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The Impact of the COVID-19 Pandemic on Cross-Border Mergers and Acquisitions' Determinants: New Empirical Evidence from Quasi-Poisson and Negative Binomial Regression Models

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Abstract: The cross-border movement of capital has suffered due to the COVID-19 pandemic since December 2019. Nevertheless, it is unrealistic for multinational companies to withdraw giant global value chains (GVCs) overnight because of the pandemic. Instead, active discussions and achievements of deals in cross-border mergers and acquisitions (M&As) are expected in the post-COVID-19 era among various other market entry modes, considering the growing demand in high technologies in societies. This paper analyzes particular determinants of cross-border mergers and acquisitions (M&As) during the pandemic year (2020) based on cross-sectional datasets by employing quasi-Poisson and negative binomial regression models. According to the empirical evidence, COVID-19 indices do not hamper M&A deals in general. This indicates that managerial capabilities of the coronavirus, not the outbreak itself, determined locational decisions of M&A deals during the pandemic. In this vein, it is expected that the vaccination rate will become a key factor of locational decision for M&A deals in the near future. Furthermore, countries that have been outstanding in coping with COVID-19 and thus serve as a good example for other nations may seize more opportunities to take a leap forward. In addition, as hypothesized, the results present positive and significant associations with M&A deals and the SDG index, confirming the resource-based theory of internationalization. In particular, the achievement of SDGs seems to exercise much influence in developing countries for M&A bidders during the pandemic year. This indicates that the pandemic demands a new zeitgeist that pursues growth while resolving existing but disregarded environmental issues and cherishes humanitarian values, for all countries, non-exceptionally, standing at the start line of the post-COVID-19 era.

Keywords: entry mode; mergers and acquisitions (M&As); sustainable development goal (SDG) index; COVID-19; generalized linear model (GLM)

1. Introduction

The COVID-19 pandemic has been sweeping the world (since December 2019), and the world economy has survived an impressive recession; in 2020, the world (nominal) GDP fell by 3.3% (IMF 2021). In particular, as multiple countries closed or tightly controlled their territorial borders to hamper the spread of the coronavirus, the cross-border movement of capital also suffered, and as a result, in 2020, FDI volume decreased by 42% (UNCTAD 2021).

International companies have been significantly affected by uncertainties caused by the health pandemic by reducing their foreign direct investment (FDI) activities (Ho and Gan 2021). Nevertheless, most countries have already been long convinced that internationalization is not a choice but a fate to accept to surmount insufficient domestic markets (in terms of production factors and business opportunities) (Moon et al. 1995, 1998), and it is hardly expected for multinational companies to withdraw giant global value

chains (GVCs) overnight due to the pandemic. In addition, for developing economies, foreign capital inflows have played a critical role in their economic growth (Ioan et al. 2020). In this sense, in the long-term perspective, the public and private sectors would best prepare for a post-COVID-19 era by developing new technologies and adopting the spirit of the new times to restore the international capital movement to that of a pre-pandemic era.

In particular, we expect active discussions and achievements of deals in cross-border mergers and acquisitions (M&As) in the post-COVID-19 era among various other market entry modes, considering the growing demand in high technologies in societies. In practice, COVID-19 accelerates the dawn of a non-contact era, which will require standard digital infrastructure. Most things have happened in a remote mode, as some countries utilize smart phone applications for efficient quarantines (for instance, South Korea's surveillance application of live tracking of a subject person in self-isolation). Multiple studies reveal that digital technology played a critical role in surveilling and controlling the COVID-19 disease (Kumar et al. 2020; Ting et al. 2020; Whitelaw et al. 2020; He et al. 2021) and will be necessary in the post-COVID-19 era (Strusani and Hounghonon 2020; Xie et al. 2020).

Furthermore, the contagious disease reminds societies of the importance of resolving existing environmental issues, as the pandemic enlightens people on how health problems can destroy and paralyze economic systems. This leads to the demand for new green technologies (Agrawala et al. 2020; Chiappinelli et al. 2021; Mohideen et al. 2021), which highly require the transfer of technology from developed to developing countries. In this sense, we expect that in the post-COVID-19 era, M&A deals will be actively accomplished in target countries that are highly developed in the innovation index, particularly in green technologies (which is in line with the zeitgeist of the post-COVID-19 era and requires nature and society to coexist as a whole).

The main theoretical contribution of this paper is to extend a resource-based view of firms' internationalization (particularly in terms of cross-border M&As) in the year 2020 as reflecting the necessary zeitgeist of the post-pandemic era. Over the last decades, M&As have been explored in diverse themes (for instance, their impact on stock returns, abnormal returns, etc., synergies, value chain creation, performance outcomes, etc.) (Hutzschenreuter et al. 2012; Nguyen et al. 2021). However, this study focuses on determinants of M&As (Rossi and Volpin 2004; Wang 2008; Nguyen et al. 2021, etc.) based on the assumption that M&As are a factor for sustainable economic growth by attracting foreign capital in target countries and the impact of COVID-19 on its determinants. To do this, our regression models include the SDG index and COVID-19 indices as key explanatory variables. The results of this paper can be used to establish guidelines for proper innovation for countries in the post-pandemic era to become an attractive destination of M&A deals without sacrificing the environment and humanitarian values for economic growth.

The remainder of this paper is structured as follows. Section 2 is a literature review on the theoretical frames of firms' internationalization and COVID-19's impacts on the main motivation of business and social activities. Section 3 presents econometric models and methodologies. Section 4 analyzes the results of quasi-Poisson and negative binomial regression models. Section 5 discusses conclusions and policy implications based on the results of the regression analyses.

2. Literature Review

There have been multiple attempts to empirically investigate the motivating factors of M&As by employing one firm's internationalization theoretical frames: an industry-based view, institution-based view and resource-based view. Some recent studies articulate motivations of M&As based on the industry-based view, which explains cross-border M&As mainly as an action to increase efficiencies amid severe market competition. For instance, according to research performed by Yu (2020), who explores the motivations and performances of vertical M&As, cost reduction and income from the initial investment (which offsets new costs) are verified as a main driving force of vertical M&As. In a study by Soni et al. (2019) on domestic and cross-border M&A motivations of Indian IT

companies from 2000 to 2015, market-seeking and efficiency-seeking are confirmed as a main driving force of M&As, but the latter motivation has gained strength after the global financial crisis (2008). [Erel et al. \(2012\)](#) investigates 56,978 cases of cross-border mergers outside of the United States, and there, we find an industry-based view. The results show that the appreciation of a currency (which is pointed out as a major factor) is associated with the decision to become a buyer company of cross-border mergers.

Other papers look for evidence of M&As by employing the institution-based view, describing cross-border M&As as a means to overcome institutional constraints at a home country. [Deng \(2009\)](#) asserts that Chinese firms go abroad to obtain strategic assets of international companies, but the reason behind these resource-driven M&As is rooted in institutional constraints of the home country. A study by [Pablo \(2009\)](#) on cross-border M&As in Latin America confirms that regardless of target or bidder countries, macro-economic and business environments are determining factors in M&A deals. The significance of institutional quality of target countries is further addressed in the following studies on international capital movements ([Hyun and Kim 2010](#); [Rjoub et al. 2017](#); [Dowling and Vanwalleggem 2018](#)).

However, compared to greenfield investments or joint ventures (JVs), multiple studies, in particular, assume the resource-based view to explain M&As by considering it an act of strategic asset-seeking. To catch up with technologies as a late-mover, a large number of multinational companies of developing countries complete M&As with companies in developed countries ([Liang et al. 2021](#)) as a rapid and efficient way to gain international market competitiveness ([Li 2011](#)). [Sun et al. \(2012\)](#) further stress the necessity of more than one M&A deal for companies of emerging countries because absorbing and developing high skills are outcomes from a continuous learning process rather than an overnight achievement. Additionally, a study by [Pradhan \(2010\)](#) points out that Indian pharmaceutical firms' cross-border acquisition seeks both market expansion and strategic assets. A recent study by [Hu et al. \(2020\)](#) suggests an interesting conclusion from observations of Chinese manufacturing firms' M&As for the period of 2009 to 2015; cross-border M&As have negative impacts on buyers' rival companies, particularly in high-tech industries.

In this sense, considering all three theoretical view-points of M&As we addressed above and the fact that that M&A deals are still mainly made in developed countries (around 80% of the total M&A deals in terms of M&A value in 2020) ([World Investment Report 2021a](#)), which includes both flows between developed countries and from developing to developed countries, our study assumes that strategic asset-seeking is a main driving factor in determining M&A locations. Then, we can raise a question related to an existing pivotal motivation of M&As and the impacts of the COVID-19 pandemic on it.

The COVID-19 pandemic has awakened people to the necessity of innovation in environmental and social systems, especially those centered on developed countries. People have realized how environmental pollution make a society vulnerable to contagious diseases and disrupt our normal daily lives. Conversely, people witness how much air pollution emissions have decreased during lockdowns throughout the world. In this vein, recent studies investigate relationships of environmental parameters with COVID-19 (or impacts of COVID-19 on environmental parameters) and their further linkage to a path of innovation, where our lifestyle and future as a whole should strive to move forward (for instance, [Barcelo 2020](#); [Bashir et al. 2020](#); [Megahed and Ghoneim 2020](#); [Facciola et al. 2021](#)).

To reflect on these circumstances and notions, the authors suggest that asset-seeking of M&As during and after the pandemic era should not simply be measured as a level of innovation (e.g., R&D expenditure ratio, the number of patents, etc.) but according to SDGs-related technologies, such as improving humanitarian values and resolving environmental problems. The importance of SDGs-oriented innovation, which focuses on humans and the environment, has been underlined by several studies (i.e., [Uang and Liu 2013](#); [Calabrese et al. 2018](#); [Soares et al. 2020](#); [Walsh et al. 2020](#)). The COVID-19 pandemic expedites the association between the environment and the economy ([Srivastava et al. 2020](#)), which legitimates environmental-friendly and sustainable development as a new growth path

(Bhattacharya and Stern 2020) and promotes awareness and the appreciation of nature, something we used to take for granted) (Rousseau and Deschacht 2020).

This paper assesses innovation (to measure the asset-seeking nature of M&A motives) in relation to the SDG index as reflecting the growing significance of sustainability-oriented innovation. In addition, we include variables related to COVID-19 to observe the impacts of the pandemic on locational decisions of M&A deals. It should further be considered that black swan events in the world economy have affected developed and developing countries in a different way. In a study by Reddy et al. (2014), which explores the impact of the 2007–2008 global financial crisis on cross-border M&As, it is revealed that developing countries obtained opportunities to acquire companies in developed countries with advantageous asset prices in the post-crisis periods. Similarly, Rao-Nicholson and Salaber (2016) reviewed the impact of the 2007–2008 global financial crisis on cross-border M&As, particularly in banking sectors, and asserted that developing countries' banks became the main purchasers during the post-crisis periods. In this regard, our study further compares the impacts of the COVID-19 pandemic in developed and developing countries.

3. Descriptive Data and Model Specifications

M&A datasets are selected in terms of M&A target (seller) countries. As presented in Table 1, M&A_number is a count variable and is therefore not normally distributed, indicating that it is not appropriate to apply ordinary least squares (OLS) regression. Conversely, UNCTAD statistics calculate the number of M&A deals by employing a net basis methodology. This implies that as divestments (sales of foreign affiliates to domestic firms) are subtracted, some countries' number of M&A deals are shown as negative values. In this sense, 145 countries with M&A deals ≥ 0 are made up of cross-section datasets (for the year 2020) to apply generalized linear model (GLM) regression analyses for a count variable. The list of countries and data sources are provided in Tables A1 and A2, respectively. Based on the previous literature, we draw that M&As are mainly associated with market-seeking, efficiency seeking and asset-seeking in a broad aspect as one method of foreign direct investment while considering asset-seeking as the main motivation. Unlike previous studies, which simply measured innovation capacity based on either the R&D expenditure ratio or patent indices, this study assesses innovation in relation to the SDG index, which is a comprehensive parameter, to estimate asset-seeking motivations as reflecting a desirable path of innovation in the post-COVID-19 era. We further assumed that COVID-19 indices significantly affect M&A activities and decisions of multinational companies during the pandemic year. In this vein, we set COVID-19 and SDG indices as key independent variables.

In terms of methodology, Poisson regression is pre-tested. However, over-dispersion is observed, which contradicts the basic assumption of Poisson regression analysis—the mean and variance should be equal. To deal with the over-dispersion issue, quasi-Poisson and negative binomial regression analyses, which are estimators of GLM to allow over-dispersion (Ver Hoef and Boveng 2007; Lindén and Mäntyniemi 2011; Naji et al. 2020), are employed to fit our models. The regression analyses were performed with R software (version 4.1.0) and “GLM2” and “MASS” packages were utilized. The equations of our regression models are as follows:

$$M\&A_{number\ i} = \exp(\beta_0 + \beta_1 \ln(Corona_{case})_i + \beta_2 \ln(SDG)_i + \beta_3 \ln(CPI)_i + \beta_4 \ln(Per_{capita})_i + \varepsilon_i) \quad (1)$$

$$M\&A_{number\ i} = \exp(\beta_0 + \beta_1 Corona_{death\ i} + \beta_2 \ln(SDG)_i + \beta_3 \ln(CPI)_i + \beta_4 \ln(Per_{capita})_i + \varepsilon_i) \quad (2)$$

where $M\&A_{number\ i}$ denotes the number of M&A deals of country i . Various parameters in regression models were used to estimate the impact of the coronavirus, but confirmed cases were for the most part determined by previous research (Cyrus et al. 2020; Pavlyshenko 2020; Liu et al. 2020; Abbas et al. 2021; Yan and Zhu 2021). In this sense, $\ln(Corona_{case})_i$ —a natural logarithm of total COVID-19 cases (per million people) of a country i is used as a proxy to the impact of COVID-19. However, for a more robust estimation, we approach COVID-19 with an additional and different proxy and clarify the consistency of

results. Here, $Corona_{death_i}$ (total COVID-19 deaths/total COVID-19 cases) is used as another COVID-19 variable. $Ln(SDG)_i$ denotes a natural logarithm of the SDG index (score 0–100) of country i .

Table 1. Variables and descriptive data (for the year 2020) analysis.

Variable Name	Mean	S.D	Minimum	Maximum	Skewness	Kurtosis	N
Dependent variable							
M&A_number	42.03448	136.8423	0.000000	1085.000	5.690170	37.88590	145
COVID-19 variables (key)							
Ln(Corona_case)	8.540317	2.184558	1.180499	11.24921	−0.969944	3.392527	145
Corona_death	0.022593	0.026950	0.000000	0.290615	7.111488	69.13461	145
Asset-seeking variable (key)							
Ln(SDG)	4.205416	0.149954	3.778508	4.439400	−0.700598	2.544913	145
Efficiency-seeking variable (control)							
Ln(CPI)	5.077244	0.548704	4.593321	8.171515	2.921059	14.13648	145
Market-seeking variable (control)							
Ln(Per_capita)	8.734716	1.420445	6.120603	11.67026	0.024867	2.081489	145

Source: composed by authors.

Moreover, $Ln(CPI)_i$ (a natural logarithm of Consumer Price Index (CPI) of country i) and $Ln(Per_{capita})_i$ (a natural logarithm of GDP per capita (dollars at current prices) of country i) are included as control variables to capture efficiency-seeking and market-seeking motivations, respectively, considering that cost reductions and market expansion amid competition also affect firms' locational decisions on M&As (Yang et al. 2009). Our research hypotheses are as follows:

Hypothesis 0 (H0). $Ln(Corona_case)$ is negatively associated with $M\&A_number$.

Hypothesis 1 (H1). $Corona_death$ is negatively associated with $M\&A_number$.

Hypothesis 2 (H2). $Ln(SDG)$ is positively associated with $M\&A_number$.

Hypothesis 3 (H3). $Ln(CPI)$ is negatively associated with $M\&A_number$.

Hypothesis 4 (H4). $Ln(Per_capita)$ is positively associated with $M\&A_number$.

Before running quasi-Poisson and negative binomial regression analyses, we conducted Pearson's correlation tests for dependent and independent variables. As described in Table 2, $Ln(Corona_case)$ is positively correlated with $M\&A_number$ at the 5% significance level. $Ln(SDG)$ shows a positive correlation with $M\&A_number$ at the 1% significance level. $Ln(Corona_case)$ shows positive co-movement with $Ln(SDG)$ at the 1% significance level, while $Corona_death$ presents a negative correlation with $Ln(SDG)$ at the 10% significance level. In addition, we conducted variance inflation factor (VIF) tests to capture potential multicollinearity issues in the linear function. As described in Table 3, our explanatory variables' VIF are all below 5, which indicate no concern of multicollinearity.

Table 2. Coefficients of Pearson's correlation tests.

	M&A_Number	Ln(Corona_Case)	Corona_Death	Ln(SDG)
M&A_number	1.000000	—	—	—
Ln(Corona_case)	0.193397 (0.0198) **	1.000000	—	—
Corona_death	0.002935 0.9720	−0.143106 (0.0860) *	1.000000	—
Ln(SDG)	0.291042 (0.0004) ***	0.626793 (0.0000) ***	−0.153034 (0.0661) *	1.000000

Note: *p* values in parentheses * *p* < 0.1, ** *p* < 0.05, and *** *p* < 0.01. Source: composed by authors.

Table 3. Variance inflation factor (VIF) tests.

	All Countries		Developed Countries		Developing Countries	
Ln(Corona_case)	1.692732	-	1.020802	-	1.485333	-
Corona_death	-	1.067852	-	1.148092	-	1.071136
Ln(SDG)	3.341304	2.987665	1.123278	1.131519	2.226291	2.001954
Ln(CPI)	1.182253	1.224407	1.013034	1.032143	1.051730	1.095998
Ln(Capita)	3.061884	2.988518	1.156723	1.243078	2.060471	1.992372

Source: composed by authors.

4. GLM (Generalized Linear Model) Estimation Results and Discussion

Table 4 describes the results of quasi-Poisson and negative binomial regression analyses for all countries. Contrary to the hypothesis, the coefficient of Ln(Corona_case) is positive but insignificant regardless of GLM estimators. This implies that the number of COVID-19 cases is not a determining factor of M&A deals of target countries. Furthermore, the results of Corona_death are not robust. The results present a positive coefficient in the quasi-Poisson regression model [2] at the 1% significance level (rejection of H1), but its significance disappears in negative binomial model [4].

Table 4. Results of GLM (generalized linear model) analysis for all economies.

Estimator	Quasi-Poisson		Negative Binomial		
	Model	[1]	[2]	[3]	[4]
Constant		−26.9462 ** (11.7524)	−28.5382 ** (13.5219)	−25.4214 *** (6.7998)	−25.1714 *** (6.5112)
COVID-19 impacts					
Ln(Corona_case)		0.0453 (0.1207)	- -	0.0205 (0.0837)	- -
Corona_death		- -	20.0127 *** (6.8708)	- -	1.9449 (5.7073)
Asset-seeking					
Ln(SDG)		4.8366 * (2.6816)	5.0382 * (2.9821)	5.1044 *** (1.7806)	5.0655 *** (1.6884)
Efficiency-seeking					
Ln(CPI)		0.0617 (0.6268)	−0.0796 (0.7357)	0.0063 (0.2915)	−0.0101 (0.2949)
Market-seeking					
Ln(Per_capita)		0.9384 *** (0.2362)	1.0769 *** (0.2601)	0.7152 *** (0.1744)	0.7299 *** (0.1723)
Observations		145	145	145	145

Note: standard errors in parentheses, * *p* < 0.1, ** *p* < 0.05, and *** *p* < 0.01. Source: composed by authors.

The coefficient of Ln(SDG) is positive and significant throughout the models [1]–[4] regardless of GLM estimators. This confirms strong asset-seeking motivations of M&A

deals during the pandemic year for the sustainable development of target countries, which supports the resource-based-view hypothesis (support of H2).

In terms of control variables, the coefficient sign of Ln(CPI) is not consistent depending on GLM estimators without statistical significance. However, Ln(Per_capita) presents a consistent positive coefficient throughout models [1]–[4] at the 1% significance level (support of H4). This indicates that during the pandemic year 2020, efficiency-seeking was not a main motivation for M&A deals while international companies were highly driven by market-seeking purposes.

These results lead us to the question of whether the same results would be repeated in models dividing economic groups or if each economic group would show a distinguishable impact of COVID-19 factors and other M&A bidders' motivations (which are confirmed to be asset-seeking and market-seeking in models for all countries).

In this sense, as shown in Table 5, we further conducted a regression analysis by dividing observations into developed and developing economies.

Table 5. Results of GLM (generalized linear model) analysis for developed versus developing economies.

Estimator	Developed				Developing			
	Quasi-Poisson		Negative Binomial		Quasi-Poisson		Negative Binomial	
Model	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Constant	−31.7347 (38.9896)	−63.3726 (37.7889)	−38.0033 (26.9740)	−42.0723 * (23.3921)	−23.7247 * (12.4020)	−22.1358 * (12.3961)	−27.2049 *** (7.8886)	−27.6833 *** (7.5618)
COVID-19 impacts								
Ln(Corona_case)	0.1336 (0.2403)	-	0.1304 (0.1643)	-	−0.1117 (0.1046)	-	0.0103 (0.1012)	
Corona_death	-	84.6211 *** (26.6780)	-	89.8634 *** (19.0938)	-	6.8596 (8.3078)		−1.9845 (6.8866)
Asset-seeking								
Ln(SDG)	0.8125 (6.8623)	4.1285 (6.1952)	−0.5542 (5.4884)	1.3399 (4.6878)	5.6421 * (3.0491)	5.1160 * (3.0117)	6.3668 *** (2.0777)	6.4921 *** (1.9801)
Efficiency-seeking								
Ln(CPI)	4.4970 (3.9317)	6.8074 * (3.7680)	4.8754 * (2.9159)	3.3847 (2.5061)	−0.1151 (0.5146)	−0.1998 (0.5105)	0.0054 (0.3298)	0.0243 (0.3360)
Market-seeking								
Ln(Per_capita)	0.9839 ** (0.4525)	1.5276 *** (0.4813)	1.9691 *** (0.3323)	2.1855 *** (0.2935)	0.4242 (0.2866)	0.4194 (0.2879)	0.2856 (0.2381)	0.2843 (0.2343)
Observations	37	37	37	37	108	108	108	108

Note: standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$. Source: composed by authors.

The coefficient of Ln(Corona_case) is consistently insignificant in developed and developing countries regardless of GLM estimators. This means that the outbreak of the coronavirus itself does not hamper a country's selection as a target country in M&A deals. A lack of negative impacts of Ln(Corona_case) in developed economies displays convincing data that these countries hold strong capacities and systems to handle contagious diseases. Thus, M&A bidders may have high expectations of prompt vaccinations in developed countries, which can lead to the expectation that the pandemic can be relatively easily controlled in developed countries as opposed to developing countries.

There requires further explanation on why Ln(Corona_case) does not hinder of M&A deals in developing countries as well. As revealed in a study by [Hayakawa and Mukunoki \(2021\)](#), the impacts of the COVID-19 can be different even between developing economies depending on various factors, such as a country's position in trade and geographical location. In this sense, the results become acceptable when we look at the main target countries of M&A deals (420 out of 907 M&A deals in developing countries in 2020) amongst developing countries. The developing countries are East Asian (e.g., China, Hong Kong (China), Republic of Korea and Taiwan province of China) and Southeast Asian (e.g., Singapore, Malaysia, Indonesia, Vietnam, etc.) countries, and many of them are developed enough to handle contagious diseases, despite the fact that they are categorized as developing economies, according to UNCTAD.

However, Corona_death shows positive coefficients in developed countries in models [6] and [8] at the 1% significant level (rejection of H2), which is in the same line as model [2] for all countries. This can be explained by the high aging index of major M&A sellers from developed countries. The top 10 M&A seller countries during the pandemic year were the United States, Canada, United Kingdom, Germany, France, Netherlands, Australia, Italy, Spain and Sweden, which contain large populations of people over the age of 65. The average Corona_death of these 10 countries is 0.024496, which surpasses that of all countries (0.022593), even developing countries (0.023776). Conversely, the average GDP per capita of these 10 countries is 44,772 U.S. dollars. Ln(Per_capita) presents positive coefficients at the 1% significance level throughout models [5]–[7] (support of H4). This indicates that market attractiveness was a strong main determinant of M&A deals in developed countries during the pandemic year even when we consider the risks of the coronavirus. As discussed in a study by [Kooli and Son \(2021\)](#), a favorable macro-economic environment encouraged M&A deals during the pandemic. This becomes clear when comparing the data with that for developing countries. The significance of Ln(Corona_death) and Ln(Per_capita) disappear in developing countries. In this sense, the positive association of Ln(Corona_death) with M&A_deals is applicable only to limited high per capita groups of developed countries, not all countries general.

Ln(SDG), however, turns out to be a much more significant determinant in developing countries; its coefficient consistently shows positive signs with statistical significance, while the statistical significance in models composed of developed countries disappears. This can be partially explained by the fact that as SDGs are at the center of policy making in developed countries, a level gap in the SDG index among these countries (which is insignificantly trivial) does not have a huge impact in the selection of a target country for M&A deals. As demonstrated in a study by [Kaya \(2020\)](#), developed countries showed better performances than developing countries in sustainable development during the pandemic. This is also indicative of how a level of achievements in SDG plays a critical role in attracting M&A deals, especially in developing countries. It further shows that fulfilling SDGs is no longer optional but mandatory in the post-pandemic era ([Van Zanten and Tulder 2020](#)).

Meanwhile, efficiency-seeking is not a main motive regardless of economic groups. Ln(CPI) even shows positive coefficients with statistical significance in models [6] and [7] of developed economies to contradict the H3 of efficiency-seeking. The coefficients of Ln(CPI) are inconsistent in terms of a sign and statistical significance in models for developing countries. These results contradict the industry-based view (e.g., [Erel et al. 2012](#); [Soni et al. 2019](#); [Yu 2020](#)) but are understandable considering the extraordinarily high costs in crossing borders during the pandemic (which hindered companies seeking efficiencies from cross-border M&As). In addition, the asset-seeking of M&As seems to have accelerated in relation to sustainable development in the post-pandemic era. In particular, for sustainability, the significance of smart cities, which utilize massive datasets with high technologies, is expected to increase in the post-pandemic era ([Lyons and Lăzăroiu 2020](#); [Scott et al. 2020](#)).

5. Conclusions and Implications

This paper examined the impacts of the COVID-19 pandemic on determinants of cross-border M&As. The results of quasi-Poisson and negative binomial regression analyses (based on cross-sectional data in the year 2020) confirmed that COVID-19 indices (namely total new coronavirus cases) do not hamper M&A deals in general. As the statistics of total coronavirus cases are somehow related to how actively a government tests potentially infected people according to their COVID-19 quarantine guidelines and receiving capabilities, it is likely that the total number of cases itself does not exert influence on M&A deals. The results are consistent in developed and developing countries. This is because the main target countries of M&A deals are developed countries (5225 out of 6201 M&A deals in the world in 2020), and even M&A deals in developing countries (420 out of 907

M&A deals in developing countries in 2020) were mostly made in East Asian (e.g., China, Hong Kong (China), Republic of Korea and Taiwan province of China) and Southeast Asian (e.g., Singapore, Malaysia, Indonesia, Vietnam, etc.) countries, many of which are developed enough to handle contagious diseases, despite the fact that they are categorized as developing economies, according to UNCTAD.

From the authors' point of view, managerial capabilities of the coronavirus, not the outbreak itself, determined locational decisions of M&A deals during the pandemic. In this vein, we expect that the vaccination rate will become a significant determinant in the near future. Furthermore, countries that have been outstanding in coping with COVID-19 and thus serve as a good example for other nations, may seize more opportunities to take a leap forward. However, developed countries may encounter serious stagnation if they fail to successfully control the coronavirus and consequently face social chaos. COVID-19 revealed the negative aspects of societies regardless of the economic wealth of countries. In addition, as proved in previous studies, black swan events (e.g., 2007–2008) may serve as new business opportunities for companies in developing countries (Reddy et al. 2014; Rao-Nicholson and Salaber 2016).

However, the death rate of the coronavirus showed mixed results; the significance of its coefficient is different between quasi-Poisson and negative binomial models. In addition, the death rate of the coronavirus showed positive associations with statistical significance in developed countries while its significance disappeared in developing countries. This is because market attractiveness was too strong of a main determinant of M&A deals in developed countries during the pandemic year, even when taking into consideration the risks of the coronavirus. The positive association of the death rate of the coronavirus with M&A_deals is applicable only to limited high per capita groups of developed countries, not countries in general.

In addition, as presumed, we found strong positive and significant associations with M&A deals and SDG and innovation variables, confirming the resource-based view of internationalization. In particular, the achievement of SDGs seems to exercise much influence for developing countries for M&A bidders in the pandemic year. However, as SDGs are at the center of policy making in developed countries, a level gap in the SDG index among these countries (which is insignificantly trivial) does not have a huge impact in the selection of a target country for M&A deals.

As the pandemic alerts us to sustainable development, which pursues growth while resolving existing but disregarded environmental issues by applying technological innovations, it may become inevitable for developing countries, countries that are late-comers and thus whose government policies have been economic growth-centered, to orient their policies towards environmental and humanitarian values. However, this requires the cooperation and support from developed countries, who may need to stop considering developing countries as countries from which they can exploit ownership advantages (which have been non-environmentally friendly but widely used during the pre-pandemic era). Rather, these countries should voluntarily invest in SDG-related sectors with humanitarian partnerships and avoid investments devastating developing countries' environments and societies with their long-term visions.

In this sense, we highly encourage governments to implement industrial development projects and guidelines related to SDGs such that international firms can more actively strive to develop environment-friendly production and sales methods. However, one of the lessons we have learnt during the pandemic era is the importance of social unity. The control of the coronavirus' spread has been highly dependent on the cooperation of society as a whole to follow quarantine guidelines. Regardless of existing economic groups, all countries stand at the start line of the post-COVID-19 era amid chaos derived from the pandemic. This implies that the world economic order may be critically rearranged depending on how thoroughly we prepare for and respond to a post-COVID-19 era. The COVID-19 pandemic served as an impetus to remind us how environmental issues and contagious diseases can paralyze economies as we look back on the history of mankind.

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Appendix A

Table A1. List of countries.

Developed countries
Australia Austria Belgium Bulgaria Canada Croatia Cyprus Czechia Denmark Estonia Finland France Germany Greece Hungary Iceland Ireland Israel Italy Japan Latvia Lithuania Luxembourg Malta Netherlands New Zealand Norway Poland Portugal Romania Slovakia Slovenia Spain Sweden Switzerland United Kingdom United States
Developing countries
Afghanistan Albania Angola Argentina Armenia Azerbaijan Bahrain Bangladesh Belarus Belize Benin Bolivia Bosnia and Herzegovina Botswana Brazil Brunei Darussalam Burkina Faso Cambodia Cameroon Chad Chile China Colombia Congo Democratic Republic of Costa Rica Côte d'Ivoire Dominican Republic Ecuador Egypt El Salvador Eswatini Ethiopia Fiji Gambia Georgia Ghana Guatemala Guinea Guyana Haiti Honduras India Indonesia Iran, Islamic Republic of Iraq Jamaica Jordan Kazakhstan Kenya Korea, Republic of Kuwait Kyrgyzstan Lao People's Democratic Republic Lebanon Liberia Madagascar Malawi Malaysia Maldives Mali Mauritius Mexico Moldova, Republic of Mongolia Montenegro Morocco Mozambique Myanmar Namibia Nepal Nicaragua Niger Nigeria North Macedonia Pakistan Panama Papua New Guinea Paraguay Peru Philippines Qatar Russian Federation Rwanda Saudi Arabia Senegal Serbia Sierra Leone Singapore South Africa Sri Lanka Sudan Suriname Thailand Togo Trinidad and Tobago Tunisia Turkey Uganda Ukraine United Arab Emirates Uruguay Uzbekistan Vanuatu Viet Nam Yemen Zambia Zimbabwe

Note: The categorization follows the World Investment Report, 2021b. Source: Composed by authors.

Table A2. Data descriptions and data sources.

Variable Name	Description	Data Source
M&A_number	Number of M&A deals	(World Investment Report 2021b)
Ln(Corona_case)	A natural logarithm of total COVID-19 cases (per million people)	(Our World in Data 2021)
Corona_death	Total COVID-19 deaths/Total COVID-19 cases (rate)	(Our World in Data 2021)
Ln(SDG)	A natural logarithm of SDG index (score 0–100)	(Sustainable Development Report 2020)
Ln(CPI)	A natural logarithm of Consumer Price Index (CPI)	(UNCTAD Stat 2021)
Ln(Per_capita)	A natural logarithm of GDP per capita (dollars at current prices)	(UNCTAD Stat 2021)

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