Impact of COVID-19 on the Trucking Industry

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Abstract

The COVID-19 pandemic has resulted in unprecedented changes in the trucking industry. 70% of all freight tonnage goes on trucks, including essential items such as food, medical supplies, and cleaning products. COVID-19 caused surges in demand for many of these products, impacting the trucking companies. Medical supplies, cleaning supplies, food, and even the COVID-19 vaccine itself rely on the trucking industry to be distributed across the nation, creating a new, increased demand for goods. The increase in demand caused a surge of trucks on the road, which is a good sign for the business, but at a cost to the drivers during these times. Closures due to the pandemic created problems for long-haul truckers who are on the road and need a place to rest, get gas, or buy food. Besides, truckers are now expected to work longer hours and make longer trips to meet the new demand. The limitations that the pandemic has created on the trucking industry have also affected the overall revenue. Trucking companies are reluctant to send trucks to highly impacted areas, even if those areas contribute most to the increased demand. This paper will explore the different ways that COVID-19 affected the trucking industry, how they responded, and how their response continues to affect the industry.

Keywords

Trucking, Transportation, COVID-19 Pandemic, Supply Chain, Logistics

1. Introduction

The trucking industry is essential for the global and domestic supply chain. Without trucks, the last mile delivery would become much more complicated and inefficient, and the majority of supply chains rely on trucks for some part of their deliveries. Due to this, the trucking industry has a massive effect on subsequent industries across the globe. Trucks deliver essential products such as food, medical supplies, gas, and water.

COVID-19 has had a dramatic effect on multiple industries, and the goal of this paper is to analyze the effect of COVID-19 on the trucking industry and the effect that it has had on the global supply chain. Some industries have been forced to cease production, whereas others have had a spike in demand. This affects the trucking industry in that the historical demand and planning were disrupted, and thus routes and quantities were unexpectedly changed. In addition to this, the frontline of the trucking industry, the truck drivers, were affected by this as well. Many of the amenities that are essential for them to complete their deliveries, such as rest stops, gas stations, and hotels, were closed, which made this already demanding job even more difficult.

This paper aims to examine the different areas in the trucking industry that experienced negative or positive changes due to the global pandemic and the importance of creating guidelines to keep truck drivers safe and vital supplies delivered globally. The goal is to highlight the influence of the COVID-19 pandemic on the trucking industry due to the immense importance that the trucking industry has in many supply chains, especially the essential supply chains of food and medical services.

2. Literature Review

In the early 1900s, goods began to be transported across the United States by trucks rather than by train or horse and wagon. The military first heavily used trucks in World War 1. After successfully using trucks in World War 1, trucking

companies developed more reliable and accessible trucks (Logistick, 2015). The trucking industry took off in the 1930s with the development of paved roads across America. In the 1960s, Interstate Highways' building created a network connecting major cities across America, creating a surge in the use of trucks for transport (Diligent, 2020).

As the trucking industry became increasingly popular, the Motor Carrier Act deregulated the industry to increase revenue and lower consumer costs. After this deregulation, the trucking industry dominated the transportation of goods over freight trains. The growth of "big box" stores like Walmart and Costco in the 20th century created a great demand for goods to be transported across the country.

Today, there are more than 26 million trucks transporting goods across America. Commercial trucking accounts for 60% of the total volume of transported goods (Diligent, 2020). The trucking industry has seen major technological advancements in the last century. The trucking industry is essential to America's economy and commerce.
One factor that has affected the trucking industry after past economic crises is the rapid rise of E-commerce. E-commerce has grown from 1.3% to 14.2% of retail sales in 2000 and 2019, respectively (Bhattacharjee et al., 2020). The increase of E-commerce has been drastic during COVID-19 due to social distancing and quarantine measures. A staggering 74.6% of people said they are likely to avoid shopping centers during the COVID-19 pandemic, while more than half of the participants would avoid shops in general (Al-maaitah et al., 2021, 2). E-commerce generally leads to lighter truck loads and shorter hauls. The "Average warehouse sizes have fallen by 9 percent since 2016 and trucks' average length of haul by 25 percent over ten years" (Bhattacharjee et al., 2020). The demand for manufacturing single-unit trucks rather than combination trucks with semi-trailers is increasing (Capstone Logistics, 2019). More and more drivers are also shifting to short-haul trucking in order to sustain a more family-friendly life. Also, these short-haul drives created "opportunities for commercial drivers under the age of 21 who can't legally cross state lines" (Capstone Logistics, 2019). Because there is a need for shorter delivery times, this means there is a need for more warehouses. With the increase of online sales, there comes an increase of reverse logistics in returns. The industry has become more efficient in managing online returns and has created better reverse logistic systems(Capstone Logistics, 2019). This rise in E-commerce is often called "the Amazon effect."

COVID-19 has impacted the truck drivers that are on the frontlines making deliveries and stops around the world. The trucking industry was already suffering from "'a freight market that was… stuck in a rut before the coronavirus hit…", and the pandemic has created more problems for the workers- from entertainment to safety (Gilroy, 2020). Before the pandemic, trucker marquee gatherings, industry shows, expositions, and even conventions were available for truckers. To avoid the large crowds and enforce social distancing, the Mid-American Trucking Show and National Private Truck Council were forced to cancel all events for the foreseeable future. These entertainment channels allowed for truckers to have an outlet away from the long driving hours they are used to and help them build up a community of fellow truck drivers. This profession is full of lonely drives that are remedied with the trucking community, and the lack of events has impacted the relationships between truck drivers and other people- especially due to the long, lonely drives they must all endure. One of the main areas affected by the pandemic was the truck stops that most truck drivers relied on to get food and rest during long drives.

Some laws protect truck drivers, so employers do not take advantage of them, and they drive a safe amount of time, so they aren't a danger to other drivers. "Once a driver has been off duty for 10 consecutive hours, the law allows him/her to work for the next 14 consecutive hours. In those 14 hours, drivers can spend only 11 hours driving" (Eyerly). Due to the long distances traveled, truck drivers usually cannot make it to their destinations in the 11 hours of driving, so they rely on truck stops for restrooms, water, food, and even showers. Due to COVID-19, many truck stops were forced to close, leaving truck drivers relying on rest stops without any amenities instead (most rest stops are simply parking lots where truck drivers can park and sleep in their trucks at). Truck drivers are already working more than the regular 8 hours/day most people work, and their lack of rest during the pandemic has had safety consequences. The lockdown orders meant that there were fewer drivers on the roads, but with the increase in household foods and cleaning supplies demand, truckers are on the road more often than before. The combination of closed truck stops and increased amount of time on the road leads to the biggest danger: drowsy driving. "The Federal Motor Carrier Safety Administration estimates that about 1-in-9 truck accidents are caused by drowsy truck drivers" (Firm, 2020). The COVID-19 pandemic has impacted truck drivers negatively due to the decline of entertainment, health and safety domains that once worked to support them.

Unfortunately, truck drivers had to deal with awful circumstances, as mentioned. However, compared to other shipping and logistics industries, trucking was not hit quite as hard. According to the International Finance Corporation, "Total container volumes handled at Chinese ports dropped by 10.1%" and "Air freight volumes fell by 19% in March 2020 due to a sharp reduction in passenger flights" (Twinn et al., 2020). Conversely, land transport has remained fairly open when looking at it in relation to air and sea transport. Although truck stops and bathrooms were closed, roads remained open, and "Trucking capacity [was] strained because of additional demand for their services—especially food and medical supply transportation" (Twinn et al., 2020).

Unlike the trucking industry, aviation is focused a lot more on commercial transportation rather than cargo transportation. The National Oceanic and Atmospheric Administration states that "On any given day, more than 87,000 flights are in the skies in the United States… [and only] 2,148 of them are air cargo flights" (NATCA, 2021). That leaves a lot of extra flights, especially considering the substantial drop in passenger flights that could be transitioned to cargo flights. The airline industry capitalized on this as Tim Clark, Emirates chief executive, mentions in Air Cargo News: " 'We've converted ourselves to a mini-UPS'" (Morrison, 2020) by transitioning 85 Boeing-777's to stand in freighters. This allowed airlines to play a significant role in the primary response to COVID-19 by distributing masks, gloves, and other PPE across the world.

3. Methods

The health of the trucking industry is an indication of the health of many other industries, as a variety of industries' supply chains rely on trucks in order to deliver and receive products. One of the goals of this paper was to evaluate how COVID-19 has affected the health of this industry and how it has affected the people surrounding it. Due to this, the questions that we analyzed are:

How has the trucking industry been affected by COVID-19?
How has the trucking industry affected other industries?
How has the trucking industry affected people, specifically the frontline workers and other people within transportation systems?

4. Data Collection

4.1 Motor Freight Carriers

In March of 2020, as COVID-19 and the restrictions it brought with it spread across the country, businesses were forced to adapt. In an interview with Commercial Carrier Journal, President of North American Transportation, Drew Wilkerson details the steps that XPO, a third-party logistics company, took in response to the pandemic. The transportation industry and trucking especially had to respond quicker than others as it is, "an essential business [and] the first one in after a natural disaster (Jaillet, 2020). Thus, XPO had to lead the pioneering of new solutions to worker safety, customer relations, and demand changes.

In the early days of the pandemic, very little was known about COVID-19 and its effects. As a result, XPO Logistics wanted to be extra cautious, provided a plethora of services, and implemented numerous measures to keep their workers safe. For drivers, these precautions included "making sure they had the PPE gear, that they're social distancing, and having our terminals deep cleaned regularly, so they feel safe as they're going about their day-to-day jobs" (Jaillet, 2020). These measures helped XPO lead the way in COVID-19 response within their company. Still, XPO also implemented contactless delivery to prevent the spread of the disease between the supplier and the customer.

For transportation companies to maintain relations with their customers, they had to adapt with the companies as supply and demand shifted more overnight than at any time in recent history. Companies involved in PPE production, including hand sanitizer, masks, and gloves, saw their demand increase exponentially (Nissen et al., 2020). Conversely, however, the manufacturing industry saw an exponential decrease in their demand. XPO had to change their scheduling to compensate for this but wanted to ensure their customers that they would continue to perform services at whatever level was needed. One example of the change in XPO is with their customer Ford Motor Company: "They shifted to making PPE gear like masks, gowns, face shields and ventilators" (Jaillet, 2020). XPO had to adopt their scheduling to guarantee that these materials would be supplied to the correct destination on time.

Trucking and transportation are essential businesses in the U.S. and global supply chain, and the solutions they adopted throughout the pandemic helped decrease the overall impact of COVID-19.

4.2 Agriculture

The COVID-19 pandemic has had a significant effect on the Food Supply chain, including the transportation of goods. The pandemic created a decrease in demand for restaurant food consumption but an increase in demand at grocery stores. "Panic buying" due to uncertainty of living standards is a large part of the demand increase at grocery stores (Harriman et al., 2020). Many food distributors, such as meatpacking plants and production factories, use Just-In-Time manufacturing due to the nature of the product (Campuzano et al., 2020). This JIT system did not hold up to the spikes in demand (Walters et al., 2020). In turn, the trucking industry was directly affected by these supply/demand constraints. Also, keeping food safe during transport can be an incredibly complicated step in the food supply chain. This is partially due to the fact that certain foods need to be regulated at specific temperatures, which can get complicated in mixed loads (Harris, 2019). Trucking is a complex and vital step in the food supply chain, so it was deemed essential during demand spikes.

The trucking industry is responsible for delivering most food & agriculture products that were stocking out during the pandemic. Many regulatory notices from the Federal Motor Carrier Safety Administration (FMCSA) were released, affecting commercial motor vehicle drivers. These orders related to what was/was not deemed as an emergency item that could be transported using emergency relief protocol. On March 13, the FMCSA gave services emergency relief that was restocking food for retail services (Walters et al., 2020). The order was expanded on March 18 to emphasize the fact that drivers needed to take the necessary hours of rest and still abide by all traffic laws (Walters et al., 2020). The drivers are allotted at least 10 consecutive hours of rest when requested (Federal Motor Carrier Safety Administration, 2020). Mixed delivery loads that were not specifically for restocking needed food items in retail stores were clarified not to be included in the emergency relief protocol after April 8 (Walters et al., 2020). Food and agricultural goods were taken out of the essential classification after June 8 (Walters et al., 2020). This is due to the adjustment of everyday life that people went through and the return to a "new normal". The stores were no longer frequently and rapidly stocking out due to panic buying. These protocols given to the trucking industry helped address the supply chain problems as rapidly and flexibly as possible in the food and agriculture industry.

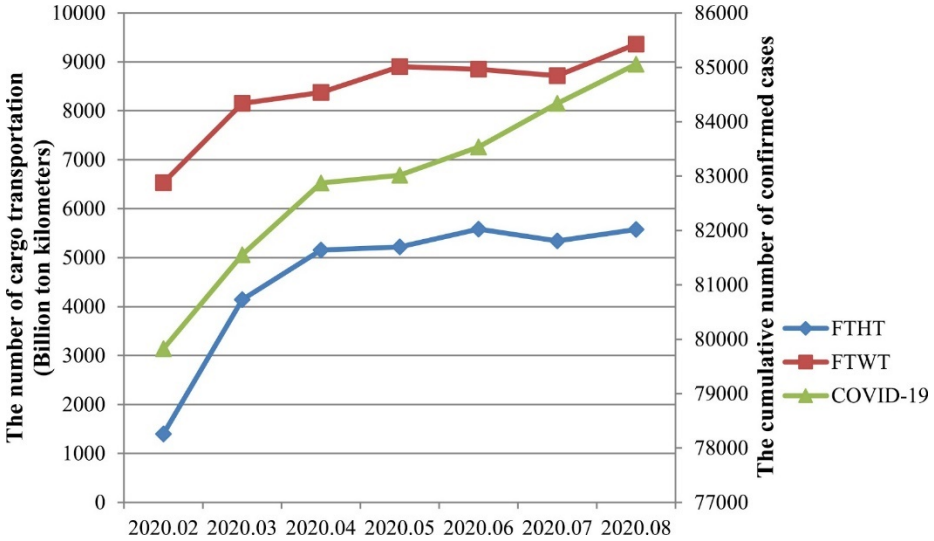

Figure 1. Cargo Transportation in China in relation to COVID-19 Cases (Ho, 2021)

4.3 Trucking Industry in China

COVID-19 first hit China in February of 2020. As the pandemic epicenter, their industries were affected first, and the rest of the world followed shortly after. Just as the pandemic spread from China to the rest of the world, the pandemic's effects quickly as well. As COVID-19 spread across the globe, mass panic was incurred, which increased demand for essential products. Meanwhile, COVID-19 halted the workforce from going to work which negatively influenced

manufacturing industries. Despite this, COVID-19 has positively affected the trucking industry in that it had a positive impact on the road freight transport turnover. As seen in Figure 1, as the cumulative number of confirmed cases increases, so does both turnover of road freight transport (FTHT) and turnover of water freight transport (FTWT) (Ho, 2021). This demonstrates that as the pandemic got worse, trucks were more in demand than ever as an essential service.

4.4 COVID-19 Impact on Truck Drivers

Even before the COVID-19 pandemic, long-haul truck driving has been considered a physically and emotionally demanding profession. Commercial truckers are put under various stressors such as long hours, extended time away from home, and emotional burnout (Lemke et al., 2020). These stressors have affected truck drivers for the last forty years but have been amplified over the last year due to COVID-19.

The nature of truck driving makes truck drivers travel hundreds of miles from home. These areas can often be desolate or positively impacted by COVID-19. Truck drivers are responsible for maintaining the supply chain of essential goods, which means delivering essential items to areas with a high density of COVID-19 cases. Traveling to both types of areas puts truck drivers at high risk for contracting COVID-19. If drivers contract COVID-19 in a remote location, they will unlikely have access to proper health care, quarantine, and personal protective equipment options (Lemke et al., 2020). Drivers have reported not having access to meals, safe parking, restrooms, and showers during the pandemic. The conditions of COVID-19 have put commercial truck drivers' health and safety at risk.

Before the COVID-19 pandemic, the trucking industry faced a labor shortage. Due to shutdowns and physical distancing, commercial trucking training schools have a 40% decrease in enrollment (Huff, 2020). The labor shortage and the lack of new truck drivers being trained to have put even more pressure on current commercial truck drivers. The lack of labor has extended the already long hours and far distances of commercial truck driving. Along with the extended hours and distances, drivers have reported feeling the pressure to maintain the supply chain and deliver health care goods and food (Lemke et al., 2020). Drivers have the added stress of being at high risk for contracting COVID-19 as they go in and out of high-risk areas. The unprecedented consequences from COVID-19 have directly impacted the emotional health and wellbeing of commercial truck drivers.

5. Spread of COVID-19 Caused by Truck Drivers

The COVID-19 pandemic has had a direct impact on the trucking industry due to different demands and other factors, but the people who are actually responsible for making sure the trucks get to their destinations were impacted as well. "Long-distance truck drivers around the world have been identified as a high-risk group for this pandemic and are consequently the targets for prevention and education-based intervention" (Malinga 2020). This case study is focused on the African region, and synthesized the findings from six different studies describing the consequences of COVID-19 on long distance truck drivers and different measures countries should consider implementing to protect them. The areas with weak health systems are of most concern for truck drivers, so it is important for them to check the health care system of the places they are travelling to, in the event of a COVID-19-related emergency. This study has shown that, in the African region, truck drivers are at risk of contracting and spreading the disease because of their work travelling long distances and interacting with different people along the way. Whether they are stopping at a truck stop to rest or staying in a hotel before the next long-distance drive, truck drivers face the challenge of staying safe without taking all the precautions others around them do. Truck drivers have not been able to assume the global lockdown measures because their services have become incredibly important for the delivery of food, medicine, and household cleaning supplies worldwide (Yowakim et al., 2020). One of the major legal recommendations that the review suggests is to create guidelines that keep sick truck drivers away from other people and potentially not allow them to travel around the country. Possible guidelines include "regulation of trade and transport: stating that those trucks that carry goods will be allowed to operate in interstate operations to ensure continuity of supply chains…" (Maling, 2020). Controlling the influx of trucks that enter the country is essential in maintaining the potential liability of spreading COVID-19. It is met with exceptions for short-term stays necessary for essential supplies. Truck drivers have been greatly affected by the COVID-19 pandemic, and this review highlights the importance of creating legislation and amenities that protect truck drivers and all the people they encounter. With a profession that requires moving around, with no permanent "home," truck drivers come in contact with different people across the world and are at a very high risk of contracting and spreading COVID-19.

6. Results and Discussion

6.1 Numerical Results

The truck tonnage index is the measure of the gross tonnage of freight transported by trucks in the U.S. Table 1 shows the truck tonnage index of each month for the years 2018-2020 (. The purpose of this table is to analyze the truck tonnage index's historical data both pre COVID-19 and during COVID-19. The time period of January 2018 to February 2020 marks the pre-COVID-19 time, and March 2020 to December 2020 indicates during COVID-19.

Table 1. Truck Tonnage Index over Time

	Month											
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	109.2	111.6	112.5	111.7	113.1	113.9	113.3	113.8	115	115.9	116.8	115.2
2019	115.9	115.8	116.7	117.2	117.1	117.5	118.5	120.1	117.4	117.8	117	116.3
2020	116.8	117	117.6	106.8	109.9	111	113.4	111.6	110.8	111.3	111.7	116.7

The data in Table 2 below highlights the relationship between the total number of COVID-19 cases and the total number of deaths due to driving behaviors in Greece and the Kingdom of Saudi Arabia (KSA) (Katrakazas et al., 2020).

Table 2.1 COVID-19 Cases vs. Total Number of Deaths Due to Driving (Greece and KSA)

	Date	26/2/2020	27/2/2020	28/2/2020	29/2/2020	1/3/2020	2/3/2020	3/3/2020	4/3/2020	5/3/2020	6/3/2020	7/3/2020	8/3/2020
Greece	Total cases	1	3	4	7	7	7	7	9	31	45	66	73
	Total deaths	0	0	0	0	0	0	0	0	0	0	0	0
KSA	Total cases	–	–	–	–	–	–	–	–	5	5	7	11
	Total deaths	–	–	–	–	–	–	–	–	0	0	0	0

Table 2.2 COVID-19 Cases vs. Total Number of Deaths Due to Driving (Greece and KSA)

9/3/2020	10/3/2020	11/3/2020	12/3/2020	13/3/2020	14/3/2020	15/3/2020	16/3/2020	17/3/2020	18/3/2020	19/3/2020	20/3/2020
84	89	99	117	190	228	331	352	387	418	464	495
0	0	0	1	1	3	4	4	5	5	6	10
15	20	45	62	86	103	118	133	171	238	274	344
0	0	0	0	0	0	0	0	0	0	0	0

Table 2.3 COVID-19 Cases vs. Total Number of Deaths Due to Driving (Greece and KSA)

21/3/2020	22/3/2020	23/3/2020	24/3/2020	25/3/2020	26/3/2020	27/3/2020	28/3/2020	29/3/2020	30/3/2020	31/3/2020	1/4/2020
530	624	695	743	821	892	966	1061	1156	1212	1314	1415
13	15	17	20	22	26	28	32	38	43	49	50
392	511	562	767	900	1012	1104	1203	1299	1453	1563	1720
0	0	1	1	2	3	3	4	8	8	10	16

Table 2.4 COVID-19 Cases vs. Total Number of Deaths Due to Driving (Greece and KSA)

2/4/2020	3/4/2020	4/4/2020	5/4/2020	6/4/2020	7/4/2020	8/4/2020	9/4/2020	10/4/2020	11/4/2020	12/4/2020	13/4/2020
1544	1613	1673	1735	1755	1832	1884	1955	2011	2081	2114	2145
53	59	68	73	79	81	83	86	90	93	98	99
1885	2039	2179	2385	2523	2795	2932	3287	3651	4033	4462	4934
21	25	29	34	38	41	41	44	47	52	59	65

Table 2.5 COVID-19 Cases vs. Total Number of Deaths Due to Driving (Greece and KSA)

14/4/2020	15/4/2020	16/4/2020	17/4/2020	18/4/2020	19/4/2020	20/4/2020	21/4/2020	22/4/2020	23/4/2020	24/4/2020	25/4/2020	26/4/2020
2170	2192	2207	2224	2235	2238	2245	2401	2408	2463	2490	2506	2517
101	102	105	108	110	113	116	121	121	125	130	130	134
5369	5862	6380	7142	8274	9362	10,484	11,631	12,772	13,930	15,102	16,299	17,522
73	79	86	87	92	97	103	109	114	121	127	136	139

Table 2.6 COVID-19 Cases vs. Total Number of Deaths Due to Driving (Greece and KSA)

27/4/2020	28/4/2020	29/4/2020	30/4/2020	1/5/2020	2/5/2020	3/5/2020
2534	2566	2576	2591	2612	2620	2626
136	138	139	140	140	143	144
18,811	20,077	21,402	22,753	24,097	25,459	27,011
144	152	157	162	169	176	184

6.2 Graphical Results

Figure 2 below shows the truck tonnage in the U.S. since 2018. As one can see, the tonnage has been pretty constant over time with a small dip in the month of March 2020. This correlates with the initial shutdown due to COVID-19 but quickly rebounded through the months of April, May and so on. This is important because the health of the trucking industry is an indication of many other industries due to their reliance on the trucking industry to transport goods.

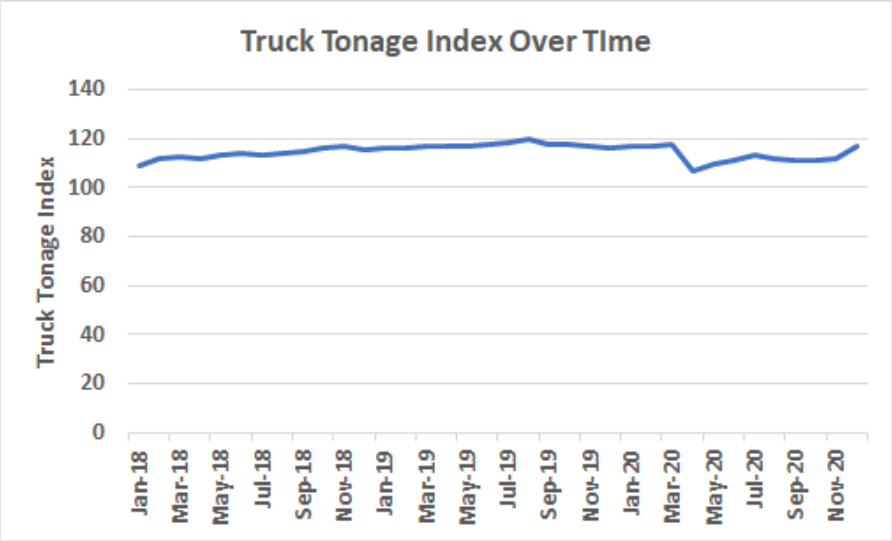

Figure 2. Truck Tonnage Index over Time (Excel, 2012)

Figures 3 and 4 highlight the relationship between the number of COVID-19 cases and the number of casualties due to driving behavior. As you can see from both graphs, there is a positive correlation between the two variables, and the R values are both above 0.95, proving the strong positive correlation between the number of COVID-19 cases and

road safety deaths. These conditions affect truck drivers and highlight the pandemic's potential consequences on the driving conditions around the world.

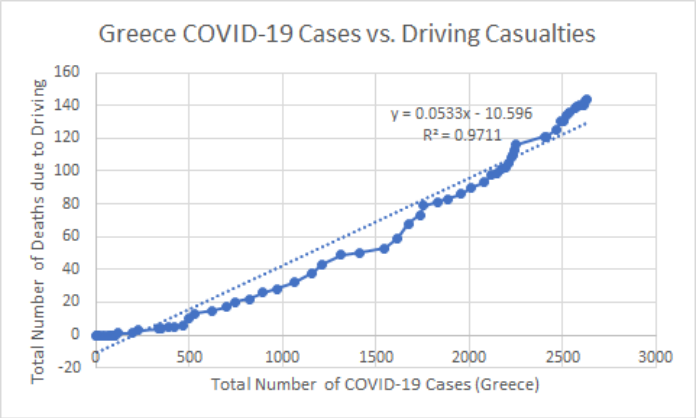

Figure 3. Greece COVID-19 Cases vs. Driving Casualties

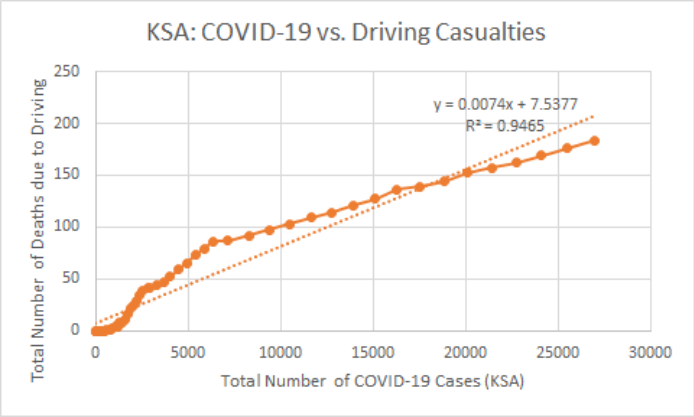

Figure 4. KSA COVID-19 Cases vs. Driving Casualties

6.3 Proposed Improvements

The trucking industry has had to adapt quickly in response to the COVID-19 pandemic. Through various case studies, it has become apparent that truck drivers are both at high risk of contracting and spreading COVID-19. In the future, trucking companies need to ensure that their drivers have the proper PPE and health care options while on the job. Due to the increased demand for essential goods, transportation companies need to have flexible schedules to ensure they can fulfill all their customers' transportation needs.

6.4 Validation

COVID-19 effects really hit the U.S. in April 2020. This was when the country began seeing a significant number of cases, and thus hours of service laws were suspended to prevent catastrophic effects on the supply chain. In this statistical test, we looked at if there was a difference in the proportion of cases of road accidents before and after these laws were abandoned to see if it influenced driver safety.

When looking further into the data, it is easy to see that the proportion of deaths for car accidents compared to the number of cases did not have a significant change as COVID-19 spread around the U.S. Figures 5 and 6 show the Minitab output for a two-sample t-test for a difference in proportions. These results yield a p-value of 0.507, which further solidifies that we cannot reject the null hypothesis and claim there is a difference in the proportion of cases to road accidents.

Descriptive Statistics

Sample	N	Event	Sample p
Sample 1	25931	382	0.014731
Sample 2	428208	6527	0.015243

Figure 5. Descriptive Statistics

Test

Null hypothesis	H_0: $p_1 - p_2 = 0$
Alternative hypothesis	H_1: $p_1 - p_2 \neq 0$

Method	Z-Value	P-Value
Normal approximation	-0.66	0.507
Fisher's exact		0.531

Figure 6. Hypothesis Test Results

7. Conclusion

As shown in this paper, the trucking industry was greatly affected by the COVID-19 pandemic. The trucking industry is a highly used and supported mode of transportation for goods cross-country. It has been growing in technology and changing due to different demands in the market. The pandemic increased E-commerce, which was one of the reasons the trucking industry needed to adapt and be flexible in uncertainty. There were both drastic increases and decreases in demand for certain goods that rely on trucking. Increases in demand of restocking stores even gave trucking "emergency relief" benefits and regulations. Truckers were also directly affected by the pandemic through many safety protocols set by rest areas, gas stations, and restaurants. Due to many of these changes, truckers' stress has increased drastically, while their overall emotional health has decreased. Truck drivers are one of the most at-risk groups due to their long-haul distance travels and being in high contact, high variety zones.

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