

## Assessment of the risk of foreign divestment in Poland during the COVID-19 pandemic

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**Abstract.** The importance of foreign direct investment (FDI) to the economic development of Poland cannot be overestimated, both at the regional level and in relation to the economy as a whole. Since FDIs are powered by capital sensitive to various national and international crises, it seems natural to ask whether the situation connected with the global COVID-19 pandemic is reflected in the reduction of FDI inflows to Poland. The aim of the paper is to identify the determinants of the foreign divestment process in the Polish economy as a whole and in its main sectors during the COVID-19 pandemic. The article analyses scenarios of foreign divestment in Poland in an annual perspective, starting from the outbreak of the epidemic in March 2020 up to February 2021. The study used data from a survey conducted in April and May 2020 among nearly 500 enterprises realising FDI in Poland. The benchmark for the surveyed companies was the level of their involvement in FDIs covering a one-year period prior to the announcement of the epidemic. The application of logit models allowed the identification of the most important factors of foreign divestment during COVID-19, including the location of FDIs in the services sector, industry, the IT sector, increased market openness and interactions of variables taking into account the restrictions introduced to the economy due to the pandemic. The level of risk of divestment of these variables depends, however, on the volume of FDI reductions declared by investors and on the sector of the economy. If considerable divestment is assumed, FDIs in the services sector are then burdened with a higher risk of divestment than FDIs in the processing industry. Assuming small divestments, FDIs in the IT sector constitute a factor bearing the greatest risk of FDI reduction in the entire economy.

**Keywords:** logit model, interactions of variables, foreign direct investment, FDI, divestment, COVID-19, risk assessment

**JEL:** C25, F21

## Ocena ryzyka dezinwestycji zagranicznych w Polsce w warunkach pandemii COVID-19

**Streszczenie.** Znaczenie bezpośrednich inwestycji zagranicznych (BIZ) dla rozwoju gospodarczego Polski jest nie do przecenienia zarówno na poziomie regionalnym, jak i gospodarki jako całości. Ze względu na zasilenie BIZ kapitałem, który jest wrażliwy na różne kryzysy krajowe i międzynarodowe, naturalne wydaje się pytanie, czy sytuacja pandemiczna na świecie znajduje odzwierciedlenie w ograniczeniu napływu tych inwestycji do Polski. Celem badania przedstawionego w artykule jest identyfikacja czynników, które w największym stopniu wpływają na dezinwestycje w całej gospodarce i jej najważniejszych działach w warunkach pandemii COVID-19. Przeanalizowano scenariusze dezinwestycji zagranicznych w Polsce w perspektywie

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rocznej od momentu ogłoszenia epidemii, czyli od marca 2020 r., do lutego 2021 r. Wykorzystano dane z badania sondażowego przeprowadzonego w kwietniu i maju 2020 r. wśród prawie 500 przedsiębiorstw, które lokowały BIZ w Polsce. Punktem odniesienia był poziom zaangażowania badanych firm w inwestycje bezpośrednie w ciągu roku poprzedzającego ogłoszenie epidemii. Dzięki zastosowaniu modeli logitowych udało się wskazać najistotniejsze czynniki dezynwestycji zagranicznych w dobie pandemii COVID-19. Należą do nich m.in.: lokowanie BIZ w sektorze usług, przemyśle i branży IT, wzrost otwartości rynku oraz interakcje zmiennych uwzględniające obostrzenia wprowadzane w gospodarce w związku ze stanem pandemii. Poziom ryzykogenności dezynwestycji tych zmiennych zależy jednak od rozmiarów redukcji BIZ deklarowanej przez inwestorów oraz od działu gospodarki. Wykazano m.in., że przy założeniu znacznych dezynwestycji lokowanie BIZ w usługach jest obciążone przeważnie wyższym ryzykiem dezynwestycji niż w przypadku przemysłu przetwórczego. Przy założeniu niewielkich dezynwestycji najbardziej ryzykogennym czynnikiem redukcji BIZ w całej gospodarce jest lokowanie ich w branży IT.

**Słowa kluczowe:** model logitowy, interakcje zmiennych, bezpośrednie inwestycje zagraniczne, BIZ, dezynwestycje, COVID-19, ocena ryzyka

## 1. Introduction

The COVID-19 pandemic has had significant social and economic effects on the global economy and it will continue to be so in the future. The freezing of many economic sectors, the imposing of strict sanitary measures, and finally, the closing of borders have resulted in the reduced production capacity in various economic sectors, as well as the disruption of domestic and international supply chains. At the macroeconomic level, these repercussions have caused a decrease in gross domestic product (GDP), an increase in government debt due to the triggering of public aid measures (as part of anti-crisis shields and lowered tax income), an increased unemployment rate, more frequent enterprise bankruptcies, and further serious social and economic repercussions (Aidukaite et al., 2021; Bergsen, 2020; Davahli et al., 2020).

Regression has also affected FDI, which, due to the epidemic, has been limited, postponed or withdrawn in host countries and in countries providing capital. The scale of the reduced inflow of FDIs during the pandemic depends on various factors, e.g. on the structure of the economy, as it is evident that not all economic sectors have suffered from the crisis in the same way. Sanitary restrictions have hit certain sectors more, having led to a full ban on production or services, while others suffered less (where the risk of virus transmission is low or where the sector is of strategic importance to the functioning of the economy). The economic sectors most affected by the restrictions related to the COVID-19 pandemic include gastronomy, hospitality, health and wellness, while construction and industry were less affected (Bergsen, 2020; Davahli et al., 2020).

Thus, the situation caused by the pandemic prompts investors of many industries affected by COVID-19 to further restrict or suspend investment in sectors more

susceptible to the effects of the phenomenon, e.g. where potential losses related to a halt on production or services provision may be considerable. The high sensitivity of foreign capital to the COVID-19 pandemic also results from deep globalisation processes connected with the emergence of global value chains (GVC) taking advantage of international labour division. The scattering of the production process and services among countries in the framework of international labour division, supervised by transnational enterprises (offshoring), acts as a closed system: interference with a GVC link in one country results in immediate consequences in the other countries involved. Investments in enterprises which are elements of such international systems seem more risky during the pandemic and may incline investors to divest. Divestment involves restricting the previous scope and scale of operations of a business which is the target of direct investment as a result of abandoning part of its operations or a complete transfer of the enterprise by its investor (Borga et al., 2019; Doctor & Bagwell, 2020; Martins & Esteves, 2008; Shin, 2000; Trencher et al., 2020). In practical terms, divestment means a change of ownership (co-ownership), rather than the closing of a business. For this reason, it is necessary to devise and assess the factors that cause an increased investment risk during a pandemic.

Such research intensifies globally during local or global economic (financial) crises and, likewise, publications on divestment usually become more frequent. Analyses of this kind mostly cover microeconomic and macroeconomic factors. Berry (2010), Harrigan (1981), Markides (1992) and Pashley & Philippatos (1990) argue that poor results of the mother company (investor) in host countries of FDIs may also be conducive to divestment. However, no unambiguous relation between the financial results of affiliates and divestment has been confirmed (Berry, 2013; Hamilton & Chow, 1993; Markides, 1992). Bergh (1997) and Berry (2010, 2013) have shown that the diversification of business operations also encourages the withdrawal of FDIs. Furthermore, the level of the internationalisation of transnational enterprises which are chief providers of capital is an important diversification factor (Berry, 2010, 2013; Norbäck et al., 2015). Borga et al. (2019) prove that the risk of foreign divestment increases along with the intensification of enterprise internationalisation. Jovanovic & MacDonald (1994) prove that technological changes increase the odds of divestment, while Chatterjee et al. (2003) and Norbäck et al. (2015) argue that institutional changes at the sector level increase chances of divestment.

Research shows that the GDP, the level of economic openness, the level of salaries and wages, currency exchange rates, inflation, political stability, membership of a country in economic associations, free trade zones and others belong to important macro-economic factors which may have an influence on divestment (Berry, 2010; Blake & Moschieri, 2017; Norbäck et al., 2015). Berry (2010), Blake & Moschieri

(2017) and Norbäck et al. (2015) proved a negative relation between economic growth and divestment, while Borga et al. (2019) and Norbäck et al. (2015) demonstrated that a greater openness of an economy encourages divestment. The papers on divestment were written before COVID-19 was declared a pandemic, so researchers did not take into account the risk factors of divestment typical of this phenomenon and the consequences of the measures introduced to counteract it. In order to correctly diagnose divestment risk, one needs to consider the factors related to the direction of the development of the COVID-19 pandemic and the potential economic restrictions imposed by governments of various countries.

The aim of the paper is to identify the most important determinants of the foreign divestment process in the entire economy of Poland and its main sectors during the COVID-19 pandemic. The process involves the estimation of the divestment risk generated by individual macroeconomic variables. The article presents the application of a logit model with effects of interaction to study the inclination for foreign divestment in Poland. The analysis is based on data from a survey carried out among foreign enterprises conducting direct investment in Poland. Such research seems necessary to monitor tendencies in the investment market on an ongoing basis. It can also be used as potential support for decision-makers in the management of foreign investment.

## **2. Research methodology**

The subject of the study concerned foreign companies which located FDIs in Poland in the years 2015–2019. The study used data from a survey conducted in April and May 2020 on a random sample of 708 randomly selected foreign subjects (simple random sampling without replacement). A questionnaire was sent to the selected entities in order to obtain information on how investors assess various risk factors leading to divestment in the context of different scenarios of the development of the COVID-19 pandemic. The return of the questionnaires reached the level of 70% and ultimately the study covered 496 correctly completed questionnaires, which constituted approximately 2% of the enterprises locating FDI in Poland. The article analyses scenarios of foreign divestment in Poland covering a year from the moment the epidemic was announced (from March 2020 to February 2021). The benchmark for the surveyed companies during the COVID-19 pandemic was the level of their involvement in FDIs during a one-year period preceding the announcement of the epidemic. The randomly selected companies represented main industries, including manufacturing, construction, IT, finance and more. The surveyed enterprises came from countries which have been in the recent years the main suppliers of FDI to

Poland: the Netherlands, Germany, France, Luxembourg,<sup>1</sup> and others. When preparing the research probe, the databases of such companies as Orbis (Bureau van Dijk, n.d. a) and Zephyr (Bureau van Dijk, n.d. b) were used. As the aim of the study was to estimate the level of divestment risk generated by different variables measured on the nominal and rank scale, a logit model with possible interactions between the variables was selected for the analysis. The ease of interpreting the results in the form of an odds ratio is also an advantage of using the logit model. The model was estimated for 3 divestment scenarios: small divestment (up to 20%), medium divestment (from 20% to 40%) and significant divestment (above 40%).

For each of the three divestment scenarios, the following coding was adopted for binary dependent variables:

- $Y_1 = 1$ , when a decision on small foreign divestment was made and  $Y_1 = 0$ , when the decision on divestment was not made,
- $Y_2 = 1$ , when the decision on medium divestment was made and  $Y_2 = 0$ , when the decision on divestment was not made,
- $Y_3 = 1$ , when a decision on significant divestment was made and  $Y_3 = 0$ , when no decision on divestment was made.

The Chart below presents a list of all the variables along with the coding of the answers given by the respondents.

**Chart.** Specification of variables with questions and sets of possible answers included in the survey

Designation of the variable	Question	A set of possible answers
$\Delta GDP_c$	expected decrease in GDP in the investor's country	1 – up to 5% 2 – over 5% to 10% 3 – over 10% to 15% 4 – over 15% to 20% 5 – over 20%
$\Delta GDP$	expected decrease in GDP in Poland	
$\Delta Ex$	expected depreciation of the Polish zloty (PLN) in relation to the euro	
$\Delta OMI$	expected increase in the market openness index	
$\Delta LC$	expected increase in unit labour costs	
$M$	investing in the industrial sector and the construction industry	1 – yes 0 – no
$S$	investing in the services sector	
$IT$	investing in the IT sector	
$O$	investing in other sectors	

<sup>1</sup> Luxembourg's presence here may be due to the fact that it is considered to be a 'tax haven' (which has also been criticised by the European Commission). As a result, many of the actual sources of FDI may be hidden.

**Chart.** Specification of variables with questions and sets of possible answers included in the survey (cont.)

Designation of the variable	Question	A set of possible answers
$\Delta i$	expected increase in the inflation rate	1 – up to 5%
$\Delta R\&D$	expected decrease in domestic expenditures on research and development in relation to GDP	2 – over 5% to 10% 3 – over 10% to 15% 4 – over 15% to 20% 5 – over 20%
$DC$	distance from Warsaw to the capital of the investor's country	1 – up to 700 km 2 – over 700 km to 1400 km 3 – over 1400 km to 2100 km 4 – over 2800 km to 3500 km 5 – over 3500 km
$L1$	introduction of minor restrictions on the economy in relation to the epidemic risk	1 – yes 0 – no
$L2$	introduction of moderately burdensome restrictions on the Polish economy and a partial freeze of the economy in relation to the development of COVID-19	
$L3$	introduction of very rigorous restrictions on the Polish economy and a considerable economic freeze	

Source: own study based on the survey results.

Almost all of the specified variables relate to investors' expectations regarding changes in individual factors.

The basic logit model used in the paper considers second-order interaction and takes the following form (Harrell, 2001; Jaccard, 2001):

$$L(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \beta_{k+1} X_1 X_2 + \beta_{k+2} X_1 X_3 + \dots + \beta_{k+(k)} X_{k-1} X_k,$$

where:

$X_1, X_2, X_3, \dots, X_k$  – independent variables,

$\beta_1, \beta_2, \dots, \beta_{k+(k)}$  – model parameters,

$L(p)$  – logit, where  $L(p) = \frac{p}{1-p}$  and  $p = P(Y = 1 | X_1, X_2, \dots, X_k)$ .

The parameters of the model have been estimated using the maximum likelihood method. The results of McFadden's pseudo  $R^2$  index, the Likelihood Ratio Test (LRT), the Schwarz information criterion, and the statistical significance of parameters have been used to select the final model.

### 3. Determinants of the divestment process in various sectors of the Polish economy

The results of the estimation of the logit models for three divestment variants in Poland are provided in Table 1. The majority of the parameters in the estimated models have a significance level of 0.01 or 0.05, whereas the results of the pseudo  $R^2$ , Likelihood Ratio (LR), LRT and the Bayesian Information Criterion (BIC) indicate a satisfactory adjustment of models to the empirical data. Selected values of the odds ratio, calculated based on the assessment of parameters of individual models have been interpreted.

**Table 1.** Estimation results of the logit model describing the inclination of foreign divestment according to three divestment scenarios in comparison to the one year before the outbreak of the COVID-19 pandemic

Variables	Divestment					
	up to 20%		from 20% to 40%		above 40%	
	coefficient	odds ratio	coefficient	odds ratio	coefficient	odds ratio
<i>Constant</i> .....	-12.15***	0.00	-9.12***	0.00	-7.02***	0.00
$\Delta GDP\_c$ .....	0.12**	1.13	0.15*	1.16	-0.10***	0.91
$\Delta GDP$ .....	0.30**	1.35	0.33**	1.39	0.06***	1.07
$\Delta Ex$ .....	0.21**	1.24	0.10***	1.11	-0.06*	0.94
$\Delta OMI$ .....	0.43**	1.53	0.62***	1.86	0.90***	2.45
$\Delta LC$ .....	0.37***	1.45	0.60***	1.83	0.46***	1.58
<i>M</i> .....	-0.19**	0.83	0.38***	1.46	0.85***	2.35
<i>S</i> .....	0.43**	1.53	0.22***	1.25	0.42**	1.52
<i>IT</i> .....	0.85***	2.33	0.42***	1.52	0.22*	1.24
<i>O</i> .....	-0.25***	0.78	-0.19*	0.83	-0.06***	0.94
$\Delta i$ .....	0.02*	1.02	-0.22*	0.81	-0.17**	0.84
$\Delta R\&D$ .....	0.08*	1.08	-0.28**	0.76	-0.68**	0.57
$\Delta DC$ .....	0.37***	1.45	0.22***	1.24	0.32*	1.37
<i>L1</i> .....	0.75***	2.13	-0.05*	0.96	-0.23*	0.79
<i>L2</i> .....	0.35*	1.43	0.64***	1.90	0.11**	1.12
<i>L3</i> .....	-0.27*	0.77	0.26**	1.29	0.87***	2.39
<i>IT</i> · <i>L1</i> .....	0.90**	2.45	.	.	.	.
<i>IT</i> · <i>L2</i> .....	.	.	0.76***	2.15	.	.
<i>IT</i> · <i>L3</i> .....	.	.	.	.	0.76***	2.14
<i>S</i> · <i>L1</i> .....	0.75**	2.11	.	.	.	.
$\Delta OMI$ · <i>L1</i> .....	.	.	0.63***	1.88	.	.
$\Delta OMI$ · <i>L3</i> .....	.	.	.	.	0.75***	2.12
$\Delta LC$ · <i>L2</i> .....	0.64**	1.90	.	.	.	.
$\Delta LC$ · <i>L3</i> .....	.	.	0.58***	1.79	0.58***	1.79
$\Delta GDP$ · <i>M</i> .....	0.17***	1.18	0.50***	1.65	0.47**	1.60
$\Delta OMI$ · <i>M</i> .....	0.55**	1.73	.	.	.	.
$\Delta GDP\_c$ · <i>IT</i> .....	.	.	0.37***	1.45	.	.
$\Delta GDP\_c$ · <i>M</i> .....	.	.	.	.	0.87***	2.39
<i>M</i> · <i>L2</i> .....	0.24**	1.27	.	.	.	.
<i>S</i> · <i>L3</i> .....	.	.	0.31**	1.37	.	.
$\Delta R\&D$ · <i>IT</i> .....	.	.	-0.35*	0.70	.	.
$\Delta O$ · $\Delta i$ .....	.	.	.	.	-0.32*	0.73

**Table 1.** Estimation results of the logit model describing the inclination of foreign divestment according to three divestment scenarios in comparison to the one year before the outbreak of the COVID-19 pandemic (cont.)

Variables	Divestment					
	up to 20%		from 20% to 40%		above 40%	
	coefficient	odds ratio	coefficient	odds ratio	coefficient	odds ratio
McFadden's pseudo R <sup>2</sup> .....	0.22		0.32		0.19	
LR .....	-166.83		-176.33		-160.29	
LRT .....	91.93***		162.17***		75.69***	
BIC .....	433.09		452.09		420.02	

Note. Significance at the level of: \*\*\* – 0.01, \*\* – 0.05, \* – 0.1.

Source: own study based on the survey results.

Table 1 shows that if individual factors are taken into consideration, the greatest increase in divestment risk at a level of no more than 20% (in comparison to the pre-pandemic period) is generated by FDIs in IT and an optimistic course of the pandemic. The odds of divestment increase for the above reasons by approximately 133% and 113%, respectively. It should also be noted that investment in branches of the processing industry may reduce the risk of divestment by approximately 17%. The results incline the author to assume that in conditions of inconsiderable divestment the industrial sector is perceived to be safer than the services sector. Interactions in most cases increase considerably the risk of divestment in comparison to the combination with at least one factor creating an interaction. Thus, the combination of FDIs in the IT sector with the occurrence of weaker restrictions imposed on the economy due to the pandemic increases the risk of minor divestment by approximately 145%, whereas the interaction of FDIs in the services sector and an optimistic scenario of the development of the pandemic increases the risk of divestment by about 111%.

As regards medium divestment (from 20% to 40%) in comparison to the pre-pandemic period, an increase in labour costs and in the value of the market openness index (OMI) bears the greatest risk. An increase in labour costs by every subsequent 5 p.p. increases the risk of moderate divestment by about 83%, while an increase in the value of the OMI by every subsequent 5 p.p. increases the risk of divestment by approximately 86%. Moderate restrictions introduced to counteract the pandemic pose an even higher risk of moderate divestment (risk increases by around 90%); the same applies to the interaction of this factor with FDIs in the sector of IT services (risk increases by about 115%). Individual factors which increase the risk level of



FDI reduction when the prospect of divestment changes from optimistic (up to 20%) to moderately pessimistic (from 20% to 40%) include: a decrease in the GDP of the investor's country, a decrease in the GDP of Poland, a reduced OMI, increased labour costs, FDIs in the processing industry, FDIs in sectors of the economy other than the services and processing industries, the optimistic variant of pandemic development, and the moderate or pessimistic variant for pandemic development.

Table 1 suggests that the greatest risk of divestment at a level above 40% in comparison to the pre-pandemic period is generated by considerable economic restrictions imposed in response to the development of a pessimistic pandemic scenario, an increase in the OMI in Poland and FDIs in the processing industry. The pessimistic scenario of the development of the pandemic increases the risk of considerable divestment by approximately 139%. An increase in the value of the OMI by another 5 p.p. increases this risk by about 145% on average, while FDIs in the processing industry increase the risk of these FDIs by around 135% on average. With regard to factor interactions, the combination of FDIs in the processing industry with a decreased GDP in the investor's country by another 5 p.p. is characterised by the greatest risk of divestment at a level exceeding 40% (risk increases by approximately 140%). More than a twofold increase in the risk of considerable divestment is also generated by a combination of FDIs in the IT sector with a pessimistic scenario of pandemic development and a combination of an increase in the OMI in Poland with severe restrictions on the economy related to the development of the pandemic. Individual factors that have increased the risk of FDI reduction in the case of a change of the divestment perspective from moderately pessimistic (from 20% to 40%) to pessimistic (above 40%) include: an increased OMI, FDIs in the processing industry, FDIs in the services sector, FDIs in economic sectors other than the services and processing industries, an increase in inflation, the geographic distance between Poland and the investor's country, and the occurrence of a pessimistic scenario of pandemic development.

FDI in Poland mainly occurs in the processing industry and the services sector (Narodowy Bank Polski, n.d.). These sectors are characterised by specific investments and a distinct level of investment risk of different factors, so an examination of the inclination for divestment in these separate economic sectors seems definitely justified. Table 2 presents the results of the logit model estimations used to describe the inclination for FDI reduction in the processing industry.

**Table 2.** Estimation results of the logit model describing the inclination of foreign divestment in the processing industry according to three divestment scenarios in comparison to the one year before the outbreak of the COVID-19 pandemic

Variables	Divestment					
	up to 20%		from 20% to 40%		above 40%	
	coefficient	odds ratio	coefficient	odds ratio	coefficient	odds ratio
<i>Constant</i> .....	-6.54***	0.00	-8.01***	0.00	-13.10***	0.00
$\Delta GDP\_c$ .....	0.21**	1.23	0.46**	1.58	0.32***	1.38
$\Delta GDP$ .....	0.32***	1.38	0.65***	1.92	0.64***	1.90
$\Delta Ex$ .....	0.06**	1.06	0.20***	1.22	0.14**	1.15
$\Delta OMI$ .....	0.35***	1.43	0.62**	1.87	0.51***	1.67
$\Delta LC$ .....	0.16**	1.18	0.78***	2.19	0.67***	1.96
$\Delta i$ .....	-0.03*	0.97	-0.14**	0.87	-0.21**	0.81
$\Delta R\&D$ .....	0.08***	1.09	0.18***	1.20	0.04*	1.04
$\Delta DC$ .....	0.13***	1.14	0.22***	1.24	0.36***	1.43
<i>L1</i> .....	0.51***	1.66	0.32*	1.37	-0.11*	0.90
<i>L2</i> .....	0.19**	1.21	1.14***	3.11	0.72***	2.06
<i>L3</i> .....	0.12***	1.13	0.80***	2.23	1.30***	3.68
$\Delta GDP\_c \cdot L1$ .....	0.63*	1.87	.	.	.	.
$\Delta GDP\_c \cdot L2$ .....	.	.	0.80***	2.23	.	.
$\Delta GDP \cdot L3$ .....	.	.	.	.	1.64***	5.17
$\Delta GDP \cdot L1$ .....	0.81***	2.24	.	.	.	.
$\Delta GDP \cdot L2$ .....	.	.	0.94***	2.55	.	.
$\Delta OMI \cdot L2$ .....	.	.	.	.	1.72***	5.56
$\Delta OMI \cdot L1$ .....	0.91***	2.49	.	.	.	.
$\Delta LC \cdot L3$ .....	.	.	1.10***	3.01	.	.
$\Delta LC \cdot L2$ .....	.	.	.	.	1.11***	3.03
$\Delta GDP \cdot \Delta OMI$ .....	0.72**	2.06	1.00**	2.71	.	.
$\Delta OMI \cdot \Delta LC$ .....	.	.	.	.	0.91***	2.49
$\Delta GDP \cdot \Delta Ex$ .....	.	.	.	.	1.10***	3.01
McFadden's pseudo $R^2$ .....	0.42		0.36		0.31	
LR .....	-181.43		-162.94		-199.07	
LRT .....	259.54***		186.51***		177.21***	
BIC .....	462.29		425.31		497.58	

Note. Significance at the level of: \*\*\* – 0.01, \*\* – 0.05, \* – 0.1.

Source: own study based on the survey results.

The analysis of the results provided in Table 2 lead to the conclusion that, with reference to individual macroeconomic factors, the greatest increase in divestment risk in the processing industry at a level up to 20% in comparison to the pre-pandemic period is generated by a decrease in Poland's GDP, an increase in the OMI and the occurrence of an optimistic variant of the pandemic. With a decrease in GDP and an increase in OMI by every subsequent 5 p.p., the odds of divestment increase by approximately 38% and 43%, respectively, whereas minor restrictions on the economy imposed to counteract the pandemic increase the risk of divestment by about 66%. In general, interactions of variables increase the risk of divestment in the processing industry by twofold in comparison to the individual factors. For example, the

combination of a decrease in the GDP of Poland (by every 5 p.p.) with minor economic restrictions related to the pandemic increases the risk of minor divestment in the industry by 124%, whereas an interaction of OMI increases (by every 5 p.p.) and the same economic restrictions lead to an increase in the risk of divestment by approximately 149% on average.

In relation to moderate divestment in the industry (from 20% to 40%) in comparison to the period before the pandemic outbreak, economic recession in Poland, an increase in labour costs and a medium variant of the pandemic development scenario create the greatest risk of divestment. A decrease in Poland's GDP by every subsequent 5 p.p. increases the risk of divestment by approximately 92%. An increase in labour costs by every subsequent 5 p.p. increases the risk of moderate divestment by about 119%. A medium variant of the pandemic development increases the odds of divestment by around 211%. As regards the statistically significant interaction of the observed factors, the following increase the risk of moderate divestment to the greatest extent: an increase in the labour costs (by every 5 p.p.) combined with the pessimistic variant of pandemic development and a decrease in Poland's GDP combined with an increase in the value of the OMI (by every subsequent 5 p.p.). In the former case, an increase in the odds of moderate divestment amounts to 201%, while in the latter case, it equals 171%. It should be stressed that all individual factors increase the level of the FDI reduction risk along with a change in the divestment prospect from optimistic (up to 20%) to moderately pessimistic (from 20% to 40%), except for an increase in inflation and the occurrence of an optimistic variant of pandemic development.

Table 2 indicates that in comparison to the pre-pandemic period, the greatest risk of considerable divestment (at a level above 40%) in the processing industry is generated by the imposing of considerable and moderate economic restrictions in response to the pessimistic development of the pandemic scenario, a greater economic recession in Poland, and increased labour costs. A decrease in Poland's GDP by every subsequent 5 p.p. generates an increase in moderate divestment by approximately 90%, and an increase in labour costs by every subsequent 5 p.p. increases the risk of divestment by about 96% on average. Moderate economic restrictions introduced to counteract the pandemic increase the risk of divestment by about 106%, whereas the pessimistic variant of the development of the pandemic increases the risk of divestment by an average of 268%.

With reference to factor interactions, the combination of a decrease in Poland's GDP by every subsequent 5 p.p. with the pessimistic variant of pandemic development in Poland, and the interaction of an increase in the OMI by every subsequent

5 p.p. with moderate economic restrictions to counteract the pandemic are characterised by the greatest risk of foreign divestment at a level above 40% in the processing industry. In the former case, the risk of moderate divestment increases by approximately 417%, and in the latter case – by about 456%.

It should also be stressed that all individual factors have increased the risk of FDI reduction along with a change of the divestment prospect from optimistic (up to 20%) to pessimistic (above 40%), with the exception of an increase in inflation, decrease in R&D expenditures and the occurrence of an optimistic variant of pandemic development.

Table 3 presents the results of the estimation of logit models used to describe the inclination for FDI reduction in the services sector.

**Table 3.** Estimation results of the logit model describing the inclination of foreign divestment in the services sector according to three divestment scenarios in comparison to the one year before the COVID-19 pandemic outbreak

Variables	Divestment					
	up to 20%		from 20% to 40%		above 40%	
	coefficient	odds ratio	coefficient	odds ratio	coefficient	odds ratio
<i>Constant</i> .....	-5.14***	0.00	-13.14***	0.00	-6.53***	0.00
$\Delta GDP\_c$ .....	0.18***	1.19	0.20***	1.22	0.95***	2.59
$\Delta GDP$ .....	0.33***	1.39	0.49***	1.63	0.34*	1.41
$\Delta Ex$ .....	0.08*	1.08	-0.15*	0.86	0.91***	2.47
$\Delta OMI$ .....	0.49***	1.63	0.82***	2.28	0.77***	2.15
$\Delta LC$ .....	0.38***	1.47	0.69***	2.00	0.52***	1.68
$\Delta i$ .....	0.17*	1.19	-0.12**	0.89	0.43***	1.54
$\Delta R\&D$ .....	-0.65***	0.52	0.40***	1.49	0.49***	1.63
$\Delta DC$ .....	0.01*	1.01	0.62***	1.85	-0.01*	0.99
$L1$ .....	0.56***	1.75	0.26***	1.30	0.48**	1.61
$L2$ .....	0.01	1.01	0.82***	2.26	1.48***	4.40
$L3$ .....	-0.20*	0.82	0.41***	1.51	1.84***	6.27
$\Delta GDP\_c \cdot L1$ .....	0.42***	1.53	.	.	.	.
$\Delta GDP\_c \cdot L2$ .....	.	.	1.41***	4.10	.	.
$\Delta GDP\_c \cdot L3$ .....	.	.	.	.	1.94***	6.97
$\Delta GDP \cdot \Delta OMI$ .....	1.38***	3.98	.	.	0.81***	2.24
$\Delta OMI \cdot \Delta DC$ .....	0.78***	2.18	1.52***	4.58	1.09***	2.98
$\Delta OMI \cdot L1$ .....	1.49***	4.44	.	.	.	.
$\Delta OMI \cdot L3$ .....	.	.	1.63***	5.09	.	.
$\Delta OMI \cdot \Delta LC$ .....	.	.	.	.	1.13***	3.10
$\Delta GDP \cdot \Delta R\&D$ .....	.	.	1.38***	3.98	0.51***	1.67
McFadden's pseudo $R^2$ .....	0.25		0.34		0.21	
LR .....	-159.08		-210.53		-184.26	
LRT .....	108.33***		218.85***		96.78***	
BIC .....	417.59		520.49		467.95	

Note. Significance at the level of: \*\*\* – 0.01, \*\* – 0.5, \* – 0.1.

Source: own study based on the survey results.

The greatest risk of minor divestment (up to 20%) in the services sector is generated by the occurrence of an optimistic scenario of pandemic development, an increase in the OMI in Poland and increased labour costs (see Table 3).

The occurrence of an optimistic variant of pandemic development increases the risk of minor divestment in the services sector by approximately 75%. An increase in the OMI by every subsequent 5 p.p. increases the odds of divestment by an average of 63%, whereas an increase in the labour costs of the same scale increases the odds of foreign divestment by about 47% on average.

As regards the interaction of factors considerably increasing the risk of minor divestment in the services sector, they include the combination of an economic recession in Poland with an increased OMI (increase in divestment risk by approximately 298%), and the combination of an increased OMI with an optimistic scenario of pandemic development (increase in the odds of divestment in the services sector by about 344%).

Factors which increase the odds of moderately pessimistic divestment the most in the services sector (from 20% to 40%) in comparison to the pre-pandemic period include an economic recession in Poland, an increased OMI and moderate restrictions imposed on the economy to counteract the pandemic. These increase the risk of divestment in the services sector by 63% (when the GDP falls by every subsequent 5 p.p.), 128% (with an increase in OMI by every subsequent 5 p.p.) and 126%, respectively. The interaction of variables taken into account in the model provided in Table 3 has increased the risk level of moderately pessimistic foreign divestment by at least two and a half times. For example, the combination of an increase in OMI in Poland (by every subsequent 5 p.p.) with an increase in the geographic distance from the investor's country increases the risk of divestment in the services sector by 358% on average, whereas the interaction of an increase in OMI (by every subsequent 5 p.p.) and the occurrence of severe restrictions on the economy leads to a risk of divestment increased by an average of about 409%.

It should be emphasised that all individual factors have increased the risk level of the reduction of FDI in the services sector along with a change of the divestment perspective from an optimistic one (up to 20%) to a moderately pessimistic one (from 20% to 40%), with the exception of a change in the exchange rate of the PLN, an increase in inflation and the occurrence of the optimistic variant of pandemic development.

Based on Table 3, it can be concluded that the greatest risk of considerable divestment (at a level above 40%) in the services sector in relation to the pre-pandemic

period is generated by the introduction of considerable and moderate restrictions on the economy in response to the pessimistic development of the pandemic scenario, increased economic recession in the investor's country, and the depreciation of the Polish currency. A decrease in the GDP of the investor's country by every subsequent 5 p.p. generates an increase in the risk of considerable divestment by approximately 159% on average, whereas a decrease in the exchange rate of PLN in relation to the euro by every subsequent 5 p.p. increases the risk of divestment by an average of about 147%. Moderate restrictions on the economy imposed to counteract the pandemic increase the risk of divestment by around 340%, while the pessimistic variant of pandemic development increases the risk of divestment by approximately 527% on average.

Regarding the interactions of factors, the combination of a decrease in the GDP of an investor's country by every subsequent 5 p.p. with a pessimistic scenario of pandemic development in Poland, and the interaction between an increase in the OMI by every subsequent 5 p.p. and a relative increase in labour costs by a similar value bear the greatest risk of considerable foreign divestment in the services sector at a level above 40%. In the former case, the risk of moderate divestment increases by approximately 597% and in the latter case – by about 210%. It should be emphasised that all individual factors have increased the FDI reduction risk level in the services sector along with a change in the divestment prospect from optimistic (up to 20%) to pessimistic (above 40%), with the exception of geographic distance from the investing country to Poland and the occurrence of the optimistic variant of pandemic development.

#### **4. Conclusions**

The COVID-19 pandemic is a new phenomenon in the modern world which threatens the stability of many sectors of the world economy and the economies of individual countries. The full economic consequences of the pandemic have not yet been entirely investigated due to the short time horizon of this phenomenon occurring. The paper attempts to fill this research gap with regard to the impact of the pandemic on FDI. In the present study, it was possible to identify the factors which increased the risk of foreign divestment in Poland, so the aim of the paper has been achieved. The application of the logit model allowed the identification of the most important factors of foreign divestment in the time of the COVID-19 pandemic. This tool proved successful in estimating the risk of divestment due to the specificity of the variables (measured on a nominal or ordinal scale) and the ease of estimating the

model and interpreting the results presented in the form of odds ratios. The obtained research results lead to the conclusion that the most important determinants of divestment in the economy as a whole are: the location of FDI in the services sector, in industry and in the IT sector, increased market openness and interactions of variables taking into account the restrictions introduced in the economy in connection with the state of the pandemic. The level of risk of divestment for these variables depends, however, on the size of the FDI reduction declared by investors and on the sector of the economy.

This is particularly visible if considerable divestment is assumed: FDIs in the services sector are then burdened with a higher risk of divestment than FDIs in the processing industry. If average divestment at a low level is assumed, FDIs in the IT sector constitute a factor bearing the greatest risk of FDI reduction in the entire economy. For the expected medium-level divestment and for the divestment level above 40%, the OMI is the FDI reduction factor bearing the greatest risk.

Economic restrictions aimed at limiting the transmission of COVID-19 and their interactions, especially interactions with the economic recession in Poland and in the investor's country and with the OMI are the factors of foreign divestment bearing the greatest risk in the processing industry and in the services sector. With the introduction of factor interactions to the model, it was possible to detect the feedback between independent variables. The interaction of variables, especially economic restrictions introduced to counteract the pandemic taken into account in logit models, in many cases, increases the risk of foreign divestment by multiple times. During the COVID-19 pandemic, the estimated logit models may make it easier for investors to make decisions to divest or facilitate the choice of new directions of investment. The changing intensity and development of the COVID-19 pandemic, which is difficult to predict, justify the need to constantly update the results of such research and to repeat it in the future, which will allow for an ongoing monitoring of the degree of investment risk of various macroeconomic and microeconomic factors. It cannot be excluded that, considering the further development of the COVID-19 pandemic, the priorities of investors regarding the scale and direction of investments will further change and divestment will turn out to be unavoidable in certain industry sectors.

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