposed an additional burden on smaller firms within the industry.

Some experts argue that the pandemic might prompt businesses to consider strategies such as diversifying or shortening their supply chains to mitigate the risks of supply shortages and ensure smoother operations. In line with this, textile companies in Turkey have begun to explore options for shortening their supply chains and increasing their utilization of locally sourced materials, such as Turkish cotton and yarn, instead of relying on imports from distant markets. This shift could potentially create new opportunities for Turkish producers to gain a stronger foothold in global supply chains, although the actual impact of these changes may take longer to materialize than anticipated.

It is evident that countries, including Turkey, are continuing to prioritize investments in sustainability and strive for a more balanced approach to supply chain management. The repercussions of unsustainable practices are likely to become more pronounced in the medium term. Therefore, a swift transition towards circular and environmentally friendly economies is imperative, with new technologies presenting valuable prospects for advancement. With that in mind, our findings suggest that resilience, digitalization, and sustainability will have to be in the center of shaping Turkish textiles supply chains in the near future.

CONCLUSION

During the pandemic, many emerging economies faced severe disruptions, leading to either a halt or slowdown in overall economic activities. The interruptions in the supply chains highlighted the importance of agility in meeting the demands of daily commerce and industrial operations. It also underscored the significance of alternative sources and local networks in enhancing flexibility and agility within supply chains. As supply strategies evolve after the outbreak, Turkish textiles and apparel industry continued to be a key player due to its robust production capabilities and well-structured position in GVCs.

Our research focuses on examining the impact of the COVID-19 pandemic on the Turkish textile supply chain to determine if Turkish industries could establish themselves as major supplier in global chains. To achieve this goal, we adopted a mixed research methodology, combining data from fixed-point surveys with qualitative insights from semi-structured interviews. This approach allowed us to capture the nuances of how the pandemic affected the supply chain processes of selected Turkish textile companies. Our survey methodology studies the sampling of individual units from a population and associated techniques of survey data collection, such as questionnaire construction, while results of fixed-point surveys and qualitative results obtained from semi structured interviews are used to capture the effects on the supply chain processes of the companies under consideration. Quantitative research would not fit well in our case since some measurable variables are not perfectly known and cannot be measured for statistical analysis, which hinders conducting possible correlations. The reason why we selected this analysis methodology was to understand population's (Turkish textiles firms operating within Turkish supply chain) disposition by analyzing opinions by the individual firms that are selected through sampling of individual units from the population.

We believe that our study sheds light on the performance of Turkish textiles supply chain during the pandemic. Our article is one of the first ones examining mentioned topic offering insights.

Our objective was to identify the key transformations in Turkey's textile supply chains during and after the pandemic and assess whether the sourcing capabilities, production processes, relationships with supply chain partners, digitalization efforts, and logistical strengths of Turkish companies could enable them to navigate the challenges posed.

The findings of our research are manifold:

(i). The Turkish supply chains were adversely impacted by the pandemic, particularly affecting overall production and demand.

(ii). Production activities faced disruptions primarily due to issues in procurement processes for raw materials and intermediate supplies, stemming from decreased supplier performance during the pandemic.

(iii). While consumer portfolios remained relatively stable, companies encountered financial struggles as total revenues declined due to disruptions in payment collection processes and spikes in intermediate goods prices.

(iv). Distribution channels experienced significant disruptions, logistics challenges arose, and border crossings became more difficult.

(v). Some Turkish textile and clothing companies opted to change their main suppliers in response to the pandemic, albeit not on a large scale. Only about one third of textile representatives reported switching suppliers to collaborate with local players.

One of the reasons why firms hesitated to switch suppliers was the concern that overall supply chain costs would rise if everyone made the shift, leading to increased expenses in stock maintenance, raw material provision, and introducing uncertainty into the entire supply chain.

Our study identified several challenges faced by Turkish textiles manufacturing producers, Difficulties in accessing raw materials and intermediate goods, and low demand from European countries during the COVID-19 pandemic impacted the Turkish textile producers negatively. These challenges highlighted he heavy dependence of Turkish textiles exports on imports.

Moving forward, we are of the view that it is crucial for Turkish textiles industries to improve their production sustainability, enhance raw material procurement, address distribution channel disruptions, embrace digitalization, and enhance integration while the findings of this study can provide insights for policy-making processes.

One limitation of the research is the small number of companies included in the study. To gather data, we distributed online survey to 110 textile apparel and clothing firms via email, and 39 of them responded. We also conducted in-depth interviews with five of these companies participated in the survey phase, despite all 39 responders had been invited to the interview phase.

Another limitation is the sole focus on the Turkish case through analyzing impacts on different textiles manufacturers producing various products. This approach was significant to comprehend the effects of the pandemic on different producers. Future research could explore similar sectoral analyses in other countries to gain a broader perspective on global changes in textiles supply chains.

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