



Risk Management of Foreign Direct Investment: The COVID-19 Crisis Experience

Jialong Mi^{1,2}

¹School of Economics and Management, Changsha University of Science and Technology, Changsha City, China

²Business School, Hunan International Economics University, Changsha City, China

Email address:

mijialong@aliyun.com

To cite this article:

Jialong Mi. (2023). Risk Management of Foreign Direct Investment: The COVID-19 Crisis Experience. *International Journal of Accounting, Finance and Risk Management*, 8(4), 123-133. <https://doi.org/10.11648/j.ijafmr.20230804.15>

Received: November 3, 2023; **Accepted:** November 27, 2023; **Published:** December 6, 2023

Abstract: The purpose of this study is to develop a methodology for analyzing corporate investment risk in the context of the impact of the COVID-19 pandemic. The research methodology is based on the use of regression analysis and scenario modeling of pandemic investment leverage. The contribution of this study is the proposed methodological approach to assessing investment risks in the context of the spread of coronavirus. Regression analysis made it possible to establish the existence of a sufficient relationship between foreign direct investment (FDI) in the studied countries and the level of pandemic investment leverage. This is the result of the stabilization in FDI sector and confirms the effectiveness of the studied countries in a given direction in the context of a pandemic.

Keywords: Deviation, Foreign Direct Investment (FDI), Investment Leverage, Pandemic, Risk Limit

1. Introduction

In the context of increasing globalization processes, the key to economic development and well-being of any state and ensuring its competitiveness in the world arena are significant positions in the investment field. Over the past decade, emerging market economies have substantially deepened their integration into global financial markets. Some emerging market economies have achieved significant resilience to capital flow volatility [23] Even countries where cash outflows exceed inflows (that is, there are current account deficits) have accumulated large foreign exchange reserves. It helps them cope with volatility in capital flows [27]. However, some of the leading countries continue to rely heavily on external funding. Some of them, for example, a number of Central and Eastern European countries, remain vulnerable to changes in the priorities and strategies of foreign investors [13]. In addition, the COVID-19 pandemic has had significant implications for international investment flows, including investments to achieve the Sustainable Development Goals, despite varying impacts across different regions and development groups. According to the forecast of the World Investment Report 2020, global FDI inflows fell

by 42% in 2020 to about \$859 billion. To the greatest extent, this decline was due to a decrease in investment inflows to Europe (by more than 100%) and North America (-46%). The decline in FDI flows to developing countries in Asia was only 4%. Due to these regional differences, the share of developing countries in total FDI inflows globally increased to 72% [37].

In the current situation of the approaching severe economic crisis in the world economy in general and in individual countries in particular, the most important means of minimizing its consequences and providing favorable conditions for getting out of it can be investments (both at the country level as a whole and at the level of individual industries or economic entities in particular). The investment process is one of the most effective mechanisms for structural changes both in the system of state management of individual industries, territories, and a state as a whole, and in the activities of individual economic entities, the introduction of modern achievements of technical progress, and the like [17, 26].

At the same time, due to the complexity and interdependence of socio-economic processes, as well as significant influence on the development of the economy of precisely non-economic factors, these problems and

consequences of the pandemic cannot be solved using exclusively economic factors and levers of influence. Of relevance is the study of investment activities of a group of countries in the context of the economic crisis, both from the point of view of a country as a whole and individual economic entities, industries, as well as territorial entities. Therefore, this study aims to fill the gap in investment research, which has arisen as a result of the spread of the coronavirus and the deepening of the crisis conditions for the development of the OBOR countries.

The pandemic has begun its journey from China and has disastrous and controversial consequences. This process will continue indefinitely for a whole range of human activities. First of all, this applies to economic activities, where foreign investment takes the central place [25]. This motivated this study, since the pandemic, in turn, affects FDI statistics, as well as the ability to analyze them and build predictive models. This made it possible to determine the purpose of this study - to form a methodological approach to the analysis of corporate investment risks, taking into account the impact of the COVID-19 pandemic. In the process of achieving this goal, the research has the following logic:

First, to identify the level of investment risks in a pandemic, the study justified the use of the indicator of pandemic investment leverage.

Secondly, based on the pandemic investment leverage, a regression analysis was carried out to determine the degree of FDI dependence on the coronavirus.

Thirdly, a scenario modeling of the level of corporate investment in the studied countries was carried out to determine the risk limit of pandemic investment leverage. On the basis of the obtained regression equations, three scenarios and possible deviations of the level of pandemic investment leverage of the studied countries were formed.

2. Literature Review

The activation of the investment process is one of the most effective mechanisms for the transformations of the economic system of both individual economic entities and national economies as a whole. The formation of the national economy of any country as an integral part of the world economy is based on the mandatory consideration of a number of important general laws in the field of investment activity. One of the most common patterns in the field of investment activity is its use as a tool for overcoming the crisis state of the economic system with the help of both real investments and the use of financial investment instruments [32].

Divestments in a pandemic are a common corporate phenomenon. Companies systematically invest and expand their activities, as well as reduce and sell their commercial activities both domestically and abroad [7]. In fact, roughly one in five foreign affiliates are sold every five years. According to the 2020 Global Business Survey, 78% of firms surveyed plan to sell part of their operations in 2021 [9]. In a global pandemic, cross-border sales could increase if rising

debt levels and a lack of liquidity force companies to sell some of their overseas operations. In the longer term, the COVID-19 outbreak, together with factors such as digitalization and trade tensions, could force companies to rethink their global supply chains [24]. Even before the onset of the current crisis, investment retention was discussed within the World Trade Organization (WTO), the G20 Working Group on Trade and Investment, and the World Bank Group [4].

Despite China being the source of the coronavirus, FDI in the country grew 6.2% year-over-year, reaching \$144.37 billion in 2020. During this period, foreign investment in services increased by 13.9% to 776.8 billion yuan, while in high-tech services by 28.5%. The country managed to tackle the COVID-19 and achieve the target of stabilizing foreign investment in 2020, overcoming the downward trend in global foreign investment [10].

The global crisis has slowed down existing investment projects around the world, and the prospect of a deep recession has forced international business groups to re-evaluate new projects [39]. In addition to the direct mechanism for reducing FDI on the part of international enterprises, there is an indirect mechanism that will affect FDI in the near future. This refers to a decrease in the income of branches and subsidiaries abroad and, as a result, a decrease in reinvested income. On average, half of the profits of multinational companies' affiliates remain in the host country in the form of reinvested income [1, 30]. Announced green-field investment projects in emerging economies decreased by 46%, mainly due to processes in the manufacturing sector [14]. All this indicates that in the context of the COVID-19 pandemic, foreign investors are increasingly reluctant to respond to new investment opportunities. Given the current events, the data may deteriorate even more. The decline in investment is the result of unprecedented quarantine measures, which provide not only restrictions or even stopping the work of certain sectors of the economy within individual countries, such as tourism, hotel and restaurant business, passenger transportation, or certain types of trade, but also the closure of borders of individual countries and entire economic zones such as the EU [10]. Initially, it was assumed that the main reason for the fall in investment would be the gap and interruption of supply within global value chains, especially in Asian countries (China, South Korea, and Japan) [21, 12]. However, it has become clear that pandemic countermeasures and lockdowns around the world have a devastating effect on all economies, regardless of their involvement in the main value chain. The main factor reducing the flow of investment is falling demand and a significant reorientation of consumer interests, as well as a rethinking of the level of usefulness of traditional goods and services [8]. As a rule, companies' investments respond to changes in GDP growth with some lag. During the financial crisis of 2008, investments reached their lowest point only in 2009, and their decline took place in economically developed countries. However, this time there is the influence of financial flows on the actual ability

of investors to invest, which in some cases is physically impossible [14]. In this regard, it is assumed that, for a number of reasons, COVID-19 might have a significantly stronger negative impact on capital flows than the previous crisis. First, it is large-scale and includes both developing and developed countries [38]. Secondly, it is more impetuous: a shock drop in demand is accompanied by a forced stop of investment projects or postponement of their implementation for an indefinite period of time [34]. Third, while the pandemic does not directly trigger a crisis in the financial sector, it could lead to one if companies fail to meet their earlier financial commitments. In this case, global investment flows are expected to further decline (Kowalski, 2020). As a result of a sharp drop in demand and lower prices for commodities around the world, investments in expanding sales markets, as well as in projects related to the extractive industries, have slowed down [36]. Investments in production facilities, which are closely integrated into global value chains, are also negatively affected. Starting from China, East and Southeast Asia, shocks are quickly transmitted along the value chains to other regions. However, they affect both suppliers of intermediate goods and services for Chinese exports and those who depend on the supply of intermediate products from China.

To date, the impact of the COVID-19 pandemic on investment flows of OBOR countries remains insufficiently studied. Therefore, the conducted research is timely and adequate to the current events in the world. The study aims at assessing the level of investment risks in the studied OBOR countries. This study takes into account different scenarios for the pandemic events and their impact on the risks of corporate investment, possible deviations, and the threshold of the risk limit, exceeding which can have devastating consequences for investment flows.

3. Materials and Methods

This study was conducted using regression analysis and scenario modeling. The study is based on the pandemic investment leverage indicator. In general, the study includes several steps.

The first step is to select a sample of countries. Since China has become the primary source of COVID-19, the study of investment processes in the pandemic is of particular relevance in the OBOR countries. The study is based on materials from 24 OBOR countries. These countries make up the northern corridor of OBOR.

The second step is to identify pandemic investment leverage. The study proposes the Pandemic Investment Leverage Indicator (PIL), which demonstrates the level of investment risks in a pandemic. It is defined as follows:

$$PIL_i = \frac{CC_i/CC_w}{FDI_i/FDI_w}, \quad (1)$$

where CC_i – number of confirmed cases of coronavirus in the i -th country;

CC_w – the number of confirmed coronavirus cases in the

world;

FDI_i – foreign direct investment of the i -th country;

FDI_w – foreign direct investment on a global scale.

The higher the value of this indicator, the higher the level of investment risk in a country.

The third step is regression analysis. It involves determining the degree of dependence of FDI in the studied countries on the coronavirus, expressed using a pandemic investment leverage. In this case, linear pairwise regression is applied. When conducting econometric analysis, it is important to define the form of mathematical dependence, i.e., equations, as the quality of the models, i.e., their compliance with the realities of the processes depends not only on the set of input values that characterize the factors and conditions of production but also on the chosen dependence.

In this work, the least squares method was used to determine the regression line. The least squares method is used to identify such a regression line in comparison with others, which is the closest to the empirical regression line, i.e., provides the smallest number of squared deviations of the indicator's real values from the calculated (theoretical) ones:

$$\sum_{i=1}^n (y_i - \tilde{y}_i)^2 \rightarrow \min, \quad (2)$$

y – experimental (final) indicator values; \tilde{y}_i – conditional (calculated) using a regression equation.

The least squares method has a significant superiority over similar techniques for finding the regression line if the deviations of y_i form a normal distribution. It is this circumstance that is one of the prerequisites for determining reliable estimates of the results obtained in modeling. In fact, the considered sets of variables usually have a normal distribution or are close enough to the normal distribution laws [3].

In order to use the regression equation outside the area specified by the actual indicators, its correct justification is required. In this case, the main source of errors is the connection method, which has a linear shape within a given area, but nonlinearity is possible outside of it. Therefore, the use of the linear regression equation for statistical analysis and forecasting needs a separate justification.

This is especially true for applying linear pairwise regression:

$$y = \beta_0 + \beta_1 x + \varepsilon, \quad (3)$$

where y – final variable;

β_0, β_1 – regression equation criteria;

x – variable indicator;

ε – an arbitrary variable, the use of the least squares method assumes the following hypotheses [40]:

1. Between the resulting variable y and the factor, there is a linear dependence of the variable x described by the regression equations:

$$y_i = \beta_0 + \beta_1 x + \varepsilon_i \text{ or } \tilde{y}_i = b_0 + b_1 x_i \quad (4)$$

2. The deterministic (non-random) value is the variable x of the coefficient.

3. For a random vector ε , the mathematical expectation (mean) is zero, and the deviation ε is a small permanently positive value, independent of the index i :

$$E\varepsilon_i = 0, D\varepsilon_i = E(\varepsilon_i^2) = \sigma^2. \quad (5)$$

4. The constituent elements of the vector are random uncorrelated values, that is $cov(\varepsilon_i, \varepsilon_j) = 0$ for a separate $i \neq j, (i, j = 1, 2, \dots, n)$.

5. It is assumed that the random variable ε is characterized by a normal distribution law with a mathematical expectation equivalent to zero and a constant of positive small variance $\varepsilon \sim N(0, \sigma^2)$.

Using the linear correlation coefficient R , the degree of density of the correlation dependence between the indicator and the factor in the paired linear relationship can be determined.

For correlation coefficients, values from -1 to +1 can be taken. The sign shows the direction of the connection: "+" - direct, "-" - reverse.

$r = 1$ - there is a linear functional relationship between x and y , i.e., one value of the coefficient x corresponds to one value of the indicator c .

$r = 0$ - there is no relationship between x and y .

Based on the Chaddock scale [22] the correlation density was determined for a random stochastic dependence (Table 1).

Table 1. Scale of correlation density values for stochastic dependence.

Dependence	Range of values R
very high	0.9 – 0.99
high	0.7 – 0.9
sufficient	0.5 – 0.7
moderate	0.3 – 0.5
weak	0.1 – 0.3

Source: compiled by the author based on (Luchko et al., 2021)

In this paper, the statistical importance of the econometric model (or the compliance of the model with the initial data) is assessed using Fisher's F-test, based on the value of the deterministic coefficients R^2 :

$$F_{crit} = \frac{R^2}{1-R^2} \cdot \frac{n-l-1}{l}, \text{ where } R^2 = 1 - \frac{\sum_{i=1}^n (y_i - \bar{y})^2}{\sum_{i=1}^n (y_i - \bar{y})^2} \quad (6)$$

F_{tabl} corresponds to the value from the table of critical indicators of Fisher's F-distribution, taking into account the probability p (or equated to the value $\alpha = 1-p$), degrees of freedom $k_1 = l, k_2 = n - l - 1$, where n – cumulative

number of observations, l – set of influencing factors.

If the condition $F_{crit} < F$ is satisfied, the proposed regression model is adequate with reliability p .

When the condition $F_{crit} > F$ is satisfied, the proposed regression model is inadequate with reliability p .

The fourth step is scenario modeling of the level of FDI in the studied countries. Based on the obtained regression equations, three scenarios were formed: realistic (according to the 2021); optimistic (reducing the PIL level by 20%); pessimistic (increase in PIL level by 20%). At the same time, possible deviations of the level of the pandemic investment leverage of the studied countries were also modeled, and the threshold of its risk limit was determined. The deviation of the level of pandemic investment leverage (V_{PIL}) is determined by the formula:

$$V_{PIL} = \sqrt{\sum_{i=1}^n (PIL_i - Exp(PIL))^2 \times p_i} \quad (7)$$

where PIL_i – pandemic investment leverage according to an optimistic, realistic and pessimistic scenario in the context of the coronavirus;

$Exp(PIL)$ – the expected level of a country's pandemic investment leverage (mathematical expectation);

p_i – the probability of a country's pandemic investment leverage level under the optimistic (0.3), realistic (0.5), and pessimistic (0.2) scenarios.

The expected level of a country's pandemic investment leverage (mathematical expectation) is determined by the formula:

$$Exp(PIL) = \sum_{i=1}^{\infty} PIL_i \times p_i \quad (8)$$

The threshold of the risk limit of a country's pandemic investment leverage is determined by the formula:

$$\lim SC_{h/l} = \frac{V_{PIL}}{Exp(PIL)} \quad (9)$$

Using indicators of the probable deviation of the level of pandemic investment leverage and its risk limit threshold, the author analyzed the impact of changes in the situation with COVID-19 on FDI in the studied countries as a result of increased risks or their minimization.

4. Results

Pandemic investment leverage has been identified on the basis of quarterly FDI and the number of confirmed COVID-19 cases in the surveyed countries and the world at large. The obtained values for 2021 are given in Table 2.

Table 2. Pandemic investment leverage of the studied countries in 2021, in conventional multiplier values.

Country	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Average value for the year
Afghanistan	0.062	1.107	0.576	0.342	0.522
Austria	-0.101	-0.300	-0.052	-0.071	-0.131
Belarus	0.230	0.690	-2.326	-9.948	-2.838
Bulgaria	0.478	0.377	0.396	1.280	0.633
China	39.085	0.846	0.173	0.064	10.042
Czechia	0.841	4.177	-0.303	3.927	2.161

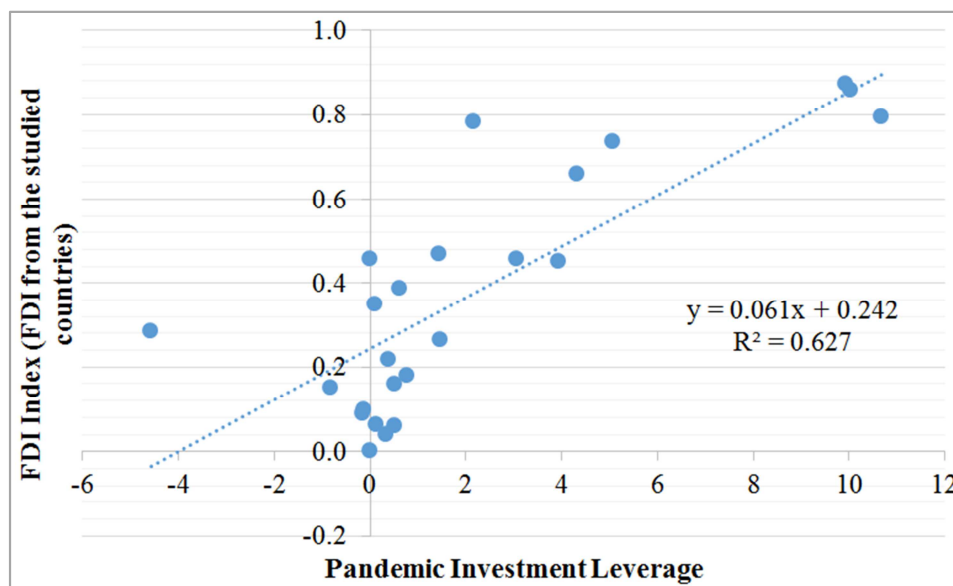
Country	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Average value for the year
Estonia	0.391	0.076	0.017	0.066	0.137
Hungary	0.316	0.098	0.125	2.600	0.785
Iran	14.948	7.898	9.802	10.111	10.690
Kazakhstan	0.018	0.101	0.170	0.141	0.108
Kyrgyzstan	0.122	-0.259	-4.407	-13.700	-4.561
Latvia	0.793	0.072	0.046	0.635	0.387
Lithuania	0.604	-2.294	0.077	1.067	-0.136
Luxembourg	-0.004	-0.001	0.003	-0.003	-0.001
Moldova	4.925	-11.748	12.272	14.887	5.084
Mongolia	0.0002	0.0002	0.0001	0.0001	0.000
Pakistan	0.744	8.102	4.954	3.474	4.318
Poland	1.375	0.754	0.407	9.745	3.071
Romania	-1.440	0.263	0.886	6.198	1.477
Russia	-0.189	1.678	7.274	7.002	3.941
Slovakia	0.072	0.489	-0.036	0.824	0.337
Tajikistan	0.003	0.974	0.673	0.415	0.516
Ukraine	-0.167	0.577	14.863	24.483	9.939
Uzbekistan	0.206	1.008	2.807	1.726	1.437

Source: compiled by the author based on own calculations and statistical data (Knoema, 2022; OECD, 2022; Tradingeconomics, 2022)

China has been the center and origin of the pandemic. In the first quarter of 2021 China is characterized by the maximum level of pandemic investment leverage, which was recorded among all the studied countries for the entire study period. However, starting from the second quarter, investment risks have been minimized and the level of threat has significantly decreased. During the study period, the highest level of investment risk as a result of the pandemic was recorded in China, Iran, and Ukraine. The most

favorable conditions for investing during a pandemic are observed in Austria, Estonia, and Kazakhstan. Mongolia has the lowest score among the surveyed countries as it has the lowest known number of cases of coronavirus infection.

To determine the relationship between the pandemic investment leverage and FDI, a linear regression equation is constructed. The graphic interpretation of the obtained result is shown in Figure 1.



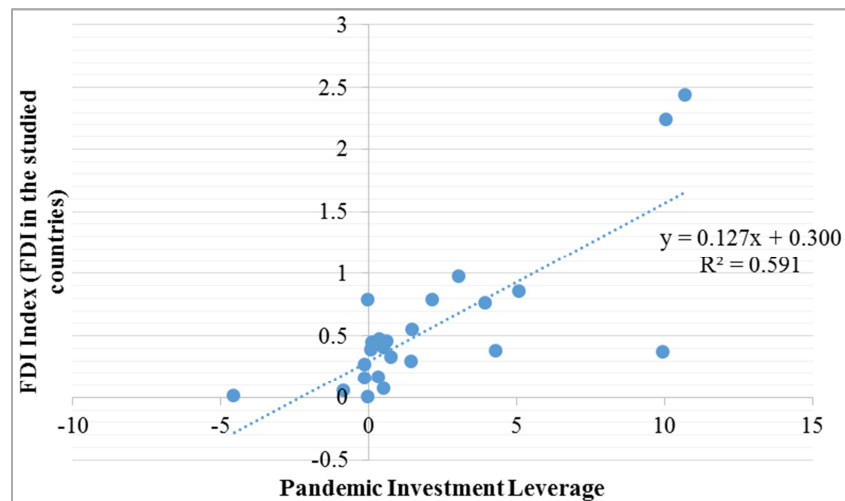
Source: generated by the author

Figure 1. Correlation between pandemic investment leverage and FDI from the studied countries.

There is a sufficient level of relationship between the studied indicators. This is confirmed by the determination coefficient $R^2=0.63$. This indicates the impact of the level of pandemic investment leverage on FDI from the studied countries. Despite the pandemic, China is the leader in investment among the studied countries. FDI was suspended

and had minimal rates in Austria, Slovakia, Lithuania, Mongolia, and Tajikistan.

To determine the relationship between pandemic investment leverage and FDI in the studied countries, a linear regression equation was constructed in a similar way. The graphic interpretation of the obtained result is shown in Figure 2.



Source: generated by the author

Figure 2. Correlation between pandemic investment leverage and FDI in the studied countries.

FDI in the studied countries is dependent on the level of pandemic investment leverage. This relationship has an average sufficient level, which is confirmed by the determination coefficient $R^2=0.59$. The dependence of FDI in the studied countries on pandemic investment leverage is slightly lower than that of FDI from the studied countries. At

the same time, the maximum indicator of FDI in a pandemic is typical for Iran and China. The minimum FDI is observed in Mongolia, Kyrgyzstan, Afghanistan, Belarus, and Slovakia.

The applicability of the constructed regression models is based on analysis of variance, the main indicators of which are shown in Table 3.

Table 3. Main indicators of analysis of variance for FDI in and from the studied countries.

Indicator	df	SS	MS	F	F sign		
Regression (CIIout)	1	1.1609	1.1609	37.0440	0.000004		
Residue (CIIout)	22	0.6895	0.0313				
Total (CIIout)	23	1.8504					
Regression (CIIin)	1	5.0575	5.0575	31.8983	0.00001		
Residue (CIIin)	22	3.4881	0.1586				
Total (CIIin)	23	8.5457					
Factor	Coefficients	Standard error	t-stat	P-value	Lower 95%	Higher 95%	
Y-intersection (CIIout)	0.2427	0.0417	5.8168	0.000007	0.1562	0.3292	
X (PIIout)	0.0610	0.0100	6.0864	0.000004	0.0402	0.0818	
Y-intersection (CIIin)	0.3002	0.0939	3.1986	0.00415	0.1056	0.4948	
X (PIIin)	0.1274	0.0226	5.6479	0.00001	0.0806	0.1742	

Source: generated by the author

The identified relationship between pandemic investment leverage and FDI is supported by a number of benchmarks. For example, the P-value for variables X (PIIout) and X (PIIin) is less than 0.05. At the same time, $F_{crit} < F$ is a positively characterizing indicator, namely, for FDI from the studied countries - $4.3 < 22.62$, for developing countries - $5.35 < 37.04$, and for FDI in the studied countries - $5.35 < 31.9$.

The applicability of these equations is confirmed on the basis of the Student's criterion, namely, $t_{crit} < t_{obs}$. For FDI from the studied countries - $2.07 < 6.09$, for FDI in the studied countries - $2.07 < 5.65$.

On the basis of the formed regression equation for FDI, a scenario modeling of its level was carried out according to three scenarios (Table 4).

Table 4. Indicators of modeling the level of FDI from the studied countries.

Country	SCpes	SCreal	SCopt	M (SC)	D (SC)	δ (SC)	limSch	limSCI
Afghanistan	0.281	0.275	0.268	0.274	0.00002	0.004	0.279	0.270
Austria	0.233	0.235	0.236	0.235	0.00000	0.001	0.236	0.234
Belarus	0.183	0.193	0.203	0.194	0.00005	0.007	0.200	0.186
Bulgaria	0.289	0.281	0.274	0.281	0.00003	0.005	0.287	0.276
China	0.978	0.855	0.733	0.843	0.00735	0.086	0.941	0.769
Czechia	0.401	0.374	0.348	0.372	0.00034	0.018	0.393	0.356
Estonia	0.253	0.251	0.249	0.251	0.00000	0.001	0.252	0.250
Hungary	0.300	0.291	0.281	0.290	0.00004	0.007	0.297	0.284
Iran	1.025	0.895	0.764	0.882	0.00833	0.091	0.986	0.803

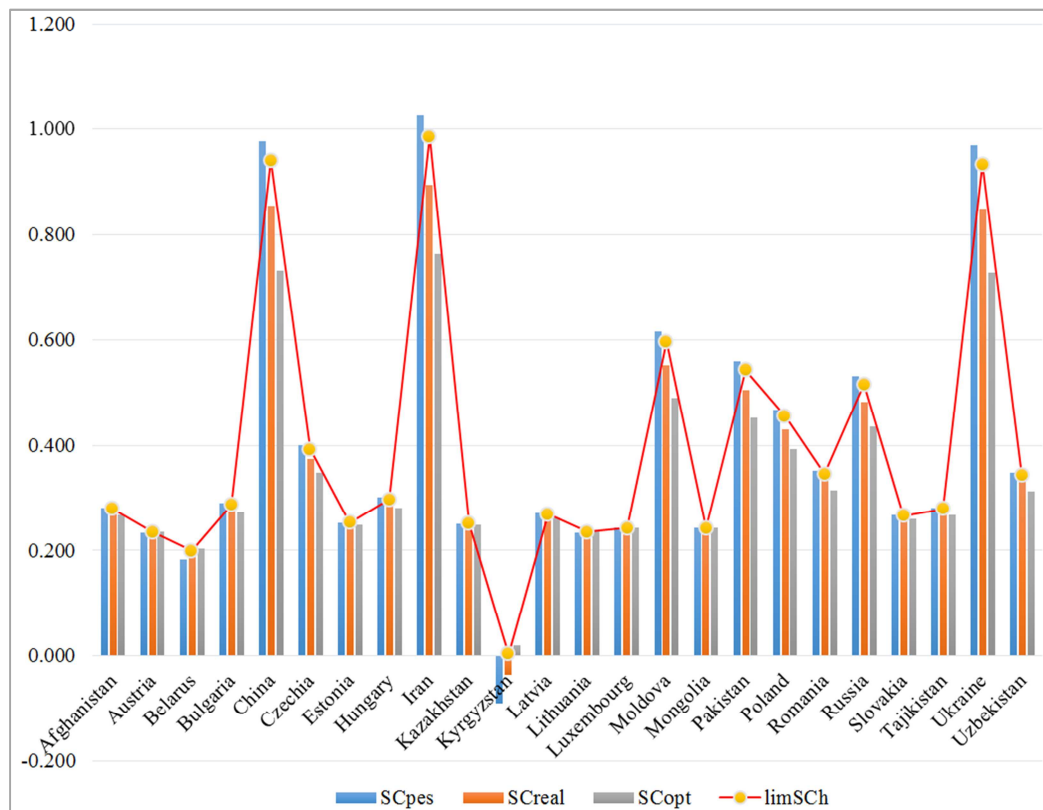
Country	SCpes	SCreal	SCopt	M (SC)	D (SC)	δ (SC)	limSch	limSCI
Kazakhstan	0.251	0.249	0.248	0.249	0.00000	0.001	0.250	0.248
Kyrgyzstan	-0.091	-0.036	0.020	-0.030	0.00152	0.039	0.003	-0.074
Latvia	0.271	0.266	0.262	0.266	0.00001	0.003	0.270	0.263
Lithuania	0.233	0.234	0.236	0.235	0.00000	0.001	0.236	0.233
Luxembourg	0.243	0.243	0.243	0.243	0.00000	0.000	0.243	0.243
Moldova	0.615	0.553	0.491	0.547	0.00189	0.043	0.596	0.509
Mongolia	0.243	0.243	0.243	0.243	0.00000	0.000	0.243	0.243
Pakistan	0.559	0.506	0.453	0.501	0.00136	0.037	0.543	0.469
Poland	0.467	0.430	0.393	0.426	0.00069	0.026	0.456	0.404
Romania	0.351	0.333	0.315	0.331	0.00016	0.013	0.345	0.320
Russia	0.531	0.483	0.435	0.478	0.00113	0.034	0.517	0.449
Slovakia	0.267	0.263	0.259	0.263	0.00001	0.003	0.266	0.260
Tajikistan	0.280	0.274	0.268	0.274	0.00002	0.004	0.279	0.270
Ukraine	0.970	0.849	0.728	0.837	0.00720	0.085	0.934	0.764
Uzbekistan	0.348	0.330	0.313	0.329	0.00015	0.012	0.343	0.318

Source: generated by the author

According to the calculations, the highest risks of FDI in a pandemic (its intensification or weakening) are observed in China, Iran, Ukraine, Moldova, Poland, Pakistan, and Russia. This is confirmed by the high level of expected pandemic investment leverage in these countries. The risks are minimal

for Mongolia and Belarus.

In order to determine the threshold of pandemic investment leverage, a critical value (limit) was determined, exceeding which maximizes investment risks (Figure 3).



Source: generated by the author

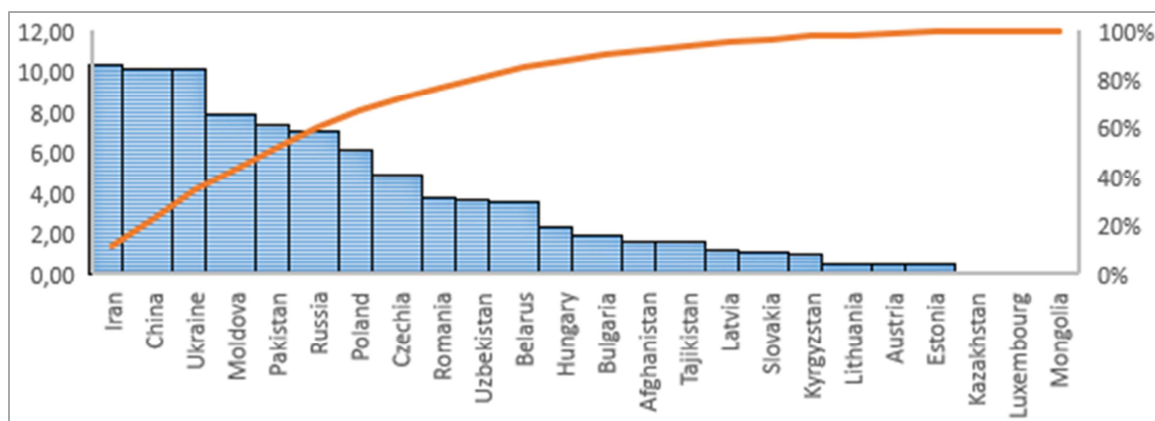
Figure 3. Risk threshold of pandemic investment leverage for the countries under study, in conventional multiplier values.

Most of the studied countries, according to the pessimistic scenario, have a pandemic investment leverage, the value of which is within the risk limit. This is the result of FDI stabilization and confirms the effectiveness of the studied countries in a given direction in the pandemic. However, there are countries for which the pandemic investment leverage exceeds the risk limit threshold. These countries

include Afghanistan and Bulgaria. For all countries, the interval between the value of the pandemic investment leverage and the risk limit threshold is insignificant, which indicates that a significant deterioration in the COVID-19 situation will have devastating consequences for FDI in the studied countries.

Possible deviations in the level of pandemic investment

leverage are shown in Figure 4.



Source: generated by the author

Figure 4. Deviations in the level of pandemic investment leverage for the studied countries.

The maximum deviation in the level of pandemic investment leverage among the studied countries, taking into account scenario modeling, is observed for Iran, China, and Ukraine. Insignificant deviations were recorded for Mongolia and Luxembourg. Thus, this study proves that investment performance in a pandemic has significant risks that can have a significant impact on both developing and developed countries. The reason for this is not so much economic threats as the spread and intensification of the pandemic in a country, which minimize or freeze investment processes.

5. Discussion

The advantage of this study is the proposed methodological approach to assessing investment risks in the context of the COVID-19 pandemic; the approach makes it possible to identify possible threats as a result of different scenarios. The scientific contribution is a formed indicator of the level of investment risks for a particular country - pandemic investment leverage. It provides an opportunity to assess the impact of the number of COVID-19 confirmed cases on the level of FDI in countries under study. At the same time, it is possible to determine deviations for different scenarios, as well as the risk limit threshold [11].

The proposed methodological approach makes it possible to increase risk management efficiency based on the identification of countries that are characterized by the highest or lowest level of FDI risks in a pandemic. The study also provides an opportunity for risk management taking into account various scenarios for the development of events in the context of an increase or decrease of the COVID-19 pandemic. Thus, based on FDI risk management, the pandemic investment leverage in these countries is determined, which demonstrates a risk limit, exceeding which can have devastating consequences for investment flows. The fact that most of the studied countries, according to the results obtained under the pessimistic scenario, have a pandemic investment leverage within the risk limit is a consequence of FDI normalization and confirms the effectiveness of the studied

countries in a given field in a pandemic [7]. However, there are countries that need increased risk management as the pandemic investment leverage exceeds the risk limit threshold. Strengthening FDI risk management should aim to increase the interval between the pandemic investment leverage and risk limit threshold for all countries.

The positive side of this study is the use of regression analysis since abrupt statistical changes in connection with the coronavirus pose challenges both for statistics in general and for FDI statistics. This is about statistical models based on time series data. This makes it possible to use the information to predict the distributions of statistical variables. The current situation, which is characterized by a very high level of uncertainty, largely makes it impossible to use such a traditional approach [29, 33]. A phase shift is observed in FDI statistics, which, unlike other economic data, react very strongly to the current situation and the state of the business environment, which is why they practically do not form long-term trends [16, 31]. In this study, this aspect has a radical rethinking and proposals for new assessment methods, including those based on the indicator of pandemic investment leverage.

The limitation of this study is the issue of choosing a new base and reference year for the time series of FDI. The need for a new base year is due to significant structural shifts in the global economy and the distribution of FDI. The reference period is chosen on the basis of its exclusivity - either as the best or as one in which the trends have changed dramatically, as well as the year of transition to completely new classifications. Pre-war or pre-crisis years are a typical example of reference years. 2019 could become a benchmark year as the year before the outbreak of the pandemic [6]. This also raises the problem of statistical profiling of large groups of enterprises. Complications of the organizational structure of groups of enterprises put forward new requirements for a final investor and a country of final investment, related to ensuring the transparency of the international investment process [5]. In a crisis, large groups of enterprises, to minimize risks, significantly complicate their already very

complex organizational structure and system of internal financial flows [15]. On the other hand, the governments of countries in such conditions can significantly strengthen protectionist measures, supporting national business and thereby creating additional obstacles to the formation of transparent statistics of FDI [41]. The statistical definition of the order of foreign investment needs to be revised since in the widespread involvement of information technologies and conducting business online, the physical presence of foreign investors is significantly reduced [20]. This changes the ratio between the income received abroad and the presence of the actual assets of foreign investors in the recipient countries of foreign investments [2]. The same aspect applies to the issue of the size of a foreign investor as a legal entity. In modern conditions, international investors, along with large groups of enterprises, can also be small enterprises.

In the future, the study can be expanded in the context of risk management of investment flows of other OBOR countries or other regions. Further studies can also focus on the dependence of investment effectiveness on the data on the number of recovered from COVID-19 or vaccination processes.

6. Conclusion

The contribution of this study is the proposed methodological approach to assessing investment risks in the context of the spread of coronavirus, which includes pandemic investment leverage. This indicator demonstrates the level of investment risks in a pandemic. The obtained values of this indicator for 2021 indicated that China had the highest level of pandemic investment leverage, which was recorded among all the studied countries. However, by the end of the study period, investment risks had significantly decreased. Based on the indicator of pandemic investment leverage, it is possible to identify countries with a high level of investment risk and countries with favorable conditions for investing in a pandemic.

Regression analysis made it possible to establish the existence of a sufficient relationship between FDI from/in the studied countries and the level of pandemic investment leverage. At the same time, the connection that arises with FDI in the studied countries is weaker than FDI from the studied countries. The generated regression equations are adequate, which is confirmed by the corresponding control indicators and criteria.

FDI risk management using the proposed approach expands its methodological toolkit in the context of identifying and minimizing the level of risks, taking into account the COVID-19 impact. The adequacy of FDI risk management is based on determining the level of risk in a pandemic for different countries and identifying among them groups of leaders and outsiders on this basis. This provided an opportunity to implement risk management, taking into account various COVID-19 scenarios. Based on FDI risk management, the pandemic investment leverage in the studied countries has been determined, which characterizes the level of their risk limit. Risk management based on scenario modeling for three COVID-19 options, expressed through the pandemic investment leverage indicator, made it possible to identify

countries with the highest FDI risks. This confirms the high level of expected pandemic investment leverage in these countries and their need to increase risk management effectiveness in this area. Assessing the critical value in the form of a risk limit, the excess of which maximizes investment risks, allows one in the process of risk management to determine the threshold of the pandemic investment leverage. The conducted risk management allowed identifying countries for which, according to the pessimistic scenario, the pandemic investment leverage is within the risk limit. This is the result of FDI stabilization and confirms the effectiveness of risk management in the studied countries in a given field in a pandemic. The study also identified countries for which the pandemic investment leverage exceeds the risk limit threshold. In this regard, it is recommended to focus risk management on increasing the gap between the pandemic investment leverage and the risk limit to minimize the consequences for FDI in the studied countries. Analysis of possible deviations in the level of pandemic investment leverage proves that investment efficiency in a pandemic has significant risks. Thus, the latter are capable of causing significant damage to both developing and developed countries.

This study may be of interest to those working in the field of risk management, the development and justification of investment strategies, as well as policies in the context of development and investment attraction at the micro and macro levels. In the future, the study may have an expansion of the geographical focus of countries, a transformation of the indicator of pandemic investment leverage to the specifics of individual industries, including it in the indicators of national economy effectiveness.

Data Availability

Data will be available on request.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Ashraf, B. N. (2020). Economic impact of government interventions during the COVID-19 pandemic: International evidence from financial markets. *Journal of Behavioral and Experimental Finance*, 27, 100371. <https://doi.org/10.1016/j.jbef.2020.100371>
- [2] Belhadi, A., Kamble, S., Jabbour, C. J. C., Gunasekaran, A., Ndubisi, N. O., & Venkatesh, M. (2021). Manufacturing and service supply chain resilience to the COVID-19 outbreak: Lessons learned from the automobile and airline industries. *Technological Forecasting and Social Change*, 163, 120447. <https://doi.org/10.1016/j.techfore.2020.120447>
- [3] Boichenko, K., Mata, M. N., Mata, P. N., & Martins, J. N. (2021). Impact of financial support on textile enterprises' development. *Journal of Risk and Financial Management*, 14(3), 135. <https://doi.org/10.3390/jrfm14030135>

- [4] Borga, M., & Sztajerowska, M. (2021). *Divestments by MNEs: What do we know about why they happen?* Columbia FDI Perspectives, No. 297. Retrieved March 13, 2021, from <http://ccsi.columbia.edu/files/2018/10/No-297-Borga-and-Sztajerowska-FINAL.pdf>
- [5] Braaksmā, B., Zeelenberg, K., & De Broe, S. (2020). Big data in official statistics: a perspective from Statistics Netherlands. *Big Data Meets Survey Science: A Collection of Innovative Methods* (pp. 303-338). Wiley. <https://doi.org/10.1002/9781118976357.ch10>
- [6] Contractor, F. J. (2021). The world economy will need even more globalization in the post-pandemic 2021 decade. *Journal of International Business Studies*, in press. <https://doi.org/10.1057/s41267-020-00394-y>
- [7] Delios, A., Perchthold, G., & Capri, A. (2021). Cohesion, COVID-19 and contemporary challenges to globalization. *Journal of World Business*, 56(3), 101197. <https://doi.org/10.1016/j.jwb.2021.101197>
- [8] Duan, W., Zhu, S., & Lai, M. (2020). The impact of COVID-19 on China's trade and outward FDI and related countermeasures. *Journal of Chinese Economic and Business Studies*, 18(4), 355-364. <https://doi.org/10.1080/14765284.2020.1855395>
- [9] Ernst & Young (2020). *Global Corporate Divestment Study 2020*. Retrieved March 13, 2021, from https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/divestment/2020/pdfs/ey-divestment-study-2020-highlights.pdf
- [10] Fang, J., Collins, A., & Yao, S. (2021). On the Global COVID-19 Pandemic and China's FDI. *Journal of Asian Economics*, 74, 101300. <https://doi.org/10.1016/j.asieco.2021.101300>
- [11] Farzanegan, M. R., Feizi, M., & Gholipour, H. F. (2021). Globalization and the Outbreak of COVID-19: An Empirical Analysis. *Journal of Risk and Financial Management*, 14(3), 105. <https://doi.org/10.3390/jrfm14030105>
- [12] Gao, H., & Ren, M. (2020). Overreliance on China and dynamic balancing in the shift of global value chains in response to global pandemic COVID-19: an Australian and New Zealand perspective. *Asian Business & Management*, 19, 306-310. <https://doi.org/10.1057/s41291-020-00121-3>
- [13] Bogdan. (2017). China's interests in Central and Eastern Europe: enter the dragon. *European View*, 16(1), 153-162. <https://doi.org/10.1007%2Fs12290-017-0427-9>
- [14] Hejazi, W., & Tang, J. (2020). Canadian FDI in a post COVID-19 world: have we reached the tipping point? *Transnational Corporations Review*, 13(1), 88-108. <https://doi.org/10.1080/19186444.2020.1863118>
- [15] Hertati, L., Widiyanti, M., Desfitriana, D., Syafarudin, A., & Safkaur, O. (2020). The Effects of Economic Crisis on Business Finance. *International Journal of Economics and Financial Issues*, 10(3), 236-244. <https://doi.org/10.32479/ijefi.9928>
- [16] Hishan, S. S. (2021). Impact of COVID-19 pandemic on Foreign Direct Investment (FDI). *Journal of Economic Info*, 8(1), 1-3. <https://doi.org/10.31580/jei.v8i1.1830>
- [17] Klierova, M., & Kutik, J. (2017). One Stop Government-Strategy of Public Services for Citizens and Businesses in Slovakia. *Administratie si Management Public*, 28, 66-80.
- [18] Knoema (2021). *Johns Hopkins University Coronavirus (2019-nCoV) Data*. Retrieved March 13, 2021, from <https://knoema.com/kaziajg/johns-hopkins-university-coronavirus-2019-ncov-data>.
- [19] Kowalski, P. (2020). Will the post-COVID world be less open to foreign direct investment? In *COVID-19 and Trade Policy: Why Turning Inward Won't Work* (pp. 131).
- [20] Liu, Y., Lee, J. M., & Lee, C. (2020). The challenges and opportunities of a global health crisis: the management and business implications of COVID-19 from an Asian perspective. *Asian Business & Management*, 19, 277-297. <https://doi.org/10.1057/s41291-020-00119-x>
- [21] Lu, Y., Wu, J., Peng, J., & Lu, L. (2020). The perceived impact of the COVID-19 epidemic: evidence from a sample of 4807 SMEs in Sichuan Province, China. *Environmental Hazards*, 19(4), 323-340. <https://doi.org/10.1080/17477891.2020.1763902>
- [22] Luchko, M., Holinach, L., Shchyrba, I., & Muzhevych, N. (2020). Innovative technologies and social responsibility of business: Analysis of possibilities. *TEM Journal*, 9(2), 680-687. <https://doi.org/10.18421/TEM92-34>
- [23] Lv, W., Wei, Y., Li, X., & Lin, L. (2019). What dimension of CSR matters to organizational resilience? Evidence from China. *Sustainability*, 11(6), 1561. <https://doi.org/10.3390/su11061561>
- [24] Miroudot, S. (2020). Reshaping the policy debate on the implications of COVID-19 for global supply chains. *Journal of International Business Policy*, 3(4), 430-442. <https://doi.org/10.1057/s42214-020-00074-6>
- [25] Mishra, A. K., Rath, B. N., & Dash, A. K. (2020). Does the Indian financial market nosedive because of the COVID-19 outbreak, in comparison to after demonetisation and the GST? *Emerging Markets Finance and Trade*, 56(10), 2162-2180. <https://doi.org/10.1080/1540496X.2020.1785425>
- [26] Mustafakulov, S. (2017). Investment attractiveness of regions: methodic aspects of the definition and classification of impacting factors. *European Scientific Journal*, 13(10), 433-449. <http://dx.doi.org/10.19044/esj.2017.v13n10p433>
- [27] Neanidis, K. C. (2019). Volatile capital flows and economic growth: The role of banking supervision. *Journal of Financial Stability*, 40, 77-93. <https://doi.org/10.1016/j.jfs.2018.05.002>
- [28] OECD (2021). *Investment by sector*. Retrieved March 13, 2021, from <https://data.oecd.org/gdp/investment-by-sector.htm>.
- [29] Russell, T. W., Wu, J. T., Clifford, S., Edmunds, W. J., Kucharski, A. J., & Jit, M. (2021). Effect of internationally imported cases on internal spread of COVID-19: a mathematical modelling study. *The Lancet Public Health*, 6(1), 12-20. [https://doi.org/10.1016/S2468-2667\(20\)30263-2](https://doi.org/10.1016/S2468-2667(20)30263-2)
- [30] Sharma, B. (2021). COVID-19 and recalibration of FDI regimes: convergence or divergence? *Transnational Corporations Review*, 13(1), 62-73. <https://doi.org/10.1080/19186444.2021.1890433>
- [31] Shvydanenko, O., Sica, E., & Busarieva, T. (2019). Creativity as the new production factor of the world economy. *Management Theory and Studies for Rural Business and Infrastructure Development*, 41(1), 127-134. <https://doi.org/10.15544/mts.2019.12>

- [32] Strange, R. (2020). The 2020 COVID-19 pandemic and global value chains. *Journal of Industrial and Business Economics*, 47, 455-465. <https://doi.org/10.1007/s40812-020-00162-x>
- [33] Takahashi, H., & Yamada, K. (2021). When the Japanese stock market meets COVID-19: Impact of ownership, China and US exposure, and ESG channels. *International Review of Financial Analysis*, 74, 101670. <https://doi.org/10.1016/j.irfa.2021.101670>
- [34] Tetteh, I. A., & Gao, J. (2020). Analyzing the effect of the COVID-19 on the global economy: A case study of its influence on Africa's FDI and foreign exchange inflows. *Open Journal of Business and Management*, 8(06), 2396. <https://doi.org/10.4236/ojbm.2020.86147>
- [35] Tradingeconomics (2021). *Foreign direct investment*. Retrieved March 13, 2021, from <https://tradingeconomics.com/slovakia/foreign-direct-investment>
- [36] Tröster, B., & Küblböck, K. (2020). Unprecedented but not Unpredictable: Effects of the COVID-19 Crisis on Commodity-Dependent Countries. *The European Journal of Development Research*, 32(5), 1430-1449. <https://doi.org/10.1057/s41287-020-00313-9>
- [37] UNCTAD (2021). *Trade and investment under COVID-19*. Retrieved March 13, 2021, from https://unctad.org/system/files/official-document/sgsinf2021d1_en.pdf
- [38] Vujanović, N., Stojčić, N., & Hashi, I. (2021). FDI spillovers and firm productivity during crisis: Empirical evidence from transition economies. *Economic Systems*, in press. <https://doi.org/10.1016/j.ecosys.2021.100865>
- [39] Wang, Z., & Sun, Z. (2021). From globalization to regionalization: The United States, China, and the post-COVID-19 world economic order. *Journal of Chinese Political Science*, 26(1), 69-87. <https://doi.org/10.1007/s11366-020-09706-3>
- [40] Wu, J., Ma, Z., Liu, Z., & Lei, C. K. (2019). A contingent view of institutional environment, firm capability, and innovation performance of emerging multinational enterprises. *Industrial Marketing Management*, 82, 148-157. <https://doi.org/10.1016/j.indmarman.2019.01.018>
- [41] Zhang, W. B., Ge, Y., Liu, M., Atkinson, P. M., Wang, J., Zhang, X., & Tian, Z. (2021). Risk assessment of the step-by-step return-to-work policy in Beijing following the COVID-19 epidemic peak. *Stochastic Environmental Research and Risk Assessment*, 35(2), 481-498. <https://doi.org/10.1007/s00477-020-01929-3>