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The effect of COVID-19 on foreign direct investment

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THE EFFECT OF COVID-19 ON FOREIGN DIRECT INVESTMENT

Kazunobu Hayakawa, Hyun-Hoon Lee, and Cyn-Young Park

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Kazunobu Hayakawa, Hyun-Hoon Lee,
and Cyn-Young Park

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ABSTRACT

This study empirically examines how the coronavirus disease (COVID-19) has impacted foreign direct investment (FDI), using the quarterly data on bilateral FDI flows from 173 home to 192 host countries from the first quarter of 2019 to the second quarter of 2021. We measure the severity of COVID-19 damage using three indicators—the number of confirmed cases, the number of deaths, and the stringency index of government policies that restrict people’s activities. We also differentiate FDI flows via two different entry modes—greenfield FDI and cross-border mergers and acquisitions (M&A). We find heterogeneous effects of COVID-19 impacts on FDI by sector and entry mode. The severity of COVID-19 in host countries adversely affected FDI in the manufacturing sector regardless of the entry mode, but the effect of home countries’ COVID-19 situation on FDI was insignificant. On the other hand, in the service sector, the severity of COVID-19 in both host and home countries has significantly negative impact on greenfield FDI, not on cross-border M&A.

Keywords: COVID-19, greenfield FDI, cross-border M&A

JEL codes: F21, F23, I15

I. INTRODUCTION

Coronavirus disease (COVID-19) was first reported in Wuhan, People's Republic of China in December 2019 and spread worldwide. In an attempt to control the spread of the virus, many countries introduced social distancing and lockdown orders and imposed entry bans on foreigners, severely curtailing economic activity. According to the International Monetary Fund (2021), the global economy in 2020 contracted 3.2% and global trade by 8.3%. The pandemic caused a more dramatic fall in foreign direct investment (FDI) in 2020. According to United Nations Conference on Trade and Development (2021), global FDI flows dropped by 35% to \$1 trillion in 2020, from \$1.5 trillion in 2019. Thus, in 2020, global FDI decreased more considerably than global gross domestic product or trade.

FDI is often vulnerable to economic and various other types of shocks. Past studies have noted the negative effects of financial crises (Dornean, Işan, and Oanea 2012; Dornean and Oanea 2015; Poulsen and Hufbauer 2011; Stoddard and Noy 2015) and disasters triggered by natural hazards (Anuchitworawong and Thampanishvong 2015, Escaleras and Register 2011) on FDI. Financial crises lead to liquidity constraints for investors, whereas disasters triggered by natural hazards destroy physical infrastructure such as roads and industrial parks. Compared with these shocks, one of the most distinctive features of the COVID-19 pandemic is the forced adoption of infection prevention measures such as lockdowns and social distancing. These measures raise the costs for pre-investment investigation, searching costs for location and workers, and running costs of FDI. Moreover, the COVID-19 pandemic has yet again illustrated the vulnerability of global trade and value chains to external shocks. When a country in the global value chain suffers a big COVID-19 outbreak leading to shutdowns of its factories, the entire global supply chain can be disrupted. To minimize and diversify the risk of disruptions, many companies have been tempted to reduce their reliance on concentrated production in foreign countries (Lee and Park 2020). A potential shift in the direction and patterns of global supply chain could affect FDI decisions given the complementarity between intermediate goods trade and FDI (Carril-Caccia and Pavlova 2018; Aizenman and Noy 2006; Hanson, Mataloni, and Slaughter 2005; Kumar 1994).

Against this background, this study empirically examines the impact of COVID-19 on bilateral FDI flows.¹ We use quarterly data on bilateral FDI flows from 173 home to 192 host countries from the first quarter (Q1) of 2019 to Q2 2021. We measure the severity of COVID-19 damage using three indicators—the number of confirmed cases, the number of deaths, and the stringency index of government policies that restrict people's activities. We examine the impact of these COVID-19 indicators on greenfield FDI and cross-border mergers and acquisitions (M&A).² FDI flows are measured by number of cases or deals and the US dollar values in the manufacturing and service sectors. To control for unobservable factors, we introduce various types of fixed effects. Thus, our study intends to uncover the heterogeneous effects of COVID-19 on FDI at various dimensions.

There have been few studies on the effects of COVID-19 on FDI. Camino-Mogro and Armijos (2020) examine the effect of lockdown policies on FDI inflows in Ecuador using weekly data. They find

¹ One of the coauthors of this paper has also assessed the impact of COVID-19 on the global value chain (Hayakawa and Mukunoki 2021a), international trade in goods (Hayakawa and Mukunoki 2021b, 2021c), and international trade in services (Ando and Hayakawa 2021).

² Nocke and Yeaple (2007, 2008) and Blonigen et al. (2014) theoretically considered firms' choice between cross-border and greenfield FDI.

a negative impact of COVID-19 on FDI flows, especially from North and South American countries. By employing quarterly data on 43 countries from Q1 2009 to Q3 2020, Fang, Collins, and Yao (2021) find that COVID-19 confirmed cases have had significantly negative effect on total FDI inflows. They also show that the negative impact of COVID-19 on FDI is most severe in North and South America, followed by Europe.

A study most closely related to ours is Fu, Alleyne, and Mu (2021). Using bilateral FDI data from January 2019 to June 2020, they found evidence of the negative impacts of COVID-19 on FDI in host countries. But our study is different from that of Fu, Alleyne, and Mu (2021) in the following aspects. First, as mentioned above, we examine how the impact of COVID-19 differs between two different entry modes of FDI, i.e., greenfield FDI and cross-border M&A. This differentiation is important because greenfield FDI, which requires building new factories and hiring new workers, seems costlier to carry out than M&A FDI when mobility restrictions and infection prevention measures are in place. Second, whereas Fu, Alleyne, and Mu (2021) use the number of confirmed cases and deaths to measure the COVID-19 situation, we also use the government stringency index. Third, whereas Fu, Alleyne, and Mu (2021) use only the US dollar value of FDI, we use not only the US dollar value but also use the number of greenfield projects and M&A deals. This is because the US dollar values of FDI are often not publicly available (as will be explained in Section III). Fourth, we extend the data to June 2021 so that our research can explore a longer period of the COVID-19 pandemic. Fifth, unlike Fu, Alleyne, and Mu (2021), we control fixed effects at a full level based on the dimension of our interest variables to avoid omitted variable bias.

Our findings are summarized as follows. The COVID-19 situation exerts different impacts across sectors and entry modes. In the manufacturing sector, COVID-19 damage in host countries has significant negative impact on both greenfield FDI and cross-border M&A. But home countries' COVID-19 situation does not have significant impact on both types of FDI. This finding is particularly evident when FDI flows are expressed by number of cases or deals. However, in the service sector, COVID-19 damage in both the host and home countries are found to have negative impacts on greenfield FDI, whereas the impact of COVID-19 on cross-border M&A appears to be mostly insignificant. When a quarter-lag is allowed, COVID-19 damage in the home countries is also found to have a negative impact on M&A FDI.

The rest of this paper is organized as follows. The next section presents our conceptual framework on the effects of COVID-19 damage on FDI. Section III provides our empirical framework with a brief overview of the recent global FDI flows. Section IV presents the estimation results. Section V concludes.

II. CONCEPTUAL FRAMEWORK

This section discusses possible channels through which the COVID-19 pandemic impacts FDI flows. The magnitude of FDI depends primarily on the supply capacity of the home country (e.g., the number of potential investors or average productivity), the size of demand in the host country, production costs (e.g., wages) in the host country, and fixed costs for FDI (Helpman, Melitz, and Yeaple 2004; Kleinert and Toubal 2010). The COVID-19 pandemic is deemed to influence these factors and hence FDI flows around the world. We examine the impact of COVID-19 damage on bilateral FDI flows in three dimensions.

The first is the damage caused by COVID-19 to the host country versus the home country. The severity of the host country's damage would likely discourage FDI flows because the host country may be not only the investor's actual business place but also a consumption market. The COVID-19 damage will decrease economic activity, dampening the market demand and making the host country less attractive as an investment destination. The fixed cost of investment (e.g., various search costs of location and workers) will likely be much higher as well in countries where COVID-19 damage is severe. Moreover, various types of uncertainty caused by the COVID-19 pandemic discourage FDI (Azzimonti 2019; Choi, Furceri, and Yoon 2021; Julio and Yook 2016; Chen, Nie, and Ge 2019). In summary, FDI inflows decrease in countries with severe damage from COVID-19.

The severity of COVID-19 in the home country can also have a negative impact by reducing investment capital. Investors may face increased business constraints at home, need to minimize the loss of home business and thus may not afford to invest abroad. This reduces the number of investors. On the other hand, the damage caused by COVID-19 in the home country may induce outward FDI. One channel of this positive effect is the increase in export-platform FDI to less damaged countries. Firms may switch their export base from home to abroad to continue production activities. The other channel is the rise in transport costs. The mobility restriction induced by the COVID-19 pandemic reduces the handling capacity of freight due to the shortage of truck drivers and port laborers, thereby increasing both domestic and international transport costs. Thus, firms may switch from exporting from home to producing abroad and selling domestically in the host country. So-called horizontal FDI may increase due to the increase in transport costs.

The second dimension is manufacturing versus services. To contain the spread of COVID-19, many countries imposed various restrictions on business operations. In general, the work-from-home model is more difficult in manufacturing than in services (Dingel and Neiman 2020). Investors cannot initiate a new business abroad if work-from-home is an infeasible option for their business operations, e.g., production operation in factories. A similar effect may exist in some service sectors (e.g., transportation and warehousing, construction, retail trade, and accommodation and food services).

The third dimension is cross-border M&A versus greenfield FDI. While the former acquires a foreign company's assets, including buildings and workers, the latter requires the investor to set up a new business from scratch. However, once lockdown is implemented, it would be difficult to hire new workers and build new factories. Thus, the damage from COVID-19 may decrease greenfield FDI more greatly than cross-border M&A. On the other hand, the severe damage in the host country may lower the valuation of acquired firms, known as "fire-sale FDI" (Stoddard and Noy 2015), enabling investors to acquire local firms with lower prices. This could increase cross-border M&A in countries severely hit by the COVID-19 pandemic. Another difference is that M&A can typically be implemented much more quickly as it does not entail a time-consuming permitting stage (Stoddard and Noy 2015). Thus, COVID-19 damage may have different effects on the two entry modes of FDI.

III. EMPIRICAL FRAMEWORK

This section outlines our empirical framework for examining the impact of COVID-19 damage on FDI flows. As summarized in the previous section, there can be various effects on FDI, both negative and positive. Thus, the overall impact of COVID-19 damage on FDI flows needs to be analyzed empirically. To empirically investigate the impact, we employ quarterly bilateral FDI data from Q1 2019 to Q2 2021. In our study, there are 173 investing (i.e., home) countries and 192 host countries.

Specifically, we estimate the following equation:

$$FDI_{ijyq} = \exp\{\alpha_1 COVID_{iyq} + \beta_1 COVID_{jyq} + \delta_{ijy} + \delta_{ijq} + \delta_{yq}\} + \epsilon_{ijyq} \quad (1)$$

FDI_{ijyq} refers to FDI flows from country i to j in quarter q year y . FDI flows are either greenfield FDI or cross-border M&A, measured in either in US dollar values or number of deals or cases. We regress FDI flows (the US dollar value of M&A, the number of M&A deals, the US dollar value of greenfield FDI, and the number of greenfield projects) for the manufacturing and service sectors separately.³ $COVID_{iyq}$ and $COVID_{jyq}$ are the extent of the COVID-19 damage in the home and host countries, respectively. δ_{ijy} , δ_{ijq} , and δ_{yq} are various fixed effects, which are explained below. ϵ_{ijyq} is a disturbance term. As our dataset for estimation includes zero-valued FDI in many pairs, we estimate the equation using the Poisson pseudo maximum likelihood (PPML) method proposed by Santos Silva and Tenreyro (2006). The PPML method estimates the equation without taking the log of the dependent variable.⁴

The data on bilateral greenfield FDI are from fDi Markets (Financial Times Ltd.). Relying on various social and news media as well as investment promotion agency sources, fDi Markets tracks companies announcing or opening greenfield FDI in a new physical project or expansion of an existing investment, which creates new jobs and capital investment. The data includes FDI projects that have either been “opened” or “announced” by a company. An announced project is when the company has made their final investment decision and are moving toward project implementation. An opened project is when the project is fully operational. When the information on the US dollar values of greenfield FDI is not publicly available, fDi Markets use “algorithms” to estimate the values.⁵

The data on bilateral M&A are from the Zephyr database. The information is collected by Bureau van Dijk researchers from a large number of sources worldwide. It includes not only completed and announced but also pending and rumors. When the US dollar values of M&A FDI are not publicly available, Zephyr simply indicates that the values are unavailable in their data. Whereas Fu, Alleyne, and Mu (2021) include FDI rumors, announcements, and completions in their study, we restrict our

³ We do not disaggregate the service sector because the number of observations in each subsector is too small. In addition, we do not examine FDI in the primary sector because there are few quarterly observations in our bilateral setting.

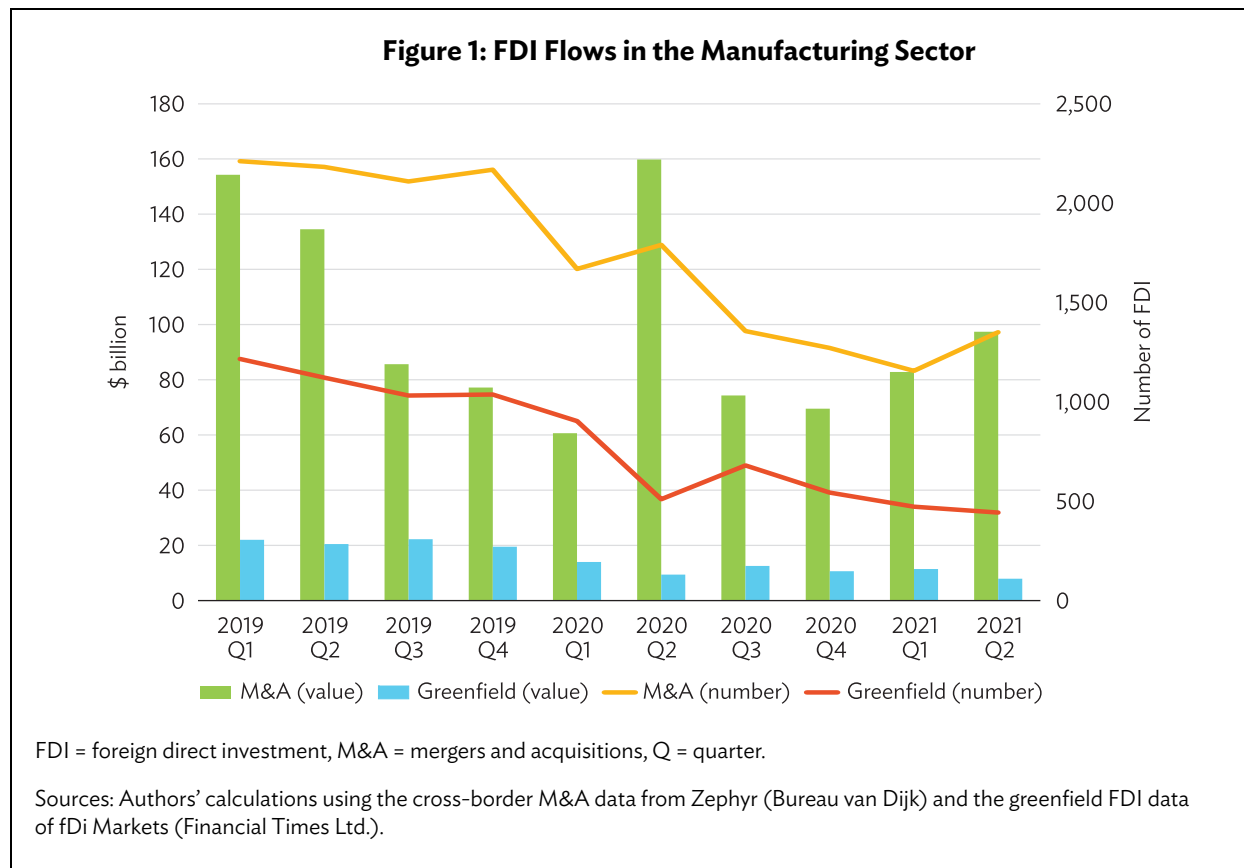
⁴ For various discussions on PPML, see <https://personal.lse.ac.uk/tenreyro/lgw.html>. We use the `ppmlhdfc` Stata command written by Correia, Guimarães, and Zylkin (2020) to deal effectively with many zeros in the dependent variable and with multiple high-dimensional fixed effects.

⁵ For details, see pp. 5–6 of fDi Markets Methodology (fDi Markets).

study to opened greenfield FDI and completed M&A, because rumors and announcements are often not realized.⁶

In our sample, global greenfield FDI (“opened” only) in the manufacturing sector decreased by 44.7%, from \$84 billion in 2019 to \$47 billion in 2020; by project, it decreased by 40.2%, from 4,407 in 2019 to 2,636 in 2020. Moreover, cross-border M&A (completed only) decreased by 19.4% from \$452 billion to \$364 billion and decreased by 29.8% by number of deals, from 8,670 to 6,086. Moreover, global greenfield FDI in the service sector decreased by 30.5%, from \$157 billion in 2019 to \$109 billion in 2020, whereas global M&A FDI in the service sector decreased by 7.2%, from \$766 billion in 2019 to \$711 billion in 2020.

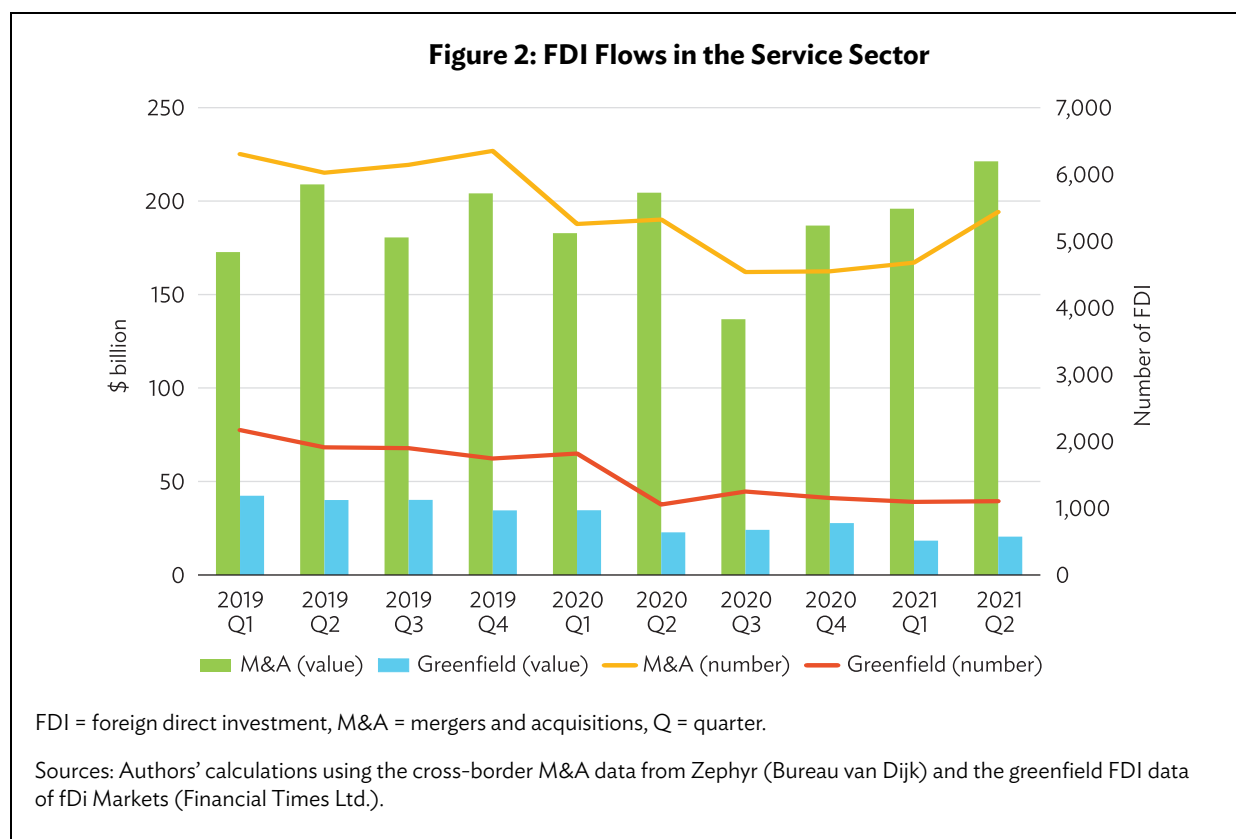
Figure 1 shows the trend of the quarterly flow of global greenfield FDI and cross-border M&A in the manufacturing sector. The figure shows that in Q2 2020, both the US dollar value and the number of greenfield projects drastically decreased, and in the following quarters of 2020 and 2021, greenfield FDI was smaller than the pre-COVID-19 period. In contrast, cross-border M&A in Q2 2020 surged, especially in US dollar value.⁷ In the subsequent quarters of 2020, both M&A value and the number were smaller than those in the same quarters of 2019. In Q1 and Q2 2021, there was a gradual recovery of M&A FDI in both the value and number.



⁶ As a robustness check, we will also assess the impact of COVID-19 on announced greenfield FDI and announced and pending M&A. In the case of M&A, we include “pending” because there are very few “announced” M&A deals, and both “announced” and “pending” refer to the status before completion.

⁷ This surge was partly because one M&A deal from the United States to Ireland had a large value (\$63.5 billion), which accounted for 40% of the total M&A (\$159.9 billion) in that quarter.

Figure 2 shows the trend of the quarterly flow of global greenfield FDI and cross-border M&A in the service sector. Similar to the results of the manufacturing sector in Figure 1, both the value and the number of greenfield FDI projects started to decrease in Q2 2020, whereas the M&A FDI value and number increased in Q2 2020 and decreased only in Q3 2020. Thus, cross-border M&A responded to the pandemic slowly.



As noted, we measure the extent of the damage caused by COVID-19 on three scales. The first and second are the numbers of confirmed cases and deaths by quarter, the data obtained from the COVID-19 Data Repository by the Center for Systems Science and Engineering at Johns Hopkins University. The figures for 2019 are set to zero. We then add a value of one to these numbers and take logs. The third measure is the stringency index, which is calculated by the Oxford Coronavirus Government Response Tracker project. This index is a composite measure of nine response metrics, taking a value between 0 and 100.⁸ A higher score indicates a stricter response. We use the simple average of the daily indices for each quarter.

Both confirmed cases and deaths cause physical harm to people. A higher number of cases and deaths also have a psychologically negative effect on people who are not infected. Because the number of confirmed cases and deaths presents different perceptions of the severity of COVID-19,

⁸ The nine metrics used to calculate the stringency index are school closures, workplace closures, cancellation of public events, restrictions on public gatherings, closures of public transport, stay-at-home requirements, public information campaigns, restrictions on internal movements, and international travel controls. See Hale et al. (2021) for a full description of how this index is calculated.

these two figures may have different effects on FDI. In particular, the effectiveness of lockdown policies depends on the cooperation of citizens. If a large number of cases or deaths are observed, the citizens are likely to abide by strict control measures (Zhang, Luo, and Zhu 2021). The stringency index captures the existence of measures that restrict people's activities and hence directly affect businesses. The numbers of cases and deaths are entered in logs in regressions, whereas the stringency index ranges from 0 to 100, with a higher value indicating stronger stringency.

The fixed effects controls for various elements. δ_{ijy} is country pair-year fixed effects, which control for the annual averages of investors' mass and host countries' demand sizes, as well as the availability of trade or investment agreements. As this type of fixed effect also controls for population size, the effect of the number of cases or deaths is equivalent to the effect of the number per population.⁹ δ_{ijq} is country pair-quarter fixed effects and controls for the seasonality of FDI. δ_{yq} is year-quarter fixed effects, which controls for variations in world income. It also controls for the major type of COVID-19 variants in the world.¹⁰ Furthermore, most countries began to close their borders to foreign travelers from around the latter half of March 2020. Thus, year-quarter fixed effects may also control for the effects of people's cross-border movements worldwide.

One important empirical issue is the timing of investment decisions and investment payment or registration. The general process of FDI is as follows: conducting feasibility studies, making a concrete business plan, applying for the registration of affiliates, paying investment capital, constructing factories, recruiting workers, and initiating business. The process is slightly different between greenfield FDI and cross-border M&A. As explained above, we restrict our study to "opened" greenfield projects and "completed" M&A deals, which are identified around the time of registration. Thus, our equation uncovers how the severity of COVID-19 in a country affects the decision of firms that have already selected a particular country as a host country on whether they finally complete the registration of their affiliates or not. If the COVID-19 damage is severe at the registration stage, investors might delay or even stop their registration.

⁹ The unusual workloads in governments due to the spread of COVID-19 may delay the approval of FDI. If this effect is associated with the capacity or quality of government services, our country pair-year fixed effects may control for it to some extent.

¹⁰ The expert group convened by the World Health Organization has recommended using letters of the Greek Alphabet for specific variants. The Beta variant was first found in South Africa in May 2020, followed by the Alpha variant in the United Kingdom in September 2020. Subsequently, the Delta and Gamma variants were discovered in India in October and in Brazil in November 2020, respectively.

IV. EMPIRICAL RESULTS

This section reports the estimation results. The basic statistics of our variables are presented in Table 1. For all estimates, we cluster standard errors by country pair.

Table 1: Basic Statistics

	Obs.	Mean	Std. Dev.	Min.	Max.
Manufacturing sector					
Greenfield FDI: Value (\$ billion)	3,808	31	87.7	0	1,967
Greenfield FDI: Number	3,808	2	2.5		39
M&A FDI: Value (\$ billion)	3,002	295	1,914	0	63,682
M&A FDI: Number	4,218	4	13.6		286
Host cases	4,218	6.1	5.9	0	16.7
Home cases	4,218	5.7	5.8	0	16.7
Host death	4,216	3.8	4.2	0	12.4
Home death	4,216	3.5	4.1	0	12.4
Host stringency	3,794	33.3	31.7	0	92.6
Home stringency	3,794	31.9	30.6	0	89.8
Service sector					
Greenfield FDI: Value (\$ billion)	6,022	42	102.4	0	1,629
Greenfield FDI: Number	6,022	2	4.2	0	95
M&A FDI: Value (\$ billion)	6,114	280	1,210	0	33,768
M&A FDI: Number	9,112	6	22.9	0	529
Host cases	9,112	5.9	5.7	0	16.7
Home cases	9,112	5.7	5.8	0	16.7
Host death	9,088	3.6	4.1	0	12.4
Home death	9,088	3.5	4.1	0	12.4
Host stringency	8,172	33.4	31.4	0	94.1
Home stringency	8,172	32.6	30.9	0	92.6

FDI = foreign direct investment, M&A = mergers and acquisitions, Max. = maximum, Min. = minimum, Obs = observations, Std. Dev. = standard deviation.

Source: Authors' calculations.

Table 2A presents the estimated results of greenfield FDI and M&A FDI in the manufacturing sector. We examine the three measures of COVID-19 damage—(i) the number of confirmed cases, (ii) the number of deaths, and (iii) the stringency index—in three panels. All the coefficients of the variables representing the host country's COVID-19 damage are negative and highly significant for both types of FDI, especially when they are expressed as per the number of greenfield projects and M&A deals. For example, a 10% rise in confirmed cases in host countries decreases both the number and value of greenfield FDI by 1.4%. In contrast, the home country's COVID-19 variables do not have any statistically significant negative coefficients. Rather, they appear to have statistically significant positive coefficients when COVID-19 damage is measured by number of confirmed cases and the

stringency index. As discussed in Section II, this result suggests there may be a shift in export-platform FDI from more damaged countries to less damaged countries.

Table 2A: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Manufacturing Sector

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	-0.138*** [0.026]	-0.141*** [0.044]	-0.084** [0.034]	-0.137 [0.118]
	Case in home	0.067** [0.031]	0.057 [0.084]	-0.047 [0.047]	0.015 [0.151]
	No. of observations	3,808	3,808	4,218	3,002
	pseudo R-squared	0.455	0.849	0.771	0.93
II	Death in host	-0.083*** [0.018]	-0.03 [0.032]	-0.074*** [0.027]	-0.103 [0.091]
	Death in home	0.028 [0.022]	-0.048 [0.070]	-0.034 [0.027]	-0.112 [0.164]
	No. of observations	3,794	3,794	4,216	3,002
	pseudo R-squared	0.454	0.848	0.772	0.93
III	Stringency in host	-0.009** [0.004]	-0.013 [0.008]	-0.010*** [0.004]	-0.022 [0.015]
	Stringency in home	0.007** [0.003]	0.001 [0.009]	0.001 [0.006]	0.022 [0.014]
	squared				
	No. of observations	3,808	3,808	3,794	2,630
	pseudo R-squared	0.453	0.848	0.781	0.93

FDI = foreign direct investment, GF = greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

The results from the service sector are presented in Table 2B. In the case of greenfield FDI, the results are somewhat similar to those from the manufacturing sector. That is, COVID-19 damage in the host country negatively impacted greenfield FDI in the service sector. The difference is in the host country's COVID-19 damage by number of deaths and the stringency index but not by number of confirmed cases, as it also had a statistically significant negative impact on greenfield FDI flows in the service sector. Another difference is that COVID-19 damage in the home country also negatively impacted greenfield FDI in the service sector. This suggests significant financial constraints faced by the service sector investors given the potentially greater COVID-19 impact on the service sector globally. But the impact was weaker than in the host country in the value of the coefficients and the level of significance. In cross-border M&A, the COVID-19 damage did not appear to have an immediate impact on FDI in the same quarter. This is consistent with the observations depicted in Figures 1 and 2, which show that the response of M&A to the pandemic damages was somewhat delayed.

Table 2B: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Service Sector

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	-0.073*** [0.021]	-0.07 [0.054]	-0.029 [0.028]	0.007 [0.068]
	Case in home	-0.043* [0.026]	-0.08 [0.073]	0.03 [0.033]	-0.056 [0.080]
	No. of observations	6,022	6,022	9,112	6,114
	pseudo R-squared	0.574	0.843	0.838	0.926
II	Death in host	-0.068*** [0.016]	-0.083** [0.038]	-0.038 [0.026]	-0.008 [0.044]
	Death in home	-0.031 [0.019]	-0.064 [0.056]	0.005 [0.018]	-0.077* [0.045]
	No. of observations	6,002	6,002	9,088	6,102
	pseudo R-squared	0.575	0.843	0.839	0.927
III	Stringency in host	-0.008*** [0.002]	-0.015*** [0.006]	-0.003 [0.003]	0.002 [0.007]
	Stringency in home	-0.006** [0.003]	-0.014* [0.007]	0.002 [0.004]	0.003 [0.009]
	No. of observations	6,010	6,010	8,172	5,356
	pseudo R-squared	0.574	0.844	0.846	0.929

FDI = foreign direct investment, GF =greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

Next, based on our expectation about the delayed effects in cross-border M&A, we report the results when the COVID-19 damage is lagged by one quarter. Tables 3A and 3B present the results for the manufacturing and service sectors, respectively. Notably, the COVID-19 damage variables in the equations for greenfield FDI flows no longer have statistically significant negative coefficients for both the manufacturing and service sectors. However, for cross-border M&A, the COVID-19 variables in the host country are negative and significant in most cases. Overall, the finding that COVID-19 damage in the host country impacted greenfield FDI in the same quarter and M&A FDI in the following quarter is consistent with the observations depicted in Figures 1 and 2, which show the quarterly pattern of greenfield and M&A FDI for the manufacturing and service sectors, respectively. Although more instantaneous impacts in cross-border M&A was expected due to its less time-consuming permitting process, our result indicates that immediate withdrawal may be challenging due to the contract with M&A partners. This is perhaps because we focus only on completed M&A deals.

Table 3A: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Manufacturing Sector, One-Quarter Lag

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	0.017 [0.022]	0.021 [0.051]	-0.108*** [0.033]	-0.204** [0.098]
	Case in home	0.037 [0.026]	0.01 [0.061]	0.018 [0.025]	-0.037 [0.095]
	No. of observations	3,808	3,808	4,218	3,002
	pseudo R-squared	0.453	0.847	0.772	0.931
II	Death in host	0.029 [0.018]	0.016 [0.042]	-0.102*** [0.026]	-0.166** [0.078]
	Death in home	0.035 [0.023]	0.041 [0.054]	0.006 [0.028]	-0.135 [0.101]
	No. of observations	3,800	3,800	4,208	3,000
	pseudo R-squared	0.453	0.847	0.773	0.932
III	Stringency in host	0.007 [0.005]	0.018* [0.009]	-0.011 [0.007]	-0.016 [0.021]
	Stringency in home	0.003 [0.004]	0.006 [0.008]	0.004 [0.005]	-0.016 [0.020]
	No. of observations	3,808	3,808	3,794	2,630
	pseudo R-squared	0.453	0.849	0.781	0.93

FDI = foreign direct investment, GF =greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

Table 3B: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Service Sector, One-Quarter Lag

		GF		M&A	
		Number	Value	Number	Value
		(5)	(6)	(7)	(8)
I	Case in host	-0.013 [0.018]	-0.033 [0.051]	-0.047* [0.025]	-0.037 [0.034]
	Case in home	-0.016 [0.023]	-0.068 [0.065]	0.030* [0.016]	-0.033 [0.032]
	No. of observations	6,022	6,022	9,112	6,114
	pseudo R-squared	0.574	0.842	0.839	0.927
II	Death in host	-0.004 [0.015]	-0.019 [0.042]	-0.040** [0.019]	-0.037 [0.036]
	Death in home	-0.009 [0.018]	-0.045 [0.057]	0.032* [0.017]	-0.043 [0.032]
	No. of observations	6,002	6,002	9,072	6,094
	pseudo R-squared	0.574	0.842	0.839	0.927
III	Stringency in host	0.002 [0.003]	0.001 [0.006]	-0.008* [0.004]	-0.007 [0.007]
	Stringency in home	0.001 [0.003]	0.006 [0.009]	0.004 [0.003]	0.007 [0.009]
	No. of observations	6,010	6,010	8,172	5,356
	pseudo R-squared	0.574	0.842	0.846	0.929

FDI = foreign direct investment, GF = greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

As a robustness check, we repeat the estimation of the benchmark equation by restricting the home countries to only Organisation for Economic Co-operation and Development (OECD) member countries. The results in Tables 4A and 4B are similar to those in Tables 2A and 2B. One difference is that COVID-19 damage in home countries no longer has significantly positive effects on greenfield FDI in the manufacturing sector. Thus, the positive effects found in Table 2A are due to the increase in greenfield FDI from non-OECD (middle- or low-income) investing countries, which may face more financial constraints. Another difference is that COVID-19 damage in host countries does not have significant impact on cross-border M&A in both value and number. This result implies that OECD countries carry out cross-border M&A regardless of the severity of COVID-19 in the host countries.

Table 4A: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Manufacturing Sector, OECD Home Countries

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	-0.138*** [0.026]	-0.141*** [0.044]	-0.084** [0.036]	-0.06 [0.106]
	Case in home	0.068** [0.031]	0.058 [0.084]	-0.046 [0.052]	0.125 [0.134]
	No. of observations	3,800	3,800	3,674	2,520
	pseudo R-squared	0.455	0.849	0.784	0.934
II	Death in host	-0.083*** [0.018]	-0.031 [0.032]	-0.074** [0.030]	-0.1 [0.089]
	Death in home	0.028 [0.022]	-0.048 [0.070]	-0.038 [0.028]	0.112 [0.111]
	No. of observations	3,790	3,790	3,672	2,520
	pseudo R-squared	0.454	0.848	0.784	0.934
III	Stringency in host	-0.009** [0.004]	-0.013 [0.008]	-0.009** [0.004]	-0.026* [0.015]
	Stringency in home	0.007** [0.003]	0.001 [0.009]	0.002 [0.007]	0.018 [0.014]
	No. of observations	3,800	3,800	3,656	2,506
	pseudo R-squared	0.453	0.848	0.784	0.935

FDI = foreign direct investment, GF = greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

Table 4B: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Service Sector, High-Income Home Countries

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	-0.073*** [0.021]	-0.07 [0.054]	-0.022 [0.032]	0.051 [0.070]
	Case in home	-0.041 [0.026]	-0.077 [0.073]	0.041 [0.038]	-0.048 [0.105]
	No. of observations	5,976	5,976	7,762	5,030
	pseudo R-squared	0.575	0.843	0.849	0.93
II	Death in host	-0.067*** [0.016]	-0.083** [0.038]	-0.039 [0.031]	0.01 [0.045]
	Death in home	-0.03 [0.019]	-0.063 [0.056]	0.009 [0.019]	-0.097 [0.063]
	No. of observations	5,960	5,960	7,738	5,018
	pseudo R-squared	0.575	0.843	0.849	0.93
III	Stringency in host	-0.008*** [0.002]	-0.015*** [0.006]	-0.004 [0.003]	0.000 [0.008]
	Stringency in home	-0.006** [0.003]	-0.014* [0.007]	0.003 [0.005]	0.007 [0.010]
	No. of observations	5,972	5,972	7,666	4,976
	pseudo R-squared	0.575	0.844	0.85	0.93

FDI = foreign direct investment, GF = greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

So far, we have investigated the effects of COVID-19 damage on open greenfield FDI and completed M&A FDI. Although announced FDI may be withdrawn and not realized later, it may represent business or investment sentiment better than completed or registered FDI. Announced FDI may respond more instantaneously to the contemporaneous damage of COVID-19. Therefore, as the last robustness check, we repeat the estimation of the benchmark equation, replacing our “opened” greenfield FDI with “announced” and replacing “completed” M&A with “announced” and “pending.” As noted earlier, in the case of M&A, we include not only “announced” but also “pending” because there are very few “announced” M&A deals, and both “announced” and “pending” refer to the status before completion.¹¹

The estimation results are reported in Table 5. In the manufacturing sector, a stronger stringency policy in the host country results in fewer greenfield FDI announcements in both number and value. The severity of COVID-19 in home countries has positive effects on the announced values of greenfield FDI. Interestingly, all three measures of COVID-19 damage in the host countries are

¹¹ In greenfield FDI data, there is no “pending” type.

negatively associated with announced and pending cross-border M&A deals. Thus, unlike the case of completed M&A, announced and pending M&A deals were negatively affected by the COVID-19 damage. In the service sector, the number of both confirmed cases and deaths in the host country had an adverse impact on the number of greenfield project announcements, whereas stringency measures had a similar impact on the value of greenfield project announcements. Also, stronger stringency measures in the host countries negatively impacted announced and pending M&A deals. However, the COVID-19 damage in home countries seems to have positive effects on both types of FDI, reflecting the business incentive to look for less affected markets by COVID-19.

Table 5A: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Manufacturing Sector, Announcements and Pending

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	-0.134*** [0.027]	-0.120*** [0.046]	-0.063 [0.043]	-0.037 [0.151]
	Case in home	0.033 [0.055]	0.068 [0.093]	-0.012 [0.093]	0.257 [0.236]
	No. of observations	3,182	3,182	2,890	1,940
	pseudo R-squared	0.463	0.844	0.798	0.937
II	Death in host	-0.085*** [0.019]	-0.028 [0.035]	-0.063 [0.039]	-0.115 [0.150]
	Death in home	-0.030 [0.040]	-0.082 [0.076]	-0.039 [0.050]	0.304 [0.237]
	No. of observations	3,172	3,172	2,890	1,940
	pseudo R-squared	0.463	0.843	0.799	0.938
III	Stringency in host	-0.010** [0.004]	-0.011 [0.008]	-0.007 [0.005]	-0.025 [0.020]
	Stringency in home	0.005 [0.004]	-0.000 [0.009]	0.004 [0.009]	0.016 [0.019]
	No. of observations	3,182	3,182	2,836	1,886
	pseudo R-squared	0.462	0.843	0.799	0.937

FDI = foreign direct investment, GF = greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

Table 5B: Effects of COVID-19 Pandemic on Bilateral FDI Flows in the Service Sector, Announcements and Pending

		GF		M&A	
		Number	Value	Number	Value
		(1)	(2)	(3)	(4)
I	Case in host	-0.070*** [0.022]	-0.099* [0.052]	-0.024 [0.037]	0.015 [0.069]
	Case in home	-0.049 [0.041]	-0.142 [0.098]	0.077 [0.065]	0.107 [0.176]
	No. of observations	4,684	4,684	5,876	3,878
	pseudo R-squared	0.597	0.855	0.863	0.930
II	Death in host	-0.068*** [0.017]	-0.095** [0.040]	-0.048 [0.038]	-0.015 [0.054]
	Death in home	-0.047* [0.027]	-0.056 [0.080]	0.001 [0.029]	-0.020 [0.142]
	No. of observations	4,664	4,664	5,860	3,866
	pseudo R-squared	0.598	0.855	0.863	0.930
III	Stringency in host	-0.008*** [0.002]	-0.016*** [0.006]	-0.004 [0.004]	0.005 [0.008]
	Stringency in home	-0.008*** [0.003]	-0.012 [0.009]	0.005 [0.007]	0.015 [0.012]
	No. of observations	4,676	4,676	5,730	3,770
	pseudo R-squared	0.597	0.855	0.864	0.930

FDI = foreign direct investment, GF = greenfield FDI, M&A = mergers and acquisitions.

Notes: The estimation results using the Poisson pseudo maximum likelihood (PPML) method are reported. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. The standard errors reported in square brackets are those clustered by country pairs. In all specifications, we control for country pair-year fixed effects, country pair-quarter fixed effects, and year-quarter fixed effects.

Source: Authors' calculations.

V. CONCLUSION

The COVID-19 pandemic is a game-changer of our lifetime, having affected almost every aspect of human society. In particular, the economic impact has been direct on people's livelihood and will likely affect a wide range of political and social institutions. Cross-border economic activities have been severely affected as the flow of trade, investment, and people between countries has been disrupted. These economic trends also affected the FDI of multinational corporations, which has been a key source of global value chains in past decades.

This study analyzes in-depth the extent to which COVID-19 damage affected FDI flows between countries. Specifically, we analyze how COVID-19 damage in the home (investing) and host countries measured by COVID-19 confirmed cases, deaths, and the stringency of social distancing policies, such as government lockdown or mobility restrictions, affected the flow of FDI in 2020 and the first half of 2021.

We find that, in the case of the manufacturing sector, the host country's COVID-19 damage had an immediate negative impact on greenfield FDI and cross-border M&A. In the service sector, the host country's COVID-19 damage had a negative impact only on greenfield FDI. Moreover, the home country's COVID-19 damage had a positive effect on greenfield FDI in the manufacturing sector. We also find that the host country's COVID-19 damage had a negative lagged impact on M&A FDI in both the manufacturing and service sectors, whereas there was no such lagged impact on greenfield FDI. Furthermore, when we examine announced-based FDI flows, which may be withdrawn and not realized later, we find more instantaneous effects of COVID-19 damage on FDI flows. In summary, COVID-19 damage has had complex effects on FDI flows. This is consistent with the past literature on the complex relationship based on substitution between trade and FDI on one hand and complementarity on the other.

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The Effect of COVID-19 on Foreign Direct Investment

This study empirically examines how the coronavirus disease (COVID-19) has impacted foreign direct investment (FDI). The authors find heterogeneous effects of COVID-19 on FDI by sector and entry mode. The severity of COVID-19 in host countries negatively affected both greenfield FDI and cross-border mergers and acquisitions in the manufacturing sector. But the situation of home countries did not seem to matter. Greenfield FDI in the service sector was affected by the situation in both host and home countries.

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