CORPORATE INNOVATION STRATEGY AND SALES REVENUE OF MULTINATIONAL COMPANIES IN TIMES OF CRISIS: A CASE OF THE COVID-19 PANDEMIC

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Abstract

Businesses varied in their experiences during the COVID-19 crisis, some faced significant difficulties while others thrived (Hu & Zhang, 2021). Over the past three decades, literature has demonstrated that a company's success during turbulent business and stable environments is increasingly influenced by intangible resources rather than tangible ones (Masood et al., 2017). This study aims to explore the impact of corporate innovation (CI) strategy on sales revenue (SR) during the COVID-19 pandemic. The study is quantitative, based on a sample of 74 global companies that were identified as thriving during the pandemic by the Financial Times. Data for the period 2019–2021 was analyzed using a Pearson pairwise correlation matrix and cross-sectional regression analysis. Our findings revealed a positive and statistically significant correlation between CI and SR. However, the direct impact of the CI strategy on SR was found to be statistically insignificant. These findings suggest that while CI strategy may not have an immediate impact on SR, it is crucial for sustaining SR, even during the recent COVID-19 crisis.

Keywords: Competitive Advantage, Corporate Innovation, Pandemic, Resource-Based Theory, Sales Revenue

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1. INTRODUCTION

Business cycles, such as economic upswings, downturns, financial crises, and turbulence, create distinct opportunities and pose challenges to firms' strategies. The disruptive landscape caused by the COVID-19 pandemic has significantly impacted the competitive response strategies and performances of businesses (Goel et al., 2020). It is widely acknowledged by both scholars and industry professionals that corporate innovation (CI) plays a crucial role in enabling companies to maintain competitiveness, survive, and thrive in volatile markets (Sung & Kim, 2021). While previous research has explored the link between CI and a firm's sales revenue (SR) worldwide, very few studies have

focused on this relationship in the context of the COVID-19 crisis. Therefore, the objective of this paper is to investigate the impact of CI strategy on SR during the COVID-19 pandemic.

The global COVID-19 pandemic has presented both challenges and opportunities for companies worldwide. While some businesses have seen a significant increase in firm performance, others have experienced substantial losses (Ngwakwe, 2020; Hu & Zhang, 2021). In light of the potential of intangible resources at the firm level, many companies are exploring new strategies to adapt and compete effectively during the pandemic, with the aim of not only surviving but also achieving sustained SRs (Clauss et al., 2022). Adapting to pandemic-induced disruptions requires businesses to embrace modified business models, seize opportunities, and reconfigure internal resources to enhance firm value (Zia et al., 2023; Marco-Lajara et al., 2022).

There is a substantial body of empirical research on CI strategy as a driver of firm performance (Latan et al., 2020; Habtewold, 2023; Pundziene et al., 2021; Osiyevskyy et al., 2020; Dai et al., 2020; Hogeslag, 2020; Yousaf et al., 2019; Song et al., 2023). However, the findings from these studies have been inconsistent and inconclusive. Most of the research has focused on specific sectors of the economy during periods of stability. There have been relatively few studies conducted in the context of a global financial crisis and the ongoing COVID-19 pandemic.

While there are various yardsticks for CI strategy, the current study adopts investment in research and development (R&D) as a proxy for CI strategy (Demircioglu, 2016). This is because investment in R&D is considered an essential strategy for companies to access new markets, enhance and maintain quality and efficiency, increase productivity, and, mostly and more importantly, generate the possibility of developing services or products in sequence, maintaining the market positioning (Sabahi & Parast, 2020). Data obtained between 2017 and 2020, extracted from a project aimed at COVID-19-related solutions, showed an increase in sales due to the development of products created before the actual pandemic, from research and investment in development. These data led to the following question:

RQ: How does corporate innovation strategy impact sales revenue?

The subject is justified by the need to understand the best paths for companies that invest in R&D to guarantee their commercial results to weather such a serious economic crisis.

In general, companies use R&D to generate new products and processes in an attempt to increase sales (Agustia et al., 2020). The general approach has allowed us to assume that the increase in sales occurs with a lag after the R&D (Vithessonthi & Racela, 2016). However, in times of crisis, the generative function of R&D can fail or not be achieved (Giebel & Kraft, 2024). In particular, the COVID-19 crisis has serious impacts on trade and industrial production, at the same time that it intensifies globalization and makes people more connected and interdependent. Each crisis had its particularities, but it is observed that all had as a trait the fast diffusion and impact. Due to the speed of transmission between one region and the other, the crises became global and the impact of each one on companies tends to be different, but at the same time powerful (Hu & Zhang, 2021). This is because, while some companies face severe disruptions, others have huge opportunities.

The study is composed as follows. Section 2 presents the literature review. Section 3 discusses the variables and empirical strategy. Section 4 overviews the results of the main parameters. Section 5 presents a discussion of the findings and Section 6 concludes the study.

2. LITERATURE REVIEW

2.1. Theoretical review

Resource-based theory and dynamic capabilities theory are two of the common theoretical theories underscoring the performance of firms. According to resource-based theory, sustained competitive advantage and firm survival are attained by the enhancing effects generated by firm-specific resources such as the CI employed by the business organization, especially in a turbulent environment (Ramon-Jeronimo et al., 2019; Macharia, 2020; Sirmon et al., 2007). Similarly, the dynamic capabilities theory, as an extension of the resource-based view, was proposed by Teece et al. (1997): they reasoned that firms attain competitive advantage and performance heterogeneity from their capacity to maneuver their internal capabilities and resources during uncertain times, such as the recent COVID-19 pandemic (Kitenga & Thuo-Kuria, 2014).

Firm performance, hence, SR, under the resource-based theory is premised on the notion that firm-specific resources that are difficult to copy and employed by the business organization increase its performance. Internal resources are sources of sustainable competitive advantage. Also, the dynamic capabilities theory implies that firms need to seize the opportunities arising from the rapidly evolving business environment and transform their internal resources and capabilities if they are to sustain their competitive advantage (Teece et al., 1997). Therefore, these views lead to the assumption that adopting CI resources improves firm SR during crisis times.

2.2. Empirical review

The implementation of new procedures or a measure of modifying a firm, whether as a response to changes in its internal or external environments or as a pre-emptive action taken to influence an environment (Ma et al., 2021), will be referred to in this paper as "corporate innovation". A large number of empirical studies exist on the relationship between CI and SR. Many of these studies focused on either selected sectors or industries and very few have considered the relationship in the context of the COVID-19 crisis. These prior studies in developed and developing economies have provided, at best, mixed and conflicting results. For example, Telagawathi et al. (2022) found a positive and significant relationship between innovation strategies mediating COVID-19 and the business performance of small and medium-sized enterprises (SMEs) in Thailand. Leung and Sharma (2021) examined the effects of R&D intensity on firms by

employing privately owned firm-level data of firms from the Chinese stock market. The authors found that R&D intensity had a negative effect on revenue growth and net assets per share. Using data from Lithuanian technology-focused firms, Pundziene et al. (2021) reported that innovation has a positive and significant effect on firm performance. In the same vein, Ali (2022) inferred that innovation influenced firms' operating profit margin and return on assets (ROA), and innovative firms had significantly higher chances of survival than less innovative firms. In a study covering firms in Ethiopia for the years 2011 and 2015, Habtewold (2023) found that annual SR and profit are influenced by innovation.

However, using data from 500 Russian SMEs, Osiyevskyy et al. (2020) investigated the link between exploration and exploitation activities and firm revenue growth severity of Russian SMEs under different conditions of a firm-specific crisis of measured severity. The authors found that exploration, on average, lowers the firm's performance but simultaneously increases the performance variability. Further, utilizing the unbalanced panel data gathered from 2097 firms (including 15,298 observations during the period 2008–2017), Dai et al. (2020) investigated the influence of R&D on firm performance. They concluded that R&D enhanced firm productivity more effectively, but significantly decreased firm profit margins. Similarly, in an investigation of the impact of R&D on 27 firms listed on the Pakistan Stock Exchange (PSX) from 2009 to 2016, Yousaf et al. (2019) found that R&D was positively related to ROA, return on equity (ROE), and Tobin's Q (TQ).

Hogeslag (2020) investigated the relationship between green innovation and firm performance employing a panel dataset from a sample consisting of 450 unique firms with a patent on the European Patent Office. The findings revealed that both the number of patents and citations as proxies for green innovation were positively related to ROE. Further, for return on sales and profit margin, the regression reported extremely weak results and almost no significance at all for both proxies of green innovation. Most of the aforementioned literature examines the effect of CI on SR during economically healthy periods. We argue that a firm's ability to not only stay afloat but flourish with "unprecedented" SR surges during the COVID-19 pandemic crisis will be related to the adaptation and use of its internal resources. Based on the literature review, the hypothesis of this paper is proposed as follows:

H1: There is a statistically significant positive relationship between corporate innovation and sales revenue during the COVID-19 pandemic.

3. RESEARCH METHODOLOGY

3.1. Sample

To investigate the relationship between CI and SR we use data covering companies in the world prospering during the COVID-19 pandemic that were listed on the Financial Times's 2020 list of the top 100 companies prospering in the pandemic. The financial data for the dependent, independent, and control variables were collected from the annual report of the top 100 companies prospering in the pandemic over the financial years 2019–2021. We require firms to have the necessary financial data for analysis. We eliminated 26 firms without adequate data to calculate the financial statement variables. We are left with 74 firms and 219 observations firm-year observations.

3.2. Estimation model

The linear model is stated below in line with earlier studies by Ferreira and Coelho (2020), Lee and Manorungrueangrat (2019), and Ali (2022). The baseline model is expressed as:

$$y_i = \alpha + \beta_1 x_{1,i} + \beta_2 x_{2,i} + \ldots + \beta_k x_{k,i} + \varepsilon_i \quad (1)$$

where, y represents the SR of a company i, $x_1, \ldots, x_k$ are explanatory variables and $\beta_1, \ldots, \beta_k$ are the estimated coefficients of the explanatory variables 1 through k, the subscripts α and ε represent the intercept and error term, respectively.

The multiple regression model of SR is of the following form:

$$y_i = \alpha + \beta_1 CI_i + \beta' x'_i + \varepsilon_i \quad (2)$$

3.3. Description of the variables and data sources

The data for this study were collected for the period from 2019 to 2021, during the height of the COVID-19 pandemic. This study drew up its assortment of variables from the resource-based theory and reviewed the literature, to make a comparison with earlier studies meaningful. The variable measures used in previous research have been modified and given short descriptions to make them appropriate for this study (Olalere et al., 2021; Dai et al., 2020; Liu et al., 2022; Zhang et al., 2019; Bobenič-Hintošová et al., 2020). Some variables were averaged, to generate a single quantitative COVID-19 figure. For example, the COVID-19 *SR* figure was calculated by averaging the *SR* of a specific firm for the period 2019 to 2021. Table 1 presents a summary of the variables and their sources.

Table 1. Variables: descriptions and sources

Variables	*Description*	*Source*
Sales revenue (*SR*)	SR value reported in the annual financial statements	Financial statements
Size (*SZ*)	Total asset value	Financial statements
Marketing (*MKT*)	Defined as the marketing, selling, and distribution expenditures of a firm	Financial statements
Age (*AG*)	Current year minus firm's established year	Financial statements
Leverage (*LEV*)	Firms' long-term debt divided by total assets	Financial statements
Corporate innovation (*CI*)	This study used R&D expenditure and R&D intensity (defined as R&D expenses divided by operating profit) to measure CI strategy	Financial statements

Source: Authors' elaboration.

3.4. Estimation technique

The multiple regression analysis with cross-sectional data is appropriate for analyzing multiple units over the same period. It is relevant to the current study, which aims to determine the impact of *CI* on the *SR* of multinational corporations at the same time as the COVID-19 pandemic. The selection of a cross-sectional data regression analysis is based on its appropriateness for analyzing multiple units over the same period and is believed to be able to assist this study in achieving its empirical objective of expressing linear relationships between *CI* and *SR* parameters of the companies in the sample. In light of this study's objectives, therefore, the researcher employed multiple regression analysis with cross-sectional data because data for this study was collected for the period during the COVID-19 period.

3.5. Estimation procedures

All statistical analysis was conducted using the R package. Descriptive statistics were employed to determine the attributes of the variables in terms of their mean, standard deviation, minimum, and maximum values. Pearson correlation was applied to the data to find the relationship between *CI* and *SR*. Equation 2 was regressed using the multiple regression model. The acceptable significance or alpha level for this research was set at 10%, hence a p-value within the range from 0 to 10% is regarded as significant, whilst any value above 10% is regarded as insignificant. Before analyses on relationships between *CI* and *SR*, several graphical tools and residual plots were conducted for the primary assumptions for maintaining the integrity of linear regression models. These include tests such as the residuals of the model for constant variance, uncorrelatedness, and normal distribution, especially when dealing with cross-sectional datasets. The diagnostic plots showed that the residuals are independent, normally distributed, and have a constant variance. The diagnostic plots also confirm the absence of autocorrelation and influential outliers.

4. RESEARCH RESULTS

4.1. Descriptive statistics

Table 2 presents descriptive statistics for all the variables used in this study, as applicable to the sampled companies during the COVID-19 period (2019–2021). Minimum, mean, and maximum statistics are of particular interest. The results indicate that during the COVID-19 period, the sampled companies reported an average *SR* of US $42,169.19 million (ranging from $30.05 million to $535,000.00 million), and an average *MKT* expense of $7,355.77 million (ranging from $4.98 million to $124,000.00 million). These companies had been in operation for 36.27 years on average, with the youngest for a mere 5 years, and the oldest having been in continuous operation for 154 years. Their average investment in *CI* was $4,521.92 million, with the lowest investment being $1.12 million, and the highest investment being $51,865.00 million. The *SZ* of these companies, in terms of total asset value, ranged from $49.93 million to $1,320,000.00 million, with an average of $80,977.36 million. These companies' average *LEV* ratio was 0.54, ranging from 0 to 1.31.

Table 2. Descriptive statistics of variables

Variables	*Obs.*	*Mean*	*Std. dev.*	*Median*	*Min*	*Max*	*Std. error*
SR	74	42,169.19	91047.94	10327.00	30.05	535,000.00	10584.11
SZ	74	80,977.36	196398.84	21799.75	49.93	1,320,000.00	22830.90
MKT	74	7,355.77	17286.24	1245.00	4.98	124,000.00	2009.48
AG	74	36.27	35.27	22	5	154	4.10
LEV	74	0.54	0.26	0.51	0.00	1.31	0.03
CI	74	4,521.92	9850.15	1234.70	1.12	51,865.00	1145.06

Note: SR, SZ, MKT, and CI variables are expressed in million US dollars.
Source: Authors' elaboration.

4.2. Correlation analysis

Table 3 indicates a correlation matrix between dependent variables and independent variables. The coefficients indicate both the strength and direction of the relationship (positive vs negative correlations). A correlation coefficient of one, zero, or negative represents perfect positive, neutral, or negative relationships, respectively. In general, 0.5 is recognized as the point of differentiation between a strong and a weak positive relationship, whereas -0.5 differentiates a strong from a weak negative relationship.

The correlation results indicate that *CI* had a strong and highly significant relation with *SR*. This implies that *CI* increases *SR*, and vice versa. As a result, firms' efforts to invest resources in their innovation efforts and capabilities are likely to have a positive impact on *SR*. Table 3 also indicates that only two relationships are highly correlated: *SR* and *SZ* (0.930), and *MKT* and *CI* (0.800). Nonetheless, to obtain more robust results, a variance inflation factor (VIF) analysis was performed to measure the level of potential multicollinearity that might have been present as part of the regression diagnostics. All the VIF for multicollinearity were below five which concludes that multicollinearity is not significant in this study (the VIF output can be made available upon request).

Table 3. Pearson correlation matrix

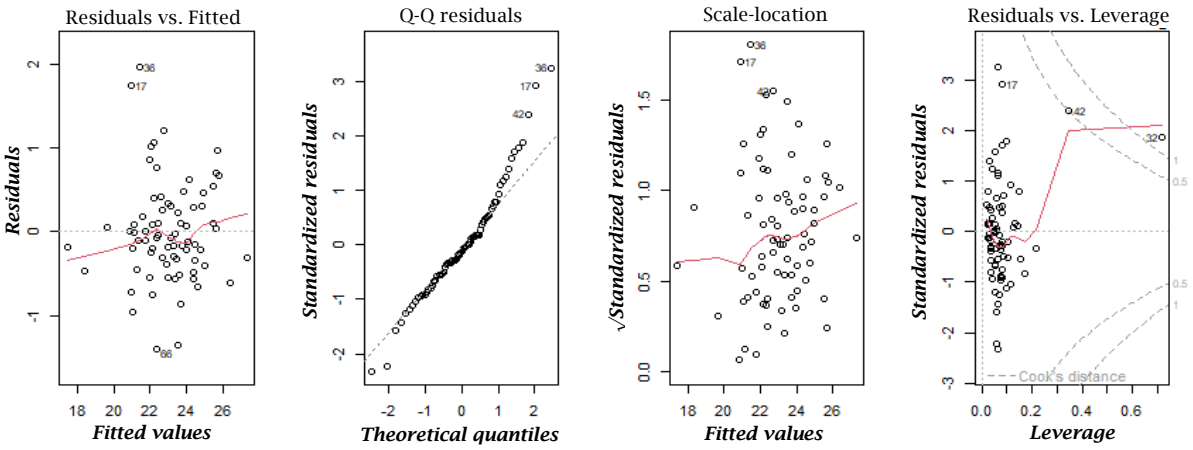
Variables	*SR*	*SZ*	*MKT*	*AG*	*LEV*	*CI*
SR	1.000					
SZ	0.930***	1.000				
MKT	0.750***	0.701***	1.000			
AG	0.020	0.050	-0.201*	1.000		
LEV	-0.070	-0.160	0.250**	-0.130	1.000	
CI	0.651***	0.590***	0.800***	-0.130	0.150	1.000

*Note: ***, **, and * represent significant levels at 1%, 5%, and 10% respectively.*
Source: Authors' elaboration.

4.3. Diagnostic tests

The primary assumptions for maintaining the integrity of linear regression models, especially when dealing with cross-sectional datasets, are that the residuals of the model have constant variance, are uncorrelated, and are normally distributed. These requirements are met as shown by the diagnostics in Table 4 and Figure 1.

Figure 1. Diagnostic plots for corporate innovation on sales revenue specification



Source: Authors' elaboration.

Table 4. Multiple regression results

Variables	*Dependent variable: ln(SRs)*
Intercept	0.887
	1.470
Ln(CI)	0.049
	0.057
Ln(MKT)	0.156**
	0.075
Ln(SZ)	0.761***
	0.068
Ln(AG)	0.165
	0.626
In(AG²)	0.033
	0.092
Ln(LEV)	0.012
	0.093
Adjusted R-squared	0.878
F-statistic	88.17
p-value	< 0.001
Diagnostics test	
Heteroscedasticity	
Studentized Breusch-Pagan (BP) test up to order 5	9.45
p-value	0.15
Autocorrelation	
Breusch-Godfrey (BG) test for serial correlation of order up to 1	1
p-value	0.32

*Note: *** and ** represent significance levels at 1% and 5%, respectively. In parentheses are standard errors. H1 of the BP and BG tests is that the residuals of the model have constant variance (homoscedasticity) and don't show autocorrelation. So, a p-value > 0.005 indicates that H1 of homoscedasticity and no autocorrelation cannot be rejected.*
Source: Authors' elaboration.

The Q-Q plots show that the normality assumption is valid because the residuals follow the straight dashed line, with no significant deviations. The extreme residuals are only points 17, 36, and 42 across all specifications. The scale-location plot illustrates that the assumption of equal variance (homoscedasticity) was not violated across all specifications because the residuals are randomly distributed along the red line, which is roughly horizontal, as required. The last plot identifies influential outliers. Outlier values can be found in the upper or lower right corner. Not all outliers have an impact on the regression. However, there shouldn't be many outliers with high "Cook's distance" scores (outside the dashed lines). The respective plots show only two outliers (points 42 and 32) outside the dashed lines, indicating that the results in Table 3 were not affected by outliers.

Table 4 presents the main results of this study. The results are after correcting for heteroscedasticity with the squared term of firm *AG* (AG^2). The variables of interest enter the *SR* model as expected based on the results in Table 3. The result indicates that the estimated coefficient of the *CI* variable is positive, albeit statistically insignificant. This result does not support the hypothesis proposing that there is a statistically significant positive relationship between *CI* and *SR* during the COVID-19 pandemic.

The results also show the estimated coefficient of *MKT* and SZ are positive and statistically significant across, implying that listed firms could

enhance their *SRs* during the COVID-19 era by increasing their *MKT* expenditure and *SZ* (total assets). Moreover, the estimated coefficient of *AG* is positive but statistically insignificant. This indicates that the listed firms' *AGs* had no significant effect on their *SR* during the COVID-19 period. The estimation coefficient of the *LEV* variable is negative and insignificant.

5. DISCUSSION OF FINDINGS

This study's objective was to determine whether there was an association between CI and SR during the COVID-19 crisis. The correlation coefficient indicates that CI had a strong and highly significant relation with SR. This implies that CI increases SR, and vice versa. As a result, firms' efforts to invest resources in their innovation efforts and capabilities are likely to have a positive impact on SR. The cross-regression analysis is thus carried out to prove the likelihood that CI positively impacted SR during the COVID-19 pandemic.

These findings are consistent with previous studies, which found that investing in CI activities allows firms to avoid imitation by competitors and to earn above-average profits to weather crises (Yousaf et al., 2019; Chen et al., 2019; Dimitropoulos, 2020; Cuevas-Vargas et al., 2022). Matekenya and Moyo (2022) and Yulianto (2021) have found that innovation is the vital driver of superior performance during environmental and economic turbulence. Although there is a significant positive correlation between SR and CI, Vithessonthi and Racela (2016) have argued that revenue benefits from R&D investments are realized in the longer term. In a similar vein, Table 4 shows that CI had a positive, albeit insignificant, impact on SR during COVID-19. This implies that investments in CI are important, but not in the short term, and must therefore be viewed as long-term investments. Teece et al. (1997) theorized that CI during times of crisis is a means of increasing firms' competitive advantage and SR. The insignificant results of this present study indicate that R&D activities may have been halted during the COVID-19 period, in part to reduce virus spread. As a result, there was either no or little investment in R&D during this period. Rather, it was a period during which firms benefited from their earlier investments in CI.

This finding lends support to the theory of Teece et al. (1997), which states that firms gain a competitive advantage and superior SR by being able to maneuver their investment in CI during times of crisis. However, Vithessonthi and Racela (2016) found that the revenue benefits of investment in R&D are realized in the long term. This implies that investments in CI have no immediate impact on sales. Empirically, this current finding supports the European study conducted by Mahmutaj and Krasniqi (2020), who found a non-significant relationship between CI and sales growth. The findings contradict the results of Rađenović et al. (2023) who studied 24 companies from the list of top 50 R&D spenders worldwide. They found that innovation had a positive and statistically significant impact on those companies' short-term profitability, and studies by.

In this study, CI is defined as investment in R&D, which may explain the insignificant results. This is because R&D expenses are recorded as operating expenses in the financial statement, and some managers may have been hesitant to invest or increase their investment in R&D during the COVID-19 crisis. Giebel and Kraft (2024) discovered support for the idea that firms reduce their investments in R&D in times of crisis because they are likely to face challenges accessing external finance. Furthermore, Hilliard and Zhang (2023) argue that firms that had been facing internal liquidity problems as a result of the COVID-19 crisis would have kept their cash and continued with their normal operations to survive, rather than investing in (speculative) innovation.

In general, empirical studies have not yielded a consensus on the effect of R&D spending on SR. As a result, it is too early to revisit the resource-based and dynamic capabilities theories, as more empirical evidence is required to test whether a lag effect is present that impact sales during a crisis.

6. CONCLUSION

The purpose of this study was to assess the relationship between CI and SR of multinational companies during the COVID-19 pandemic. The results show the positive, albeit the statistically insignificant, impact of CI on SR during the COVID-19 pandemic. The CI variable produced a p-value of above 10%, which was the alpha level set for this study. Based on these findings, it is concluded that SRs can be boosted by investment in innovation. Furthermore, the results of this research demonstrated that marketing expenses and firm size are significant predictors of SR. The study's findings may assist practitioners in understanding the role of CI as a useful/essential resource for sustained competitive advantage. Also, firms that were not able to prosper during the COVID-19 crisis may include the investment in CI in their crisis management plan, and thus maximize firm success in the face of the next set of different/challenging environmental conditions. Additionally, the results of this study should encourage governments to increase tax deductions for innovation, as the benefits of firm innovation as a way of solving societal problems outweigh the drawbacks/cost of tax reductions for firms. The findings from this study could be used as a case study for universities. Since this study focused only on the global companies ranked by the Financial Times as prospering during the COVID-19 crisis, it could be valuable to conduct comparative studies of various individual countries on the effect of CI on revenues during the same crisis period.

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