



UNIVERSITY OF
LIVERPOOL

**Big Data Analytics for Business
(EBUS633)**

Individual Coursework

Professor: Hugo Lam

**Report By:
Student ID- 201595383**

1.Introduction

The Suez Canal catastrophe threw the worldwide supply chain system into disarray. The Suez Canal, one of the busiest maritime routes, came to a standstill on March 23, 2021, by the Ever Given, a massive container ship. Over 400 vessels due to transit the Canal in East-West and West-East directions were affected. Routes and scheduling were a problem for such vessels. Shippers, consignees, ship operators, ship owners, and container terminals were among the other casualties. Every day, the canal transports around 12% of global trade, one million barrels of oil, and 8% of liquefied natural gas and with this block canal's revenues were taking a USD\$ 14m- USD\$ 15m(GBP 10.2m- GBP 10.9) hit for each day of the blockage. Despite the fact that the Suez Canal bottleneck was lifted on 29th March 2021, the global supply chain was still affected. (Suez Canal, Egypt - Image of the Week - Earth Watching, n.d.). The price of gas on the day of the disaster had climbed USD\$0.40 in the aftermath of the catastrophe, demonstrating the ripple effect of this incident. (LeBlanc, 2021)

Companies have grown increasingly reliant on suppliers and third parties from other nations, and this reliance is underlined when a supply chain link is disrupted. The reason behind selecting this event study is to understand the impact it had on different group of companies such as manufacturing and domestic and multi-national firms in the United States. Also, to understand the overall impact it had on the stock prices of different group of companies in the United States because it shows the interconnection that comes with globalisation and dependence on each other as contributors to the global supply chain.

In this report the point that will be focused mainly upon would be the effect of this event on the stock prices of the manufacturing companies of the United States, the impact of this event on domestic and multi-national manufacturing companies in the United States and the impact on machinery manufacturing firms and non-machinery manufacturing firms.

2.Hypothesis Development

According to the International Energy Agency (IEA) (2020), crude oil accounted for 31% of global energy consumption in 2019, making it the most important source of energy globally, with 61% delivered by sea. (Coleman, 2012). During the canal blockage, it caused major disruptions in the crude oil supply chain, creating uncertainty and causing crude oil prices to fluctuate. The blocking of the Suez Canal can be viewed as an external shock, and such shocks can lead to an increase in oil prices due to a disruption in supply or a rise in preventative demand. These shocks can also cause increased volatility during the crisis as a result of the market's uncertainty and instability. (Kilian, 2014)

Consumer products such as fire pits, apparel, furniture, manufacturing, auto components, and fitness equipment make up most of the traffic stuck due to the blockage. USA importers faced arrival delays of three days and this continued to grow as long as the disruption continued. (Suez Canal blockage is delaying an estimated \$400 million an hour in goods, 2021) Due to such external events, it led to an increase in the prices of different commodities. From here the first hypothesis statement is derived to understand the impact of the event on the manufacturing group of companies as it would have directly impacted the manufacturing sector and in turn had an effect on their stock prices as well.

If delivery is affected for more than a few days, it is probable that United States customers would suffer. The Pacific is used to transport finished goods from Asia to the United States. However, the canal closure may cause some components for items built in Europe and sent to the United States to be delayed. (Koenig and Rugaber, 2021). With this respect the domestic manufacturing firms that depend solely on one sea route might be heavily impacted as compared to their multi-national counterparts which forms the basis for second hypothesis.

Impacts on the retail and manufacturing sectors were reported throughout Europe, with the delays swiftly spreading to other countries due to the lengthier trade routes' delayed arrival times. Missed arrivals of vessels scheduled from Asia and the Indian Subcontinent across the Atlantic Ocean via the Suez Canal soon affected North American firms which would have had an impact on machinery manufacturing firms more than non-machinery manufacturing firms. (Bingham, 2021). This stands the

point for the third hypothesis that whether this event had an impact on machinery and non-machinery manufacturing firms.

3.Event Study

Event studies have become popular in economic, finance, and accounting research due to the wide range of applications and abundance of data available. The merit of the event study methodology is that abnormal returns owing to a firm-specific but time-independent event can be properly assessed by aggregating findings from multiple firms experiencing the same event at different times. The event study parameters that have been taken in this report is Market Model (risk model) with an estimation window of plus and minus ten days. (Ahern, 2009)

A stock price, in theory, considers all present facts as well as future predictions. As a result, the impact of a given event on a firm can be assessed by looking at the impact on the company's stock. The market model is the most prevalent type of event analysis. This method examines the actual returns of a benchmark reference market and measures the stock's correlation with the benchmark. This method can be used over time to examine how an incident affects a stock over time by analysing consecutive days. (Coutts, Mills and Roberts, 1994)

Hypothesis 1:

In this report, the first hypothesis is directed towards the Suez Canal blockage event and whether this event had a positive or negative impact on the stock prices on the manufacturing group of companies in the United States. And, also whether this impact was statistically significant or not.

For the hypothesis part, 150 manufacturing companies were selected amongst the Russell Group Companies that are listed in the United States Stock Exchange. The event study analysis is conducted by selecting the variable PERMNO which is specific for every company and the specific date on which the event occurred.

The test results are displayed in the figure 1 and 2 where Mean Cumulative Abnormal Return (car_me) is observed in the dataset. From figure 1, we can say that since Mean Cumulative Abnormal Return is a negative value (-0.0105) this event had a negative impact on the stock prices of the manufacturing group of companies in the United States.

	Model	extime	negative	numrets	car_m	ret_m	abret_m	cret_m	car_me	bhar_me	abret_t	abret_Probt	bhar_t	bhar_Probt	car_te	ci
1	Market Mo...	-10	92	144	-.0049	.0121	-.0049	.0621	-.0105	-.0147	-2.1341	.0345	-2.1341	.0345	-1.6395	
2	Market Mo...	-9	54	144	-.0012	.0107	.0037	.0621	-.0105	-.0147	2.4145	.0170	-.6439	.5207	-1.6395	
3	Market Mo...	-8	87	144	-.0012	.0138	.0000	.0621	-.0105	-.0147	.0041	.9967	-.3342	.7387	-1.6395	
4	Market Mo...	-7	59	144	.0024	.0054	.0036	.0621	-.0105	-.0147	2.4815	.0142	.7589	.4491	-1.6395	
5	Market Mo...	-6	55	144	.0061	.0109	.0037	.0621	-.0105	-.0147	2.3837	.0185	1.6734	.0964	-1.6395	
6	Market Mo...	-5	98	144	-.0024	-.0115	-.0085	.0621	-.0105	-.0147	-5.3664	.0000	-.7430	.4587	-1.6395	
7	Market Mo...	-4	62	144	-.0004	.0059	.0020	.0621	-.0105	-.0147	1.5410	.1255	-.2444	.8073	-1.6395	
8	Market Mo...	-3	62	144	.0005	-.0152	.0008	.0621	-.0105	-.0147	.4736	.6365	-.1724	.8633	-1.6395	
9	Market Mo...	-2	80	144	.0001	.0028	-.0003	.0621	-.0105	-.0147	-.2272	.8206	-.2211	.8253	-1.6395	
10	Market Mo...	-1	80	144	-.0030	.0027	-.0031	.0621	-.0105	-.0147	-2.0850	.0388	-.9375	.3501	-1.6395	
11	Market Mo...	0	114	144	-.0177	-.0244	-.0148	.0621	-.0105	-.0147	-8.7583	.0000	-3.8890	.0002	-1.6395	
12	Market Mo...	1	54	144	-.0144	-.0048	.0034	.0621	-.0105	-.0147	2.0189	.0454	-3.4182	.0008	-1.6395	
13	Market Mo...	2	47	144	-.0071	.0142	.0073	.0621	-.0105	-.0147	5.9924	.0000	-2.0562	.0416	-1.6395	
14	Market Mo...	3	54	144	.0016	.0235	.0086	.0621	-.0105	-.0147	5.4584	.0000	-.1268	.8993	-1.6395	
15	Market Mo...	4	78	144	-.0025	-.0076	-.0041	.0621	-.0105	-.0147	-2.6081	.0101	-.8752	.3830	-1.6395	
16	Market Mo...	5	65	144	.0029	.0062	.0055	.0621	-.0105	-.0147	3.8944	.0002	.0566	.9550	-1.6395	
17	Market Mo...	6	95	144	.0024	.0060	-.0006	.0621	-.0105	-.0147	-.2698	.7877	.0080	.9936	-1.6395	
18	Market Mo...	7	91	144	-.0013	.0087	-.0036	.0621	-.0105	-.0147	-2.8921	.0044	-.5936	.5537	-1.6395	
19	Market Mo...	8	82	144	-.0036	.0099	-.0024	.0621	-.0105	-.0147	-1.7842	.0765	-.9487	.3444	-1.6395	
20	Market Mo...	9	63	144	-.0024	.0022	.0012	.0621	-.0105	-.0147	1.1390	.2566	-.8045	.4224	-1.6395	
21	Market Mo...	10	110	144	-.0105	-.0082	-.0080	.0621	-.0105	-.0147	-6.1566	.0000	-2.1033	.0372	-1.6395	
22																

Figure 1: Mean Cumulative Abnormal Return(car_me)

In figure 2, t-value (car_te) and p-value (car_te_probt) is measured respectively to understand the statistical significance of this impact. Since p-value(car_te_probt) is **10.33%**, it can be added that this impact is **statistically significant at 10%**.

	car_m	ret_m	abret_m	cret_m	car_me	bhar_me	abret_t	abret_Probt	bhar_t	bhar_Probt	car_te	car_te_probt	car_t	car_Probt	pat_ar	p
1	-.0049	.0121	-.0049	.0621	-.0105	-.0147	-2.1341	.0345	-2.1341	.0345	-1.6395	.1033	-2.1341	.0345	-4.7189	
2	-.0012	.0107	.0037	.0621	-.0105	-.0147	2.4145	.0170	-.6439	.5207	-1.6395	.1033	-.5675	.5713	2.7546	
3	-.0012	.0138	.0000	.0621	-.0105	-.0147	.0041	.9967	-.3342	.7387	-1.6395	.1033	-.3690	.7127	-1.8656	
4	.0024	.0054	.0036	.0621	-.0105	-.0147	2.4815	.0142	.7589	.4491	-1.6395	.1033	.7962	.4273	2.5717	
5	.0061	.0109	.0037	.0621	-.0105	-.0147	2.3837	.0185	1.6734	.0964	-1.6395	.1033	1.7032	.0907	2.7211	
6	-.0024	-.0115	-.0085	.0621	-.0105	-.0147	-5.3664	.0000	-.7430	.4587	-1.6395	.1033	-.6484	.5178	-4.3080	
7	-.0004	.0059	.0020	.0621	-.0105	-.0147	1.5410	.1255	-.2444	.8073	-1.6395	.1033	-.0992	.9211	1.0528	
8	.0005	-.0152	.0008	.0621	-.0105	-.0147	.4736	.6365	-.1724	.8633	-1.6395	.1033	.1357	.8923	2.7216	
9	.0001	.0028	-.0003	.0621	-.0105	-.0147	-.2272	.8206	-.2211	.8253	-1.6395	.1033	.0300	.9761	-1.3260	
10	-.0030	.0027	-.0031	.0621	-.0105	-.0147	-2.0850	.0388	-.9375	.3501	-1.6395	.1033	-.6970	.4869	-5.3008	
11	-.0177	-.0244	-.0148	.0621	-.0105	-.0147	-8.7583	.0000	-3.8890	.0002	-1.6395	.1033	-3.6095	.0004	-7.4959	
12	-.0144	-.0048	.0034	.0621	-.0105	-.0147	2.0189	.0454	-3.4182	.0008	-1.6395	.1033	-3.0597	.0026	3.6728	
13	-.0071	.0142	.0073	.0621	-.0105	-.0147	5.9924	.0000	-2.0562	.0416	-1.6395	.1033	-1.5886	.1144	4.4342	
14	.0016	.0235	.0086	.0621	-.0105	-.0147	5.4584	.0000	-.1268	.8993	-1.6395	.1033	.3046	.7611	6.1848	
15	-.0025	-.0076	-.0041	.0621	-.0105	-.0147	-2.6081	.0101	-.8752	.3830	-1.6395	.1033	-.4541	.6505	-9.9857	
16	.0029	.0062	.0055	.0621	-.0105	-.0147	3.8944	.0002	.0566	.9550	-1.6395	.1033	.5641	.5736	1.8004	
17	.0024	.0060	-.0006	.0621	-.0105	-.0147	-.2698	.7877	.0080	.9936	-1.6395	.1033	.4115	.6813	-2.2257	
18	-.0013	.0087	-.0036	.0621	-.0105	-.0147	-2.8921	.0044	-.5936	.5537	-1.6395	.1033	-.2088	.8349	-1.7621	
19	-.0036	.0099	-.0024	.0621	-.0105	-.0147	-1.7842	.0765	-.9487	.3444	-1.6395	.1033	-.5708	.5690	-5.657	
20	-.0024	.0022	.0012	.0621	-.0105	-.0147	1.1390	.2566	-.8045	.4224	-1.6395	.1033	-.3848	.7009	.7095	
21	-.0105	-.0082	-.0080	.0621	-.0105	-.0147	-6.1566	.0000	-2.1033	.0372	-1.6395	.1033	-1.6395	.1033	-4.8492	
22																

Figure 2: p-value(car_te_probt) and t-value(car_te)

In table 1, it can be observed that the Market Model is used for event study with 144 companies out of total sample of 150 companies. Comparing the values of Cumulative Annual Return (AAR/CAAR) on the day of the event and its impact for the next seven days as the event went on for a week, it can be said that the event had a negative impact on the 4th, 6th, 7th and 8th day but not that significant impact after the first three days of the occurrence of the event. The corresponding p-values also suggest that the negative impact of this event is statistically significant.

Model	N	Day	AAR/CAAR	Cross-sectional t-test	p-value
Market Model	144	-10	-0.0049	-2.1341	0.0345
Market Model	144	-9	0.0037	2.4145	0.017
Market Model	144	-8	0	0.0041	0.9967
Market Model	144	-7	0.0036	2.4815	0.0142
Market Model	144	-6	0.0037	2.3837	0.0185
Market Model	144	-5	-0.0085	-5.3664	0.00
Market Model	144	-4	0.002	1.541	0.1255
Market Model	144	-3	0.0008	0.4736	0.6365
Market Model	144	-2	-0.0003	-0.2272	0.8206
Market Model	144	-1	-0.0031	-2.085	0.0388
Market Model	144	0	-0.0148	-8.7583	0.00
Market Model	144	1	0.0034	2.0189	0.0454
Market Model	144	2	0.0073	5.9924	0.00
Market Model	144	3	0.0086	5.4584	0.00
Market Model	144	4	-0.0041	-2.6081	0.0101
Market Model	144	5	0.0055	3.8944	0.0002
Market Model	144	6	-0.0006	-0.2698	0.7877
Market Model	144	7	-0.0036	-2.8921	0.0044
Market Model	144	8	-0.0024	-1.7842	0.0765
Market Model	144	9	0.0012	1.139	0.2566
Market Model	144	10	-0.008	-6.1566	0
Market Model	144	(-10,10)	-0.0105	-4.4803	3.8832

Table 1: H1 Test Results

4. Intergroup Comparison

Intergroup comparison is conducted for this impact analysis in hypothesis 2 and hypothesis 3.

Hypothesis 2:

To study the impact of the event on domestic manufacturing companies and multi-national manufacturing companies.

Q1) What is the difference in abnormal stock returns between domestic and multi-national manufacturing companies?

Q2) Was it statistically significant?

For this, International, Domestic, Both indicator (IDBFLAG) is used as one of the factors for differentiating between domestic and multi-national manufacturing firms. The test results in figure 3 suggest that the difference in abnormal stock returns between these two factors is 0.02%.

Group Statistics					
	International, Domestic, Both Indicator	N	Mean	Std. Deviation	Std. Error Mean
Cumulative Abnormal Return (CAR)	D	89	-.010412	.0749493	.0079446
	B	55	-.010614	.0803394	.0108330

Figure 3: Cumulative Abnormal Return (CAR)

Figure 4 represents Independent Sample t-tests wherein it can be observed that p-value is almost 98.8%. This means that the impact of this event on domestic and multi-national manufacturing companies is not statistically significant.

Independent Samples Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
Cumulative Abnormal Return (CAR)	Equal variances assumed	.323	.571	.015	142	.988	.0002025	.0132142	Lower: -.0259195 Upper: .0263245
	Equal variances not assumed			.015	108.456	.988	.0002025	.0134339	Lower: -.0264246 Upper: .0268296

Figure 4: Independent sample t-tests

Although the impact of the event is not significant but from Table 2 it can be said that multi-national manufacturing companies were negatively more impacted than the domestic manufacturing companies.

Group	N	Mean CAR	Mean CAR Difference	t-value	p-value
Domestic Manufacturing firms	89	-1.04%	0.02	1.5	98.8
Multinational Manufacturing firms	55	-1.06%			

Table 2:H2 Group results

Hypothesis 3:

To study the impact of the event on machinery manufacturing and non-machinery manufacturing companies by distributing them into two groups (1 and 0).

Q1) Compare whether group 1(machinery) or group 0 (non-machinery) was more affected by the Suez Canal blockage?

Q2) Determine whether the difference between the two groups is statistically significant?

For this, Standard Industrial Classification (SIC) is used as one of the factors for differentiating between machinery and non-machinery manufacturing firms. The test results in figure 3 suggest that the **difference in abnormal stock returns** between these two factors is **5.07%**. It also suggests that non-machinery manufacturing firms

were more negatively impacted than the machinery manufacturing firms due to this event.

Group Statistics					
	Machinery	N	Mean	Std. Deviation	Std. Error Mean
Cumulative Abnormal Return (CAR)	1.00	7	.037813	.1004187	.0379547
	.00	137	-.012957	.0750099	.0064085

Figure 5: Cumulative Abnormal Return (CAR)

Since the significant value is 10.5%, the upper row is considered for considering p-value which shows that the difference between the two groups is statistically significant at 10%. (p-value<10%)

Independent Samples Test									
		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower Upper
Cumulative Abnormal Return (CAR)	Equal variances assumed	2.657	.105	1.718	142	.088	.0507694	.0295488	-.0076430 .1091819
	Equal variances not assumed			1.319	6.347	.233	.0507694	.0384919	-.0421835 .1437224

Figure 6: Independent sample t-tests

Considering the Mean CAR value mentioned in Table 3, it can be said that non-machinery manufacturing companies were more impacted (negatively) than machinery manufacturing companies.

Group	N	Mean CAR	Mean CAR Difference	t-value	p-value
Machinery Manufacturing firms	7	3.78%	0.051	171.8	8.8
Non-machinery Manufacturing firms	137	-1.29%			

Table 3: H3 Group results

5. Discusstion and Conclusion

The results can be seen from figure 2 and 3 wherein the p-value is statistically significant at 10 %. Thus, it proves that the first hypothesis (H1) is accepted as it has a negative impact on the stock prices of the manufacturing group of companies.

Also, in the figure 7 cumulative abnormal return mean which was floating above 0% before the event occurred was in negative for most of the week after the event happened.

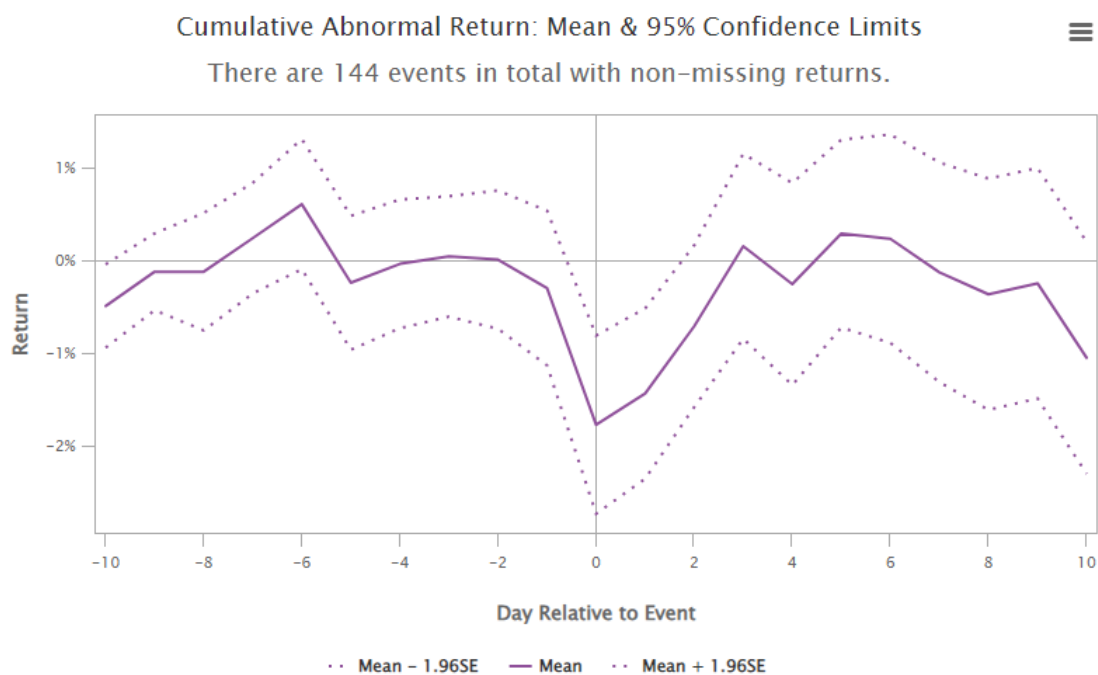


Figure 7: Cumulative Abnormal Return Mean

From table 4, it can be added that the event majorly had a negative impact on manufacturing firms of different categories. Since the p-value is at 98.8%, it can be concluded that hypothesis 2 (H2) is rejected and that this event does not have a significant impact on domestic and multi-national manufacturing firms.

Group	N	Mean CAR	Mean CAR Difference	t-value	p-value
Domestic Manufacturing firms	89	-1.04%	0.02	1.5	98.8
Multinational Manufacturing firms	55	-1.06%			
Machinery Manufacturing firms	7	3.78%	0.051	171.8	8.8
Non-machinery Manufacturing firms	137	-1.29%			

Table 4: H2 & H3 Group Results

Hypothesis 3(H3) is significant and is accepted as shown in figure 6 which suggests that the event impacted both machinery and non-machinery manufacturing firms.

The limitations in this report could be the data analysis and source of collecting data wherein less skewed data would be able to produce more impactful and accepting results.

References:

Ahern, K., 2009. Sample selection and event study estimation. *Journal of Empirical Finance*, [online] 16(3), pp.466-482. Available at:
<https://reader.elsevier.com/reader/sd/pii/S092753980900005X?token=96A7D70617832CDC86F0D223C71053BEFD9D6A5DECEBA1F6866145C7EB8BA9208D0C9B2967E221061E323B99A1FD34FA&originRegion=eu-west-1&originCreation=20220519055048>

[Accessed 19 May 2022].

Bingham, P., 2021. Suez Canal blockage supply chain disruption impacts growing. [Blog] *S&P Global*, Available at: <https://ihsmarkit.com/research-analysis/suez-canal-blockage-supply-chain-disruption-impacts-growing.html>

[Accessed 19 May 2022].

CNBC. 2021. *Suez Canal blockage is delaying an estimated \$400 million an hour in goods*. [online] Available at: <https://www.cnbc.com/2021/03/25/suez-canal-blockage-is-delaying-an-estimated-400-million-an-hour-in-goods.html>

[Accessed 19 May 2022].

Coleman, L., 2012. Explaining crude oil prices using fundamental measures. *Energy Policy*, [online] 40, pp.318-324. Available at:
<https://www.sciencedirect.com/science/article/pii/S0301421511007968?via%3Dihub>

[Accessed 19 May 2022].

Coutts, J., Mills, T. and Roberts, J., 1994. The market model and the event study method: A synthesis of the econometric criticisms. *International Review of Financial Analysis*, [online] 3(2), pp.149-171. Available at:
<https://www.sciencedirect.com/science/article/pii/105752199490023X>

[Accessed 19 May 2022].

Earth.esa.int. n.d. *Suez Canal, Egypt - Image of the Week - Earth Watching*. [online] Available at: <https://earth.esa.int/web/earth-watching/image-of-the-week/content/-/article/suez-canal-egypt/>

[Accessed 19 May 2022].

Kilian, L., 2014. Oil Price Shocks: Causes and Consequences. *Annual Review of Resource Economics*, [online] 6(1), pp.133-154. Available at:

<https://www.annualreviews.org/doi/10.1146/annurev-resource-083013-114701>

[Accessed 19 May 2022].

Koenig, D. and Rugaber, C., 2021. *Suez Canal: How blockage of 'most pivotal node in the trading network' impacts consumers*. [online] Eu.usatoday.com. Available at:

<https://eu.usatoday.com/story/money/2021/03/26/suez-canal-blockage-how-impact-consumers/7010047002/>

[Accessed 19 May 2022].

LeBlanc, J., 2021. *Suez Canal Blockage: Ripple Effect on Miami Valley Supply Chain*. [online] DigitalCommons@Cedarville. Available at:

https://digitalcommons.cedarville.edu/business_administration_media_contributions/120/

[Accessed 19 May 2022].