

Trucking in the Era of COVID-19

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Sperry, D., Schuster, A. M., Cotten, S. R., Agrawal, S., Mack, E. A., Britt, N., & Liberman, J. (2022). Trucking in the era of COVID-19. *American Behavioral Scientist*.

<https://doi.org/10.1177/00027642211066039>

Abstract

COVID-19 resulted in health and logistical challenges for many sectors of the American economy, including the trucking industry. This study examined how the pandemic impacted the trucking industry, focused on the pandemic's impacts on company operations, health, and stress of trucking industry employees. Data were collected from three sources: surveys, focus groups, and social media posts. Individuals at multiple organizational levels of trucking companies (i.e., supervisors, upper-level management, and drivers) completed an online survey and participated in online focus groups. Data from focus groups were coded using a thematic analysis approach. Publicly available social media posts from Twitter were analyzed using a sentiment analysis framework to assess changes in public sentiment about the trucking industry pre- and during COVID-19. Two themes emerged from the focus groups: (1) trucking company business strategies and adaptations and (2) truck driver experiences and workplace safety. Participants reported supply chain disruptions and new consumer buying trends as having larger industry-wide impacts. Company adaptability emerged due to freight variability, leading organizations to pivot business models and create solutions to reduce operational costs. Companies responded to COVID-19 by accommodating employees' concerns and implementing safety measures. Truck drivers noted an increase in positive public perception of truck drivers, but job quality factors worsened due to closed amenities and decreased social interaction. Social media sentiment analysis also illustrated an increase in positive public sentiment towards the trucking industry during COVID-19. The pandemic resulted in multi-level economic, health, and social impacts on the trucking industry, which included economic impacts on companies and economic, social and health impacts on employees within the industry levels. Further research can expand on this

study to provide an understanding of the long-term impacts of the pandemic on the trucking industry companies within the industry and segments of the trucking industry workforce.

Keywords: trucking, health, truck drivers, COVID-19

Introduction

Over 45 million people in the United States (U.S.) contracted COVID-19 (CDC, 2021). About 26 million Americans filed for unemployment, and millions more suffered economic impacts related to the pandemic as a result of reduced work hours, pay cuts and unpaid leave (Lund et al., 2020). In addition to these workforce impacts, COVID-19 resulted in supply chain shortages and required companies to transform business models (Barua, 2020). The magnitude of these effects suggest that the COVID-19 pandemic is the worst economic shock to U.S. society since the Great Depression (Chebly et al., 2020).

This vulnerability extends to the transportation industry and, more specifically, the trucking industry, which lies at the nexus of the economic and health concerns related to the COVID-19 pandemic. Out of all sectors, state-level reports show that the transportation/logistics sector had one the highest per-capita excess mortality rates due to COVID-19 (Chen et al., 2021; Hawkins et al., 2021). Stay at home orders and reductions in travel changed consumers' purchasing behaviors and increased the demand for deliveries. E-commerce sales also accelerated during the pandemic (Agrawal et al., 2020), growing over 30% between the first and second quarters of 2020 (Palmer, 2020). These changes in demand and supply chains presented the industry with numerous logistical challenges (Papanikolaou & Schmidt, 2020).

From a workforce perspective, essential workers faced disproportionate impacts related to a lack of protection from health risks by employers and loss of work related to business shutdowns and shelter-in-place orders (Grusky et al., 2021). Truck drivers are essential workers that could not work remotely during the pandemic (Blau et al., 2020). The pandemic increased both health and economic risks for essential workers due to 1) their employers not protecting them from health risks, and 2) their employers or government officials not protecting them from the economic

risks of COVID-19, especially as mandated business shutdowns and shelter-in-place orders disproportionately affected them (Grusky et al., 2021). This essential worker status and changes in supply chains have produced infrastructure issues, such as amenity closures, for this segment of transportation workers who have experienced increased stress and negative health impacts as a result of the pandemic (Lemke et al., 2020).

Our exploratory study contributes to the emerging body of research examining the economic, health and social impacts associated with the COVID-19 pandemic focusing on the trucking industry (ATRI & OOIDAF, 2020; Agrawal et al., 2020). We utilize a multi-level perspective to provide new insights into the industry-wide impacts of the pandemic that builds upon and expands prior work focused on particular levels within the industry (e.g., industry and individual drivers; ATRI & OOIDAF, 2020; Agrawal et al., 2020). To do this, we draw upon survey and focus group data from individuals at varying organizational levels of trucking companies (i.e., upper-level management, supervisors, and drivers) to gauge the range of impacts, including health and economic impacts, experienced during the pandemic. We also examine public perceptions of the trucking industry before and during COVID-19 to further understand impacts on truck drivers in a more social, public context.

We examine three main research questions in our study:

- 1.) How have business strategies of trucking companies changed as a result of COVID-19?
- 2.) What were truck drivers' experiences while working during the pandemic?
- 3.) Have public perceptions of truck drivers shifted as a result of the pandemic?

Industry Challenges

Even prior to COVID-19, the trucking industry had substantial challenges. Table 1 displays the latest top ten concerns in the trucking industry. Driver shortages are the top concern

(ATRI, 2020). Most truck drivers are 55 years and over, which is older than the average age in other careers such as office and administrative support occupations where the median age is 42.9 years (BLS, 2021). The age of the truck-driving workforce reflects the challenges associated with the job, which involve long stretches of time away from home and family, and insufficient compensation to overcome these challenges (Turnbull, 2017). Studies also point to the Federal Motor Carrier Safety Administration (FMCSA) Drug and Alcohol Clearinghouse and its respective regulations as a factor that results in challenges recruiting new drivers, which contributes to driver shortage (ATRI, 2020).

[Table 1 About Here]

New industry challenges have emerged during COVID-19. The trucking industry was impacted by a combination of trends stemming from manufacturing shutdowns and changes in consumer purchasing behavior due to stay-at-home orders (Fairlie, 2020). Once a national emergency was declared in the U.S., trucking activity increased due to panic buying and an increase in e-commerce sales (ATRI, 2020). As physical distancing measures became increasingly common, the demand for retail food pickup and delivery services increased, leading to long wait times for such services (Gray, 2020). Consequently, the impact of COVID-19 on the trucking industry varied based upon the organization's sector and type of hauled freight. Some industries experienced an increase in the value of stock investments, such as medical supplies and grocery stores, while other sectors, such as the hospitality industry, experienced declines (Thorbecke, 2020). Business closures and manufacturing shutdowns also reduced the demand for certain trucking services (Reagan & Saphores, 2020).

Traces of these countervailing forces are manifested in the Truck Tonnage Index, which is a relative measure of the total tonnage transported by the trucking industry (Figure 1; BTS,

2018). As Figure 1 highlights, a steep decline in the volume of shipments started on March 1, 2020 and ended on April 1, 2020. This period includes the date that the President of the U.S. declared a state of emergency (i.e., March 13, 2020; The White House, 2020). Since April 1 2020, the volume of truck shipments rebounded, reaching a peak on July 1, 2020, albeit below prior peak shipping levels.

[Figure 1 About Here]

In addition to a relative recovery from the April 1 trough of trucking activity, studies suggested a brighter outlook for the trucking industry. For example, local trips (less than 100 miles) increased to 18.2% from 7.8% since the start of pandemic restrictions due to a shift in fleet operations to move essential consumer goods locally or regionally, rather than nationally, to satisfy increased consumer demand locally (ATRI & OOIDAF, 2020). Reductions in fuel prices (Gray, 2020) and shorter average traffic delays, as reported by drivers (ATRI & OOIDAF, 2020), were also observed as positive outcomes of COVID-19.

Driver Challenges

The pandemic also exacerbated several pre-existing work challenges for truck drivers. Pre-pandemic analysis of stress in long-haul truck drivers suggests it is a result of a combination of macro-level factors: (1) declines in manufacturing wages (which are strongly correlated with truck driver wages), (2) federal policies leading to a reduced union presence, (3) increased trucking industry competition, and (4) federal hours-of-service regulations in an extremely competitive industry (Lemke et al., 2020). This competitive environment leads to poor work schedules consisting of long hours and shift work, often leading to fatigue (Boyce, 2016). Aside from the social isolation drivers face during time away from family and friends (Lemke et al., 2020), other job-related problems for drivers include poor diets and drug abuse, which can

compound negative health outcomes such as obesity, high blood pressure, stress, and high suicide rates (Boyce, 2016). Drivers may feel mentally and physically burnt out by their role demands, especially for long-term drivers who find leaving the industry more difficult due to concerns over their health and future employability (Snyder, 2016).

In addition to these occupation-related concerns, the pandemic yielded new concerns for drivers. Truck drivers are generally older and male, which makes this group of workers more vulnerable to the negative effects of COVID-19 (Ghilarducci & Farmand, 2020). Although truck drivers could self-isolate to a certain degree while working, their role in delivering essential goods needed by the public required them to venture into COVID-19 hotspots (Ghilarducci & Farmand, 2020). On the road, government sanctions shut down service areas, which complicated finding food and restroom stops (Lemke et al., 2020; Gray, 2020). However, some organizations including the American Trucking Association (ATA) created initiatives such as their #ThankATrucker campaign where they distribute masks and provide hand sanitizer refill stations across the country (ATA, 2021).

Public Perceptions of Trucking

As noted above, both the trucking industry and truck drivers are subject to stressors experienced at the societal level. We suggest that public perceptions of trucking may also potentially act as a stressor for both the trucking industry and truck drivers. The negative public perception of truck drivers has been identified as one of the causes of driver shortages in the trucking industry (Costello & Karickhoff, 2019). A public opinion survey conducted by Wakefield Research for Verizon Connect before the COVID-19 pandemic revealed that a majority of everyday drivers believe that truck drivers exhibit unsafe driving behaviors (Verizon Connect, 2019). Since direct interactions between the public and the trucking industry are rare,

these safety-related perceptions from on-road interactions can influence public perceptions of the trucking industry. Lack of respect and support from those who share the road with truck drivers, along with stakeholders, customers, and the government, have been reported as a psychological stressor truck drivers experience (Williams et al., 2017; Reiman et al., 2018). Public opinion and perception also have substantial impacts on forming public policy (Burstein, 2003). The industry has taken some measures, such as Trucking Moves America Forward (truckingmovesamerica.com), to improve its deteriorating public image. However, during the pandemic, the public perception of the trucking industry has improved in the U.S. (Mulero, 2020a), with the President of the U.S. praising the pandemic response of the trucking industry publicly in April 2020 (Mulero, 2020b).

While some research has analyzed the economic and health impacts due to COVID-19 (Kalogiannidis, 2020; Thorbecke, 2020; Ghilarducci & Farmand, 2020; Lemke et al., 2020), there is little research investigating trucking industry changes introduced and/or exacerbated due to the pandemic. The current trucking literature related to COVID-19 evaluates overarching effects, referring to the U.S. economic impacts as a whole or the transportation industry more broadly (Gray, 2020; Thorbecke, 2020; Papanikolaou and Schmidt, 2020). Research that does pertain specifically to the trucking industry refers primarily to industry changes and not company-level changes (ATRI & OOIDAF, 2020; Lund et al., 2020) and limited research has been devoted to driver concerns (see Lemke et al., 2020 for an exception).

Few studies have examined the potential and realized impacts of COVID-19 on the trucking industry, in particular with trucking companies and truck drivers. Of the extant research in this area, we know that different sectors of the trucking industry are likely to be impacted differently. Our exploratory study expands on research examining the impacts of COVID-19 on the trucking

industry and truck drivers by conducting a multi-level analysis that incorporates three perspectives on the COVID-19 pandemic: company perspectives, truck driver perspectives and perspective of the general public. We examine three main research questions in our study:

- 1.) How have business strategies of trucking companies changed as a result of COVID-19?
- 2.) What were truck drivers' experiences while working during the pandemic?
- 3.) Have public perceptions of truck drivers shifted as a result of the pandemic?

Methods

Data Collection and Sampling Strategy

As part of a larger study on the impacts of automated vehicles on the workforce, data were collected from participants at three levels in the trucking industry (i.e., supervisors, upper-level management, and drivers). To recruit participants for this study, a list of trucking companies in one Midwestern and one Southern state were created from city and regional transportation agencies and firm directories. Recruiting calls were made to each of the companies on the list. Team members explained the purpose of the study and what participation in the study would involve. Those who agreed to participate in the study completed an online survey and participated in a focus group. We also sampled publicly available data from Twitter to investigate the changes in public perception towards the trucking industry on social media after COVID-19 was declared a national emergency in the U.S.

Survey Data

Data were collected between June 2020 and January 2021 through an online survey consisting of demographic questions and questions related to the trucking industry (e.g., impacts of COVID-19). Demographic questions included participants age, gender, and race. Participants were asked open-ended questions about their job, *What is the name of your*

organization/employer?, How long have you worked for your current organization?, and What is your current position or title? Participants were asked about the influence of COVID-19 related to their work with two questions. The first question, *Has COVID-19 affected your work?*, had two response options “Yes” or “No.” Those that said yes were asked, *How has COVID-19 affected your work?* Select all that apply response options included: “Increased the amount of hours/time spent working,” “Increased the stress associated with my work,” “Increased the health risks associated with my work,” “Increased the amount of pay I receive,” “Decreased the amount of hours/time spent working,” “Decreased the amount of pay I receive,” and “I was laid off from work.” Participants were asked about COVID-19 related future changes in their organization’s workforce with three questions, *Do you expect the size of your organization’s workforce to increase, stay the same, or decrease in the next 2, 5, and 10 years as a result of COVID-19?* Response options for all three questions included: “Increase,” “Stay the same,” and “Decrease.” The online survey took approximately 19 minutes to complete.

Focus Group Data

Twenty-three focus groups were conducted virtually on Zoom with trucking managers, supervisors, and truck drivers. While the managers and supervisors job tasks varied from drivers, the inclusion of managerial and supervisor focus groups when exploring workplace experience of drivers was important because they work closely with drivers, meet with drivers daily and serve as their first line of communication. Managerial input provides more depth into the holistic opinion, reflecting on experiences or beliefs of multiple subordinates, compared to the experience of one individual.

Each focus group included an interviewer, two note takers, and between 1- 4 participants. All participants provided informed consent prior to focus group participation. A semi-structured

protocol, including questions about the impact of COVID-19 on the trucking industry, guided each focus group. Focus groups lasted approximately 75 minutes and were audio recorded. A third-party transcription service was used to transcribe the audio recordings. After a preliminary analysis of the transcripts, two focus groups did not discuss the pandemic and were excluded from analysis providing a total of 21 focus groups (N= 42 participants) to code and analyze in greater detail. As is the case with any focus groups and/or interviews, there are always individuals who do not show up for the interview or focus group. Thus, sometimes when we were expecting 4 participants, we might end up with 2 participants in a group. Our initial goal was to have approximately 6 participants per group. However, we determined early in the data collection that having that many participants limited the amount of in-depth information from participants. Thus, we continued with fewer participants per group as a whole, with a result that some of the groups were even smaller than anticipated due to no-shows and pandemic constraints. We continued to conduct focus groups until data saturation was achieved.

Twitter Sentiment Analysis Data

In recent years, several studies have analyzed social media posts using a sentiment analysis framework to examine public perception towards a variety of topics (Drus & Khalid, 2019). Our study analyzes social media posts from Twitter (www.twitter.com) to extract public perception of the trucking industry before and after the declaration of COVID-19 as a national emergency in the U.S. To accomplish this, publicly available Twitter posts (or *tweets*) between February 28, 2020 and March 27, 2020 were acquired using the Salesforce Marketing Cloud's Radian6 software (Salesforce, 2021). This time period provided data within a two-week time window before and after March 13, 2020, the day COVID-19 was declared a national emergency in the United States (The White House, 2020). To analyze changes in whether the sentiment of

public discourse around trucking on social media pre- and during-COVID-19 pandemic. The following steps were taken to collect and clean data. First, tweets were filtered based on their geotag metadata to include only U.S.-based tweets. Second, trucking-related tweets were extracted by filtering them using three keywords, namely, “trucker”, “truckers”, and “trucking”. Third, to reduce noise from the data that arises from tweets that include the aforementioned keywords in a different context, we excluded tweets that contained the keywords “cap”, “hat”, and “mother trucker”. Within the date ranges specified above, 201,599 Twitter posts were flagged and used in the analysis that follows. No other filters were included, as the goal of the two separate data collection points of focus groups and Twitter data is to measure attitudes of those inside the industry and the general public, respectively. By performing sentiment analysis on sampled Twitter posts, researchers have access to a data source with a diverse group of over 300 million active monthly users, whose views offer a means of gauging the sentiment of a large number of people.

Data Analysis

Survey and Focus Group Data

Collected survey data was analyzed descriptively. Data from focus groups were coded using a thematic analysis approach (Nowell et al., 2017) by two members of the research team using NVivo 12. Initial codes were developed through review of the interview guide and a line-by-line review of the transcripts. The codes were then thematically categorized based on the frequency, meaning, and relationship among the codes. Intercoder reliability was established with a kappa coefficient > 0.80 . Using these themes, we were able to draw inferences that allowed us to answer our exploratory research questions.

Twitter Sentiment Analysis Data

After retrieval from Twitter using Salesforce Marketing Cloud’s Radian6 software (Salesforce, 2021), the sampled tweets were classified as either positive, neutral, or negative based on sentiment analysis of their content using the Salesforce Social Studio’s proprietary Sentiment Model (Salesforce, 2021). Sentiment analysis involves natural language processing of textual data to determine its underlying sentiment or opinion. Tweets from February 28, 2020 to March 12, 2020 were classified as pre-COVID-19 and from March 13, 2020 to March 27, 2020 as during-COVID-19.

Results

Sample Characteristics

Participants (N = 42) were, on average, 48 years old (SD = 12.2, range 25-72 years), and predominantly male (90.5%) and White (87.5%). The majority of the participants were in upper-level management positions in trucking companies (57%). Managers had been working at their company for the longest time (257.7 months), of the three employee positions. Among the participants, there were 21 trucking companies represented. Sample characteristics are presented in Table 2.

[Table 2 About Here]

Survey Results for COVID-19 Impacts on Work

Eighty percent of participants thought COVID-19 affected their work. The top three ways COVID-19 affected participants’ work was by increasing the stress associated with work, increasing the health risks associated with work, and increasing the amount of hours/time spent working (Table 3). The majority of the participants thought that the size of their organization and workforce would stay the same over the next 2, 5, and 10 years as a result of COVID-19 (Table

4); almost none thought that the size of their organization would decrease over these time periods.

[Table 3 About Here]

[Table 4 About Here]

Focus Group Findings

Two main themes emerged from the focus groups: 1) trucking company business strategies and adaptations and 2) truck driver experiences and workplace safety. As a result of the pandemic, there were external changes, such as changes in consumer buying trends and supply chain disruptions that affected the internal day-to-day operations of trucking companies. In order to stay in business, trucking companies had to adapt their business models. Trucking companies also had to be vigilant about the safety of their truck drivers who were on the road during the pandemic; a workplace hazard for drivers that increased their risk of contracting COVID-19 and presented new pandemic related challenges.

Theme 1: Trucking Company Business Strategies and Adaptations (RQ 1)

At the onset, there was panic buying. However, as the pandemic progressed and people were confined to their homes, buying habits reflected this shift. A 27-year-old manager explained:

In the US, buying habits have changed a lot since COVID. People aren't spending as much on experiences, like travel and entertainment, and restaurants...they're spending more on durable goods for their home...so all that stuff has to be shipped.

In contrast to the uptick in COVID-19 related consumer buying trends, there were supply chain disruptions that affected the trucking industry and business operations. Reasons given for these disruptions included vendor labor shortages and an inability to ship due to mandatory shutdowns. These inhibitors within the supply chain reduced flexibility and rushed deliveries, since

warehouses could no longer keep inventory, and many were operating using just-in-time purchasing practices. A driver, 54 years old, said, “Other than like before the COVID and some of the factories ...they stocked up on stuff, but as a general rule they’re just-in-time freight. They don’t do a lot, because that’s a lot of lost money.” This constraint placed additional pressure on drivers to make their deliveries on time. A manager, 55 years old, shared, “Our priority is in buying and rushing stuff right now.”

Participants described adaptations that their trucking companies made as a result of COVID-19. From the start of the pandemic, participants noted the variability of freight volume. Each trucking company had to figure out how to survive through the unpredictability of restrictions, fluctuations in shipping volumes, and shifts in delivery timelines. Some participants explained that COVID-19 had a significant impact on their company. A 36-year-old manager shared:

It's been a big impact to our company, not only from a revenue perspective. In the beginning, we didn't see much change in volume at all because we deliver to a lot of power plants and wastewater treatment centers that have to keep going. But as more and more manufacturing started shutting down completely, those volumes dropped as well. So, it's difficult to keep people employed and busy when the freight just isn't there.

Other participants explained that there was some impact on their company. When the initial shutdown occurred, there was not a lot of business; but as time passed business rebounded or even increased. A manager, 59 years old, explained from their perspective that, "The business probably slowed down a little bit initially, but in the last few months we're actually busier than we have been in probably the last year." However, changes in the freight volume for each company was contingent on the particular sector served (e.g., steel, home goods, produce). Trucking companies began hauling different types of freight depending on availability and established customer relationships. For example, one company shifted from running office

furniture to outbound (brokered) food loads and toilet paper. This shift highlights how companies pivoted their business models to brokered freight to stay open and running. A 37-year-old driver noted:

When COVID first said it was only essential goods, which is not office furniture and not hot water heaters. So, they [dispatch and backhaul employees] quickly, quickly, it was impressive, switched over to brokered freight.... like getting into other competitors' markets.

In addition to making larger company changes in the freight hauled and to the business model, participants described temporary fixes their company made to keep them afloat during the pandemic, including laying off employees, tapping into monetary reserves, or adjusting insurance policies. Companies reduced the number of employees working each day to cut down on overhead costs. Participants explained their company had to temporarily lay off some employees to get through the tough time. A manager, 27 years old, said, "Three quarters of our guys got laid off... they were getting unemployment so they were collecting good checks." Although employees were laid off from companies, participants (both from their own personal experience and from what drivers have told management) noted these employees were not struggling financially because they received unemployment pay. Management also sometimes withdrew from their financial reserve funds in order to sustain operations in the face of lower revenues. Upper-level management explained they learned from previous hard times, such as the recession in 2008, that they needed to have emergency funds in the event of a crisis. Changes in insurance policies to keep the budget balanced were another method explained by participants. A 55-year-old manager explained:

I think the best thing that we did as a company in preparing for this is from the Great Recession until now, we set aside ample reserves and improve our balance sheet so that we could get through an issue like this. We just didn't know that it was going to be COVID.

Theme 2: Truck Driver Experiences (RQ 2) and Workplace Safety

Companies were continuously striving to be responsive to their employees' reactions to COVID-19. Participants explained that some employees were afraid, while other employees were skeptical of the severity of COVID-19. A supervisor, 31 years old, shared what drivers had been telling them, saying, "We've got guys who don't think it's a real thing, we've got guys who's overly serious about it. So right now, the climate that we're in is just trying to manage all of these new things."

As a whole, participants explained that their companies were focused on employees during the pandemic and fought hard to keep their workers employed, satisfied, safe, and paid. Participants noted that companies were empathetic to employees who were afraid to come to work for fear of contracting COVID-19, employees who had to miss work because a family member contracted COVID-19, or if an employee tested positive for COVID-19. A manager, age unknown, said, "So anybody that's had a problem and was required to be out of work, they haven't missed a paycheck. We're going to take care of our folks and try to get through this thing."

In addition to the emphasis placed on individual employees, trucking companies adopted new business protocols aimed at protecting their employees from contracting COVID-19. Trucking companies developed protocols for maintaining a sanitized work environment, particularly for drivers. A supervisor, 39 years old, explained, "As a company, we do everything that we can. We provide them with all the PPE that they're going to need, we give them sanitizing stuff, whatever they're going to need, masks." Some of the drivers shared how they use hand sanitizer and masks in their truck. None of the drivers expressed an issue with PPE distribution or lack of safety equipment from their company.

Trucking companies also initiated remote or isolated work for their in-office employees. Participants described a divided work environment where office employees worked remotely or came into the office, and drivers were kept separate from all office employees. A supervisor, 42 years old, shared:

When the governor, when we got the shutdown, we stayed open as an office, but we locked ourselves out. Our dispatchers, load planners, and everybody else, we came in. Our billing and up-front workers, they did split shifts here. But we did lock the drivers from ... because they're traveling all over the country

Although the division between drivers and office staff was meant to keep employees safe, participants explained that it aroused animosity among the drivers. One supervisor, 25 years old, reflected on what drivers had been telling them, saying:

I think it's caused a bit of a morale issue among the drivers. The driver comes back to the terminal at the end of the long week and then sees nobody there. As a driver, you think, well, I'm out here away from home potentially exposing myself while everybody in the office is sitting safe and sound at home.

Participants described changes to truck drivers' quality of life resulting from COVID-19 related policy changes and public perceptions. As a result of the pandemic, many businesses shut down indefinitely, leaving fewer drivers on the road; most rest areas and restaurants in some parts of the U.S. also ended up closed. These closures impacted drivers' quality of life, as it became significantly more difficult to access bathroom facilities or get food while traveling. One manager, 53 years old, reflected on stories their drivers had shared with them, saying:

Not to be graphic or anything, but they stepped outside of the truck and they went alongside the road because they shut them out of everywhere. The hardest part for a lot of the people that I know that drove was trying to find places to eat and everything too... My trucks are not set up with refrigerators and all that kind of stuff. So, my drivers were used to being able to stop somewhere, grab a quick bite to eat, kind of thing. And that was major for them to not be able to grab any food, to not be able to stop and go to the bathroom, kind of thing. It was a big change for us.

Not only did drivers' quality of life change due to policy changes made state-wide, but their job quality and operations were impacted due to changing vendor protocols. New protocols restricted the amount of social interaction; due to safety concerns, truck drivers could not participate in normal job duties, such as loading and unloading freight. One manager, 58 years old, shared driver concerns that had been relayed to them, saying:

Because you cannot get out of your truck now in a lot of facilities. They don't allow you to do that. So how do you know they loaded your trailer right? How do you know that they secured it properly if you can't get out of your truck?

Still, technology was a lifeline that allowed companies to continue operations while maintaining workplace social distancing measures. These changes in vendor protocols may have exposed a need for contactless delivery in the industry. A driver, 54 years old shared:

For about the first three months, there was a lot of places, they refused to accept any of your paperwork. They did everything electronically. You would sign, your dispatcher would take care of it all. All you would do is come in. They'd either load you or unload you and that was it. You didn't touch any paperwork.

Truck drivers also contended with threats to their personal safety by traveling to areas experiencing high rates of COVID-19 to deliver goods throughout the pandemic. Delivering to high case zones caused anxiety for drivers. A supervisor, 39 years old, noted:

I think just general stress of going out and driving into new places. They're going to places all over the country, some of the places that they go to have higher case counts than we have here in our hometown, and just that general stress is probably quite a bit for them to handle.

Truck drivers expressed that they perceived changes in public interaction and information other truck drivers shared about their experiences interacting with the public as they were recognized for their efforts delivering goods throughout the pandemic. Participants referred to truck drivers as "essential workers" and explained that while other occupations had the ability to convert to work-from-home company structures, truck drivers had no option but to travel to

deliver supplies in high demand such as toilet paper and groceries. A 50-year-old driver said, “You were talking about the COVID-19, even with the vaccines, I heard nothing mentioned about truck drivers getting the vaccine. I’m like, wow, we’re frontline, front and center. If it wasn’t for us, you wouldn’t even have the vaccine.”

Participants noted that truck drivers have had a poor reputation in recent years, due to highly litigious accident cases and misconceptions about the occupation; however, COVID-19 made the public aware and appreciative of truck drivers’ work. A manager, age unknown, shared:

Truck drivers were America’s heroes as this pandemic started because we deliver toilet paper to the stores. I’m serious. People were going to grocery stores and panicking because the shelves were empty, and truck drivers were heroes. I said, “Well, we need to enjoy it while it lasts because it won’t take long... our reputation will get tarnished again, just by the mere fact that there’s a bad perception.”

Perceptions of the Public (RQ 3): Sentiment Analysis of Twitter Data

The results of the sentiment analysis of Twitter data support the participants’ accounts related to public awareness and appreciation of truck drivers during COVID-19. As shown in Figure 2, there is a sharp increase in the volume of tweets following the declaration of COVID-19 as a national emergency in the United States (March 13, 2020). This indicates a significant increase in public attention towards truckers and the trucking industry during-COVID-19. The results also illustrate higher positive sentiment of tweets during-COVID-19 (54.8%) compared to pre-COVID-19 (38.3%). There were no significant changes in negative sentiment pre-COVID-19 (25.0%) and during-COVID-19 (24.3%). This suggests that the public’s perception of the trucking industry, as represented in publicly available tweets, became more positive after the national emergency declaration, confirming findings from the focus groups.

[Figure 2 About Here]

Discussion

As a first step to understanding holistic impacts of the pandemic, the aim of this exploratory study was to examine the perceptions of workers in multiple levels of the trucking industry (i.e., upper-level management, supervisors, drivers) using data from a survey, focus groups, and a sentiment analysis of public perceptions of the trucking industry. The findings of this analysis provide new insights into trucking companies' responses and adaptations to the pandemic and highlight the increased positive perception of drivers during COVID-19. Consistent with the literature, we found that employees had mixed reactions to the virus, companies adapted their safety procedures, and there were COVID-19 related rest stop closures.

Specifically, our study yielded new information about company efforts to cope with fluctuations in revenue in the transportation industry during the pandemic (Papanikolaou and Schmidt, 2020). Pivoting to different freight was one method employed by trucking companies to supplement or in some cases improve revenues. This change was also thought to help compensate for some supply chain disruptions. For example, durable goods and e-commerce sales increased freight volumes to higher than pre-pandemic levels. This finding corroborates previous research that suggested e-commerce and panic buying would increase sales (ATRI, 2020) with our findings adding that the economy bounced back as more solutions have developed over time. Other methods such as temporary layoffs and new cost reduction efforts were employed by companies to survive during this period. In addition to the company efforts to keep the company afloat during the pandemic, unemployment checks temporarily allowed laid-off employees to compensate for lost wages.

While driver shortages have been a main concern across the trucking industry (ATRI, 2020), driver shortage was not a concern shared by the participants in the survey or focus groups.

This may be due to temporary reductions of drivers in the trucking industry; perhaps those drivers who were working through the pandemic were busier. It could also be that drivers view their job security as a future issue and managers and supervisors are focusing on issues related to survival in the present climate.

Results from the survey and focus groups were comparable in that most participants thought that COVID-19 affected their work. However, in the survey, 56% of participants noted an increased amount of work time and only 25% of participants reported decreased pay. These results contradict previous research reporting pay cuts and reduced hours due to COVID-19 across multiple industries, including the transportation industry (Lund et al., 2020). It may mean that truck driving jobs were less vulnerable to negative, personal economic impacts from the pandemic than other occupations. This could be attributed to the necessity of goods distribution (i.e., food and medical products) during stay-at-home orders while other industries were not operating at pre-pandemic volume due to not being essential. Or this finding could be due to the nature of the sample of participants in this study, as most of the participants were from two U.S. states. It could be that workers in other areas of the U.S. had different experiences. Further research which examines impacts over the long-term of the pandemic and with larger, more diverse samples could help further clarify these findings.

New company protocols emerged to reduce COVID-19 risks for employees at all levels of trucking companies. For drivers, this resulted in an unintended consequence of feeling isolated from trucking company office workers, a change that decreased driver morale and well-being as employee interactions are important after driving alone for prolonged periods of time. These findings are consistent with the literature on job safety during COVID-19, where resentment grew due to remote workers not sharing the same risks as essential workers (Grusky, 2021). No

drivers reported team driving in our focus groups, which may be due to mask requirements implemented that may discourage team driving, even requiring spousal driving teams to always wear masks (ATA, 2021). Even prior to the pandemic, drivers were already prone to feeling socially isolated (Lemke et al., 2020). It is unknown the extent that these restrictions may be impacting their well-being or how it may create a sharper divide between job-levels in trucking.

The perception of truck drivers improved during the pandemic as reported by participants and further supported by our sentiment analysis of tweets prior to the declaration of a national emergency due to COVID-19 and the two-week period following this announcement. Not only did the discussion of truck drivers on Twitter increase, but the positive sentiment did as well, reflecting a more positive depiction of truck drivers. Similar information can be seen between the public social media conversation and truckers' reports of their view of the public perception around the industry. The decrease in proportion of tweets labelled as negative and increase in tweets labelled as positive is indicative of a more positive view of the trucking industry by the general public, as specifically reported by the truck drivers in the focus groups. This is a unique finding, though it is unknown if this positive sentiment will continue as COVID-19 impacts subside over time.

Overall, drivers had mixed emotional reactions to the virus. Some drivers were scared to operate as they did in pre-pandemic times, as reported by about half of participants across all three levels of employment. This finding is consistent with workers in all occupations, especially those with older workers such as drivers, who are more fearful of COVID-19 yet feel forced to go to work due to the limited amount of paid sick leave (Ghilarducci & Farmand, 2020). Drivers who contracted the virus were advised to not attend work, but it is unknown if employees across all of the companies adhered to this rule. Other workers were skeptical about the severity of

COVID-19. They may also reflect a change in perceptions over the course of the pandemic, as focus groups occurred over multiple months of the virus outbreak. For example, prior work conducted at earlier stages of the pandemic noted a lack of company policies and personal protective equipment (PPE) distribution (Lemke et al., 2020).

This mixed response may be due to individual differences among participants, and it can be difficult for upper-level management to balance conflicting feelings. Over the course of the pandemic, attitudes may have shifted during the months of data collection which may account for some variance in responses. Additionally, the majority of participants reported that companies were sympathetic to employees' concerns, so workers who were afraid of the risks presented by COVID-19 were allowed to stay home and taken care of financially by the company or by unemployment in the interim. Given that our data collection occurred over several months, it is likely that companies and employees adjusted to COVID-19 in the workplace, with drivers possibly becoming more secure over time due to new company and vendor protocols.

However, participants did not view all of the new protocols favorably, as they sometimes interfered with the work process. For example, some protocols made it more difficult to check if loads were secured properly at vendor locations. Results from this study suggest that there is a need to improve contactless delivery processes and quality control procedures in the trucking industry in order to prevent lapses in safety.

Drivers dealt with unforeseen challenges on the road with rest area closures and limited access to resources. This finding is consistent with research illustrating the impact of government sanctions on truck drivers, which is a high-stress occupation due to macro-level factors (Lemke et al., 2020). These findings may inform companies about downstream effects and implications

of policies. They may also aid in the development of better solutions, including but not limited to: equipping trucks with fridges, working with the government and municipalities to establish functioning rest stops for appropriate hygiene and food access, and finding creative ways to boost employee morale.

Though this study makes unique contributions to the literature, there are a few study limitations to note. Although individuals were included from a range of trucking transportation sectors and company sizes, participants were primarily from two states – a Midwestern state and a Southern state due to researcher proximity. Thus, the results of this study may not be reflective of the entire trucking industry across the U.S. Additionally, the majority of participants were male. However, this is reflective of the gender distribution of trucking industry employees where females represented only 6.6% of the industry in 2018 (Costello & Karickhoff, 2019). Future research should examine a national sample of employees from the trucking industry with proportionate organizational representation of employee types and genders. Furthermore, although focus groups typically consist of 6 - 8 participants, recruitment was difficult due to pandemic-related constraints and the limited availability of truck drivers due to variability of work hours. As a result, we had smaller focus groups (and some consisting of only one person due to last minute cancellations); however, the information retrieved from each focus group/participant was consistent across group sample sizes. Finally, this study only captured the insights of individuals employed during the pandemic. Our results may not fully capture the challenges of employees laid off due to the pandemic. Data collection continued until saturation was reached during the pandemic. We do not have specific information about pre-COVID-19 operations for the trucking companies within our study. Future research should explore whether

these laid off employees reenter the trucking workforce, or transition to new careers outside of the transportation industry.

Additional research is needed that investigates how COVID-19 will further impact business operations and the need for new technology (e.g., self-driving trucks) in the trucking industry. Examining the evolution of public perceptions of the trucking industry during- and post-COVID-19 could yield insights into designing public policy. Societal views may influence whether truck drivers think more favorably about their occupation and the entry of new drivers into this occupation, and whether the future workforce even considers trucking as an occupation of interest. In addition, macroeconomic factors and improvements in public perception will have the potential to influence public policy around trucking occupations in the future. The increase in positive public perception of trucking on social media during the pandemic may suggest a newfound appreciation for the crucial role truckers play in the economy via the delivery of consumer goods and necessities.

Conclusion

As the pandemic continues, it is unclear what the aftermath of COVID-19 will hold for the trucking industry and the country. The economy changed drastically in the span of months, affecting the daily productivity of trucking companies and the industry broadly. Some changes have been positive, such as e-commerce generated freight volumes, while other unpredictable factors (e.g., supply chain disruptions) led to setbacks. It is unknown what consequences of COVID-19 will linger in company operations and industry trends long after the pandemic is resolved.

Drivers have continued to work in potentially dangerous situations throughout the pandemic and remain at the forefront of the trucking industry. The trucking industry kept

America running during an unprecedented time in history. The findings of this study provided insights into the intricacies of pandemic-related impacts on the trucking industry. As economy and society continue to evolve during and post-pandemic, it will be interesting to see how the trucking industry continues to evolve.

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Table 1: Top 10 Concerns in the Trucking Industry

Rank	Description of Concern
1	Driver Shortage
2	Driver Compensation
3	Truck Parking
4	Compliance, Safety, Accountability
5	Insurance Cost/Availability
6	Driver Retention
7	Tort Reform
8	Economy
9	Detention / Delay at Customer Facilities
10	Hours-of-Service (HOS)

Note. (ATRI, 2020)

Table 2. Sample Characteristics

	N (%)
Age*	
Upper-level Management	Avg. 52 years (SD=10.7) Range: 27-72 years
Supervisor	Avg. 36 years (SD=10.2) Range: 25-57
Driver	Avg. 47 years (SD=10.8) Range: 30-65
Gender	
Female	4 (9.5)
Male	38 (90.5)
Race*	
White/Caucasian	35 (87.5)
African American	2 (5)
American Indian/Alaska Native	1 (2.5)
Hispanic/Latino	1 (2.5)
Other	1 (2.5)
Employee Type	
Upper-level Management	24 (57)
Supervisor	7 (17)
Driver	11 (26)
Length of Time at Job*	
Upper-level Management	Avg. 257.7 months (SD=168.3) Range: 36-504 months
Supervisor	Avg. 91.7 months (SD=50) Range: 24-168 months
Driver	Avg. 129.4 months (SD=141.7) Range: 4-468 months

Note. Data from pre-survey (N = 40). * Missing responses for 1 driver and 1 manager.

Table 3. COVID-19 Effects on Work

	N (%)
Yes	32 (80)
No	8 (20)
Of those that said yes:	
Increased the stress associated with my work	29 (91)
Increased the health risks associated with my work	20 (63)
Increased the amount of hours/time spent working	18 (56)
Decreased the amount of pay I receive	8 (25)
Decreased the amount of hours/time spent working	5 (16)
Increased the amount of pay I receive	3 (9)
I was laid off from work	2 (6)

Note. Data from survey (N = 40). Missing responses for 1 driver and 1 manager.

Table 4. Anticipated Changes in Company Size due to COVID-19

	Stay the Same	Increase	Decrease
	N (%)	N (%)	N (%)
in the next 2 years?	24 (60)	14 (35)	2 (5)
in the next 5 years?	22 (55)	17 (42.5)	1 (2.5)
in the next 10 years?*	23 (59)	15 (38)	1 (3)

Note. Data from survey (N = 40). Missing responses from 1 driver and 1 manager. *Missing response for 1 manager.

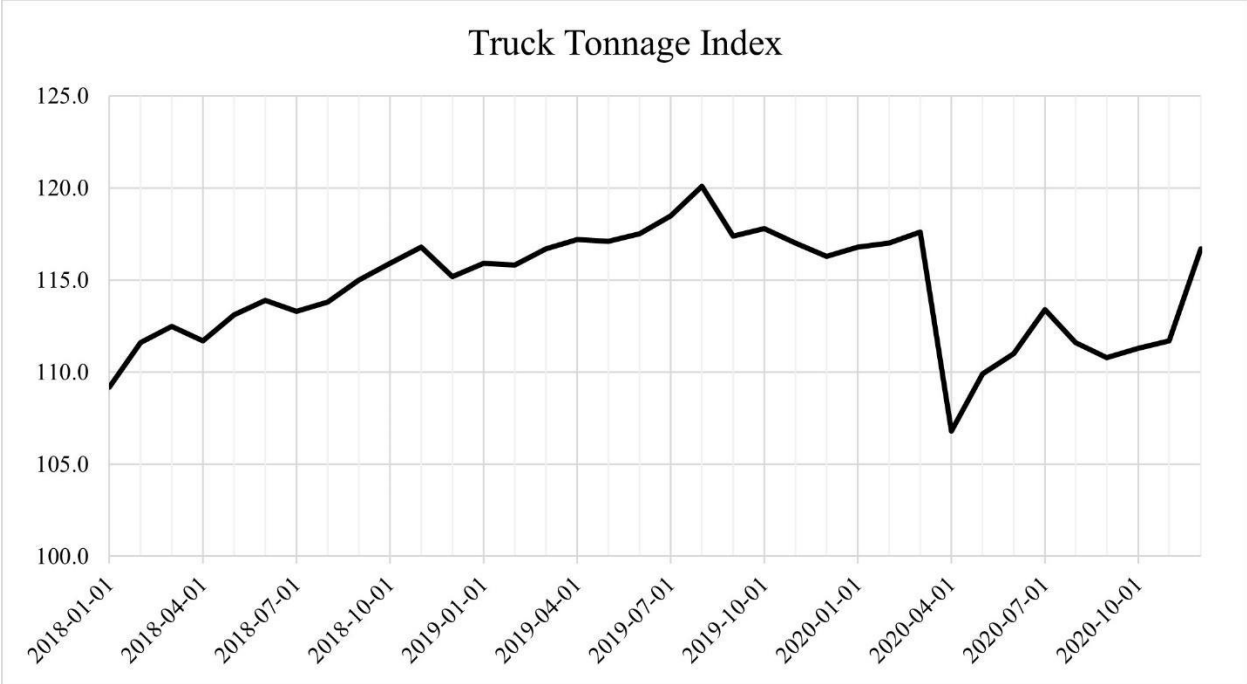


Figure 1. Truck Tonnage Index (seasonally adjusted), base year 2000 = 100 (FRED, 2020)

COVID Declared as a National Emergency

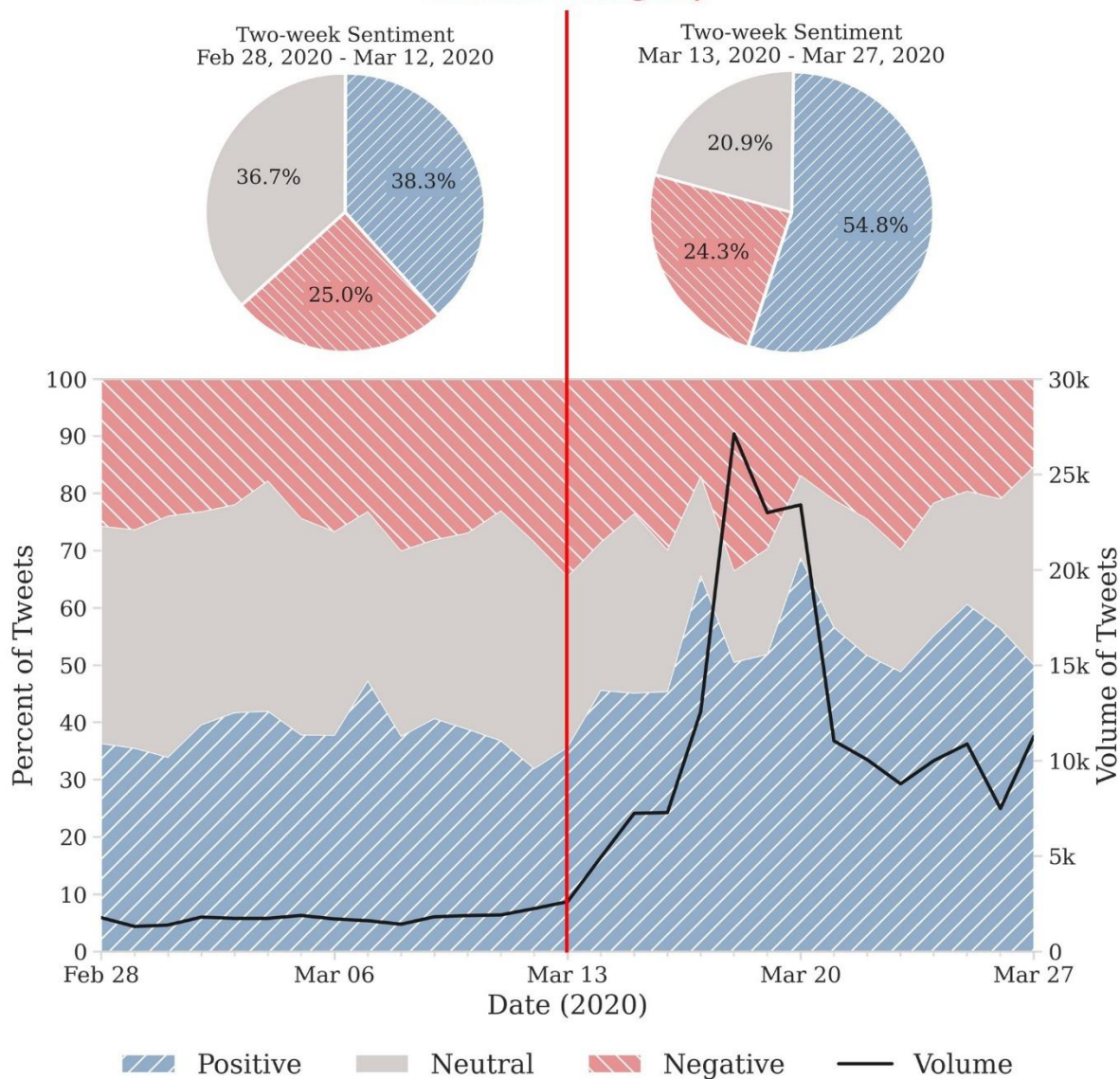


Figure 2. Volume trend and sentiment distribution of the sampled tweets (N = 201,599 Twitter posts)