Logistics in the post-COVID era: a preliminary survey

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Abstract: The logistics sector, involved in the handling and distribution of goods, was among the industrial fields most severely affected by the Covid-19 pandemics. At the beginning of the pandemics, the Covid-19 caused a strong increase in the volumes handled by logistics companies, especially those working with companies manufacturing or delivering essential goods (e.g., the food/beverage industry), which also experienced a significant increase in the volume of products handled and sold. In the medium term, despite a gradual restore of the pre-pandemic conditions in various sectors, the logistics sector still maintained higher volumes than those handled in the pre-Covid period. These situations forced logistics companies to reorganize their activities to face the increase in the volume of products handled in the immediate term but also in the medium term. After approx. four years from the outbreak of the Covid-19 pandemic, time has come to explore the medium/long-term effect of Covid-19 on logistics companies, focusing on how these companies have reorganized their activities in the post-Covid era, and, in case, whether some aftershock aspects still affect the sector. This paper tries to explore this point, by means of an empirical investigation in the form of a questionnaire survey, which was administered to a sample of companies working in the logistics field and was answered by 31 respondents. Some aspects, expressively related to the business activities, and consequent to Covid-19, are investigated through the survey. Examples of these aspects include work organization, smart working, e-commerce sales, consumers' behavior, and resilience strategies. Results provide an initial overview of the logistics activities in the post-Covid era and are expected to fuel discussion on this topic in the next years.

Keywords: Covid-19; post-Covid era; logistics; survey.

1.Introduction

The outbreak of the Covid-19 pandemic for sure had impact on everyone's lives. Italy was one of the first European countries affected by the Covid-19, in early 2020. Governments in various countries have adopted countermeasures to contain the spread of the virus, including the interruption of all non-essential economic activities. The logistics sector, which is the focus of this paper, was one of the industrial fields most severely affected by the Covid-19 pandemic. Preventive measures, such as social distancing, usage of masks, and temporary business closures, contributed to partially halt a sector that with globalization was becoming increasingly crucial to industries (Loske et al., 2020). At the same time, however, logistics activities oversee distribution of goods, including essential ones, for which an increase in demand was observed during the pandemic (Chowdhury et al., 2021; Nandi et al., 2021), often motivated by "panic buying" behaviours of customers. Rinaldi & Bottani (2023) have investigated the impact of Covid-19 on various industrial sectors and found a strong effect of Covid-19 on the volumes handled in the immediate term (Kraus et al., 2020), with positive trends observed for the sectors manufacturing or delivering essential goods and negative trends in non-essential sectors (De Vet et al., 2021). In the medium term, instead, researchers observed a gradual recovery of sales in various sectors, with the logistics sectors, however, maintaining higher volumes than those handled in the pre-Covid period (Rinaldi & Bottani, 2023). In Italy, the Covid-19 pandemic involved a significant decrease in turnover immediately in 2020 in various (mainly non-essential) industries, with, in general, a greater impact on small enterprises than on large ones. For the logistics sector, and more specifically in transportation and warehousing, an economic loss of approx. 18% (≈30 billion €) was observed, mainly due to decline in domestic production and foreign trades. Nonetheless, for third-party logistics companies, the 2021 turnover was almost back to pre-pandemic levels, reaching 87 billion € in total (Istat, 2022). The Covid-19 pandemic had various effects on companies. First, it pushed many sectors to focus on contract logistics, which indeed was one of the few sectors experiencing a very limited decrease in its activity in 2020 (-2%; Istat, 2020). Also, it contributed to the advent of logistics 4.0 (i.e., the application of Industry 4.0 technologies to logistics), which is characterized by new, state-of-the-art automated technologies aimed at increasing process efficiency and versatility, as well as at integrating all process data. Logistics 4.0 opens unlimited development opportunities and at present, it is almost indispensable for offering a high level of service and thus meet the increasingly demanding needs of consumers (Bielecki, 2023). Another effect was the growth of e-commerce, whose sudden increase in the pandemic period was caused by the closure of some businesses, which forced consumers to adapt to online shopping; sales and purchases through the e-commerce channel were sometimes the only way to buy some categories of items (Sułkowski et al., 2022). Idealo (2021) estimates that 36% of Italians have changed the way they buy the products, shifting towards electronic channels instead of visiting physical stores. Logistics companies working as (or collaborating with) express couriers obviously benefited from this trend, experiencing an increase in the volume of items handled. Also, some authors (e.g. Alderighi, 2021) have conjectured that among the future effects of the Covid-19, a constant usage of e-commerce is to be expected, thus suggesting that the role of logistics companies will be more and more important. A last important change involved by the pandemic emergency is smart working, i.e. the possibility of work fully remotely. This phenomenon has increased in Italy since the Covid-19 pandemic, reaching rates of 40% of total workers in Europe in 2020. At the most critical stage of the pandemic in Italy, the quota of smart working reached 33.3%, corresponding to 6.5 million remote workers. In 2022, the smart-working rate reached 50% in small businesses and 90% in large companies (Eurostat, 2023). The benefits to companies are various, including lower likelihood of workplace accidents, greater efficiency, fewer delays, and finally also higher employee morale (Green et al., 2020).

After approximately four years from the outbreak of the Covid-19 pandemic, companies have now entered the post-Covid era, and thus, time has come to explore how and to what extend the logistics sector has reorganized its activities, and, in case, whether some aftershock aspects still affect the sector. This paper tries to investigate this point, by means of an empirical analysis in the form of a questionnaire survey, which was administered to a sample of companies working in the logistics field and was answered by 31 respondents. Some aspects, expressively related to the business activities and consequent to Covid-19, were investigated though the survey. Examples of these aspects include work organization, smart working, e-commerce sales, consumers' behaviour, and resilience strategies. Overall, the effects of the Covid-19 were related with respect to some specific aspects, such as: the company's size; its geographic location; and the primary market (Italian or foreign).

Results provide an initial overview of the logistics activities in the post-Covid era and are expected to fuel discussion on this topic in the next years. The remainder of the paper is organized as follows. Section 2 describes the methodology followed for carrying out the study. Section 3 presents the main results from the survey. Implications, limitations and future research directions are finally discussed in the Conclusions.

2.Material and methods

2.1 Sample construction

A sample of 100 Italian companies working in the logistics field was built starting from data available in the Kompass database (www.kompass.com). The selected companies offer logistics and warehousing services, trucking, and freight transport activities. These companies were contacted by e-mail for presenting the research and sending them a link to a questionnaire. Managers were targeted as the best respondents for the questionnaire; nonetheless, the recipients could forward the questionnaire to a colleague in case they were not the most appropriate people to answer.

2.2 Questionnaire development

The questionnaire consists of 14 closed-ended questions, with proper response scales or options. Besides these questions, four preliminary items (called pre-questionnaire) were included, with the aim to delineate the profile of the respondent company. The pre-questionnaire consists of the following questions:

A) How many employees does your company has? This question is intended for determining the size of the respondent company and compare the impact of the pandemic for large companies vs. small ones. Options: <100; 100-500; >500;

B) In what area [of Italy] is the company's headquarters located? Inquiring about a company's location in Italy allows for investigating possible differences in the impact of the pandemic based on geographic positioning. The greater prevalence of the pandemic in the North as well as the greater presence of logistics companies in that area must be taken into account. Options: North; Center; South;

C) Does your company also work abroad? In addition to Italy, many logistics or transportation companies also work for foreign countries, so it is interesting to understand whether there are differences in the impact of the pandemic between them and those that work only in Italy. Options: yes/no;

D) What is your role in the company? (open question). This question investigates the role of the respondent, to be sure that the questionnaire was submitted to the right person.

Questions A-C were used to stratify the responses obtained according to the company's characteristics and to check whether some specific effects of the pandemic emergency can depend on those characteristics. As far as the questions specific to the Covid-19 impact, they are listed and commented in Table 1.

Table 1: structure of the questionnaire and rationale.

Question ID & description	Rationale
1 - *How much have protocols on distancing and sanitization changed the way your company works?* (Scale: from 1=very few, to 4=very much)	During the pandemic emergency, various rules were imposed by companies to limit the spread of the virus, possibly impacting the company's internal policies; in the medium term, with the advent of mass vaccination, these measures were partially relaxed. Some measures implemented included the use of mask, the obligation to test the temperature before entering a workplace and the obligation to introduce partitions, particularly in offices, between two adjacent workstations, again to counteract the spread of the virus.

2 - *With the advent of these protocols, were changes needed in the warehouse due to management or organizational problems?* (yes/no)	This question is intended to investigate the impact of the measures described above on the business management and organization.
3 - *How much have e-commerce-related work volumes changed from before to after Covid-19 in your company?* (Scale: from -2=significantly decreased, to 2=significantly increased; 0=no changes)	This question is intended to evaluate the impact of the Covid-19 on the volumes handled by the company through the e-commerce channel, during the pandemic emergency but also in subsequent times.
4 - *What has been the trend in employee smart-working rate from pre-pandemic to post-pandemic?* (Scale: from -2=significantly decreased, to 2=significantly increased; 0=no changes) 5 - *If there has been any change, by how much has it increased/decreased?* (Scale: from 1=very few, to 4=very much)	Questions 4-5 investigate expressively the usage of smart working practices and the changes in those practices from the pre-Covid to the post-Covid period.
6 - *What effect did Covid-19 have on your turnover?* (Scale: from -2=significantly decreased, to 2=significantly increased; 0=no changes) 7 - *If turnover has increased/decreased, by how much?* (Scale: from 1=very few, to 4=very much)	The Covid-19 emergency involved significant economic losses in various industrial contexts and fundamentally changed the business organization; investigating the severity of the Covid-19 impact in the logistics field is therefore relevant (Rinaldi & Bottani, 2023).
8 - *How much has consumer demand changed in terms of volumes by sector?* (Scale: from 1=very few, to 4=very much)	This question focuses on the consumers' behaviour and specifically on how much the pandemic has affected the company's business volumes in response to a change in consumer demand.
9 - *Does the company need to be more flexible and efficient after the pandemic to handle all orders?* (yes/no) 10 - *If so, to what extent have you increased your flexibility/efficiency?* (Scale: from 1=very few, to 4=very much)	Questions 9-10 investigate whether (and to what extent) companies had to change their work organization for improving efficiency and flexibility, possibly at the expenses of other aspects. Efficiency and flexibility, assisted by digitization, are key elements for companies' competition in today's market, which has become more unstable and unpredictable due to the Covid-19.
11 - *With the pandemic emergency, remote communication programs became increasingly popular. Have these programs changed your approach and relationship with customers?* (yes/no) 12 - *If so, to what extent did these programs change those relationships?* (Scale: from 1=very few, to 4=very much)	Technology has changed the (traditionally physical) way of communicating with customers. Companies have embraced new channels, such as. e-mails, chat boxes, instant messaging or social media, to manage supply chain relationships. Digitization also allowed consumers to be constantly updated on offers and promotions from the company and to get advertisement or suggestions based on past purchases. Questions 11-12 focus on these points.
13 - *Did your company increase the stock level to face a more variable consumer demand?* (yes/no)	Companies, to cope with increasingly variable customer demand, have generally increased inventory levels (Rinaldi & Bottani, 2023).
14 - *Did you need to reduce the personnel from before to after Covid-19 to decrease management costs?* (yes/no)	In 2020, the decrease in employment led to a serious loss of liquidity for companies and a sharp decline in investment, which prompted a lowering of costs to avoid bankruptcy, sometimes resulting in staff cuts. Governments have introduced layoff measures for employees of struggling companies, excluding those in bankruptcy. In 2022 the government continued to issue extensions, including the requirement to declare the layoff at least 90 days in advance in the case of companies on the verge of bankruptcy or that needed to cut at least 50 employees.

2.3 Analysis

Outcomes from the questionnaire were processed using Statistical package for the social science (SPSS), v.29 for Windows, first for providing an overview of the responses received, and then to evaluate possible differences in the responses as a function of the company's profile, i.e. questions A, B and C. Because some of these questions have more than 2 response options, multiple comparisons were made when required, incorporating the Bonferroni correction (Field, 2005) in the evaluation of the relating significance.

3.Results and discussion

3.1 Overview of the sample

Figure 1 depicts the role of the person who filled out the questionnaire. In most cases, this is an employee working in the office (39%), the logistics manager (26%) and the supply chain manager (16%); in some sporadic cases only, respondents were the owner, executive assistant, director or R&D manager.

As far as the size of the companies, most of them (24 out of 31, 77%) own less than 100 employees, while a smaller proportion of companies (3, 10%) have between 100 and 500 employees or more than 1,000 (4, 13%). Most of the companies are headquartered in northern Italy (22, 71%), followed by those located in the South (6, 19%) and the Center (3, 10%). Finally, approx. over half of the companies (17, 55%) also work for foreign countries.

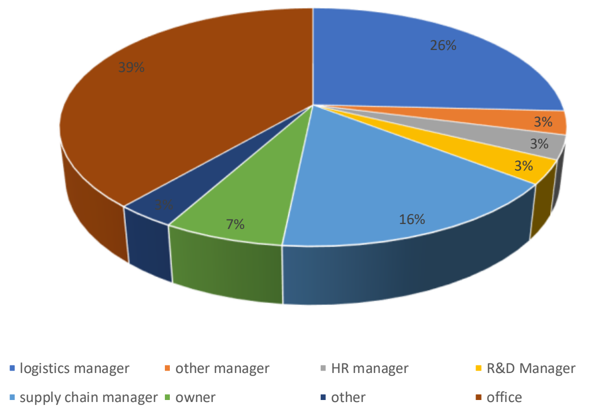

Figure 1: role of the respondents to the questionnaire.

3.2. Influence of the firm size on the pandemic effects

The effect of the firm's size on the observed impact of the Covid-19 pandemic was first analysed, by evaluating the average score of the responses obtained by the companies as a function of their number of employees (Table 2).

The measures, such as sanitation or distancing protocols (question 1), seem to have had a relevant impact on the way the company works. Nonetheless, the impact was lower for enterprises with number of employees<100, while it appeared to be more relevant for larger companies (number of employees>500). This difference, although not significant, is probably because the rules on distancing have been more difficult to implement for companies with large staffs. Four companies expressively mentioned that they experience a change in the way they work following the introduction of the new protocols.

As far as the impact of these protocols on warehouse management and organization (question 2), overall 13 firms introduced changes in the warehouse activities, while for the remaining 18 companies, no changes were needed. Table 2 shows that most companies with less than 100 and with more than 1,000 employees did not make significant changes to the warehouse, while all 3 medium-sized companies (number of employees between 100 and 500) had to implement specific measures to effectively address management or organizational problems. This probably stems from the fact that companies with many employees have large warehouses that are flexible for any unforeseen contingency, while smaller companies, with limited budget, probably own less structured warehouses.

Looking at the changes in the e-commerce activity, most of the companies did not experience significant changes in the volumes handled through the electronic market (question 3). The detailed outcomes show that 8 firms experienced an increase in the volume handled, while 2 (small) companies only experienced a decrease. Literature has highlighted that e-commerce generally increased during the Covid-19 period (Sulkowski et al., 2022; Perkumiene et al., 2021); however, it can be inferred from the outcomes of this study that logistics companies were relying on e-commerce activities even before the pandemic, and thus the impact of the pandemic itself was modest. Indeed, online sales allow companies to reach larger markets, thus meeting the needs of both Italian and foreign customers: in 2021 about 18% of Italian small and medium-sized companies made use of the online sales channel, and about 19% launched a new online sales channel (Istat, 2022).

Most companies with less than 100 employees experienced no changes in the rate of smart working during the pandemic, while few indicated an increase or decrease (questions 4-5). There are no significant trends determined by the company's size, but medium to large companies have slightly higher scores in questions 4 and 5. These results suggest that many companies may have already implemented remote work before the pandemic or that this practice may not be essential for smaller companies in the logistics sector. In contrast, large companies have seen an increase in remote working, as supported by Eurostat (2023) and by Politecnico di Milano (2024).

As far as the changes in turnover (questions 6-7), for most logistics companies with less than 100 employees, the turnover increased, while for larger firms it tended to decrease, showing a significant difference in the type of impact. However, some small firms experienced instead a decrease in turnover, with ultimately result in an almost null score against question 6. These results support the considerations that the economic impact of the pandemic in the logistics sector is still somehow unclear (Rinaldi & Bottani, 2023). Indeed, many logistics companies remained open during the pandemic, especially those dealing with primary services; on the other hand, some companies closed temporarily, and thus experienced a decrease in turnover.

Question 8 shifts to the consumer's side by investigating the change in volume demand. Most companies, regardless of the size, experienced an increase in the consumer's demand. Possibly, this could be case for the consumption of some food products, such as pasta or beverages (Rinaldi et al. 2021).

The companies surveyed, again regardless of their size, agreed on the need for being more flexible and efficient after the pandemic (question 9), thus confirming the crucial role of these characteristics for facing an increasingly variable market. Improvements in this respect can be obtained by leveraging the logistics 4.0 paradigm, i.e. automating the warehousing activities or implementing digital inventory management tools. In general, the increase in flexibility and efficiency is considerable for most companies, regardless of their size (question 10).

Question 11 focuses on the new methods of approaching customers implemented as a result of digitalization, and how these have changed the relationship with customers. Some differences in the average responses (although not significant) were observed among companies of different size; small companies almost did not experience changes in their relationship with customers, while some changes were observed for medium/large companies. On the contrary, the extent of the change, when experienced, is in general more relevant for medium/large companies than for small ones, showing significant differences as a function of the company's size (question 12). These outcomes reflect those observed earlier for the smart-working rate.

Table 2: results and statistical tests.	Company's size			Geographic locatoin			Market location	
Question ID & description	**0-100 (n=24)**	**100-500 (n=3)**	**>500 (n=4)**	**North (n=22)**	**Center (n=3)**	**South (n=6)**	**Italy only (n=14)**	**Abroad (n=17)**
1 - *How much have protocols on distancing and sanitization changed the way your company works?*	2.38	2.67	3.00	2.59	2.00*	2.33*	2.43	2.53
2 - *With the advent of these protocols, were changes needed in the warehouse due to management or organizational problems?*	0.38	1.00*	0.25	0.36	0.33	0.67	0.50	0.35
3 - *How much have e-commerce-related work volumes changed from before to after Covid-19 in your company?*	0.76	0.67	0.67	0.63	0.00*	1.60*	0.85	0.64
4 - *What has been the trend in employee smart-working rate from pre-pandemic to post-pandemic?*	0.00	1.00	0.50	0.09	0.67	0.17	0.14	0.18
5 - *If there has been any change, by how much has it increased/decreased?*	2.17	2.67	2.25	2.33	2.50*	1.50	1.75*	2.64*
6 - *What effect did Covid-19 have on your turnover?*	0.17	-0.67*	-0.25	0.05	-0.33	0.20	0.14	-0.06
7 - *If turnover has increased/decreased, by how much?*	2.95	3.00	3.00	2.94	3.00	3.00	2.78	3.08
8 - *How much has consumer demand changed in terms of volumes by sector?*	2.52	3.00	2.75	2.52	2.50	2.83	2.50	2.67
9 - *Does the company need to be more flexible and efficient after the pandemic to handle all orders?*	0.86	1.00	0.75	0.80	1.00	1.00	0.77*	0.94*
10 - *If so, to what extent have you increased your flexibility/efficiency?*	3.05	2.67	3.00*	3.00	3.00	3.00	3.09	2.93
11 - *With the pandemic emergency, remote communication programs became increasingly popular. Have these programs changed your approach and relationship with customers?*	0.42	0.67	0.75	0.50	0.67	0.33	0.29*	0.65*
12 - *If so, to what extent did these programs change those relationships?*	2.40	3.00*	3.00*	2.53	2.50	2.67	2.13*	2.83*
13 - *Did your company increase the stock level to face a more variable consumer demand?*	0.43*	0.00	0.00	0.33	0.00*	0.50	0.29	0.38
14 - *Did you need to reduce the personnel from before to after Covid-19 to decrease management costs?*	0.08	0.00	0.00	0.09	0.00	0.00	0.00	0.12

*significant differences at p<0.05.

Most of the respondent companies did not increase the stock level (question 13), even if, by looking at the detailed responses, some differences can be found in the companies' behaviour as a function of their size. Small companies, in particular, increased the stock in more than 40% of cases, while for all the remaining companies the stock level was kept unchanged. These outcomes confirm the greater need for small firms to adapt to the increased variability of consumer's demand after the pandemic, compared to medium/large ones, for which, in general, such adaptation was not necessary. Probably those companies have always stocked enough product, with no needs to further increase the amount of inventory in response to the pandemic. Similarly, only some small companies implemented staff cuts to decrease management costs (question 14), while almost all companies did not implemented layoffs, probably thanks to government aids.

3.3. Influence of the company's location on the effects of the pandemic

Outcomes relating to the possible impact of the company's location on the effects generated by the Covid-19 pandemic are shown in Table 2, again in terms of the average score resulting from the responses gathered.

The introduction of the new spacing/sanitization protocols had a significantly different impact on the company's work organization depending on the firm's location (question 1). For companies in Northern Italy, the measures introduced had a medium-high impact, while for firms in Central Italy and most of those in the South, the effect was more limited. This imbalance could be due to the fact that North was more affected by the pandemic emergency and has undergone more stringent preventive measures. The impact of safety protocols on the warehouse activity (question 2) was similar (and quite limited) for companies in the Northern and Central Italy, and more relevant for companies in the South of Italy, even if the difference observed is not statistically significant.

Changes in e-commerce volumes (question 3) were almost null for companies located in Central Italy, weak for companies in the North of Italy and more relevant for companies in the South of Italy. This significant difference could stem from the fact that before the pandemic, companies in Southern Italy relied mainly on classical sales systems, and only with the outbreak of Covid-19 did they started implementing e-commerce sales. The smart-working rate of employees from the pre-Covid to the post-Covid period to the pandemic did not vary significantly for companies in the North vs. South of Italy, while an increase was observed for companies in Central Italy, even if with no significant differences depending on the firms' location. On the contrary, the increase of the smart-working rate was significantly different depending on the company's location, and more evident for companies in Central Italy.

Regarding the change in turnover (questions 6-7), variability in the responses was observed, even if, overall, the effect does not appear to be particularly significant nor dependent on the company's location. Similarly, the magnitude of the effects is similar across companies located in the North, Center or South of Italy, and in general, it was substantial.

The change in the demand by the consumer (question 8) and the need to improve flexibility and efficiency (question 9) in response to the pandemic again do not exhibit differences by geographic area. The majority of participants reported a significant change in the consumer's demand and had to significantly increase flexibility and efficiency to cope with the pandemic, without dependence on the company's location (question 10).

Responses to question 11 are balanced as well, suggesting that the changes in the way of approaching customers as a result of digitization were similar and did not depend on the company's location. Similar considerations hold true for the magnitude of the changes in the relationships with the customers (question 12); respondents in general agree that the changes were significant, but no particular difference emerge as a function of the company's location.

Significant differences emerge instead in the increase in stock levels of warehouses in relation to variable consumer demand (question 13), with almost no increase for companies in the Center of Italy (as opposed to a medium increase declared by companies in the North and South of Italy). Firms located in the South are on average smaller and therefore less prepared to respond to the change in consumer demand that occurred due to the pandemic. Finally, staff cuts (question 14) were very modest for all companies surveyed and no significant differences emerge across firms with different location.

3.4. Influence of foreign activity on the effects of the pandemic

The third set of analyses investigates the impact of the company's business (Italy only vs. foreign countries) on the effects generated by the Covid-19 pandemic; outcomes are shown in the last part of Table 2, always in terms of the average score resulting from the responses gathered.

From Table 2 it is immediate to see that in general, the boundaries of the company's business do not emerge as determinant of the effects of the pandemic emergency. More precisely, the impact of introducing distancing or sanitization protocols (question 1) is almost the same for both groups of companies, with a very slightly higher impact for companies working with foreign countries; at the same time, however, this latter group of companies needed to implement less changes to the warehouse activities (question 2), showing greater flexibility of companies working abroad and less need to change their activities. Similarly, the volume of e-commerce products (question 3) and the smart-working rate of employees (question 4) do not vary significantly across the two groups of companies, regardless of the presence of foreign relations. On the contrary, looking at companies that have modified their smart-working rate (question 5), it can be stated that firms working abroad have experienced a more significant increase in their smart-working rate compared to companies working in Italy only.

Also, companies working abroad seem to have been somehow more affected by changes in turnover and appear to be more likely to experience changes in the consumer demand, which again could be reasonable as for sure those companies face differentiated markets. However, none of this effect was found to be significant (questions 6-8).

Interestingly, instead, outcomes of question 9 appear to be significantly different between the two groups of companies: in particular, the change in the company's flexibility and efficiency is perceived to be more important for companies working abroad. As far as the magnitude of the increase in flexibility and efficiency (question 10), this was almost the same across the two groups of companies.

Question 11 shows a significant difference, suggesting that remote programs have changed the way of approaching customers mainly in companies having relationships with foreign countries. Question 12 shows similar outcomes, with a greater magnitude of change in the approach to customers for companies operating abroad.

The level of warehouse stock did not undergo appreciable changes for both groups of companies (question 13); similarly, almost all companies did not have to resort to layoffs, regardless of their international or domestic activity (question 14).

4.Conclusions

The results of this study allow to state that the firm's size seems to play a significant role in determining the effect of the pandemic on the logistics company. Medium to large companies have somehow taken advantage of the forced digitalization process involved by the pandemic for becoming more flexible and efficient, and to change the way of doing business with their suppliers. These results support the need for "external reorganization" (Rinaldi & Bottani, 2023) of companies for enhancing the robustness of their network. The geographic location of companies was found to significantly affect the volume of products sold through the e-commerce channel and the implementation of distancing or sanitization measures. This probably depends on the fact that countermeasures against Covid-19 were issued on regional basis and varied as a function of the spread of the virus, with consequent greater or lower impact on the business activity depending on the geographical location. From the outcomes of this study, it could be argued that before the pandemic, the online sales were not so popular in some regions of Italy (Southern Italy in particular), and that those regions were forced to implement e-commerce sales to reach the customer during the pandemic period (maintaining this practice in the middle term). The boundaries of the company's activity (Italy only vs. working abroad) explain, instead, the difference observed against the smart-working rate, need for flexibility and efficiency, and remote/digital programs implementation. The former aspect, possibly, could be an effect of the "internal reorganization" (Rinaldi & Bottani, 2023), i.e. the promotion of agile work practices obtained by leveraging digitalization, which is particularly important for supply chain spanning across the globe. A greater need for flexibility and efficiency was observed for companies working abroad, in line with the fact that more perturbations and higher variability of markets are likely to be faced when working with foreign countries.

Summarising the above findings, this study provides an overview of how logistics companies have reorganized their activities in the post-Covid era, but it also introduces further aspects, such as the crucial role of flexibility and efficiency of logistics companies for coping with increasingly varied and elastic consumer demands, as well as on the role of digitization to gain and maintain an advantage in the market. These aspects could be evaluated in greater detail in dedicated empirical analyses, in the form, e.g., of case studies or of a more extensive survey. Moreover, for some aspects investigated in this study, such as the effect of the business boundaries on the changes in turnover or perceived variability of the consumer's demand statistical evidence could not be provided. These aspects, for sure, would benefit from a future investigation, to be repeated in some time taking a longitudinal perspective, to check whether the trends observed in this study can be confirmed or rather, have changed.

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