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Claremont McKenna College

Zoom In, Class Out:

An Event Study on Publicly Traded Ed Tech Firm Valuations During COVID-19

submitted to

Professor Janet K. Smith

by

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for

Senior Thesis

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Abstract

This paper examines how publicly traded Ed Tech firms reacted to negative announcements regarding COVID-19. Using an event study method, I document how an international portfolio of Ed Tech firms react across multiple event windows. The results show that Ed Tech firms reacted positively to the announcement of the first US death and negatively to the World Health Organization's declaration that COVID-19 was a pandemic. Additionally, differences in geographical location did not impact cumulative abnormal returns across event windows. Finally, firm-specific characteristics such as volatility and financial leverage had little or no significance on stock returns.

Contents

1 Introduction

As the coronavirus quickly spread across the globe, institutions usually filled with people shut down and continued their operations online. Schools were no exception as screens at home replaced classrooms. As faculty and students try to retain the same level of engagement as experienced in classrooms, E-learning's importance has quickly become a vital part of education.

As educational institutions transitioned to virtual learning, I researched how COVID-19 impacted Ed Tech valuations and whether the sample of firms produced cumulative abnormal returns (CAR) over the benchmark, the S&P 500, across various event windows and geographical locations. Between February 20^{th} and March 23^{rd}, the S&P 500 dropped by over 30%, with the biggest one-day drop of 9.5% on March 12^{th}, a day after the World Health Organization (WHO) declared COVID-19 a pandemic.[1] Using an international data set of Ed Tech firms, I use an event study method and look at three event windows centered around January 29^{th}, February 28^{th}, and March 11^{th}. The first recorded US case occurred on January 29^{th}, February 28^{th} was the first US COVID-19 death, and March 11^{th} was the day the WHO announced COVID-19 was a pandemic. These dates were critical events in the progression of COVID-19 and more details about the event dates are discussed in Section 3.3.

Initially, I investigate whether CARs are statistically significant across these event windows. Furthermore, I conduct a cross-sectional analysis on individual Ed Tech firms across the three event windows to investigate possible determinants of variation in the CARs. Additionally, I use dummy variables to distinguish whether or not the geographical location significantly impacts variations in firms' abnormal returns. I specifically look at Ed Tech firms headquartered in China and hypothesize that the China dummy variable would be significant for the January 29^{th} event window as Chinese educational institutions close and become more reliant on Ed Tech.

[1] Ballentine, Claire, Vildana Hajric, and Sarah Ponczek. 2020. "U.S. Stocks Sink in Worst Day Since Black Monday: Markets Wrap." *Bloomberg.* https://www.bloomberg.com/news/articles/2020-03-11/asia-stocks-set-for-losses-dow-enters-bear-market-markets-wrap

While many authors have written papers about market performance during the pandemic as well as the pandemic's impact on education, there is a literature gap on Ed Tech firm valuation during this unprecedented point in history. I seek to understand if Ed Tech firms have a positive reaction to events related to COVID-19 and whether firms' geographical location influences their valuation as the pandemic spread across the world.

I hypothesized that negative announcements regarding COVID-19 would cause Ed Tech firms to react positively relative to the rest of the market. As traditional educational institutions close, I expected that Ed Tech usage would increase and their valuations would also rise. As anticipated, the event window centered around February 28^{th} which marked the first US COVID-19 death, produced positive CARs, significant at the 1% confidence level. In contrast, the March 11^{th} event date that signifying WHO's announcement that COVID-19 was a pandemic generated negative CARs for the portfolio of firms, significant at the 1% confidence level. The March 11^{th} CARs contrast my hypothesis that negative COVID-19 announcements would cause a positive price reaction in the portfolio of Ed Tech firms. Finally, in the cross-sectional analysis, while certain control variables produced little significant impact on CARs, the geographical location had none.

2 Literature Review

My work relates to two strands of literature. First, I build on literature studying the impact of earning expectation changes and price reactions during the COVID-19 period. Landier and Thesmar (2020) discuss firm-level analyst forecasts during the COVID-19 crises. Throughout January 2020 to Mid May 2020, their paper finds no exhibit of over-reaction in the short term though they expect a long-lasting impact of the crisis. The authors look at the FED's impact to try stimulate the economy and observe that discount rate stability comes from an increase in the equity premium, which fully offset the reduction in interest rates. Additional findings include the risk premium increase being due to the leverage effect, and relevantly, adverse news increased the cost of equity.

Ali, Alam, and Rizvi (2020) studied the negative reaction of global financial markets and their volatility. The authors pinpointed their study around March 11th, when The WHO announced that COVID-19 was a pandemic.[2] They concluded that as the coronavirus epicenter moved away from China to Europe and the US, China's markets stabilized while western countries experienced a freefall as a quarter of wealth eroded in less than a month.

Finally, Heyden and Heyden (2020) examine short-term market reactions in US and European stocks. Using an event study method and controlling for firm-specific characteristics, they find returns to be negatively significant to the first death announcement in firms' respective countries.

Second, my paper discusses education technology firms' progression over the past two decades while specifically focusing on the exogenous shock of COVID-19 on E-learning demand and growth in the past year. Soni (2020) researches the transfer of learning from traditional educational systems to virtual learning and an update on its increased usage. The paper expresses the importance of E-learning in a world utterly dependent on information

[2]Ducharme, Jamie. 2020. "World Health Organization Declares COVID-19 a 'Pandemic.' Here's What That Means." *Time*. https://time.com/5791661/who-coronavirus-pandemic-declaration/

technologies and the benefits and challenges that have arisen in the past several months. However, the sudden outbreak of COVID-19 did not allow for sufficient time in determining the quality of E-learning, therefore leading to returns not being as high as the author initially hypothesized.

China's response to COVID-19 has been relatively successful since the outbreak. During the lockdown they implemented the campaign "School's Out, But Class's On." L. Zhou, Li, Wu and M. Zhou (2020) summarize the transition to online education of its 270 million students and 20 million faculty. The authors commend China on their ability to quickly adjust given the emergency scenario and the integration of education and technology. They also discuss the individual problems associated with E-learning and the distracting teaching environment.

The Ed Tech market has grown exponentially, and Escueta and Holloway (2019) discuss the opportunity for innovation and entrepreneurship within the field.[3] The authors' paper discusses the importance of normalizing digital literacy in education. Furthermore, the quickly growing Ed Tech market also shows its infancy and correlates with Soni's (2020) argument that the lack of quality associated with E-learning means the stock market fails to realize as high of returns as initially thought.

[3]HolonIQ. 2019. "Global Education Technology Market to Reach $341B by 2025," press release. https://www.holoniq.com/topics/ar/global-education-technology-market-reach-341b-2025

3 Method

3.1 Methodology

To assist with the methodology, I investigate research on international and domestic event study cases; Brown and Warner (1984) is the backbone for many papers on the topic in the years that followed. The paper examines the properties of daily stock returns and how their characteristics affect event study methodologies. The authors find that daily stock returns do not depart from normality anymore than monthly returns.

Additionally, MacKinlay (1997) discusses the effectiveness of event studies to measure economic event impacts on firm valuations. The author finds that the effect of an event should be immediately reflected in the stock price. The paper stresses the importance of finding a distinct event date and previous research using event study methodology where the event date is difficult to identify have been less successful. His findings are relevant to this paper as many events took place during the initial spread of COVID-19 and there is ambiguity regarding how quickly Ed Tech securities reacted to these events. It is more likely that any wealth effects incorporated into the stock price would be realized as more educational institutions integrate E-learning into traditional teaching methods.

3.2 Data

Definition of Ed Tech There are many definitions of Ed Tech, and as technological innovation continues to grow, the definition has evolved with it. For example, in 1972, Ed Tech was defined as "the facilitation of human learning through systematic identification, development, organization and utilization of a full-range of learning resources"[4]. The Ed Tech field will continue to grow, and its definition will change; however, at this point as the world adapts to virtual learning, Huang, Spector and Yang's (2019) definition, stated below, is the most appropriate.

[4]Association for Educational Communications and Technology. (1972). The field of educational technology: a statement of definition. Audio-visual Instruction, 17(8), 36-43.

> *Educational technology refers to the use of tools, technologies, processes, procedures, resources, and strategies to improve learning experiences in a variety of settings, such as formal learning, informal learning, non-formal learning, lifelong learning, learning on demand, workplace learning, and just-in-time learning. Educational technology approaches evolved from early uses of teaching tools and have rapidly expanded in recent years to include such devices and approaches as mobile technologies, virtual and augmented realities, simulations and immersive environments, collaborative learning, social networking, cloud computing, flipped classrooms, and more.*[5]

For this research, I extracted my sample of firms from S&P CapitalIQ. From the initial sample of 148 firms, it was necessary for the study that these firms related to education instead of alternatives such as training. The companies varied in specialization, from Pre-School to Post-Graduate education across different disciplines. Given the data-set includes international firms, I made corrections regarding trading days and displayed stock prices and control variables in US Dollars at historical exchange rates. The end-of-day stock prices were taken from Bloomberg, though due to missing data on individual exchanges, the sample used for analysis fell to 59 firms.[6] This study was from the perspective of a US investor; therefore, the benchmark used was the S&P 500.[7]

[5]Huang R., Spector J.M., Yang J. (2019) Introduction to Educational Technology. In: Educational Technology. Lecture Notes in Educational Technology. Springer, Singapore. $https://doi.org/10.1007/978-981-13-6643-7_1$

[6]Many companies had incomplete data, this liquidity issue is also partly due to some firms being "penny stocks" and therefore, went through consecutive periods where the stock was not traded.

[7]SPX was used as the appropriate tracker of the S&P 500.

Table 1: Geographical Breakdown

	Headquarters			Ticker Region		
	Freq.	**Percent**	**Cum.**	**Freq.**	**Percent**	**Cum.**
Africa	2	3.39	3.39	2	3.39	3.39
Asia	36	61.02	64.41	26	44.07	47.46
Europe	2	3.39	67.8	2	3.39	50.85
Middle East	1	1.69	69.49	1	1.69	52.54
Oceania	3	5.08	74.58	3	5.08	57.63
South America	3	5.08	79.66			
North America	12	20.34	100	25	42.37	100
Total	59	100		59	100	

59 firms were used for the cross-sectional analysis. Listed above is the continental breakdown featuring the firms' headquarters and trading exchange locations.

Due to trading days mismatching, I introduced daily stock prices for missing data point using Scholes and Williams' (1977) jump method. The authors filled in the stock price from the previous day. It was important when calculating CARs to avoid double counting abnormal returns in a volatile event window. The authors' method for acquiring more composite data was not used if there was continuous missing data but more so applicable for individual gaps between data points.

3.3 Event Dates

To capture the rise in abnormal returns for Ed Tech firms, I used multiple event windows. Kothari and Warner (2006) discuss potential problems in event studies, such as the aggregation of security-specific abnormal returns and the calibration of the statistical significance of abnormal returns. These issues are exacerbated in long-horizon event windows. For that reason, event windows were 5 and 11 trading days. Dissimilar to previous literature using an event study method where we see a trail leading up to the event beforehand, the uncertainty around COVID-19 and its impact at the time failed to provide a specific event date where Ed Tech firms' performance would have been abnormally impacted.

Table 2: Event Date Description

Variable	Event/Description
January 29^{th}	The first recorded case in the US, two days prior (On January 27^{th} was when China's Minister of Education announced that the 2020 spring semester would be postponed.[8]
February 28^{th}	The date of the first recorded death due to COVID-19 in the US.[9]
March 11^{th}	Ali, Alam and Rizvi (2020) used March 11^{th} as their event date to study the negative reaction of global financial markets and their volatility; this was the date the World Health Organization (WHO) announced that COVID-19 was a pandemic instead of an epidemic.[10]

January 29^{th} The event date was chosen to see how the portfolio of firms reacted to the first case, yet includes China's announcement to transition to virtual learning. At this point, the deadliness of coronavirus was still uncertain. From a financial-markets standpoint, the S&P 500 was still growing, reaching an all-time high on February 19^{th}.[11] The purpose of this event date was to see if Ed Tech firms and specifically Chinese-based firms had generated positive CAR relative to the S&P 500.

[8]Zhu, Qingyi. 2020. "Why did China close all schools?" https://covid-19.chinadaily.com.cn/a/202004/07/WS5e8c1e64a310aeaeeed507e6.html

[9]It was only until more postmortem testing had been done that it was announced the first death was on February 6th. Soucheray, Stephanie. 2020. "Coroner: First US COVID-19 death occurred in early February." https://www.cidrap.umn.edu/news-perspective/2020/04/coroner-first-us-covid-19-death-occurred-early-february

[10]Ducharme, Jamie. 2020. "World Health Organization Declares COVID-19 a 'Pandemic.' Here's What That Means." *Time*. https://time.com/5791661/who-coronavirus-pandemic-declaration/

[11]Jasinski, Nicholas. 2020. "The S&P 500 Is Trading Near an All-Time High. It's the Fastest Recovery Ever." *Barron's*. https://www.barrons.com/articles/the-s-p-500-is-nearing-an-all-time-high-why-this-will-be-the-fastest-recovery-ever-51597084137

February 28^{th} As seen in Heyden and Heyden's (2020) research, firms reacted negatively to the news of the first death in their respective countries. In contrast, I hypothesize that Ed Tech firms react positively to the news of the first US COVID-19 death. As people realize the severity of the virus, educational institutions would start to think about the idea of shutting down and, therefore, increase the necessity for E-learning.

March 11^{th} Ali, Alam, and Rizvi (2020) pinpoint their study around this event, WHO's declaration that COVID-19 was a pandemic. Similarly to the February 28^{th} event date, I believed that the announcement would further solidify the necessity for E-learning, at least in the near-term future.

3.4 Analysis

Firstly, for the event study analysis, I computed abnormal returns (AR) for each stock, i on day t, $AR_{it} = R_{it} - E(R_{it})$. I then calculated cumulative abnormal returns (CAR) for 5 and 11 day event windows. Table 3 provides descriptive statistics and significance tests of CARs. To ensure for stock price reactions for the given events, I decided they had to have stock price data for at least 200 days of the calendar year.[12] Furthermore, I regressed control variables on CARs for the cross-sectional analysis that was conducted using Heyden and Heyden's (2020) approach to study short-term market reactions of US and Asian stock returns in the beginning of the COVID-19 pandemic. The cross-sectional analysis was conducted across the 11 day event windows for the three event dates, Table 5 displays the results of the analysis.

[12]The maximum number of trading days for any individual firm was 253, this includes data points that were added using Scholes and Williams' (1977) Method.

3.4.1 Firm Characteristics

For the cross-sectional analysis, I control for differences in firm characteristics by including control variables that were selected through previous literature that studied how firm characteristics effected firm performance. Bates, Kahle and Stulz's (2009) discuss the positive impact of liquidity and tangible assets on firm valuation during periods when firms' cash flows are riskier, such as economic recessions. In Haugen and Baker's (1996) study they find that lower volatility, higher profitability, and higher dividend yield increase expected returns. Ramelli and Wagner (2020) identify market-to-book ratio, firm size and profitability as 'standard control variables' to capture market reactions during the pandemic and how real shocks drive firm value. Finally, Asquith, Pathak, and Ritter (2005) research how short interest and proportion of institutional ownership impact stock returns. The authors use institutional ownership as a proxy for supply of shares that are able to be shorted. Boehmer and Wu (2012) find that lower institutional ownership increases the availability of short selling to be conducted which has a positive impact on pricing efficiency. On top of these variables, I also included a China dummy variable to identify any differences in firm performance due to geographical location. Descriptions of control variables are listed in Appendix I.

4 Results

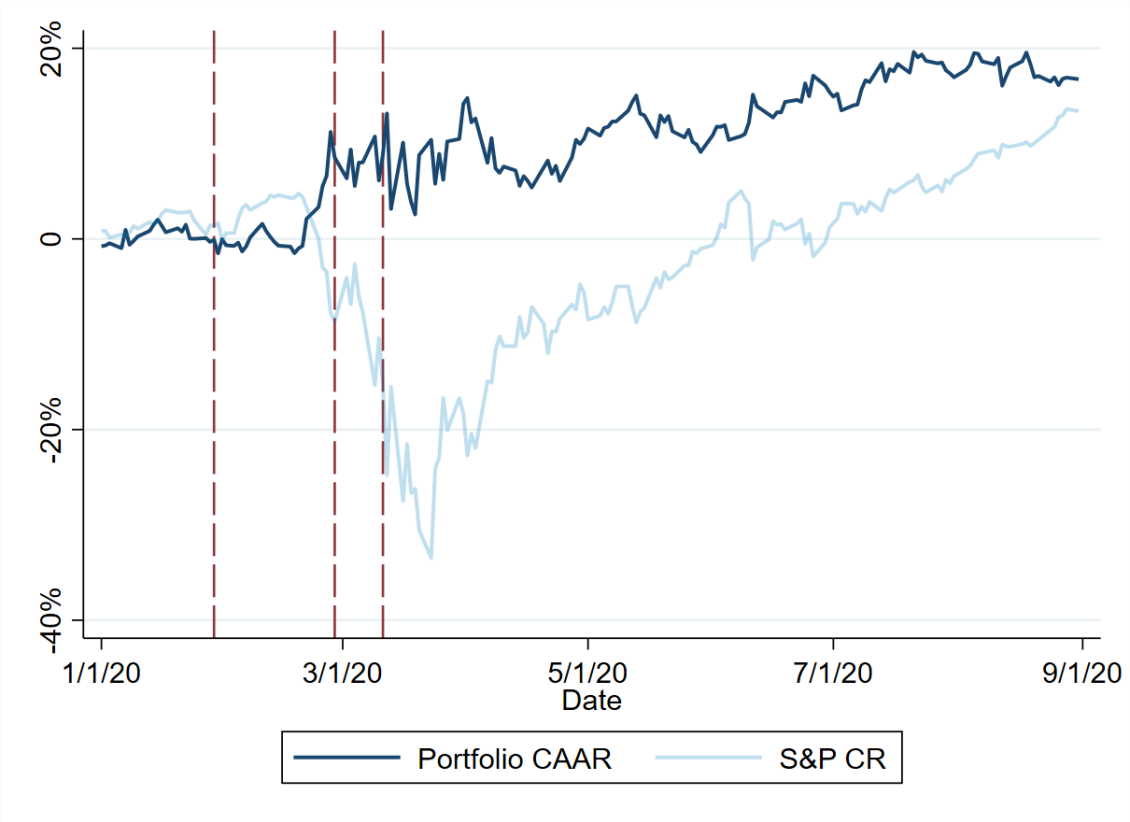

Figure 1: Portfolio CAAR vs S&P 500

An initial analysis was conducted on the portfolio Cumulative Average Abnormal Returns (CAAR) against the S&P 500 Cumulative Returns across an 8-month period from January 2020 to August 2020. As seen in Figure 1, during the worst period for the benchmark, the portfolio of Ed Tech Firms was able to continue to generate abnormal returns. The growth trend continued for the latter months, even though the S&P 500 recovered faster.

Table 3 shows the descriptive statistics of CARs across three event dates and six event windows. In Panels two and three, cumulative abnormal returns were statistically significant. Interestingly, Ed Tech firms reacted positively to the first US COVID-19 death; however, the portfolio reacted negatively to WHO's announcement that COVID-19 was declared a pandemic.

The January 29^{th} event window CARs were statistically insignificant to the announcement of the first US case. The S&P 500 continued to grow to an all-time high until February 19^{th}.[13] At this point in the spread of COVID-19, US investors were unaware of the virus' potential global impact, and there was no significant variation between the portfolio and the S&P 500 index. In the February 28^{th} event windows, CAR[-2,2] and CAR[-5,5] were 4.36% and 9.61%, respectively. These results are in line with the hypothesis that Ed Tech firms responded positively to negative announcements regarding COVID-19. The March 11^{th} event windows, CAR[-2,2] and CAR[-5,5] were -4.97% and -5.62% respectively. A potential reason for these negative results could be attributed to the magnitude of instability during the event window causing investors to be bearish and invest in less volatile alternatives.

Table 3: Descriptive Statistics and Significance Tests of CARs

	N	Mean	Std. Dev.	25th Perc.	Median	75th Perc.	t-stat	p-value
Panel 1: January 29th								
CAR[-2,2]	59	-0.01%	7.46%	-2.32%	0.39%	2.65%	-0.01	0.992
CAR[-5,5]	59	1.36%	7.99%	-3.16%	0.65%	3.27%	1.305	0.197
Panel 2: February 28th								
CAR[-2,2]	59	4.36%	13.38%	-4.07%	1.78%	8.56%	3.96	0.015
CAR[-5,5]	59	9.61%	18.96%	0.52%	5.81%	16.13%	4.424	0.000
Panel 3: March 11th								
CAR[-2,2]	59	-4.97%	12.13%	-11.78%	-4.47%	2.34%	-3.148	0.003
CAR[-5,5]	59	-5.62%	19.59%	-22.15%	-4.42%	9.39%	-2.203	0.032

The event windows are represented as $t \in [-x,x]$ where $t = 0$ denotes the event date.
S&P 500 cumulative returns across event windows presented in Table 7.

Table 4 breaks down the descriptive statistics of the control variables used in the cross-sectional analysis. The control variables reflect the infancy of the Ed Tech industry. Many firms had negative profit margins and low levels of institutional ownership. There was also large volatility in firms' stock prices, which only increased once the stock market become more unstable in the first quarter of 2020. Ed Tech firms also had a large proportion of tangible assets. Shleifer and Vishny (1992) research that tangible assets act as a potential cash source for interest repayments, especially during an economic recession.

[13] Jasinski, Nicholas. 2020. "The S&P 500 Is Trading Near an All-Time High."

Table 4: Control Variables

Control Variable	N	Mean	Std. Dev.	25th Perc.	Median	75th Perc.
Assets	58	$771.3m	$1555.2m	$71.8m	$224.6m	$618.4m
Dividend Yield (DY)	59	0.09%	0.30%	0%	0%	0%
Institutional Ownership (INST)	56	42.0%	35.6%	10.2%	28.6%	78.7%
Liquidity (LIQ)	58	46.4%	21.6%	27.9%	45.9%	60.6%
Market-to-Book Ratio (MTB)	59	4.05	8.90	1.04	1.91	5.24
Tangible Assets (TAN)	58	82.6%	16.6%	72.3%	87.4%	97.8%
Total Leverage (TLEV)	54	19.6%	17.6%	6.5%	15.7%	27.1%
Profit Margin (PROF)	58	-60.0%	384.6%	-10.6%	3.5%	10.3%
Volatility (VOLA)	58	42.0%	56.6%	17.3%	24.7%	47.9%

The table shows descriptive statistics of all variables except the dummy variables. The control variables were collated from Bloomberg and represent the figures from the end of 2019. See Appendix I for descriptions of control variables.

Table 5 shows the cross-sectional analysis using the control variables in Table 4. The constant represents the average reaction of the portfolio of firms for the given event window. In Panel 3, the constant had a significantly negative impact on the dependent variable, CAR. In Panel 1 and 2, firm liquidity postiviely impacted CARs and is in line with Bates, Kahle and Stulz's (2009) findings that higher liquidity acts as a safeguard against exogenous shocks. Finally, differences in geographical location were not significant for differences in CAR across all event windows.

Table 5: Cross-sectional analysis of CARs

	Panel 1: Jan 29 [-5,5]	Panel 2: Feb 28 [-5,5]	Panel 3: Mar 11 [-5,5]
Assets	0.000	0.001	-0.004
	(0.001)	(0.001)	(0.002)
DY	0.272	-3.076	-5.419
	(1.491)	(7.218)	(7.610)
INST	-0.044	-0.133*	0.108
	(0.027)	(0.070)	(0.111)
LIQ	0.144**	0.342**	-0.133
	(0.057)	(0.104)	(0.175)
MTB	0.048	0.096	0.776**
	(0.193)	(0.193)	(0.264)
TAN	0.008	0.087	0.425**
	(0.074)	(0.153)	(0.196)
TLEV	0.000	-0.067	-0.128
	(0.069)	(0.146)	(0.237)
PROF	-0.029	0.053	0.026
	(0.034)	(0.033)	(0.056)
VOLA	-0.020	0.012	0.023
	(0.022)	(0.020)	(0.030)
China	3.123	-6.068	6.556
	(5.130)	(5.385)	(7.473)
CONS	-3.665	-5.337	-14.106*
	(5.789)	(10.409)	(7.436)
R^2	0.30	0.35	0.29
N	50	50	50

*,**, and *** represent statistical significance at the 10%, 5% and 1% level, respectively. Robust standard errors are featured below estimate values in parentheses.
This table shows OLS estimates of the impact of COVID-19 has on the CARs across three event windows. The dependent variables are CARs across the event window. The China dummy variable is equal to one if the firm is headquartered in China.

5 Limitations

Several limitations of the data arose during this event study. Initially, the data-set featured 148 publicly traded Ed Tech firms. However, many firms had to be cut due to their lack of reported trading days. The data points were missing on their exchange websites, Bloomberg, and S&P CapitalIQ. Apart from the illiquid trading of firms, stock exchange holidays differ vastly. For example, the Shanghai Stock Exchange (SSE) was closed at the end of January for ten consecutive days due to the Chinese New Year.[14] The SSE's non-trading days intersected with most of the event window days centered around the January 29^{th} event date.

A grey area existed regarding what is considered 'Ed Tech' or, in other words, may have been a large contributor in facilitating online education; for instance, Zoom Video Communications (NasdaqGS: ZM). Zoom's abnormal performance can not be solely due to the necessity of its software for education, but also a large proportion would be to allow business employees to communicate. Additionally, while all sample firms are Ed Tech firms, several firms also provide products and services more applicable in traditional education. Therefore, a fall in demand for traditional education products may have overshadowed their Ed Tech division growth.

Furthermore, conducting breakdown analysis could not be done due to the small sample size. Given the event study was from the perspective of a US investor, the sample does not account for currency risk and fluctuations depending on what international stock exchange the firm traded. More problems arose with using an international data set, some companies traded on a foreign exchange, but the firm's headquarters were located in another country. As COVID-19 spread across the world, problems regarding differences between headquarter and exchange location may have caused conflicting valuation reactions. Finally, due to Ed Tech being a quickly growing infant market, a large majority of Ed Tech firms remain private. Therefore, the data may not be representative of the Ed Tech population as a whole.

[14] The New York Times, 2020. "Market Holidays." *The New York Times*. https://markets.on.nytimes.com/research/markets/holidays/holidays.asp?display=market&exchange=SHH

6 Conclusion

This paper examines how publicly traded Ed Tech firms reacted to COVID-19 related events. By calculating cumulative abnormal returns against the S&P 500, I evaluate how Ed Tech firms performed from the perspective of a US investor during the worst pandemic since the Spanish Flu in 1918. Using an international portfolio of Ed Tech Firms, I aim to understand whether Ed Tech firms (1) outperformed the benchmark and, (2) whether geographical location impacted firm valuations as the virus spread from Wuhan, China across the globe.

As educational institutions transitioned to virtual learning, I aim to uncover whether the market identifies the importance of Ed Tech firms through higher valuations. Previous literature discusses the growth of the Ed Tech industry and the effectiveness of virtual learning and price reactions due to COVID-19; however, as of yet there is no literature that tries to specifically understand Ed Tech firms' price reactions during the pandemic.

The results indicated that geographical location was not statistically significant in producing cumulative abnormal returns. However, the portfolio's CAR was positively statistically significant on the announcement of the first COVID-19 related death in the US. This outcome is in line with my hypothesis that as investors understood the severity of the virus, educational institutions would need to transition to online platforms, causing the necessity of Ed Tech firms to rise. In contrast, WHO's announcement that COVID-19 was a pandemic caused the portfolio's CAR to be negatively statistically significant.

Regarding future potential research, due to most Ed Tech firms being privately traded, looking into usage growth during this period may also shed some light on Ed Tech necessity during the pandemic. As the Ed Tech market continues to grow, more firms will become public, and more comprehensive studies on publicly traded Ed Tech firms can be conducted. To capture the whole Ed Tech industry, doing an event study on private and publicly traded firms' user demand during COVID-19 may give a better insight into how the industry performed.

Additionally, as mentioned in Soni (2020), understanding the quality of E-learning will take time to be fully realized, and altering the sample and running analysis on high-quality versus low-quality online education platforms may provide insight on how COVID-19 impacted their valuations. To understand how differences in quality effect firm valuation, controlling for characteristics such as the management team, quality of product, target market, and rounds of seed funding can provide insight into what makes an Ed Tech firm successful.

A pandemic is an anomalous event; however, it does provide insight into how quickly investors adapt to a circumstance that none of them would have previously experienced to this magnitude. As seen in Figure 1, active positions in Ed Tech firms that would have otherwise been overlooked generated positive abnormal returns.

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Appendix I

Table 6: *Overview of firm-level control variables*

Variable	Description
Assets	Total Assets
Dividend Yield (DY)	Ratio of firm's last dividend payout to current stock price
Institutional Ownership (INST)	Percentage of stocks that are in possession of Institutional Investors
Liquidity (LIQ)	Ratio of current to total assets
Market-to-book ratio (MTB)	Ratio of equity's market value to book value
Tangible (TAN)	Ratio of tangible assets to total assets
Total Leverage (TLEV)	Ratio of total debt to total assets
Profit Margin (PROF)	Ratio of net income to sales
Return on Equity (ROE)	Ratio of net income to the book value of equity
Volatility (VOLA)	The stock's annual volatility based on daily prices
China	Dummy Variable if the firm is headquartered in China

Table 7: *S&P 500 cumulative returns*

	S&P 500 CR
Panel 1: January 29th	
CAR[-2,2]	-2.11%
CAR[-5,5]	-0.65%
Panel 2: February 28th	
CAR[-2,2]	-3.82%
CAR[-5,5]	-12.13%
Panel 3: March 11th	
CAR[-2,2]	-7.77%
CAR[-5,5]	-19.82%