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Effects of the COVID-19 Pandemic on Logging Contractors in Sweden: A Survey on Personnel Absenteeism, Safety Measures and Economic Impacts

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Abstract: Forestry contractors perform the majority of forestry work in Sweden. Many contractors have small financial margins and may therefore be sensitive to disturbances. Recent years have been extraordinary due to the COVID-19 pandemic, and the objective of this study was to clarify how Swedish logging contractors were affected by it. In 2022, a survey was sent to 1175 companies registered to perform logging, and finally, the responses of 205 contractors were analyzed. The results show that 32% of the contractors experienced a higher absence of personnel during the pandemic. A correlation between the number of employees and the degree to which the company suffered from personnel absenteeism was identified. The majority of contractors implemented safety measures to reduce the risk of infection, usually concerning personal hygiene and social contacts in the workplace. At the time of the study, 51% of the logging contractors perceived that their financial situation was worse than before the pandemic, with those primarily engaged in logging having been hit harder than those with a more varied range of services. The study concludes that, overall, the contractors seem to have handled the pandemic quite well, but high fuel prices and inflation pose major challenges to their finances.

Keywords: wood harvesting contractors; logging contractors; work safety; COVID-19; profitability

Citation: Kronholm, T. Effects of the COVID-19 Pandemic on Logging Contractors in Sweden: A Survey on Personnel Absenteeism, Safety Measures and Economic Impacts. *Forests* **2023**, *14*, 2173. https://doi.org/10.3390/f14112173

Academic Editors: Raffaele Spinelli, Enrico Marchi, Carola Häggström, Kalle Kärhä, Omar Mologni, Benno Richard Eberhard, Toshio Nitami, Richard Cristan and Ebru Bilici

Received: 5 October 2023
Revised: 27 October 2023
Accepted: 31 October 2023
Published: 31 October 2023

1. Introduction

In Sweden, 57% of the land area, corresponding to 23.4 million hectares, is covered by productive forests, and the annual felling volume exceeds 90 million cubic meters [1]. Consequently, forestry is an economically important industry, which provides jobs for about 120,000 people and contributes a significant share of the country's export revenues [2]. Key actors in the Swedish forestry sector are the forestry contractors who carry out much of the daily forest operations. Since the 1990s, when large forest companies decided to outsource much of their forest operations, the number of forestry contractors has gradually increased, and it currently amounts to approximately 3700 [3,4]. Today, forestry contractors employ about 15,000 people and conduct more than half of all forestry work in Sweden, including most of the logging operations [5].

In Sweden, forestry contractors are typically small-sized businesses, with an average of four to six full-time employees [4,6]. They are also, in many cases, family businesses, since the owners and their family members constitute more than 40% of the workforce [5]. Usually, forestry contractors are specialized in either logging or silvicultural services, but there are also contractors with a more diverse service portfolio (including services not related to forestry). Furthermore, they typically have one main customer for their services, normally a large forest company or forest owner association, which strongly influences their business model [7]. Being small-sized businesses that serve a limited number of large customers has resulted in their bargaining power being weak, and their forestry contractors' profitability has often been low [8–11]. During the period 2013–2018, the median net profit margin for Swedish logging contractors was around 2%–3% [6]. Consequently, many

forestry contractors operate with small financial margins and buffers and may therefore be sensitive to business interruptions and unforeseen events that cause extraordinary costs or loss of income. Furthermore, the lack of capital is an obstacle to contractors' performance [12].

The last few years can certainly be regarded as extraordinary times for forestry contractors. In March 2020, the World Health Organization (WHO) declared that the novel coronavirus disease (COVID-19) could be characterized as a pandemic, the first one ever caused by a coronavirus [13]. Three years later, the number of confirmed cases of COVID-19 reported to the WHO was more than 770 million, and the number of confirmed deaths was 7 million [14]. When the pandemic became a fact at the beginning of 2020, governments around the world implemented several public health measures to prevent the virus from spreading in the population. The strategies used and the specific measures taken were different between countries and regions, but a common feature has often been social distancing. Many of these public health measures did not only affect individuals' personal lives but also had significant socio- and macroeconomic effects on both the societal and global levels [15].

Unlike some other countries, Sweden never implemented strict stay-at-home orders (i.e., lockdowns), and many of the public health measures relied on voluntary actions from individuals and business owners [16–18]. For example, to follow the guidelines issued by the Public Health Agency of Sweden (PHA), which declared that everyone had a responsibility to take appropriate actions to prevent the spreading of COVID-19, the guidelines advised people to be careful with their personal hygiene, keep distance to others both indoors and outdoors, keep distance from others when using public transportation, avoid attending large social events, avoid non-essential travel, avoid travelling in rush hours, and avoid changing clothes in public locker rooms when visiting the gym or other sports facilities. In general, the same guidelines were applied in workplaces as in the rest of society. In addition, business owners were advised to offer their customers hand disinfection, to make markings on the floor so that people would remember to keep their distance from each other, and to put up signs that showed how many people could be in the room at the same time [16].

For some sectors, the pandemic had severe negative consequences, while others benefited from people spending more time at home. For the Swedish forest industry, recent years have been economically strong, with high timber prices and strong demand for forest products. A sign of this is that several of the major forest companies reported historically high profits in 2021 [19–21]. Consequently, it could be assumed that the demand for logging services was favorable during the pandemic. However, in some markets, such as parts of Asia and the United States, it has been found that many logging firms were forced to reduce their production during the pandemic, with significant economic impacts [22–25]. In addition, there are indications that contractors had different approaches to preventive measures when it comes to reducing the spread of infection. Factors outside the workplace may also have affected the staff's ability to work and thus the logging companies [26]. So when most of the COVID-19-related restrictions in Sweden were lifted in February 2022 [27], it was an opportune time to investigate how Swedish logging contractors had managed to deliver these services, given that a higher than normal absence of personnel during the pandemic could have a noticeable impact on these small businesses. Especially since previous studies have shown that contractors in general have difficulty finding competent personnel [11,12,28]. Therefore, the objective of this study was to elucidate how the COVID-19 pandemic affected Swedish logging contractors by answering the following research questions:

- Did logging contractors experience a higher absence of personnel during the pandemic, and to what extent did it affect their businesses?
- Did logging contractors take specific measures to ensure a safe working environment and prevent infections in the workplace?
- How has the logging contractors' financial situation been affected by the pandemic?

2. Materials and Methods

2.1. Sample

The database Retriever Business contains information about all companies in Sweden and was therefore used for collecting company information. To limit the search to companies working with logging, the Swedish Standard Industrial Classification (SNI) code 02.200 was used. A second criterion was that the companies relevant to the study should have been registered before the year 2020 to ensure that they had all been in operation throughout the pandemic. Third, only limited liability companies were included in order to have access to the companies' financial statements. Companies with a turnover exceeding SEK 50 million (approximately EUR 5 million) were excluded in order to avoid having large industrial forest companies in the sample. Of all the limited liability companies registered to perform logging, this group of large companies accounted for 2%. Applying these criteria, information about 1870 companies was retrieved from the database. Due to resource limitations, it was not feasible to contact all of them, so a random sample of 1175 companies was made. Based on the response rate in previous surveys [6], this sample size was judged to be adequate to obtain a sufficient number of responses [29]. According to the companies' financial statements for 2020, those included in the sample had a net turnover of SEK 4.7 million (EUR ~470,000) and 2.8 full-time employees. The companies were fairly evenly distributed across the country (Table 1).

Table 1. Average net turnover and number of full-time employees as well as location of the companies for the sample and the population as a whole according to financial statements for 2020. One Swedish krona (SEK) corresponds to approximately EUR 0.1.

Company Characteristics	Population	Sample
Net turnover, SEK million	4.8	4.7
Number of employees	2.8	2.8
Region:		
North (Norrland)	32.7%	31.7%
Central (Svealand)	30.5%	31.0%
South (Götaland)	36.8%	37.3%

2.2. Questionnaire

A questionnaire consisting of 25 questions was constructed. The questions were largely inspired by the topics that appeared in the news media during the pandemic. The questionnaire consisted of three parts. The first part included questions about the company in general: the number of staff, the proportion of staff working with forestry services, how large a share of sales that different services accounted for, and what type of customers they serve. The second part included questions about the personnel situation during the pandemic. For example, if the company had hired or laid off personnel during the pandemic, the extent to which the company had been affected by personnel being absent for COVID-19-related reasons, and what type of measures the company had implemented in order to decrease the risk of infection in the workplace. The third part of the survey focused on the company's financial and operational issues. This included, for example, how they had experienced the demand for their services during the pandemic, to what extent the company had been affected by price increases or disturbances in supply chains, and if they had been forced to temporarily stop their operations due to COVID-19-related factors. Finally, the respondents were asked to give their overall judgement of the company's current financial situation compared to before the pandemic. Most questions had either categorical response alternatives or a seven-grade Likert scale. For example, when the companies were asked to what extent they had been affected by absence among the staff, the scale was from not at all (1) to a very high extent (7). To ensure that the questions were relevant and well formulated, research colleagues, a business developer at the Swedish Association of Forestry Contractors, and a forest company employee working with contractor-related

questions were asked for feedback on the questionnaire. Their comments resulted in minor adjustments in wording and response options.

2.3. Data Collection

In May 2022, the survey was sent out to the randomly selected companies by post, and they were able to return the completed questionnaire free of charge with a provided return envelope. The return envelope was marked with an identification number to ensure that the responses could be matched with the company information collected from the database. In the questionnaire's cover letter, the recipients were informed about the objective of the study, that their participation in the study was voluntary, and that no company would be identifiable in the published material. As the survey was aimed at limited liability companies and did not collect sensitive data about individuals, it was judged that, according to national regulations, the study did not need to undergo a formal ethical review before implementation.

Twenty-three companies could not be reached due to invalid addresses. In addition, 42 companies replied by phone, email, or mail that they did not perform forestry service, that the company was inactive, or that they, for other similar reasons, did not belong to the target group for the survey. Therefore, these 65 cases were excluded from the sample. Data collection ended at the end of June 2022. In total, 260 completed questionnaires were received, corresponding to a response rate of 23%. Some 37% of the respondents were located in the north (Norrland), 36% in the south (Götaland), and 27% in the middle of Sweden (Svealand). There was no significant difference between respondents and non-respondents concerning their geographical location.

2.4. Statistical Analysis

For the analysis, respondents were categorized based on the proportion of logging they performed, measured as the proportion of the company's sales of different types of services. Respondents stating that logging accounted for more than 50% of their turnover were categorized as ordinary logging contractors (OLCs). Companies performing some logging, but less than OLCs, were categorized as secondary logging contractors (SLCs). The group of OLCs consisted of 167 companies, of which 90% stated that logging accounted for more than 75% of the company's turnover. The group of SLCs consisted of 38 companies, of which half stated that logging accounted for 1%–25% of their sales and for the other half it was 26%–50%. Finally, 55 companies did not perform any logging at all and were thus excluded from further analysis. The average number of employees (including owners who actively work in the company) was 4.9 for OLCs and 4.8 for SLCs, and the median was 4.0 and 2.0, respectively. In 2021, the average net turnover for OLCs was SEK 8 million (EUR ~800,000) and for SLCs, it was SEK 5.4 million (EUR ~540,000).

When applicable, differences between groups of contractors were statistically analyzed by using non-parametric tests such as Mann–Whitney U test, chi-square test (χ^2), and Spearman's rank order correlation. IBM (Armonk, NY, USA) SPSS Statistics software (versions 27 and 29) was used for statistical tests.

3. Results

3.1. Absence of Personnel

The majority of contractors (62%) did not experience any difference in personnel absenteeism during the pandemic compared to previously, but 32% stated that it was higher than normal. Hence, only a few contractors experienced a lower degree of personnel absenteeism than before. There was no significant difference between OLCs and SLCs. There was a small but significant correlation between the number of employees and the level of personnel absenteeism (Spearman's rho = 0.287, $p < 0.001$).

The companies were to an equal extent affected by employees being on sick leave due to COVID-19, as they had been affected by employees being away for other reasons such as taking care of sick children, being in quarantine due to exposure to the virus, or other

reasons with a direct connection to COVID-19 (Figure 1). Overall, the average influence of these two factors on the contractors' businesses was 2.4 and 2.5, respectively, on a seven-point scale from one (not at all) to seven (to a very high extent). There were no significant differences between OLCs and SLCs on these two factors. There was a medium-strong correlation (Spearman rho = 0.414, $p < 0.001$) between the number of employees and to what extent the contractors had been affected by employees being on sick leave. Similarly, there was a medium-strong correlation (Spearman rho = 0.467, $p < 0.001$) between the number of employees and how much they had been affected due to absenteeism for other COVID-19-related reasons.

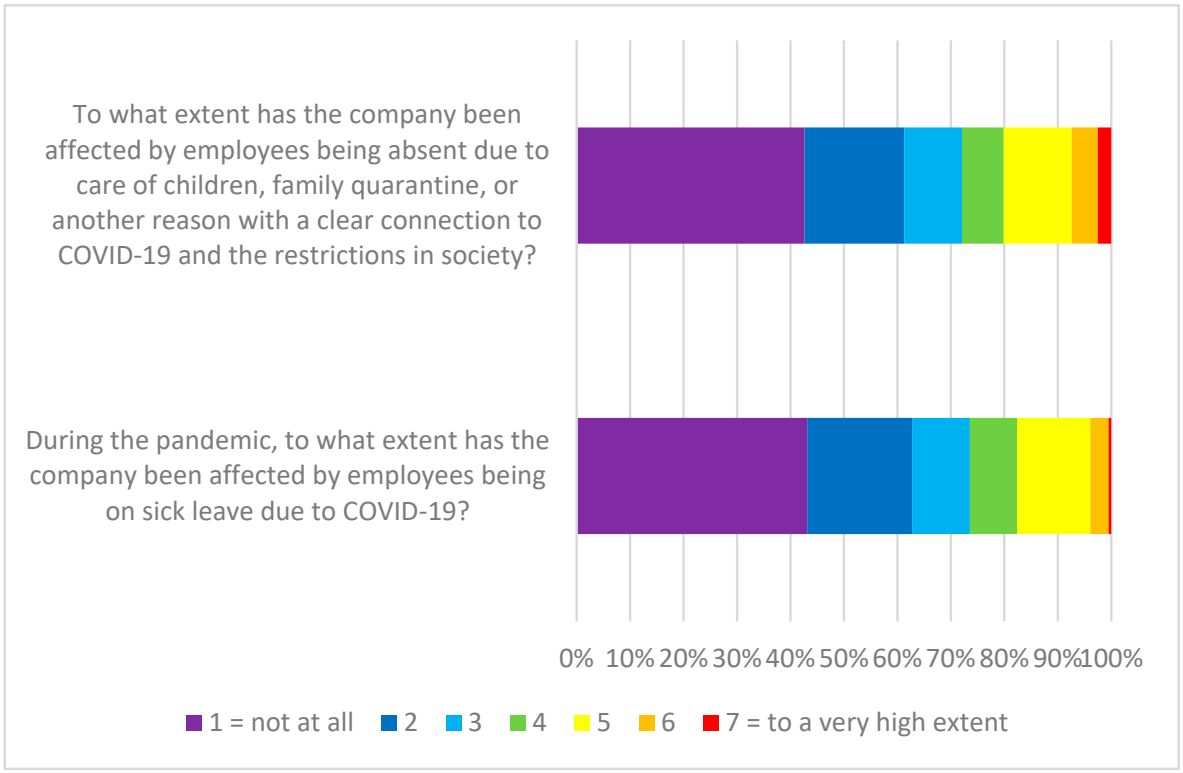

Figure 1. Distribution of respondents' opinions regarding the extent to which the company had been affected by employees being absent due to sick leave or other COVID-19-related reasons.

3.2. Safety Measures

The majority (72%) of contractors implemented one or several extraordinary safety measures or guidelines during the pandemic to reduce the risk of employees becoming infected with COVID-19 by their colleagues or other people in the workplace. There was no significant difference between OLCs and SLCs regarding this. There was no significant difference between groups based on the number of employees. The contractors were asked to specify what kind of safety measures they had implemented, and the provided examples were sorted into categories based on their commonalities. As shown in Table 2, many of the examples were in some way linked to reducing social contacts and increasing awareness of personal hygiene. Furthermore, it was also common to disinfect sticks and handles in the machines between work shifts. Other but less frequently mentioned safety measures were to have digital meetings, commute to work in separate cars, and only work single shifts or avoid transferring operators between machines. Some had also avoided offering internships or training for employees.

Table 2. Types of safety measures mentioned by those contractors who had implemented one or several extraordinary safety measures during the pandemic (n = 147).

Safety Measures	Proportion of Respondents (%)
Keeping distance to other people	37
Reduced social contact	36
Personal hygiene	30
Disinfection of sticks and handles in the machines	27
Digital meetings	12
Work only single shifts or avoid transferring operators between different machines	10
Commute to work in separate cars	9
Follow the advice from the Public Health Agency (e.g., stay home in case of symptoms)	7
Other (e.g., no internships, no staff training)	6

3.3. Economic Impacts

3.3.1. Temporary Shutdowns

Some 20% of the contractors stated that they had been forced to temporarily shut down their operations at some point due to COVID-19-related reasons. There was no significant difference between OLCs and SLCs. On average, the reported downtime was 25 days, and the median downtime was 15 days. The most common reason behind the interruptions was that the customers decreased or halted their timber procurement. Some respondents mentioned that this was the case, especially at the beginning of the pandemic, as there was a high level of uncertainty in the market. In addition, a few respondents stated that their customers had large timber stocks at that time and therefore decreased timber production for some time. During the pandemic, some contractors' customers had problems with shipping out their finished products, which forced them to stop or reduce their production. In total, 67% of the interruptions was in some way linked to the customers. In 15% of the cases, the shutdown was due to the contractors themselves having trouble acquiring spare parts for their machines. In 18% of the cases, the shutdown was due to the absence of personnel.

3.3.2. Service Demand

Overall, 23% of the contractors experienced higher demand for their services during the pandemic, while 13% experienced lower demand. The rest did not notice any difference compared to before the pandemic (Figure 2). When comparing OLCs and SLCs, it was found that a higher proportion of the SLCs experienced an increased demand for their services (χ^2, p = 0.037) (Table 3). There was a small but significant correlation between the number of employees and the experienced service demand (Spearman's rho = 0.150, p = 0.033).

Table 3. Respondents' perception of the service demand during the COVID-19 pandemic according to contractor category.

Service Demand during the Pandemic	Ordinary Logging Contractors (%)	Secondary Logging Contractors (%)
Lower than before	15	5
No difference	66	58
Higher than before	19	37

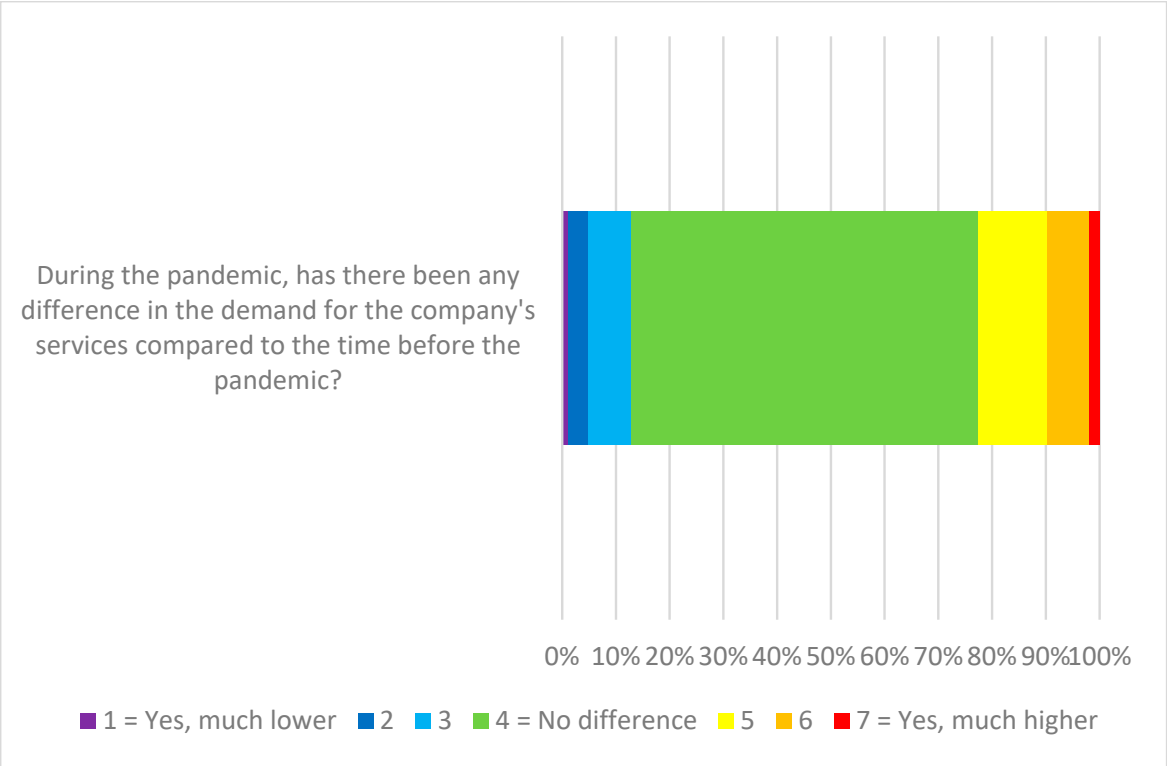

Figure 2. Distribution of respondents' opinions regarding the service demand during the COVID-19 pandemic compared to before the pandemic.

Three contractors reported that they had permanently laid off staff due to the pandemic. In two of the cases, one employee had been laid off, while the third company did not mention how many employees it concerned. Furthermore, ten companies implemented short-term layoffs, either for some or all their staff. Short-term layoffs meant that, under certain conditions, companies could reduce employees' working hours (at most up to 80%) without reducing wages to a corresponding degree and instead receive compensation from the state for part of the cost. The majority (76%) of contractors did not hire new employees during the pandemic. Some 14% of the contractors hired new employees in order to increase the workforce permanently, while 7% hired new employees in order to replace employees who had retired or left for other reasons. In addition, 7% hired seasonal workers. For most of the contractors (95%), recruitment was not affected by travel restrictions. Furthermore, in the 5% of cases where it affected the contractors' recruitment, it was to a low or medium extent.

3.3.3. Inflation and Supply Chain Disturbances

Contractors were asked to what extent the business was negatively affected by (i) supply chain disturbances, (ii) increasing fuel prices, and (iii) increasing prices on spare parts, maintenance, and similar services (Figure 3). Of these three, fuel prices were the one that, on average, had affected the contractors to the largest extent, while disruptions in supply chains had the relatively least impact. There were significant differences between OLCs and SLCs concerning fuel prices and increasing prices on spare parts and maintenance (Mann–Whitney U, $p < 0.05$). In both cases, OLCs considered that the negative effects of these factors were stronger on their businesses (Table 4).

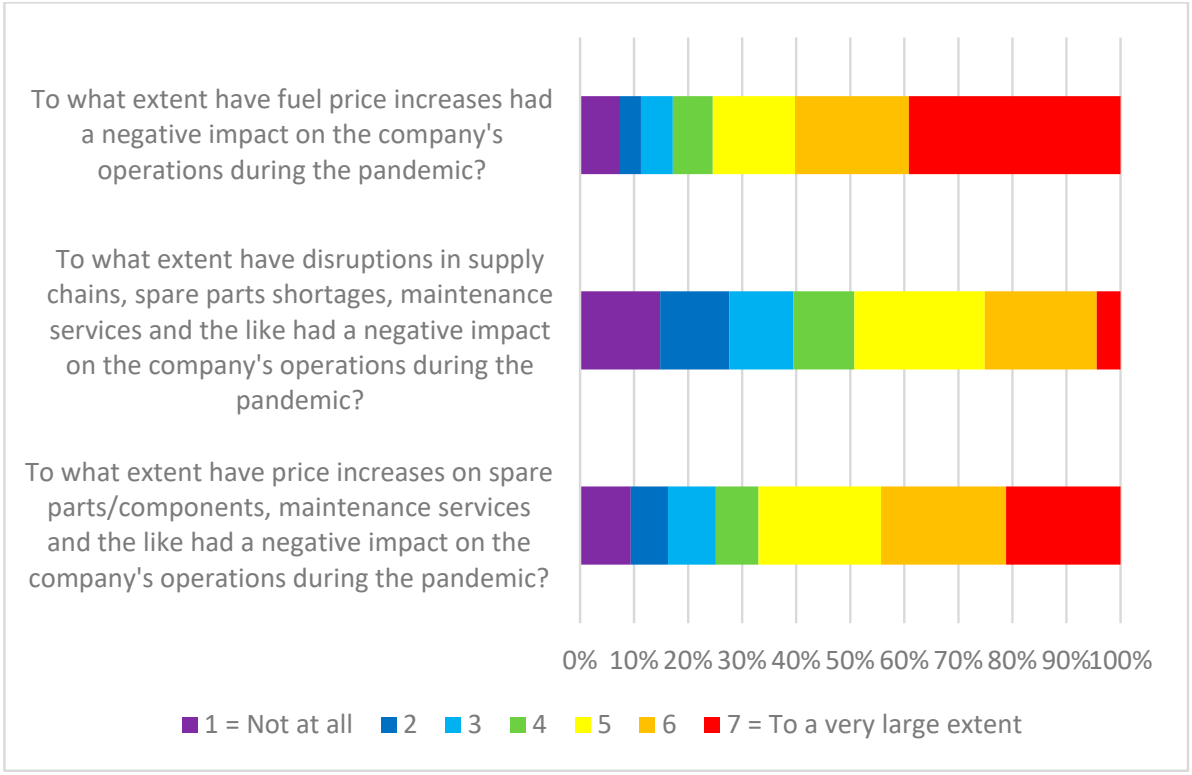

Figure 3. Distribution of respondents' views on the extent to which fuel price increases, disruptions in the supply chain, and price increases for spare parts, maintenance, and the like had a negative effect on the company's operations during the COVID-19 pandemic.

Table 4. Respondents' average perception of the extent to which their business had been negatively affected by fuel or spare parts price increases and supply chain disruptions, on a scale of one (not at all) to seven (very much). Significant differences between groups are marked with an asterisk (Mann–Whitney U, $p < 0.05$).

Impact Cause	Ordinary Logging Contractors	Secondary Logging Contractors	Total
Fuel price increase	5.5 *	4.9 *	5.4
Disruptions in supply chains	4.1	3.5	4.0
Price increase on spare parts, maintenance, and the like	5.0 *	4.0 *	4.8

Compared to OLCs, SLCs considered that they could, to a significantly higher extent, compensate for higher prices on fuel and other supplies by increasing the prices of their own services (Mann–Whitney U, $p = 0.003$). The average scores on this factor measuring the contractors' pricing power were 4.2 for OLCs and 5.2 for SLCs. Compared to SLCs, a significantly higher proportion of OLCs' contracts with customers included an index-based compensation for fuel costs (χ^2, $p = 0.020$). Of OLCs, 82% stated that they had such a clause in their contracts, and 63% of SLCs had it. However, comments given in connection with this question indicated that the index-based compensation did not always fully cover the actual price increases. Furthermore, it was mentioned that the updates to the index were lagging behind.

3.3.4. Contractors' Finances

Based on the contractors' own perception of their financial situation, for the majority (51%), it had become worse during the pandemic, while it was unchanged for 37%, and for the rest, it had become somewhat better (Figure 4). There was a significant difference between the OLCs and SLCs (Mann–Whitney U, $p = 0.002$), where OLCs experienced a stronger negative development than SLCs (Table 5).

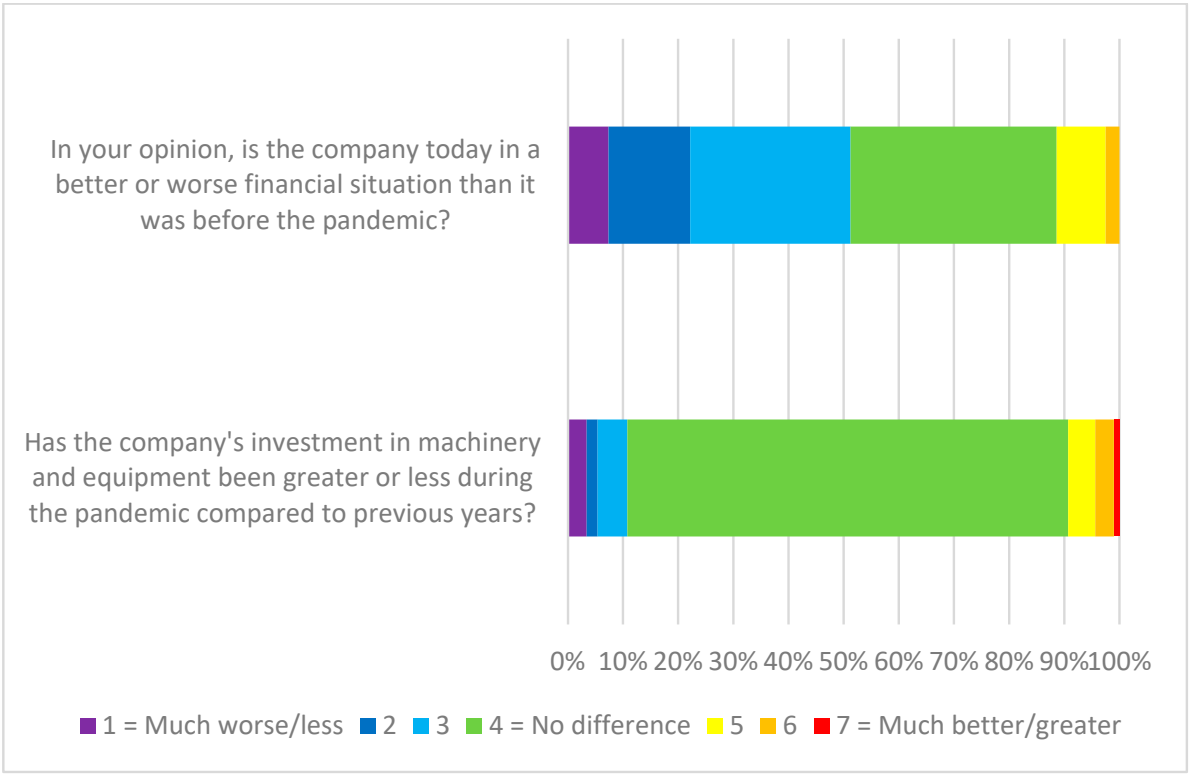

Figure 4. Distribution of the respondents' perceptions of the company's financial situation and the amount of investments made compared to before the pandemic.

Table 5. Respondents' view of their financial situation and level of their investments compared to before the pandemic on a scale of one to seven, where one is much worse/less and seven is much better/greater. Four thus means that the situation was unchanged. Differences between groups were significant on both indicators (Mann–Whitney U, $p < 0.05$).

Financial Indicator	Ordinary Logging Contractors	Secondary Logging Contractors	Total
Financial situation compared to before the pandemic	3.2	3.9	3.3
Investments made compared to before the pandemic	3.9	4.2	4.0

The majority of contractors with a negative view of their financial development referred to increasing prices on fuel, oils, spare parts, maintenance, and other essential supplies. For example, one contractor stated that their costs had rapidly risen by 20%, but they had only managed to pass on 16% to the customer. In addition, other contractors expressed that their customers were reluctant to give full compensation for increased costs. Seven contractors explicitly mentioned the pandemic as a reason for the economic downturn, such as temporary shutdowns and the absence of personnel. For example, one contactor pointed out that "a lot of childcare equals lost income", which was a consequence

of what the contractor described as "extreme restrictions in kindergartens". Among those who considered that they had strengthened their financial situation, an increased service demand was the most common explanation. Furthermore, some mentioned that they had good agreements with their customers. A couple of contractors also mentioned improved management structures and investments in new and more efficient machines.

For the majority of contractors (80%), the level of investments in machines and equipment had not changed during the pandemic compared to previous years. For 11% of the contractors, investments were lower during the pandemic, and for 9%, investments were higher (Figure 4). There were significant differences between OLCs and SLCs concerning the level of investments during the pandemic (Mann–Whitney U, $p = 0.009$), where SLCs had marginally increased their investments while OLCs had slightly decreased theirs (Table 5).

4. Discussion

This study investigated how the COVID-19 pandemic affected Swedish logging contractors' operations. This study highlights that the high inflation that followed the pandemic has been a bigger problem for contractors than the direct effects of the pandemic, such as employees being sick or absent for other COVID-19-related reasons.

4.1. Personnel Absenteeism

The results of this study indicate that logging contractors with more employees were affected by employee absenteeism to a higher extent than those with few employees, although the negative effects in general seem to have been moderate. From the respondents' answers, it was noticeable that some of those who were working alone went to work during the pandemic, although they were not completely fit, as they did not risk infecting others at the workplace. Consequently, those who had more colleagues in the workplace had to be more careful about going to work. Furthermore, it was noticeable that the effects of the pandemic on different contractors may vary depending on the characteristics of the workforce. For example, contractors who themselves or whose employees have children might have been more affected than others, which has also been highlighted by Scott et al. [26]. Because, in 2021, the number of days that Swedish parents stayed at home taking care of sick children was at a record high. In total, the Social Insurance Agency paid out economic compensation for 8.4 million days, divided among 840,000 children [30]. What is noteworthy is that the level of absenteeism from work due to sick children continued to be at historically high levels in 2022, and one reason for this is that the tolerance level for attending school or kindergarten with symptoms of sickness has become lower [31]. This affects all types of employers, and it will be interesting to see whether this is a temporary phenomenon or if it will be the new post-pandemic normal. Therefore, more studies within this area are recommended, and especially comparisons between male-dominated sectors such as forestry and other more female-dominated sectors would be of interest. In any case, contractors should consider this when planning their future operations. Perhaps it will be more important in the future to have a pool of substitutes who can jump in at short notice for employees who need to be off. However, a barrier to this is the apparent lack of skilled operators [11,28].

4.2. Safety Measures

The extraordinary safety measures that the majority of contractors implemented during the pandemic were, to a large extent, in line with the recommendations and guidelines provided by the PHA [16]. In some cases, they went even further (e.g., the use of facemasks), but in general, personal hygiene and social distancing were the key measures. Thus, the measures do not differ significantly from what logging contractors in other countries have managed [26]. These types of measures are, in most cases, simple to follow, and they come with little or no economic cost for the contractor. In some cases, it can even reduce costs (e.g., for travel and meetings). However, for the workers, this can imply both social costs

(e.g., due to less interaction with colleagues) and increased economic costs (e.g., increased costs for commuting alone to the workplace instead of carpooling). Which of the implemented health and safety measures will remain after the pandemic is something that future studies could clarify.

4.3. Economic Impacts

In the later phase of the COVID-19 pandemic, inflation started to increase and soared at the beginning of 2022. This was clearly reflected in the survey results, as a large share of the contractors perceived that their financial situation had become worse due to increasing costs. According to the Swedish Association of Forestry Contractors, the hourly cost of operating a harvesting machine increased by 26.3% from June 2021 to June 2022. For forwarders, the increase was even higher, as the hourly cost for this type of work became 32.3% more expensive during the same period [32]. Rising costs are not something that only Swedish logging contractors have experienced in recent years, but this is also pointed out as a major challenge among logging contractors in, for example, the USA [22]. As shown by this study, a significant share of logging contractors consider it difficult to transfer these increases in costs to their customers, which consequently weakens the contractors' financial situation. That contractors have limited bargaining power against their customers is a well-known phenomenon, but it might become even more evident in times when costs increase quickly [10,33] because Swedish logging contractors typically have long-term contracts with their customers, which are often re-negotiated on a yearly basis [6,7]. However, the terms for regulating some operating costs might be index-based, e.g., fuel costs. Nevertheless, the results of this study show that many contractors perceive that the current index-based compensation schemes have problems, as they lag behind and do not fully compensate for all increases. Another problem has been that different companies have applied different indexes, causing confusion and misunderstandings between parties, but recently an industry-wide agreement was reached on the introduction of a new fuel clause [34]. In future studies, it would therefore be interesting to evaluate to what extent this can solve the identified problems and improve the contractors' opportunities to receive what they perceive to be fair compensation.

Overall, SLCs were found to be more positive about their financial situation than OLCs. Since previous studies have shown that forest company managers prefer to manage flexibility in harvesting capacity with short-term contracts [35], it is possible that SLCs have been able to provide the additional harvesting capacity needed when the demand for timber has been high. The fact that contractors with more varied service offerings often sell their services as single assignments may also explain why SLCs perceive their pricing power to be better than OLCs, who typically have long-term contracts [6]. However, it is important to note that there were large variations between individual contractors, so one should be careful about drawing general conclusions based on this.

The share of contractors who had increased their levels of investments in new machines or equipment was clearly lower than the share of contractors who had experienced an increasing demand for their service during the pandemic. This is reasonable considering that these types of investments are made with a long-term perspective, and growing the business during periods of high demand also comes with the risk of facing high costs on the day demand decreases. Moreover, if the company's finances are already unstable, hasty investments can make the situation even worse [36]. Finally, since contractors can often manage temporary changes in service demand by adapting the use of existing logging resources [37], the need for investments will also depend on the extent of increasing demand.

4.4. Strengths and Limitations of the Study

This survey was conducted only a few months after the last COVID-19-related restrictions were lifted, and the contractors thus had the events fresh in their minds and were able to evaluate the two most distinctive years of the pandemic. Therefore, the timing of the survey was considered very favorable. However, during this time, inflation was

increasing rapidly, and this may have influenced respondents' answers to some extent because inflation was at the top of everyone's minds at the time.

Targeting surveys at specific groups of businesses has certain limitations and challenges. In this study, more than 20% of the respondents did not carry out logging despite being registered with the logging code in the company register. An implication of the inaccuracies in the company register is that it becomes difficult to evaluate the representativeness of the respondents. It may also lead to frustration among business owners when they receive surveys that are irrelevant to them. Therefore, improving the accuracy of the company registers would be beneficial for research as it can save costs and improve the quality of studies. The response rate of this study was not very high, but fairly in line with previous contractor surveys conducted in Sweden [6]. Due to resource constraints for the project, no reminder was sent out to non-responders, which to some extent negatively affected the response rate.

5. Conclusions

Few studies have so far been performed regarding pandemic effects on forestry contractors' operations, especially in the Nordic context, and this study has thus contributed to an increased understanding of the consequences of the COVID-19 pandemic within this industry. The study highlights that the Swedish logging contractors were affected by the COVID-19 pandemic, but that inflation, the problems with supply chains, and the increased fuel prices that followed appear to have been bigger problems than the virus itself. For the majority of contractors, the absence of personnel did not increase, and for those contractors who were affected, the influence on the operations was small to moderate. Therefore, it seems that the extraordinary safety measures and guidelines that the majority of contractors implemented might have paid off. Finally, the study shows that many contractors had a negative perception of their financial development during the pandemic, mainly due to increasing costs, especially among the OLCs. To alleviate these problems in the future, it is important that logging contractors clarify their customer agreements regarding how price changes in fuel prices and the like can be reflected in the price the customer pays. However, as the long-term effects of the pandemic and subsequent inflation will continue to affect contractors' business operations for some time, more studies are needed to achieve a deeper and more holistic understanding of all the effects that the COVID-19 pandemic had on this sector.

Funding: This study was supported by Stiftelsen Fonden för Skogsvetenskaplig Forskning (The Foundation for Forest Science Research), which is administered by the Swedish University of Agricultural Sciences.

Data Availability Statement: The data presented in this study are available on reasonable request from the corresponding author. The data are not publicly available due to ethical reasons.

Acknowledgments: The author would like to thank the respondents and reviewers for their valuable contributions to the completion of this paper.

Conflicts of Interest: The author declares no conflict of interest.

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