The Effect of COVID-19 on Foreign Direct Investment

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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 economies from the first quarter of 2019 to the second quarter of 2021. The severity of COVID-19 in host economies adversely affected FDI in the manufacturing sector regardless of the entry mode, but the effect of home economies’ COVID-19 situation on FDI was insignificant. On the other hand, in the services sector, the severity of COVID-19 in both host and home economies has significantly negative impact on greenfield FDI, not on cross-border M&A.

KEYWORDS

COVID-19; greenfield FDI; cross-border M&A

JEL CLASSIFICATION

F21; F23; I15

1. 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; Dornan and Oanea, 2015; Poulsen and Hufbauer, 2011; Stoddard and Noy, 2015) and natural disasters (Anuchitworawong and Thampanishvong, 2015; Escaleras and Register, 2011) on FDI. Financial crises lead to liquidity constraints for investors, whereas natural disasters 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 minimise 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 economies 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. 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 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 economies. 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 3). 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 summarised as follows. The COVID-19 situation exerts different impacts across sectors and entry modes. In the manufacturing sector, COVID-19 damage in host economies has significant negative impact on both greenfield FDI and cross-border M&A. But home economies’ 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 economies 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 organised as follows. The next section presents our conceptual framework on the effects of COVID-19 damage on FDI. Section 3 provides our empirical framework with a brief overview of the recent global FDI flows. Section 4 presents the estimation results. Section 5 concludes.

2. 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 minimise 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 labourers, 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.

3. Empirical Framework

This section outlines our empirical framework for examining the impact of COVID-19 damage on FDI flows. As summarised 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 analysed 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:

\[
\text{FDI}_{ijyq} = \exp \{\alpha_1 \text{COVID}_{iyq} + \beta_1 \text{COVID}_{jyq} + \delta_{ijy} + \delta_{ijq} + \delta_{yq} \} + \epsilon_{ijyq}
\]

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. \(\delta_{ijy}, \delta_{ijq}, \text{and } \delta_{yq}\) are various fixed effects, which are explained below. \(\epsilon_{ijyq}\) is a disturbance term. This is consistent with the usual gravity equation framework suggested by Head and Mayer (2014). 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 include 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 rumours. 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 rumours, announcements, and completions in their study, we restrict our study to opened greenfield FDI and completed M&A, because rumours and announcements are often not realised.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 4407 in 2019 to 2636 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 8670 to 6086. 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 2020.7

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.8 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.

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. Their data are 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
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. 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, 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 control for various elements. $\delta_{ijy}$ 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. $\delta_{iyq}$ is country pair-quarter fixed effects and controls for the seasonality of FDI. $\delta_{yq}$ is year-quarter fixed effects.
which control for variations in world income. It also controls for the major type of COVID-19 variants in the world. Furthermore, most countries began to close their borders to foreign travellers 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/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.

4. 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 2 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 2, this result suggests there may be a shift in export-platform FDI from more damaged countries to less damaged countries.

The results from the service sector are presented in Table 3. 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 services sector investors given the potentially greater COVID-19 impact on the services 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

Table 1. Basic statistics.

|                      | Obs | Mean | Std. Dev. | Min   | Max  |
|----------------------|-----|------|-----------|-------|------|
| Greenfield FDI: Value (US$ Billion) | 3808 | 31   | 87.7      | 0     | 1967 |
| Greenfield FDI: Number | 3808 | 2    | 2.5       | 0     | 39   |
| M&A FDI: Value (US$ Billion) | 3002 | 295  | 1914.4    | 0     | 63,682 |
| M&A FDI: Number | 4218 | 4    | 13.6      | 0     | 286  |
| Host Cases | 4218 | 6.1  | 5.9       | 0     | 16.7 |
| Home Cases | 4218 | 5.7  | 5.8       | 0     | 16.7 |
| Host Death | 4216 | 3.8  | 4.2       | 0     | 12.4 |
| Home Death | 4216 | 3.5  | 4.1       | 0     | 12.4 |
| Host Stringency | 3794 | 33.3 | 31.7      | 0     | 92.6 |
| Home Stringency | 3794 | 31.9 | 30.6      | 0     | 89.8 |
| Greenfield FDI: Value (US$ Billion) | 6022 | 42   | 102.4     | 0     | 1,629 |
| Greenfield FDI: Number | 6022 | 2    | 4.2       | 0     | 95   |
| M&A FDI: Value (US$ Billion) | 6114 | 280  | 1210.4    | 0     | 33,768 |
| M&A FDI: Number | 9112 | 6    | 22.9      | 0     | 529  |
| Host Cases | 9112 | 5.9  | 5.7       | 0     | 16.7 |
| Home Cases | 9112 | 5.7  | 5.8       | 0     | 16.7 |
| Host Death | 9088 | 3.6  | 4.1       | 0     | 12.4 |
| Home Death | 9088 | 3.5  | 4.1       | 0     | 12.4 |
| Host Stringency | 8172 | 33.4 | 31.4      | 0     | 94.1 |
| Home Stringency | 8172 | 32.6 | 30.9      | 0     | 92.6 |

Note: The number of observations in regressions is smaller than all possible observations because we drop singleton groups (i.e. fixed effects groups with only a single observation) to avoid underestimating standard errors (Correia, 2015).

Source: Authors’ compilation.
### Table 2. 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***| −0.141***| −0.084** | −0.137 |
|                | [0.026]  | [0.044] | [0.034]  | [0.118] |
| Case in home   | 0.067**  | 0.057 | 0.047    | 0.015  |
|                | [0.031]  | [0.084] | [0.047]  | [0.151] |
| Number of obs  | 3808     | 3808  | 4218     | 3002   |
| Pseudo R-squared | 0.455   | 0.848 | 0.771    | 0.93   |
| II Death in host | −0.083***| −0.03 | −0.074***| −0.103 |
|                | [0.018]  | [0.032] | [0.027]  | [0.091] |
| Death in home  | 0.028    | −0.048| −0.034   | −0.112 |
|                | [0.022]  | [0.070] | [0.027]  | [0.164] |
| Number of obs  | 3794     | 3794  | 4216     | 3002   |
| Pseudo R-squared | 0.454   | 0.848 | 0.772    | 0.93   |
| III Stringency in host | −0.009***| −0.013| −0.010***| −0.022 |
|                | [0.004]  | [0.008] | [0.004]  | [0.015] |
| Stringency in home | 0.007** | 0.001 | 0.001    | 0.022  |
|                | [0.003]  | [0.009] | [0.006]  | [0.014] |
| Number of obs  | 3808     | 3808  | 3794     | 2630   |
| 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 parentheses 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’ estimation.

### Table 3. Effects of COVID-19 pandemic on bilateral FDI flows in services sector.

|                | GF       |       | M&A      |       |
|----------------|----------|-------|----------|-------|
|                | Number   | Value | Number   | Value |
| (1)            | (2)      |       | (3)      | (4)   |
| I Case in host | −0.073***| −0.07 | −0.029   | 0.007 |
|                | [0.021]  | [0.054] | [0.028]  | [0.068] |
| Case in home   | −0.043*  | −0.08 | 0.03     | −0.056|
|                | [0.026]  | [0.073] | [0.033]  | [0.080] |
| Number of obs  | 6022     | 6022  | 9112     | 6114   |
| Pseudo R-squared | 0.574   | 0.843 | 0.838    | 0.926  |
| II Death in host | −0.068***| −0.083**| −0.038   | −0.008 |
|                | [0.016]  | [0.038] | [0.026]  | [0.044] |
| Death in home  | −0.031   | −0.064| 0.005    | −0.077*|
|                | [0.019]  | [0.056] | [0.018]  | [0.045] |
| Number of obs  | 6002     | 6002  | 9088     | 6102   |
| Pseudo R-squared | 0.575   | 0.843 | 0.839    | 0.927  |
| III Stringency in host | −0.008***| −0.015***| −0.003   | 0.002  |
|                | [0.002]  | [0.006] | [0.003]  | [0.007] |
| Stringency in home | −0.006** | −0.014* | 0.002  | 0.003  |
|                | [0.003]  | [0.007] | [0.004]  | [0.009] |
| Number of obs  | 6010     | 6010  | 8172     | 5356   |
| 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 parentheses 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’ estimation.
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.

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 one quarter. Tables 4 and 5 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.

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 states. The results in Tables 6 and 7 are similar to those in Tables 2 and 3. 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 2 are due to the increase in greenfield FDI from non-OECD (middle- or low-income) investing countries, which may face more financial constraints.

Table 4. Effects of COVID-19 pandemic on bilateral FDI flows in the manufacturing sector: one-quarter lag.

|          | GF                          |              | M&A                         |              |
|----------|-----------------------------|--------------|-----------------------------|--------------|
|          | Number (1)                  | Value (2)    | Number (3)                  | Value (4)    |
| I        | Case in host                | 0.017        | 0.021                       | −0.108***    | −0.204**    |
|          |                             | [0.022]      | [0.051]                     | [0.033]      | [0.098]     |
|          | Case in home                | 0.037        | 0.01                        | 0.018        | −0.037      |
|          |                             | [0.026]      | [0.061]                     | [0.025]      | [0.095]     |
|          | Number of obs               | 3808         | 3808                        | 4218         | 3002        |
|          | Pseudo R-squared            | 0.453        | 0.847                       | 0.772        | 0.931       |
| II       | Death in host               | 0.029        | 0.016                       | −0.102***    | −0.166**    |
|          |                             | [0.018]      | [0.042]                     | [0.026]      | [0.078]     |
|          | Death in home               | 0.035        | 0.041                       | 0.006        | −0.135      |
|          |                             | [0.023]      | [0.054]                     | [0.028]      | [0.101]     |
|          | Number of obs               | 3800         | 3800                        | 4208         | 3000        |
|          | Pseudo R-squared            | 0.453        | 0.847                       | 0.773        | 0.932       |
| III      | Stringency in host          | 0.007        | 0.018*                      | −0.011       | −0.016      |
|          |                             | [0.005]      | [0.009]                     | [0.007]      | [0.021]     |
|          | Stringency in home          | 0.003        | 0.006                       | 0.004        | −0.016      |
|          |                             | [0.004]      | [0.008]                     | [0.005]      | [0.020]     |
|          | Number of obs               | 3808         | 3808                        | 3794         | 2630        |
|          | 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 parentheses 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’ estimation.
Table 5. Effects of COVID-19 pandemic on bilateral FDI flows of the services sector: one-quarter lag.

|                      | GF     | M&A    |
|----------------------|--------|--------|
|                      | Number (5) | Value (6) | Number (7) | Value (8) |
| I Case in host       | -0.013 | -0.033 | -0.047* | -0.037 |
|                      | [0.018] | [0.051] | [0.025] | [0.034] |
| Case in home         | -0.016 | -0.068 | 0.030* | -0.033 |
|                      | [0.023] | [0.065] | [0.016] | [0.032] |
| Number of obs        | 6022   | 6022   | 9112   | 6114   |
| Pseudo R-squared     | 0.574  | 0.842  | 0.839  | 0.927  |
| II Death in host     | -0.004 | -0.019 | -0.040** | -0.037 |
|                      | [0.015] | [0.042] | [0.019] | [0.036] |
| Death in home        | -0.009 | -0.045 | 0.032* | -0.043 |
|                      | [0.018] | [0.057] | [0.017] | [0.032] |
| Number of obs        | 6002   | 6002   | 9072   | 6094   |
| Pseudo R-squared     | 0.574  | 0.842  | 0.839  | 0.927  |
| III Stringency in host | 0.002 | 0.001 | -0.008* | -0.007 |
|                      | [0.003] | [0.006] | [0.004] | [0.007] |
| Stringency in home   | 0.001  | 0.006  | 0.004  | 0.007  |
|                      | [0.003] | [0.009] | [0.003] | [0.009] |
| Number of obs        | 6010   | 6010   | 8172   | 5356   |
| 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 parentheses 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’ estimation.

Table 6. Effects of COVID-19 pandemic on bilateral FDI flows in the manufacturing sector: OECD home countries.

|                      | GF     | M&A    |
|----------------------|--------|--------|
|                      | Number (1) | Value (2) | Number (3) | Value (4) |
| I Case in host       | -0.134*** | -0.120*** | -0.063 | -0.037 |
|                      | [0.027] | [0.046] | [0.043] | [0.151] |
| Case in home         | 0.033  | 0.068  | -0.012 | 0.257 |
|                      | [0.055] | [0.093] | [0.093] | [0.236] |
| Number of obs        | 3182   | 3182   | 2890   | 1940   |
| Pseudo R-squared     | 0.463  | 0.844  | 0.798  | 0.937  |
| II Death in host     | -0.085*** | -0.028 | -0.063 | -0.115 |
|                      | [0.019] | [0.035] | [0.039] | [0.150] |
| Death in home        | -0.030 | -0.082 | -0.039 | 0.304 |
|                      | [0.040] | [0.076] | [0.050] | [0.237] |
| Number of obs        | 3172   | 3172   | 2890   | 1940   |
| Pseudo R-squared     | 0.463  | 0.843  | 0.799  | 0.938  |
| III Stringency in host | -0.010** | -0.011 | -0.007 | -0.025 |
|                      | [0.004] | [0.008] | [0.005] | [0.020] |
| Stringency in home   | 0.005  | -0.000 | 0.004  | 0.016  |
|                      | [0.004] | [0.009] | [0.009] | [0.019] |
| Number of obs        | 3182   | 3182   | 2836   | 1886   |
| 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 parentheses 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’ estimation.
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.

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 realised 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.\(^\text{12}\)

The estimation results are reported in Tables 8 and 9. In the manufacturing sector, a stronger stringency policy in the host country results in fewer greenfield project announcements, whereas...
Table 8. 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| −0.026   | 0.01      | −0.122 | −0.956**  |
|               | [0.019]  |           | [0.085] | [0.449]   |
| Case in home  | 0.019    | 0.202***  | 0.071  | 0.418     |
|               | [0.026]  | [0.073]   | [0.090] | [0.726]   |
| Number of obs | 2956     | 2956      | 2108   | 1220      |
| Pseudo R-squared | 0.429    | 0.885    | 0.303  | 0.794     |
| II Death in host| −0.008   | −0.02     | −0.010 | −1.108*** |
| Death in home | 0.021    | 0.137**   | −0.008 | 0.376     |
|               | [0.019]  | [0.060]   | [0.062] | [0.436]   |
| Number of obs | 2948     | 2948      | 2108   | 1220      |
| Pseudo R-squared | 0.429    | 0.884    | 0.303  | 0.793     |
| III Stringency in host| −0.005**  | −0.012**  | −0.018*| 0.039     |
| Stringency in home| 0.002    | 0.023**   | 0.003  | −0.064    |
|               | [0.003]  | [0.008]   | [0.009] | [0.049]   |
| Number of obs | 2952     | 2952      | 1890   | 1050      |
| Pseudo R-squared | 0.429    | 0.885    | 0.305  | 0.795     |

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 parentheses 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’ estimation.

Table 9. Effects of COVID-19 pandemic on bilateral FDI flows in service sector: announcements and pending.

|                | GF       | M&A       |
|----------------|----------|-----------|
|                | Number   | Value     | Number | Value     |
| (1)           | (2)      |           | (3)    | (4)       |
| I Case in host| −0.054** | −0.029    | −0.103 | −0.112    |
|               | [0.023]  |           | [0.067] | [0.159]   |
| Case in home  | −0.034   | 0.015     | −0.031 | 0.240     |
|               | [0.029]  |           | [0.059] | [0.219]   |
| Number of obs | 3954     | 3954      | 4564   | 2496      |
| Pseudo R-squared | 0.515    | 0.857    | 0.376  | 0.776     |
| II Death in host| −0.030*  | −0.014    | −0.040 | 0.036     |
| Death in home | 0.017    | 0.039     | −0.025 | 0.386*    |
|               | [0.027]  |           | [0.043] | [0.230]   |
| Number of obs | 3950     | 3950      | 4556   | 2492      |
| Pseudo R-squared | 0.515    | 0.857    | 0.376  | 0.776     |
| III Stringency in host| −0.004   | −0.009*   | −0.005 | −0.081**  |
| Stringency in home| 0.007**  | 0.017***  | −0.008 | 0.083*    |
|               | [0.003]  |           | [0.007] | [0.043]   |
| Number of obs | 3950     | 3950      | 3548   | 2014      |
| Pseudo R-squared | 0.515    | 0.858    | 0.358  | 0.775     |

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 parentheses 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’ estimation.
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.

5. Concluding Remarks

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 analyses in-depth the extent to which COVID-19 damage affected FDI flows between countries. Specifically, we analyse 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 realised 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.

Notes

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, 2022).
2. Nocke and Yeaple (2007, 2008) and Blonigen et al. (2014) theoretically considered firms’ choice between cross-border and greenfield FDI.
3. We do not disaggregate the service sector because the number of observations in each sub-sector 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 ppmhdfef 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).
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. Since we collect the data on new M&A or greenfield investments, we do not have negative values in the FDI variable.
8. 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.
9. 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.
10. 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. In addition, the number of confirmed cases may contain an error depending on the country’s ability to detect the COVID-19 cases. If the magnitude of such an error is related to the country’s economic development level, it is controlled by the country–year component of country pair-year fixed effects.
11. 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.
12. In greenfield FDI data, there is no ‘pending’ type.

Acknowledgement
We thank the reviewers for their valuable comments and suggestions.

Disclosure Statement
No potential conflict of interest was reported by the author(s).

Funding
This work was supported by Asian Development Bank.

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