

The Impact of Supply Chain Disruptions on Stock Market Returns During Covid-19

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INTRODUCTION

- In past decades, the world experienced several food-borne and animal diseases, which impacted financial markets (e.g., Thompson et al (2019), Pendell and Cho (2013), Jin and Kim (2008)).
- On March 11th, WHO declared that the virus COVID-19 became a pandemic (WHO 2020a).
- Covid-19 has exposed the vulnerabilities of agribusiness supply chain logistics leading to many disruptions and shutting down of meat processing plants due to the impossibility to implement social distancing guidelines.
- Between April and May 2020, 17,358 Covid-19 positive cases and 91 deaths in U.S. meat processing plants were recorded (Waltenburg 2020).
- This research sheds light on the stock market price reaction to the agri-food supply chain logistics disruptions linked to COVID-19.
- Findings provide significant insights to investors on how sensitive stock market returns are to outbreaks that affect human health.

OBJECTIVE

- The goal of this research is to evaluate how events related to the Covid-19 pandemic and consequent disruptions in the meat supply chain impacted processing companies' stock market returns.
- This disruption will be examined in terms of COVID-19 outbreaks among employees and plant shutdowns in 14 major meat processing industries.

DATA AND EMPIRICAL MODEL

- Our sample comprises of fourteen publicly traded meat processing firms with US headquarters. Companies were selected from the 2019 list of top meat and poultry processor (Gazdziak, 2020) and the USDA Meat, Poultry and Egg Product Inspection Directory (USDA n.d).
- Nine of fourteen firms had negative mean returns for the study period, as did S&P 500 returns. Five firms have positive mean returns. The magnitude of positive returns were smaller than the negative returns (Table 1).

Table 1: Summary statistics of adjusted closed stock prices and S&P 500 in US\$ from January 2nd to July 2nd, 2020

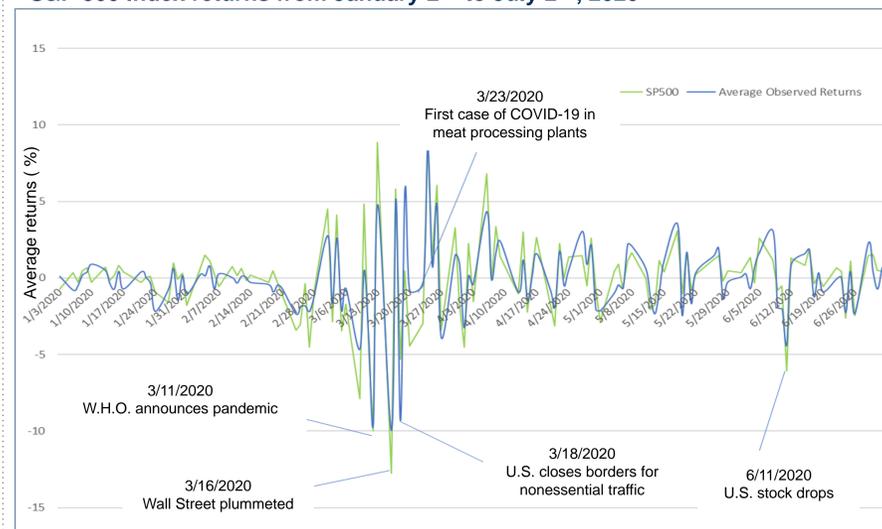
	Adj. close		Returns	
	Mean	SD	Mean	SD
Conagra Brands, Inc	31.660	2.673	0.051	2.702
Hormel Foods Corporation	46.524	2.018	0.073	2.400
The Kraft Heinz Company	28.318	3.075	0.029	3.480
Mondelez International, Inc	52.291	3.381	-0.033	2.839
Pilgrim's Pride Corporation	21.841	4.360	-0.519	3.857
Sanderson Farms, Inc.	133.266	15.096	-0.351	3.525
Sysco Corporation	59.850	14.145	-0.341	5.620
Tyson Foods, Inc.	66.941	11.792	-0.332	3.962
Seaboard Corporation	3310.179	474.327	-0.292	2.962
The Chef's Warehouse, Inc.	21.532	11.511	-0.818	12.095
Alco, Inc	31.619	3.451	-0.089	4.600
Bridgford Foods Corporation	19.147	3.562	-0.307	6.582
MamaMancini's Holdings, Inc.	1.433	0.264	0.335	4.951
Cal-Maine Foods, Inc.	40.281	3.068	0.046	3.064
S & P 500	2995.322	277.273	-0.03177	2.915112

Notes: SD is defined as the Standard Deviation.

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- Sample firms account for over 60% of the beef market, 65% of the poultry market, and 30% of pork market in the U.S. (Cismarket n.d.).
- Adjusted stock prices for companies and the S&P 500 are collected from Yahoo Finance and Mergent Online from January 02 to July 02, 2020.
- Figure 1 displays the average stock returns of meat processing companies and the S&P 500 index returns with large negative returns recorded after the announcement of the pandemic on March 11th by the WHO.
- Pandemic announcement caused larger drop in returns than first Covid-19 case in meat processing plants (Figure 1). Greater movement in stock market returns after March.

Figure 1: The average stock returns of meat processing firms and S&P 500 Index returns from January 2nd to July 2nd, 2020



Source: Yahoo Finance and Mergent. Returns calculated by the authors.

- We used the event study approach to measure the economic impact of event announcements on company stock returns.
- The events considered are: 03/11 (WHO declares a Pandemic) and 03/23 (First Case of Covid-19 in meat processing firm).
- The expected returns are estimated as constant returns. As explained by (MacKinlay A., 1997) the constant mean returns model is estimated as follows:

$$\text{Constant Return}_{it} = \text{Mean Return}_i + \text{Disturbance term}_{it} \quad (1)$$

When,

$$E(\text{Disturbance term}_{it}) = 0 \quad (2)$$

$$\text{var}(\text{Disturbance term}_{it}) = \sigma^2 \text{Disturbance term}_i \quad (3)$$

- Where, i is the security, and t is the time period. E the expectation and var the variance.
- We estimate abnormal returns, used to evaluate the impact of COVID-19, by subtracting the observed returns from the constant returns. For every firm i at day t we have:

$$\text{Abnormal Return}_{it} = \text{Actual Returns}_{it} - \text{Constant Returns}_{it} \quad (4)$$

- Next, we estimate the Average Abnormal Return (Avg. Abnormal Ret.) on date t which is the sample mean across the events of the firm. We will proceed in the same order as (Thompson et al. 2019) to estimate it as follows:

$$\text{Avg. Abnormal Ret.}_t = \sum_{i=1}^N \text{Abnormal returns}_{it} / N \quad (5)$$

- We use a 95% confidence interval to assess whether the average abnormal rate of return is statistically significant.

PRELIMINARY RESULTS AND DISCUSSION

- Figure 2 shows the reaction of the firms when the COVID-19 was declared a pandemic on March 11th. The 95% confidence interval is represented by the dotted lines. It demonstrates statistically significant negative abnormal returns a day prior to the event (03/11) and persisting beyond 10 days thereafter.
- It appears that before WHO declared COVID-19 a pandemic, investors may already have expected stock markets to be impacted by COVID-19 (Figure 2).
- Figure 3 reflects the impact of the event of the first cases of COVID-19 in meat processing firms on stock returns. Statistically significant negative average abnormal returns are witnessed prior to the event.
- Results indicate that Covid-19 cases in meat processing plants may have been foreseen by investors due to the announcement of the COVID-19 pandemic. This may explain why no statistically significant abnormal returns were witnessed on and after 03/23 (Figure 3)

Figure 2: Plot of the cumulative constant mean return model when COVID-19 was declared a pandemic (March 11th)

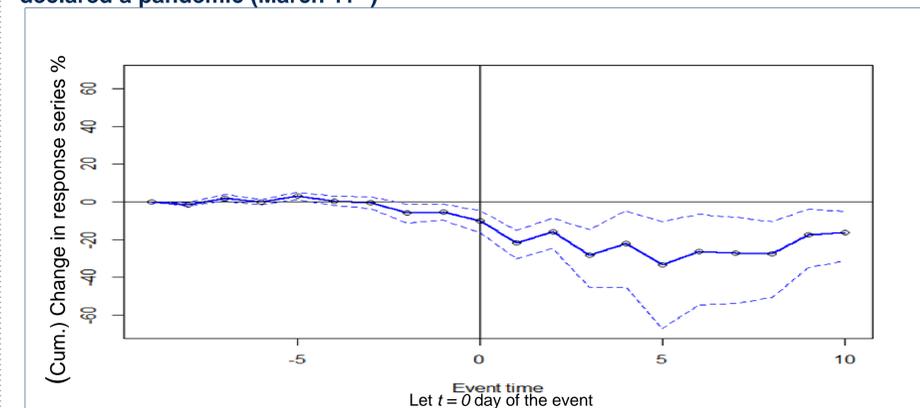
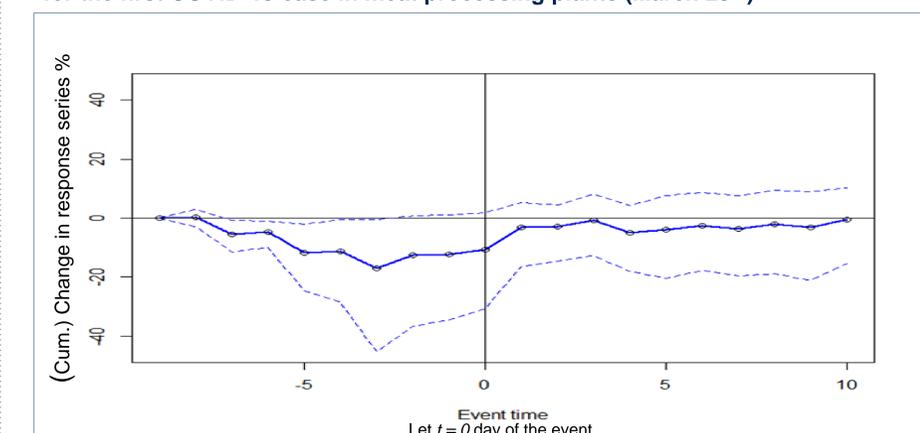


Figure 3: Plot of the cumulative abnormal returns using constant mean returns for the first COVID-19 case in meat processing plants (March 23rd)



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