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Do stringent environmental and business regulations, and uncertainty matter for foreign direct investment inflows? Evidence from G7 and BRICS economies

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ABSTRACT

This paper empirically evaluates the impact of environment stringency policy, business regulations, policy and economic uncertainty, and real GDP per capita on foreign direct investment (FDI) inflows by employing the autoregressive distributed lag approach and using data from 2000 to 2015. Specifically, we focus on two groups of countries with different economic development, the Group of Seven (G7) and the BRICS countries, and the composite indices of business and environmental regulations and policy-induced uncertainty, along with real gross domestic capital (GDP) per capita, were selected to reflect the multidimensionality of the settings in the selected countries. Our results indicate that only the effect of real GDP per capita turned out to be homogenous and statistically significant across different income groups and time horizons. Findings also show that more friendly business regulations significantly encourage FDI inflows in the long run, but there is a bottom line. When regulations are already at a low level, as is the case with G7 countries, further liberalization would adversely affect FDI inflows. Furthermore, more stringent environmental regulations have a marginally adverse effect on FDI inflows only in the long run. At the same time, they weakly support the pollution haven hypothesis. The impact of policy-induced uncertainty on investment is adverse but largely nonsignificant in the short run. It appears that cross-border investments follow a pattern of the safe-haven effect to avoid uncertainty in the long run.

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1. Introduction

Studies of aggregate cross-border foreign direct investment (FDI) flows have received considerable attention from policymakers and scholars because of their important role in a country's economic growth and welfare, regardless of its level of development (Te Velde, 2006). As a result, developing and developed countries have created

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different policies to encourage FDI flows into their country, trying to attract those FDIs that have a substantial multiplier effect in terms of employment, exports, productivity, income, innovation, technology, knowledge and skills. Not surprisingly, there is a growing interest in the determinants of FDI that affect its location, magnitude and dynamics. Several papers have reviewed its determinants, highlighting that FDI is a complex, multidimensional phenomenon that depends on a large number of interrelated factors (Blonigen, 2005; Sahiti et al., 2018; Tocar, 2018) that can be broadly classified into economic and non-economic factors. However, the effects of economic factors such as market size, wages or purchasing power have been extensively studied, and to a lesser extent, non-economic factors, political and environmental in particular.

Interest in political and environmental factors has increased since the early 2000s, particularly as global uncertainty and attention to environmental issues have increased. Since the beginning of this century, global uncertainty has shown a growth trend, as clearly indicated by the World Uncertainty Index (WUI), which reflects economic and political uncertainty (Wui, 2021). It is well known that economic agents can postpone their decisions and activities under uncertainty (Ahir, 2019) therefore, it is plausible to expect that it adversely influences cross-border investment. A few studies explored the impact of policy-induced uncertainty on FDI (Chen et al., 2019; Nguyen et al., 2018; Nguyen & Lee, 2021) and supported this observation, however it remains unanswered how uncertainty affects FDI in combination with economic and political factors in developing and developed countries over different time horizons.

Studies indicate that FDI inflow has a positive and significant impact on CO2 emissions (Jianguo et al., 2022; Luo et al., 2021; Ullah et al., 2022), the main source of environmental degradation. The world needs to reduce global emissions, to prevent the worst effects of climate change.

Policy responses to climate change and global warming are increasingly reflected in stricter environmental regulation, which affects not only environmental performance but also the economic performance at the macro and micro levels.

More stringent environmental regulations imply higher compliance costs for companies (Bialek & Weichenrieder, 2021), at least in the short run, shifting their investment interest and activities towards new, more efficient and cleaner (green) technologies and business processes. At the same time, according to the pollution haven hypothesis, there is a growing interest of companies to relocate their operations or parts of them abroad to avoid environmental costs (for a brief overview of empirical studies, see (Shao et al., 2019)). If this hypothesis holds, this would be reflected in FDI flows between countries and in a change in international trade patterns. Several studies provided evidence of the detrimental effect of FDI on environmental quality in developing countries (Bakirtas & Cetin, 2017; Sapkota & Bastola, 2017); however, no conclusive results have yet been obtained. For example, the impact found is significant and positive (Rahul & Viswanathan, 2018; Rivera & Oh, 2013), significant and negative (Kukenova & Monteiro, 2008) and nonsignificant (Koźluk & Timiliotis, 2016).

Regarding the interplay between political factors and business regulation among them, the same inconclusive conclusions have been reached. Although the literature that examined the effect of business regulation is limited, it appears to play an

important role in companies' FDI location decisions (Mudambi et al., 2013; Smith-Hillman & Omar, 2005; Vučković et al., 2020).

Existing research that focused on the influence of political factors on FDI inflows revealed contrary findings: Jadhav (2012) pointed out that voice and accountability negatively affected FDI inflows, while the quality of regulation, political stability and control of corruption were found to be nonsignificant and authors like Teeramungcalanon et al. (2020) found that political stability, rule of law, and voice and accountability have a statistically significant effect on FDI inflow.

There are considerable variations across countries in absorption capacities, therefore, is crucial to understand better the main determinants of FDI inflow so that underdeveloped and developing countries to have information on factors that can enhance their capacities to attract higher volumes of FDI.

Even many studies focused on different FDI determinants, only a few of them are based on the impact of the environmental stringency policy, business regulations, policy and economic uncertainty, and GDP per capita on FDI inflows, and the results are not always consensual. There are many uncertainties related to the role of these variables in attracting FDI therefore further research in this area is necessary.

In this context, our research aims to respond to the following research questions regarding FDI inflow:

Do stringent environmental policies have effects on the FDI inflow in the short or long term?

Do business regulations have an impact on the FDI inflow in the short or long term?

Do policy and economic uncertainty affect the FDI inflow in the short or long term?

Does real GDP per capita have an impact on FDI inflows in the short or long term?

By exploring the short and long-run relationships between FDI and political and environmental factors, including policy-induced uncertainty, in different economic and political settings over the period 2000–2015, the present paper aims to extend previous research. Three complex indices were selected to capture the settings, the Environmental Policy Stringency (EPS) index developed by Botta and Koźluk (2014), the Business Regulation Index (BUSREG) proposed by Fraser Institute (2021) and the WUI created by Ahir (2019). The selected indices reflect the multidimensionality of countries' environmental and regulatory policies as well as the policy-induced uncertainty that affects FDI flows. Such variable selection allows us to simultaneously test the pollution haven hypothesis and to show whether countries with less stringent environmental and business requirements were able to attract more FDI. As Omri et al. (2014) emphasized, a deep understanding of the relationship between FDI, the economy and the environment is essential for proper policy design.

Previous studies suggest that FDI determinants differ between developed and developing countries (Saini & Singhania, 2018) therefore, our sample consists of two groups of countries: the Group of Seven (G7- Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) and BRICS countries (Brazil, Russia, India, China and South Africa). They differ significantly in terms of growth rates, income levels, economic power, demography, stringency of environmental and

Table 1. Dataset's main characteristics.

Model 1 (G7 + BRICS countries)				
Variable	MEAN	STD.DEV.	MIN.	MAX.
FDI (% of GDP)	2.3256	1.9495	−0.7264	12.7631
EPS (0–6)	1.7578	1.0859	0.375	3.8541
BUSREG (0–10)	6.6232	1.4517	2.8375	8.8724
GDP (real GDP per capita, constant 2010 USD)	27317.58	18191.95	826.5925	52168.13
WUI	0.1924	0.1340	0	0.7319
Model 2 (G7 countries)				
FDI (% of GDP)	2.2341	2.3097	−0.7264	12.7631
EPS (0–6)	2.4545	0.8441	0.8958	3.8541
BUSREG (0–10)	7.6096	0.6965	5.7257	8.8724
GDP (real GDP per capita, constant 2010 USD)	42251.84	4425.401	33666.69	52168.13
WUI	0.1934	0.1054	0.0186	0.4771
Model 3 (BRICS countries)				
FDI (% of GDP)	2.4537	1.2902	0.2294	5.9831
EPS (0–6)	0.7826	0.4458	0.375	2.1625
BUSREG (0–10)	5.2423	1.0503	2.8375	7.3048
GDP (real GDP per capita, constant 2010 USD)	6409.605	3707.56	826.5925	11993.48
WUI	0.1908	0.1666	0	0.7319

Source: Authors' calculation.

regulatory policy, the pattern of financial flows and level of uncertainty (Gautam & Sharan, 2020).

The first group includes seven highly economically powerful and industrialized countries, considered the largest providers and recipients of FDI, characterized by stringent environmental and business regulatory policies and facing a lower level of uncertainty (see Table 1). The second group includes five leading emerging and fast-developing countries whose economic power and role in the global market are increasing, as well as FDI flows, indicating new challenges and opportunities in global FDI distribution patterns. These countries have less stringent environmental regulations but experience a higher level of uncertainty than countries in the first group (Table 1). Mostafa and Mahmood (2015) delineated that BRICS countries have the potential to overtake G7 countries in the long run because they have competitive advantages that they expand faster. Both groups of countries are expected to lead in developing a more sustainable economy.

To test the short and long-run relationship between the variables of interest, the autoregressive distributed lag (ARDL) model in the error correction form is applied. The model is estimated based on the pooled mean group (PMG) estimator (Pesaran et al., 1999) and the mean group (MG) estimator (Pesaran & Smith, 1995). Understanding how economic conditions, economic and political uncertainty, environmental and business regulations affect FDI in developed and developing countries, across different time horizons, can help both investors and host countries to create appropriate economic and environmental policies.

The paper differs from previous studies in several ways: firstly, it defines a multivariate setting that covers simultaneously economic, political, and environmental determinants of FDI inflows, secondly, it applied the panel ARDL methodology to estimate the short and long-run effects of selected FDI determinants and thirdly, it compares the results obtained in different economic and political groups of countries, which allows us to draw more general conclusions and policy implications. In short,

the paper confirms that FDI inflows are a highly complex phenomenon under the influence of numerous interrelated economic, political and environmental factors, which effects differ considering the development level of the countries and time horizons under investigation.

The paper is structured as follows: Section 2 summarizes the literature related to the FDI determinants, Section 3 describes the data, method and empirical model, Section 4 provides the results with discussion while Section 5 concludes the paper.

2. Literature review

The literature on FDI has attracted growing research interest as FDI is seen as an important driver of economic growth and socio-economic transformation of a country by bringing needed capital, technology, knowledge and skills to a country. In line with its importance, special attention has been paid to studying its determinants in order to deepen the knowledge on how to promote or constrain the attraction of FDI in a country.

Several papers that reviewed the state of the art in this field (Blonigen, 2005; Sahiti et al., 2018; Tocar, 2018) concluded that it is a highly complex phenomenon under the influence of numerous interrelated factors that can be broadly classified into economic and non-economic factors. The complexity of the determinants is the reason why Blonigen (2005) concluded that a comprehensive overview is not possible and therefore the research attention of scholars is focused on a specific group of determinants. Dunning (2000) proposed the eclectic approach to the study of FDI determinants, which emphasizes the need to consider the different groups of factors in order to understand the factors behind FDI decisions. In this paper, following this approach, the focus is on domestic macro factors that shape the economic and political environment in which FDI flows occur together with domestic economic activities in a country. These are not commonly studied factors, but their influence is increasing worldwide. Considering that the economic factors have been widely studied, Biswas (2002) has already pointed out that the non-traditional factors should not be ignored. Previous studies suggest that FDI determinants differ by income level; therefore, the brief literature review that follows will review economic, political and environmental factors that drive FDI in developed (G7) and developing (BRICS) countries.

As for BRICS countries, economic factors, such as market size, labor cost, exchange rate or trade openness, have been extensively studied in the literature and their importance has been mostly confirmed (Biyase & Rooderick, 2018; Gupta & Singh, 2016; Maryam & Mittal, 2020; Tsaurai, 2017), the impact of political and environmental factors has been at the margins of research interest. Recently, the situation has started to change, and several papers occurred that examined the impact of these factors. For example, Elfakhani and Mackie (2015) demonstrated that political variables (restriction on capital repatriation, degree of democracy, corruption, property protection, civil liberties), as opposed to economic variables, played a significant role in determining FDI during the period 1980–2008. However, the importance of the former variables declined during 1999–2008. Jadhav (2012) highlighted that

economic factors were a more important FDI determinant than political factors during 2000–2009 and pointed out that this was because FDI in these countries was motivated by the search for markets rather than resources. In terms of political variables, he found that voice and accountability negatively affected FDI inflows, while the quality of regulation, political stability and control of corruption were found to be nonsignificant. Asongu et al. (2018) also failed to find evidence of the importance of institutional quality on FDI for the period 2001–2011 but in contrast, Arif et al. (2020), based on an analysis that focused on the 1995–2015 period, revealed that corruption had a positive and significant impact on FDI, although the effects were inconsistent when the analysis was focused on each country separately. Kumar et al. (2018) found that intellectual protection rights were significant in attracting FDI over the period 2000–2015 and pointed out that stronger protection leads to an increase in technology-based FDI.

In contrast to BRICS countries, few relevant studies have been focused exclusively on FDI determinants in G7 countries therefore we extended our literature review to OECD or developed countries. Abolfazl and Zahra (2011) confirmed the importance of economic factors such as open trade, real exchange rate and income level on FDI in G7 countries over the period 1995–2006 and also indicated that democracy and property rights have a negative and positive effect on FDI, respectively. Many other studies related to developed countries also corroborated the importance of economic variables such as market size, stock market boom, exchange rate or infrastructure (Alam & Shah, 2013; Baltas et al., 2018; Gast & Herrmann, 2008). Some of them expanded the regressors by including the political and environmental variables. For example, Gast and Herrmann (2008) added political stability to the economic variables, for which they found a statistically significant impact on FDI in 22 OECD countries over the period 1991–2001, while Baltas et al. (2018) added taxation and several institutional variables for 24 OECD countries over the period 1980–2012. Raza et al. (2021), who examined the impact of government policies on FDI in OECD countries for the period 1996–2013, among others, concluded that effective government policies promote FDI. Yüksel et al. (2020) found a negative effect of carbon emissions on FDI and no causal relationship between variables in G7 countries.

Although Maryam and Mittal (2020) focused on macroeconomic determinants of FDI in BRICS countries, they emphasized the need for a policy shift towards more liberal policies to increase the attractiveness of the location. However, if the environmental policy aspect is not taken into account, this may cause that BRICS countries become a haven for dirty FDI. Using a panel quantile regression analysis, Zhou et al. (2019) have confirmed that this just happened during the period 1992–2014, when an increase in FDI contributed to an increase in the emissions variable, unlike in G7 countries, where the pollution halo effect was detected. The same conclusion was reached by Banerjee and Murshed (2020) for G7 and BRICS countries using the Westerlund-Edgerton LM bootstrap test for the period 2005–2015. In contrast, Shao et al. (2019) rejected the validity of the pollution haven hypothesis for the case of BRICS countries. They applied a panel vector error correction model (VECM) and a panel co-integration test to investigate the relationship between FDI and selected variables, including pollution, over the period 1982–2014. Similarly, Rahul and

Viswanathan (2018), who tested the effect of the EPS index for 33 countries (27 OECD and BRICS countries) over the period 2005–2016, using panel data analysis, revealed a positive relationship between them in both samples.

The literature is extremely sparse when it comes to the effects of economic and political uncertainty. Uncertainty about the future consequences of economic and political events, including policy decisions, can significantly increase uncertainty about economic agents' current activities, decisions and plans for the future. Uncertainty is an important factor considered when companies make decisions about investments and their potential location and literature shows that it often increases the value of postponing investment and leads to choosing the location where it is lower (Ahir, 2019). However, the literature failed to examine the impact of uncertainty on FDI for the groups of countries selected for our research. Nevertheless, given the findings of the available studies that have detected a negative impact of uncertainty on domestic investment (Bahmani-Oskooee & Maki-Nayeri, 2019; for G7 countries), and on FDI in particular (Chen et al., 2019; Nguyen et al., 2018), it is plausible to expect that the negative effect on FDI to be also present for BRICS and G7 countries.

In summary, the reviewed literature shows that economic variables such as market size, trade openness, or exchange rate are mainly significant determinants of FDI in both BRICS and G7 countries and their effects have been widely studied in contrast to the effects of political and especially environmental variables. As for the political variables, such as economic freedom, tax incentives, property rights, political stability, or corruption, the literature shows that not all of them are significant. Moreover, inconclusive results are reported between BRICS and G7 countries in terms of their significance, magnitude, and direction of influence that can be attributed to different model specifications, the period considered, the method applied and income levels. This is also true for the environmental variables, which generally include different pollution and environmental policy variables. However, while there seems to be no difference between the effects of the economic variables between these two groups of countries, the same cannot be said for the political and environmental variables, together with economic and political uncertainty. We can notice that there is a gap in the research focused on the effects of political and environmental factors on foreign direct investment (FDI) inflows that this paper attempts to fill.

3. Data and econometric methodology

Drawing on the literature review, this paper explores the effect of environment stringency policy, business regulations, policy and economic uncertainty and real GDP per capita on FDI inflows by employing the ARDL model.

3.1. Data

In the econometric analysis, FDI inflows (*FDI*) were proxied by FDI annual inward flows as a percent of GDP and the source of our data was the database of the United Nations Conference on Trade and Development (UNCTADSTAT., 2021). Environmental policy was represented by the EPS index (*EPS*) developed by Oecd

(2021), an index that ranges from 0 (not stringent) to 6 (highest stringency degree). The stringency shows the degree of environmental policies putting the price on polluting or environmentally harmful behavior (see Botta and Koźluk (2014) for detailed information on the index construction). The business regulations were represented by the BUSREG index (*BUSREG*), proposed by Fraser Institute (2021), that captures administrative requirements, bureaucracy costs, starting a business cost, extra payments, bribes, favoritism, licensing restrictions, and cost of tax compliance. The BUSREG index ranges from 0 to 10, and higher scores show relatively higher market-oriented business regulations. Environmental regulation is one category of business regulation; however, we wanted to assess its effect separately given the importance of sustainability in each economy. Policy-induced uncertainty is represented by the WUI index (Wui, 2021), its higher values indicating the presence of a higher level of policy-induced uncertainty. Lastly, real GDP per capita was expressed in constant 2010 USD and was provided by the World Bank database (2021).

All the series are annual and the study period was selected to be 2000–2015 because the data for *BUSREG* variable is available as of 2000 and for the *EPS* variable ended in 2015.

The dataset summary characteristics for our three models are reported in Table 1; Model 1 includes G7 and BRICS countries, while Models 2 and 3 consists of G7 and BRICS countries individually. In general, BRICS countries succeeded to attract more FDI concerning their GDP. Their business environment within which FDI flows took place was characterized by more complicated business regulations and less concern for the environment, which generally supports the pollution haven hypothesis. As for the policy-induced uncertainty, it seems that, on average, it equally burdened business decision-making in both subsamples; however, given the minimum and maximum values, they are considerable differences in both subsamples.

Given the main aim of the paper, to assess the effect of environmental and business regulations, policy-induced uncertainty, and real GDP per capita on FDI inflows in developed (G7) and developing (BRICS) countries in the short and long run, the following empirical model was established for empirical analysis:

$$FDI_{it} = \alpha_0 + \beta_1 LNGDP_{it} + \beta_2 LNEPS_{it} + \beta_3 LNBUSREG_{it} + \beta_4 LNWUI_{it} + u_{it}, \qquad (1)$$

where the prefix *LN* denotes the log form taken from the variables, *i* denotes the country and *t* represents the period of interest ($t = 2000, \ldots, 2015$). Parameters to be estimated are represented by the following symbols α_0, $\beta_1, \ldots, \beta_4$ and u_{it} is an error term.

3.2. Econometric methodology

In estimating the long and short run coefficients of Eq. (1) under a panel framework, several pre-concerns have to be addressed to avoid bias and size distortions in concluding the relationships under investigation. Firstly, bearing in mind the existence of intensive international FDI flows, the presence of cross-sectional dependence and heterogeneity of the slope coefficients of each country group must be checked, secondly, the stationarity of the time series must be examined. Testing for cross-sectional dependence, slope homogeneity and statistical properties of time series will enable us to select an appropriate estimator. Then, applying the Westerlund-Durbin-Hausman

cointegration test we investigate the presence of cointegration between variables. This test is recommended to be used when the independent variables have different integration levels, but the dependent variable is I(1). It is also suitable when a panel has cross-sectional dependence and the presence of heterogeneity is confirmed.

The cointegration test simultaneously calculates Durbin-Hausman group (DH_g) and Durbin-Hausman panel (DH_p) statistics. The DH_g statistic is taken into consideration for the heterogeneous panels and DH_p statistic is used for the homogeneous panels. Both statistics are calculated as follows (Westerlund, 2008):

$$DH_g = \sum_{i=1}^{n} \overline{S}_i \left(\tilde{\emptyset}_i - \overline{\emptyset}_i\right)^2 \sum_{t=2}^{T} \overline{e}_{it-1} \tag{2}$$

$$DH_p = \overline{S}_n = \left(\tilde{\emptyset}_i - \overline{\emptyset}_i\right)^2 \sum_{i=1}^{n} \sum_{t=2}^{T} \overline{e}_{it-1}. \tag{3}$$

The cointegration coefficients are estimated through estimators of ARDL-MG introduced by Pesaran and Smith (1995) and ARDL-PMG by Pesaran et al. (1999). The main advantage of MG and PMG estimators over the estimators of AMG (Augmented Mean Group) and CCEMG (Common Correlated Effects Mean Group) is that both groups of estimators consider the dynamic interaction among the variables, therefore, the cointegration coefficients are estimated regarding the short run interaction among the variables. However, both MG and PMG do not consider the cross-sectional dependence among the series. In this context, the first cross-section averages of the series are calculated and then MG and PMG estimators are used with the demeaned data formed by taking differences between original data and cross-section averages of the series. The selection between MG and PMG estimators is made in view of Hausman test (1978), of which the null hypothesis suggests that the PMG estimator is efficient and robust.

The MG estimator does not impose any constraints on the parameters of ARDL specification and derives the cointegration coefficients through averaging the cointegration coefficients from individual ARDL estimations. On the other hand, the PMG estimator imposes a constrain, that the long run parameters should be the same among the countries but allows the constant error variances and short-term coefficients to differ among the countries. Therefore, short-term heterogeneity is allowed depending on long-term homogeneity (Güler & Özyurt, 2011).

The following ARDL model was formed to analyze the interaction among the *FDI*, *EPS*, *BUSREG*, *GDP*, and *WUI* variables:

$$\begin{aligned} FDI_{it} =& \beta_0 + \sum_{j=1}^{m} \beta_{ij} + EB_{it-j} + \sum_{j=1}^{n} \beta_{ij} + EPS_{it-j} + \sum_{j=1}^{\rho} \beta_{ij} \\ &+ BUSREG_{it-j} + \sum_{j=1}^{k} \beta_{it} + GDP_{it-j} + \sum_{i=1}^{L} \beta_{ij} + WUI_{it-j} + \mu_i + \varepsilon_{it}. \end{aligned} \tag{4}$$

Table 2. Results of cross-sectional dependency and homogeneity tests.

Test	Model 1 Test Statistic	Model 2 Test Statistic	Model 3 Test Statistic
Cross-sectional dependency test			
LM	97.731**	39.73***	53.030
LM adj[a]	2.762***	3.649***	−1.129
LM CD[a]	1.854**	3.055***	−0.301
Homogeneity tests			
$\tilde{\Delta}$	2.740***	1.855*	1.994**
$\tilde{\Delta}_{adj.}$	3.495***	2.347**	2.574***

Notes: ***, ** and * is respectively significant at 1%, 5% and 10% significance level, respectively.
[a]two-sided test.
Source: Authors' calculation.

In Equation (4), m, n, ρ, k, and l are lag that are calculated considering AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion).

The Stata 16.0, Gauss 10.0 and Eviews 10.0 were employed in the econometric analyses.

4. Empirical analysis with results

First, the presence of cross-sectional independence in all three models was questioned through LM test of Breusch and Pagan (1980), LM CD test of Pesaran (2004) and $LM_{adj.}$ test of Pesaran et al. (2008) and results are shown in Table 2. The null hypothesis of cross-sectional independence was declined at 1% significance level for Models 1 and 2, while it was accepted for Model 3, therefore, the presence of cross-section dependency was reached for the whole sample and G7 countries.

Furthermore, delta tilde tests of Pesaran and Yamagata (2008) were applied to check the presence of the cointegrating coefficients' homogeneity and the test statistics were also reported in Table 2. The null hypothesis of homogeneity was declined for all three models, because the probability values of the tests were found to be lower than 5% significance level. Consequently, the cointegrating coefficients were found to be heterogeneous for Models 1–3.

The integration levels of the series in all three models were checked by performing the Pesaran (2007) CIPS test and the test results are given in Table 3. The *WUI* variable is I(0) and the other variables are I(1) in Model 1. This fact makes the panel ARDL approach suitable for implementation.

The cointegration relationship among the series was questioned by employing the Westerlund-Durbin-Hausman cointegration test (2008) because the series had different integration levels and there existed cross-sectional dependency and heterogeneity and results are reported in Table 4. The Durbin-Hausman group statistics were taken into consideration in view of heterogeneity and in turn, the null hypothesis of no cointegration relationship among the series was declined for all models. Hence, a significant cointegration among the series was revealed, which was expected given the globalization processes and intensive capital and commodity international flows.

The long and short-run coefficients for Models 1–3 were estimated by employing the PMG and MG estimators and the results are shown in Table 5. Lastly, the Hausman test was conducted to decide which estimator is better. Negative and

Table 3. CIPS panel unit root test results.

Model 1			Model 2		Model 3	
Variables	Constant	Constant + Trend	Constant	Constant + Trend	Constant	Constant + Trend
FDI	−1.044	−1.842	−1.311	−1.451	−2.199	−2.588
d(FDI)	−4.702***	−4.749**	−5.598***	−3.993***	−4.929***	−5.597***
LNGDP	−1.827	−2.085	−1.641	−2.314	−1.653	−1.713
d(LNGDP)	−2.760***	−2.876**	−3.408***	−3.038**	−2.516**	−2.931**
LNEPS	−1.765	−1.710	−1.387	−2.533	−1.852	−1.654
d(LNEPS)	−3.072***	−3.180***	−3.550***	−3.324***	−2.836**	−2.982**
LNBUSREG	−2.045	−2.180	−1.964	−2.235	−1.878	−1.655
d(LNBUSREG)	−4.417**	−4.388	−3.751***	−3.740***	−3.058***	−4.372
LNWUI	−4.027**	−3.635***	−3.069***	−3.351***	−2.988***	−3.024***
d(LNWUI)	−4.085***	−2.130**	−4.578***	−4.289***	−4.242***	−4.354***

Notes: *** and ** is respectively significant at 1% and 5% significance level.
Source: Authors' calculation.

Table 4. Results of the Westerlund-Durbin-Hausman cointegration test.

	Model 1		Model 2		Model 3	
Test	Statistic	p-value	Statistic	p-value	Statistic	p-value
Durbin-Hausman Group Statistic	8.488	0.000	3.074	0.001	−0.449	0.043
Durbin-Hausman Panel Statistic	1.120	0.131	9.249	0.000	0.522	0.301

Source: Authors' calculation.

significant error correction terms (*COINTEQ01)* indicate that the error correction mechanism worked in all models.

The ARDL analysis discloses that all variables across all models influence FDI inflows in the same direction in the short run. However, the significance of these effects differs. In general, real GDP is the most influential variable and it positively and statistically significantly affects FDI inflows. Although a stringer environmental policy encourages foreign investment, this impact is statistically nonsignificant in all models. Differences in the significance of the variables are obtained concerning the level of burden with business regulations and uncertainty, although both of them negatively affect FDI inflows in the short run.

In the long-run, GDP per capita also positively and statistically significantly influences FDI inflows in all models. However, all other variables affect them differently in terms of significance, magnitude and sign of direction, as well as the level of income and period considered. This indicates the necessity of their investigation, as Dunning (2000) and Biswas (2002) hypothesized.

5. Discussion

The results indicate that real GDP per capita is the only determinant that boosts FDI inflows in both groups of countries and both the short and the long run. This is expected; indeed, previous literature provided the same evidence on the important role income plays in FDI inflows for both groups: G7 countries (Abolfazl & Zahra, 2011) and BRICS countries (Mudambi et al., 2013; Smith-Hillman & Omar, 2005; Zhang, 2012). The importance of real GDP is particularly pronounced in the short run when it becomes the key FDI determinant. Higher real GDP per capita indicates a higher standard of living and emphasizes the importance of the market size in

Table 5. PMG and MG Estimation Results ARDL models.

	Model 1 (G7 + BRICS) ARDL (1,1,2,2,1)		Model 2 (G7) ARDL (11112)		Model 3 (BRICS) ARDL (11100)	
	Long Run Estimation		Long Run Estimation		Long Run Estimation	
Independent Variable	PMG	MG	PMG	MG	PMG	MG
LNGDP	6.262***	11.688***	4.220***	16.979*	3.066***	1.071
LNEPS	−0.297*	−0.724	0.066	0.924	−0.123	0.342
LNBUSREG	2.599**	−3.9591	−3.852***	−18.916*	10.384***	4.491
LNWUI	−0.213*	−0.588	0.067	−0.314*	−0.762***	0.7456
	Short Run Estimation		Short Run Estimation		Short Run Estimation	
COINTEQ01	−0.659***	−0.984***	−0.786***	−1.363***	−0.485**	−0.910***
ΔLNGDP	29.418***	18.748**	30.545***	35.717**	16.859**	15.262***
ΔLNEPS	1.094	−0.026	0.632	1.025	1.169	1.483*
ΔLNBUSREG	−3.063	−7.088	−8.651*	−25.371*	−4.403	−4.313*
ΔLNWUI	−0.465**	−0.751	−0.0418	−0.004	−0.219	−0.713*
Constant	−44.625***	−100.486***	−28.291***	−199.313*	−21.905**	−5.908
Hausman test (chi2(4))	13.09 (0.111)		5.96 (0.202)		2.04 (0.729)	
Observation	171		105		51	

Notes: ***, **, and * is respectively significant at 1%, 5%, and 10%.
Source: Authors' calculation.

attracting FDI inflows. At the same time, higher real GDP per capita is associated with more skilled workers, innovation, more developed financial markets, better infrastructure, and other factors that the literature recognizes as the important FDI determinants. This can explain why GDP per capita is the more influential determinant of the FDI inflows in G7 countries compared with BRICS countries. However, over time, the importance of real GDP per capita weakens, and some other determinants are gaining in importance.

Besides GDP, business regulations have a significant influence on FDI inflows in G7 countries, confirming their relevance already detected in the literature (Emmanouilidis & Karpetis, 2019; Mudambi et al., 2013; Smith-Hillman & Omar, 2005; Zhang, 2012). A sound regulatory environment reduces the costs of doing business and enhances market efficiency (Zhang, 2012). The results show that a friendlier regulatory environment to investors significantly supports FDI inflows in Model 1 in the long run, but this impact is nonsignificant in the short run. Table 1 indicates higher regulatory costs in terms of, for example, administrative requirements, bureaucracy costs, the level of corruption, or the protection of property rights in BRICS countries compared with G7 countries. These differences are reflected, although not significantly, in the effect that business regulations have on FDI inflows in these two income groups. While in the long run, in BRICS countries, more friendly business regulations encourage FDI inflows, in G7 countries it has an opposite effect. It appears that further lowering the regulatory burden in G7 countries, which has been already low, may deter FDI inflows in both the short and the long run. Hence, the paper indicates some regulations like the protection of property rights support business. They represent the desirable bottom line. The finding on the presence of the bottom line can be supported by Zhang (2012), who explored the effect of business regulation on 64 host countries in 2000 and confirmed the presence of the threshold level in the efficiency of regulation policy in attracting foreign investment.

Our results suggest that the level of environmental policy stringency has a different impact on FDI, depending on the income level and the period considered. Previous

literature revealed that more stringent environmental regulations imply higher compliance costs for investors, lead to delaying the location decisions and activities related to them (Ahir, 2019) and thus deter foreign investment (Bialek & Weichenrieder, 2021; Yüksel et al., 2020). The results of our study are in line with this finding; environmental regulation becomes an obstacle to foreign investors in the long run. Such effect is stronger, but still nonsignificant, in BRICS countries that attracted more dirty industries over time (Banerjee & Murshed, 2020; Zhou et al., 2019). Interestingly, this is not the case with G7 countries, where environmental regulation is considerably more stringent than it is in BRICS countries (see Table 2). Indeed, the effect of stringer environmental regulation favorable, but not significantly, influences FDI inflows in G7 countries in both the short and the long run. This favorable effect may be attributed not only to increased investment in more efficient and cleaner (green) technologies and business processes in G7 countries but also to the reallocation of the operations or parts of them abroad to avoid environmental costs.

This study indicates that policy uncertainty adversely and significantly affects FDI inflows in Model 1 in both the short and the long run, suggesting that this type of uncertainty considerably reduce the attractiveness of a country to foreign investment. This finding is consistent with the evidence of other studies in this area (Chen et al., 2019; Nguyen et al., 2018; Nguyen & Lee, 2021). Moreover, our study shows that investors are more sensitive to uncertainty in BRICS countries over time; indeed, in the long run, the effect of uncertainty is negative and significant in this group of countries. In G7 countries, on the contrary, the effect is positive although nonsignificant; this situation can be explained by the so-called safe-haven effect. According to it, an increase in uncertainty encourages cross-border investments to flow from lower-income countries to more stable higher-income countries. Using a sample of 116 countries, Nguyen and Lee (2021) also corroborate the presence of this effect. It appears that sound institutions, infrastructure, and developed financial markets weaken the adverse effect of policy uncertainty on the location decision.

6. Conclusion

The determinants of investment have occupied the attention of scientists and politicians for many years, however, the literature has not yet concluded what the most influential determinants are. While previous literature was mostly focused on the economic determinants, recently other determinants such as political and environmental have attracted the research attention. The focus of this paper has been to investigate the short and the long run effect of the selected economic, political and environmental variables in G7 and BRICS countries.

The paper provides novel evidence about cross-border investment. First, it turned out that the effect of income on FDI inflows, while the only one that is homogenous and statistically significant across different income groups and time horizons, weakens over time. The effect of environmental policy stringency and uncertainty also exhibited a decrease in magnitude over time. Second, in the long-run, friendlier business regulations encourage investment, but there is a bottom line; when regulations are already at a low level, as is the case with G7 countries, further liberalization would

harm FDI inflows. Third, more stringent environmental regulations have a marginally adverse effect on FDI inflows in the long run and a nonsignificant effect in the short run. Yet, it seems that G7 countries unlike BRICS countries managed to offset this effect by concerning more on sustainability, reallocating their dirty operations or parts of them abroad, and/or offering better economic conditions. Finally, the impact of policy-induced uncertainty on FDI inflows is adverse but largely nonsignificant in the short run. It appears that cross-border investments follow a pattern of the safe-haven effect in the long run, meaning that they flow from lower-income countries to higher-income countries that have developed, stable and sound political and economic business environments.

Policymakers have a wide range of regulatory schemes that support both the businesses' and communities' needs but must take into account that their measures must contribute to economic and financial stability at the national and also global levels. Development and implementation of basic rules for international corporate governance can prevent the intense competition for FDI.

More stringent environmental standards will force companies to use cleaner technologies and to implement environmental management systems (EMS) but even costs associated with the implementation of EMS can be high in the short term, companies will benefit by reducing costs in the long term. Choosing countries with less stringent environmental regulations to move their activities cannot be the perfect solution for companies since the introduction of new technologies can help them to improve efficiency and production, increase their market share, to achieve international technological leadership.

Innovation-specific policies can reduce the perceived negative effects of environmental regulations on companies' profitability and can positively influence investment decisions.

The limits of this paper are simultaneously the suggestions for further research. For this research, we have selected G7 and BRICS countries but for more comparative results the sample can be extended by including other groups of countries. Also, our sample is limited to the period 2000–2015 therefore further research should extend the period under consideration to recent years. Indeed, it would be very interesting to investigate the impact of the Paris agreement on FDI inflows and compare the effects before and after that great event. Another important aspect is that the period of time covered by this study includes the financial crisis period that can influence the results so it will be interesting to analyze a long period of time and to compare the results from the pre-crisis, crisis and post-crisis period.

Additionally, as the paper used the composite indices to proxy for environmental and business regulations, it may be beneficial to distinguish between different categories among them to find out which of them makes the bottom line for foreign investors. Additionally, disaggregation of FDI inflows should help in providing more reliable evidence on the pollution haven hypothesis. Finally, alternative methods may be used to gain a deeper understanding of the FDI determinants.

Author contributions

All authors have contributed significantly for this research in all phases and sections.

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