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The determinants of Germany's outward foreign direct investment (OFDI)

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ABSTRACT

The aim of this study is to investigate the determinants of Germany's OFDI in the last 21 years on the set of top ten Germany's OFDI destination (United States of America, United Kingdom, China, France, Poland, Mexico, India, Turkey, Spain and Russia (Russian Federation)) by using panel data analysis. The research revealed that Germany's OFDI are driven by market seeking motives (FDI vertical), and also highlighting the importance of the stable political environment, attractive tax environment, more trade openness, and stable macroeconomic environment of the top ten Germany's partners for attractiveness of the Germany's OFDI. It indicates that openness of an economy is statistically significant in attracting FDI.

Keywords: Germany's OFDI, Tax Policy, Market Size, Political Environment, Macroeconomic Environment, Panel Data Analysis

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1. Introduction

Several traditional theories of multinational enterprises were developed in recent decades. The Market power theory focuses on the industrial composition of FDI, including motives for control of productive facilities in foreign countries [1]. Then, the Internalization theory developed by [2] and [3] explains oversees expansion of companies through FDI. Further, [4] motives for international production explained in his Eclectic paradigm was one of the pioneer's models widely accepted by many economists. Fifteen years later, [5] extended his model including market seeking, resource seeking and efficiency seeking motives for FDI flows. [6] explored two models of entry into a new market by MNCs, one, by exporting products and second one by creating productive capacity via FDI. The authors conclude that FDI has some advantages because it allows for lower marginal costs than exporting does.

The intention of this study is to explore the main determinants of Germany's OFDI toward the set of top ten partner countries. Germany is chosen because it is one of the largest outward director investors beyond U.S., China, U.K., and Japan [7]. The research is based on the theoretical assumption of internalization theory, choice of foreign operational mode by MNCs and entry mode to new markets. Thereby, there is an intention to elucidate the difference of OFDI from the well-developed country toward other countries. As a result of the growing debate about importance of Germany's OFDI in international finance it is assumed that the findings of this study add to the literature by exploring determinants of Germany's OFDI and shed light on the possible impact of Germany's policies on their promotion and the global FDI distribution. Germany's OFDI has increased considerably in the last decade. In addition, Germany is seen as the important source of FDI in developed and emerging economies as one of the largest exporters of the capital in the world. This study uses more recent data,

and it can provide more reliable data on the newest Germany's OFDI determinants. More specifically, it aims to investigate the role of the host countries' determinants in attracting FDI from Germany.

2. Literature review

A mode of OFDI can be determined by home and host country conditions. Although advanced economies play an important role as the source and destination of FDI in recent times some emerging MNCs are also very active. In one of the previous empirical studies, [8] explored the effects of governance structures on FDI inflows and outflows using a set of 144 countries between 1995 and 1997 investing. The study provided valuable findings that governance structure acts as an important determinant for MNCs to operate abroad.

Following the International investment strategy approach, [9] confirmed general motives of OFDI (resource seeking, market seeking and, in some cases, efficiency seeking motives) that govern emerging MNCs, especially exploring Chine's OFDI. [10] explored the geographic and sectoral structure of Czech's OFDI and found that they are directed to countries with a large market potential. Several studies have attempted to explain OFDI in advanced economies following the international investment strategy approach [11] and [12].

Progress in the development of the evolutional MNEs theory was given by [13]. His framework is called the knowledge capital model that combines vertical, horizontal, and national strategies as response to different home and host country characteristics.

[14] studied distribution and size of Germany's OFDI, using cross-country data (e.g., GDP per capita income and population size) and time-series data (i.e., exports and relative unit labor costs). The results indicate that OFDIs from Germany are influenced by the market size, exports, and low levels of labor costs. [15] investigated the main drivers of Germany's OFDIs by using firm-level data in more than 100 countries by highlighting the role of country-level and firm-level determinants of FDI. Also, the findings of the research confirm that OFDI of Germany's enterprises are rather motivated by market access (horizontal FDI) as opposed to the lower production costs (vertical FDI). [16] explored motives or home country determinants of Germany's investments in Eastern Europe in 1990s by examining of 420 Germany's MNEs. The study finds that FDI of Germany MNEs to the CEE region is motivated by lower labor costs (Vertical FDI).

In other well-known study, [17] investigated FDI bilateral flows between source and host economies or precisely between mostly EU countries and several European transition countries between 1994 and 2000. The authors found that FDI is determined with source and host country GDP, but inversely with distance between countries and unit labor costs. A brief overview of existing literature relevant for this research is listed in Table 1.

Table 1. Overview of existing literature

Author(s)	Period	Econometric method	Conclusion
[18]	1975-1997	panel data regression analysis	Human capital, trade regime and density of infrastructure are shown as robust variables in determination of FDI flows
[15]	1989-2001	panel data regression analysis	FDI of Germany MNEs are motivated by market access (horizontal FDI) but not by lower production costs (Vertical FDI).
[9]	1984-2001	panel data regression analysis	Chine's OFDI are motived resource seeking, market seeking and, in some cases, efficiency seeking motives) that govern emerging MNCs
[19]	1989–2002	panel data regression analysis	Countries with large market size have greater capacity to perform foreign production
[20]	2000 -2006	FE estimation techniques	OFDI are led by escape from the economic and political conditions in the home countries
[21]	1992-2015	ARDL Bound Test	positive correlation between the host countries variables and OFDI
[22]	2010	Probit model	Germany's direct investment of MNEs in Czech Republic are more motived by market access (horizontal FDI) than lower production costs (vertical FDI).
[23]	1996–2016	Pseudo Poisson Maximum	vertically and horizontally integrated FDI from Germany's MNEs are found in the CEE countries

Author(s)	Period	Econometric method	Conclusion
		Likelihood (PPML) Estimation	
[24]	2010-2016	Gravity model	lower institutional quality and higher political risks affected negatively on Germany's direct investment
[25]	1996 -2012	Bayesian statistical techniques	horizontal FDI and vertical FDI motives for Germany's FDI
[26]	2000 -2019	VECM estimation procedure	causality between the home country's institutional quality and OFDI in both European regions under consideration.

Source: (Authors' compilation, 2022)

Next, the research by [27] could not find evidence that FDI inflows are influenced and predicted with a country business regulatory environment neither in Central Eastern European nor in Southeast European countries [21]. studied the determinants of Turkey's OFDI by using the ARDL Bound Test. The authors found that there is a positive correlation between the host countries' variables (i.e., market size, technological development, trade openness) and the OFDI.

Political stability, which implies respect of political rights, is tightly connected to the level of corruption. According to [28] the countries with high level of democracy and respect toward political rights have high OFDI, whereas the countries that express low level of democracy and political rights have high level of inflows of FDI. In another study, [29] found in the case of China that government effectiveness, political stability and voice and accountability have no significant relationship with FDI inflows underlying the effect of one party-government. However, the study found a positive link between control of corruption, rule of law and regulatory quality, and FDI inflows in China. [30] also studied the impact of the Arabic Spring on OFDI in 12 North African countries using panel data approach and data between 2000 and 2016. The results of the study showed that the impact of the Arab Spring estimator is negatively correlated with FDI outflows in the countries that witnessed the Arab spring and its neighboring countries. Thus, conflicts and instability negatively affected the FDI outflows. [24] compared 115 Germany's FDI destinations by using country-level data for the years 2010-2016. The study found that geographical distance is an important variable of Germany's FDIs in abroad while the lower institutional quality and higher political risks affected negatively on Germany's direct investment.

Similarly, [25] explored Germany's FDI between 1996 and 2012 using Bayesian statistical techniques and big set of different variables. Interestingly, for developed countries market seeking motives or horizontal FDI are most important, while for developing countries the factor endowments and cost saving motives play a greater role. Further, for Germany's MNEs that operate in Latin America and Asia horizontal FDI and vertical FDI motives coexist with focus on institutional quality. [23] analyze the determinants of Germany's direct investment in the Central and Eastern European (CEE) countries to estimate the reasons which affect German MNE activities in 11 CEE countries that joined the EU in 2004, 2007 and 2013. Their findings revealed that the Visegrad group countries (Czech Republic, Poland, Slovakia, and Hungary) attracted the highest volume of FDI from Germany's companies compared to the rest of CEE countries. Both types of vertically and horizontally integrated FDI from Germany's MNEs are found in the CEE countries.

Although the importance of Germany's companies is shown to be significant in many empirical studies, an analysis of OFDI determinants shows different results for different regions. In fact, they are remaining too far to being conclusive. Up to now, more empirical studies about Germany's OFDI focus on some regions not for top ten investment destination. Accordingly, the research of Germany's OFDI determinants for top ten FDI destinations can contribute to a better understanding of motives for FDI in these countries.

3. Research methodology

There are numerous host and home determinants of FDI outflows as identified in the literation. To analyse the host determinants of OFDIs for Germany all data were sourced from the World Bank database. The following subsection explains variables used for the purpose of analysis.

3.1 Definition of Variables

The dependent variable of the interest is the Germany's OFDIs to the top ten partner countries. It uses natural logarithm of real Germany's OFDIs directed to each recipient country, calculated in current USD. The most empirical research using Germany's FDI data has been undertaken with respect to the industrialized economies, but only some studies employed political risk variables [31].

Generally, the market size is seen as a variable that allows exploitation of the economies of scale and plays an essential role in attracting FDI flows. In this study, the GDP (per capita) is employed as a proxy variable for the market size, and it expresses host country's market potential through the access to third markets or absorptive capacity [31]. Some authors such as [32] and [30] (2018) indicate that countries with higher market size have more capacity to attract FDI.

To proxy a host country's openness a variable of trade openness is employed. It is expressed as the ratio of aggregate value of imports and exports divided by GDP. [33] and [34] confirmed in their empirical studies the importance of trade openness on FDI inflows. It is anticipated that a host country's trade openness and FDI inflows from Germany are positively related.

Next, the interest rate variable is included in the model since an empirical study, [35] found that some volatility in interest rates can attract or deter FDI flows. High interest rate spread in host economies can attracts more FDI inflows from abroad. It is expected that the interest rate of a host country and FDI inflows from abroad to be positively related.

A variable, corporate tax rate (RATE), is included in the model because corporate tax rate influences directly the return of FDI. The research by [36] and [37] point out the significance of taxation policy in boosting FDI flows where higher host country's tax rate discourages FDI. Also, empirical research by [38] points to no explicit agreement on the relationship between taxation and FDI despite the competition for FDI, by either the developed or the developing economies and even more intra-country variations, while [39] found that FDI flows are not affected significantly by corporate tax rate.

Additionally, the model includes the variable of INF as a proxy variable for the macroeconomic environment of a host country. In the theory, the inflation is referred to a rise of price level. Price volatility and high inflation will restrain inflows of FDI and vice versa. For example, [9], [40] and [41] found that the FDI and inflation rates have an inverse relationship, suggesting the importance of stable host countries macroeconomic policies in attracting FDI from abroad. However, another study by [42] found out that the inflation itself has no significant influence on the FDI inflows. The reason for this is the probability that the inflation may not have a negative impact on FDI if it does not exceed a certain threshold. Again, the study by [43] revealed that FDI has significant effect on the economic growth of Albania and Macedonia.

To indicate institutional inefficiency and political environment, political stability and absence of violence are included in the model. FDI plays a vital role for multinational enterprises, so investors extensively analyse riskiness of their investments [8]. [44] and [26] explained the importance of political stability and absence of political violence events when entering foreign markets.

3.2. Specification model and hypothesis

This research is based on the secondary data from the available literature (e.g. national statistical reports, and WDI). The model developed in this paper includes the following seven variables: FDI – outflows, gross domestic product, indicator of the relative importance of international trade in the economy of a country, interest rate spread, corporate tax rate, inflation and political stability). The available literature with focus on FDI (outflows) uses a different set of indicators that explain FDI (outflows) as the dependent variable. To generate a normal distribution, the data are transformed via natural logarithm. The functional form of the theoretical model of this study is drawn as:

$$FDIOUT = f(MARKET\ SIZE, TRADE\ openess, IR, TAX\ RATE, INF, PSAV) \quad (1)$$

where a linear equation of model can be expressed as follows:

$$OFDI_{it} = \beta_o + \beta_1\ GDPPC_{it} + \beta_2\ Trade_{it} + \beta_3\ IR_{it} + \beta_4\ TAX_{it} + \beta_5\ INF_{it} + \beta_6\ PSAV_{it} + \varepsilon_{it} \quad (2)$$

Where $OFDI_{it}$ is dependent variable of individual country i at a period t, while ε_{it} is error term. Logarithmic values are used in the data analysis to get a rid of trends and variability in the data. Accordingly, eq. 2 can be converted in the logarithmic values, as follows:

$$logOFDI_{it} = \beta_o + \beta_1\, logGDPPC_{it} + \beta_2\, logTrade_{it} + \beta_3\, logIR_{it} + \beta_4\, logTAX_{it} + \beta_5\, logINF_{it} + \beta_6\, logPSAV_{it} + \varepsilon_{it} \quad (3)$$

Related literature models are chosen by following two conditions – availability of data on given variables and the sample size. Accordingly, the hypotheses are respectively set, as following:

- H1: Germany's OFDIs in top ten partner destinations is positively associated to host market size.
- H2: Germany's OFDIs in top ten partner destinations is positively associated to trade openness of the host countries.
- H3: Germany's OFDIs in top ten partner destinations is positively associated with stable political environment of the host countries.
- H4: Germany's OFDIs in top ten partner destinations is inversely associated with high tax rates in the host country.
- H5: Germany's OFDIs in top ten partner destinations is positively associated with stable macroeconomic environment in the host country.

Employing the fixed effects (FE) models focus is given on relationships within countries over time. On the contrary the random effects (RE) model the intercept is assumed to be a random outcome variable. In the current study, F-test statistics, Hausman Specification Test, and Breusch-Pagan Lagrange Multiplier test are conducted. The efficiency of RE estimators and the FE estimators are checked by using Husman's test estimates. The significant p-value suggests that the FE model should be applied and vice versa for the RE model.

4. Empirical findings

The model does not seem to produce multicollinearity problem. Table 2 reports that the correlation coefficients have values from -0.5616 to 0.5498. It means that none of the independent variables are critically correlated to each other. Variable OFDI is positively correlated with GDP (per capita), corporate tax rate and the political stability of the country and negatively correlated with other variables. Further, GDP is shown to have positive correlation with corporate tax rate and the political stability of the country, same as OFDI, while being negatively correlated with the remaining variables.

Table 2. Correlation matrix

	LOGFDI~S	**LOGGDP~A**	**LOGIR**	**LOGTAXR**	**LOGTRADE**	**LOGINF**	**LOGPSAV**
LOGOFDI~S	1.0000						
LOGGDPPC	0.4889	1.0000					
LOGIR	-0.3185	-0.1141	1.0000				
LOGTAXR	0.1411	0.4642	-0.0350	1.0000			
LOGTRADE	-0.5437	-0.1871	0.2209	-0.1454	1.0000		
LOGINFL	-0.2198	-0.3603	0.3223	-0.3891	0.0825	1.0000	
LOGPSAV	0.0624	0.5498	-0.3811	0.2969	0.0346	-0.5616	1.0000

Source: (Authors' compilation, 2022)

Interest rate spread is positively correlated with corporate tax rate and inflation while negative correlation was observed with respect to OFDI, GDPPC, corporate tax rate and political stability. Variable RATE shows positive correlation only with the OFDI and political stability of the host country, while being negatively correlated with the remaining variables. TRADE has a negative correlation with FDI, GDP and RATE while being positively correlated with the remaining variables. The impact of this variable on Germany's OFDI is expected to be mixed. Theoretically, positive, or negative correlations mostly depending on the host country's trade policies. A negative relationship between trade openness and Germany's OFDI indicates that the host countries with fewer restrictions on imports and exports have a lower chance of attracting FDI. The variable of INF is shown to have positive correlation only with interest rate spread and TRADE while PSAV shows negative relationship with interest rate spread and inflation rate.

To estimate preferred model, correlation among residuals is tested through three tests as follows: F-test, Hausman test, and Breusch-Pagan. The reason for this is the fact that cross-sectional dependence may lead to bias in tests results. Table 3 reports the results of specifications tests.

Table 3. Specification tests

Spec. Tests	p-value	Tested	Selection
Hausman	0.0000	Fixed/Random	Fixed
Breusch-Pagen	0.0050	OLS/Random Random	Random
F-test	0.0000	OLS/Fixed	Fixed

Source: (Authors' compilation, 2022)

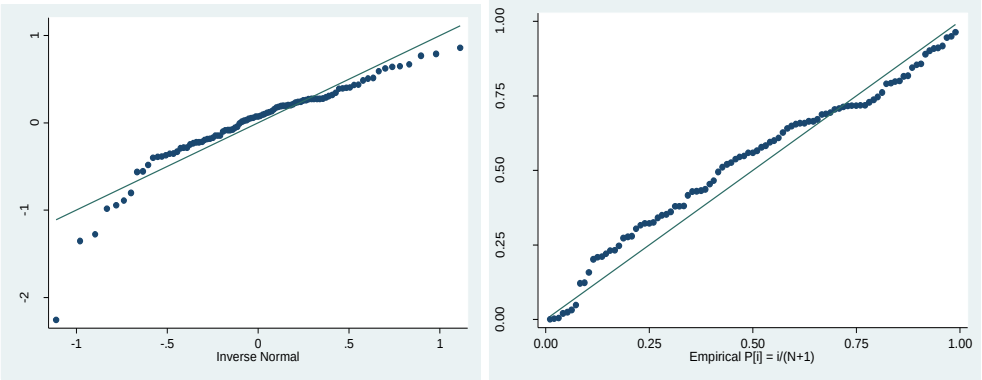
Small p-value, by the Hausman test shows that coefficient estimated by RE effects model and FE model are not same and there is distinguish between FE model and RE models. In our case, the Hausman test shows that FE and RE effects are different by rejecting the null hypothesis. It indicates that FE model is preferred over RE model. Moreover, the findings of redundancy tests are shown in Table 4, and they confirm a validity of usage of cross-sectional fixed effects and cross-section/period effects. The null hypothesis of redundancy for both models can be rejected at 1 % level.

Table 4. Redundant Fixed Effects Tests

Effects Test	Statistic	d.f.	Prob.
Cross-section F	18.433762	(6,63)	0
Cross-section Chi-square	96.295218	6	0
Period F	1.756136	(19,63)	0.0496
Period Chi-square	40.377356	19	0.0029
Cross-Section/Period F	6.810104	(25,63)	0
Cross-Section/Period Chi-square	124.353792	25	0

Source: (Authors' compilation, 2022)

In addition, Figure 1 shows two plots. The left one presents standardized normal probability plot, while the right one plots quantiles of the residuals against the quantiles of the normal distribution.



Source: (Authors' compilation, 2022)

Figure 1. Standardized normal probability plot & plot of quantiles of residuals against quantiles of normal distribution

A set of data that was assumed to have a normal distribution (bell curve) was analysed, using a data graph to help decide whether the data is normal or not. A normal Q-Q diagram was used to test this assumption. This diagram shows the scattering plot and is created by drawing two sets of quantiles against each other. Both plots show slight deviations from the normal, but not extreme.

To test the significance variables, the three models listed in Table 5 are used. The Model 1 shows RE effect, Model 2 presents FE effect where the intercept is allowed to vary across the countries and the Model 3 controlling variable that are constant across the countries but vary over time. Model 2 (FE) and Model 3 (FE period model) are both FE model according to which we will perform statistical analysis. Model 1 (RE) is placed only for comparison. In this context, it is important to emphasize that the Model 3 (FE) considers the time effect to see whether changes over the years have an impact on FDIOUT.

The adjusted R^2 of Model 1 is 0.56, 0.80 for Model 2 and 0.79 for Model 3. This indicate that about 56 percent of variations in dependent variable of OFDI for Model 1, and about 80 percent of variations in dependent variable for Model 2 and 79 percent in Model 3, are explained by the independent variable.

Table 5. Regression output

Variables	Model 1 (RE)	Model 2 (FE)	Model 3 (FE Period-effects)
LOG_IR	-1.345318 (0.25182)***	-0.281088 (0.319899)	-0.867395 (0.337380)**
LOG_GDPPC	1.521468 (0.145644)***	1.961495 (0.511062)***	0.735980 (0.185588)***
LOG_TAXR	-1.190780 (0.414909)***	-4.016900 (0.975025)***	-0.214205 (0.398985)
LOGTRADE	-2.631407 (0.368848)***	1.692188 (0.705061)**	-3.280611 (0.300413)
LOGINFL	-0.318485 (0.106730)	-0.121302 (0.124453)	-0.200799 (0.099087)**
LOGPSAV	-1.384605 (0.213269)***	-0.176364 (0.398034)	-0.644145 (0.251512)**
C	13.53443 (0.96225)***	5.699791 (3.836509)	14.97591 (0.841823)***
R^2	0.584745	0.828441	0.828441
Adjusted R^2	0.556432	0.803334	0.787046
F-statistic	20.65300	32.99736	14.89640
Prob(F-statistic)	0.000000	0.000000	0.000000
Durbin-Watson stat	0.572805	0.910145	0.707783

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: (Authors' compilation, 2022)

Finally, the indicator Prob (F-statistic) = 0.0000 suggest that all coefficients within the model are different from zero. It makes the model statistically significant and acceptable. The value of F-test indicates that the FE effect is favourable than the Pooled OLS (Ordinary Least Squares).

According to the Table 5, the model produced three significant variables. For example, in the Model 3 with included time effect the variables GDPPC have a statistically significant impact at 1 % while variables interest rate, inflation and political stability have a statistically significant impact at 5 % on the dependent variable. So, as we assumed, GDPPC proved to be a significant host determinant of Germany's OFDI, showing that the higher market size led to more FDI inflows from Germany. Thus, as it turned out, GDPPC has a positive

correlation with OFDI, considering that market size in host economy has a statistically significant impact on FDI inflows from Germany at level of 1 percent.

Further, corporate tax rate is shown to be statistically significant host determinant at a significance level of 1% in the Model 1 and the Model 2 at 5% level on the dependent variable. The assumption that the country benefits from tax exploitation due to public sector policy proved to be correct [36] and [37]. This result shows that Germany's OFDI has inverse relationship with host country corporate rate. In addition, an inverse relationship with host country corporate rate is confirmed in all three models under considerations, although in Model 3 as statistically insignificant. Then, it can be concluded that if corporate rate decreases it leads to rise of FDI inflows from Germany.

Another significant variable is influenced by Germany's OFDI is trade openness of host economy. In our case, the Model 2 reveals that trade openness of host economy is positively related to the FDI flows from Germany at a significance level of 5%. It can be interpreted, as a host country is more trade opened it leads to rise of FDI inflows from Germany. It is confirmed by some the earlier empirical studies done by [33] and [34]. The time effect (Model 3) is not shown as a significant in attracting FDI flows from Germany.

Moreover, the analysis of data shown in Table 5 reveals that the trade openness also plays a key role in the determination of Germany's FDI. The findings indicate that the greater trade openness of the host country leads to better flows of FDIs. According to the results from Model 2 political stability of host country has inverse relationship with FDI flows from Germany. Although, political stability in the host countries is shown to have a statistically negative effect on OFDI from Germany in the Model 1 (RE) and Model 3 (FE period-effect).

Furthermore, in the Model 3, if the time effect is used to conclude that the variables IR, INFL and PSAV, have a statistically significant impact with 5% and for GDP per capita 1% statistical significance on the Germany's OFDI. In fact, in Model 3, in the long run, the inflation rate in the host economies has an inverse relationship with OFDI from Germany. Furthermore, the value of Durbin-Watson Statistic is higher than the value of adjusted R squared ($DW>R^2$) and that proves that there is no problem of spuriousness in this simple regression model.

In Model 3, if the time effect is used to conclude that the variables interest rate spread (IR) have a statistically significant impact on the dependent variable, at 5 percent level, as it is expected. The result showed that the variables of the interest rate spread have an inverse relationship with FDI from Germany. This variable is not in line with study's expectations, and it can be explained by the findings provided [35].

5. Conclusion

In line with the theory and earlier empirical papers, the results have empirically confirmed some previous empirical findings between host determinants OFDI. Also, the study confirmed a validity of theoretical assumption of the internalization theory, choice of foreign operational mode by MNCs and the entry mode to new markets by Germany's MNEs

In terms of H1, which measured by link between the host GDPPC and OFDI the study found that Germany's OFDI is driven by the market size motives (Vertical FDI). This study indicates that there is a strong complementary link between the host of GDPPC and Germany's OFDI.

Refereeing to the H2 hypothesis, the study (Model 2) confirms study's expectation showing the importance of trade openness regarding Germany's OFDIs in the Top 10 partner destinations.

Referring to the testing of H3 the study found that the current political environment has the positive effects on the FDI flows in countries under consideration. It is obvious that a government should pay more attention to ensuring democracy and political stability. It implies that the countries with high level of democracy and respect toward political rights have higher FDI inflows from abroad and vice versa.

H4 asserted that host country lower tax rate encourages inflows FDI from Germany. In fact, the study's findings confirm validity of H4 hypothesis that lower corporate tax rate lead more inflows from Germany's MNEs.

In terms of H5, which was measured by a link between Germany's OFDIs and macroeconomic environment, the study found that a proxy variable inflation in host country has an inverse relationship with FDI inflows from Germany. Although, in all the models the inflation has an inverse relationship with FDI inflows from Germany, it has shown to be statistically significant only in the Model 3. It might be explained that an uncertainty of the macroeconomic environment may discourage FDI inflows.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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