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THE IMPACT OF DIGITALIZATION AND GREENING ON FDI IN THE EU IN THE VUCA ERA

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ABSTRACT

The twin green and digital transition has become a central policy priority for achieving carbon neutrality in the European Union (EU) by 2050. However, increasing global uncertainty—often characterized by volatility, uncertainty, complexity, and ambiguity (VUCA)—poses significant challenges to foreign direct investment (FDI) inflows. This study empirically examines the impact of digitalization and greening on FDI in the EU, with particular emphasis on the moderating role of the political environment as a proxy for institutional conditions under uncertainty. Using panel data from 27 EU countries over the period 2018–2023, the study applies a dynamic panel estimation approach based on the System Generalized Method of Moments (SGMM) to address endogeneity and capture the persistence of FDI. The results indicate that digitalization has a positive and statistically significant effect on FDI inflows, whereas greening exerts a negative impact in the short term. Furthermore, the political environment strengthens the positive effect of digitalization while amplifying the negative effect of greening, highlighting the importance of institutional quality in shaping investment outcomes. The findings suggest that while digital transformation enhances the attractiveness of host countries to foreign investors, environmental policies may impose short-term adjustment costs that influence investment decisions. Overall, the study provides empirical evidence that the effects of digitalization and greening on FDI are conditional on institutional factors, rather than reflecting the full spectrum of the VUCA framework.

Keywords: VUCA, Foreign Direct Investment, digitalization, greening, European Union, SGMM.

1. INTRODUCTION

In recent years, businesses and member states of the European Union (EU) have experienced profound transformations driven by two interrelated processes: digitalization and greening, both unfolding within the context of the VUCA era (Volatility, Uncertainty, Complexity, and Ambiguity). This environment is characterized by heightened unpredictability, which complicates the EU's strategic objectives, including achieving carbon neutrality by 2050 under the European Green Deal and advancing its digital transformation agenda. As these priorities evolve simultaneously, balancing sustainability objectives with economic competitiveness has become increasingly challenging.

Global developments—such as de-globalization, the post-COVID-19 recovery, climate change, and geopolitical tensions—have significantly reshaped the international business landscape. These dynamics intensify volatility, uncertainty, complexity, and ambiguity, thereby requiring multinational enterprises (MNEs) to adapt their strategies to cope with rapidly changing conditions [1]. In such an environment, traditional planning approaches become less effective, as VUCA conditions limit the predictability of future outcomes and constrain strategic responses [2]. Consequently, understanding Foreign Direct Investment

(FDI) location decisions necessitates careful consideration of institutional factors, including political stability, government effectiveness, policy uncertainty, and corruption [3]. Political instability, often reflected in changes in executive power [4], can lead to abrupt policy shifts, while institutional complexity—characterized by ambiguous and inconsistently interpreted regulations—further shapes firms' investment decisions [5]-[7].

Against this backdrop, this study examines whether the host country's political environment—representing the institutional–political dimension of the VUCA world—affects the relationships between digitalization, greening, and FDI inflows within the EU. FDI plays a critical role in economic development by enhancing production capacity, facilitating market access, generating foreign exchange revenues, and promoting technology transfer [8]. However, global FDI flows experienced a sharp decline during the COVID-19 pandemic, falling by 49% in 2020, with developed economies particularly affected [9]. In the EU, FDI inflows dropped by 73% between 2019 and 2020 before recovering in 2021, especially in sectors such as digital technology, infrastructure, and renewable energy [10]. Despite this rebound, FDI growth slowed again during 2022–2023 due to persistent geopolitical risks and supply chain disruptions.

Digitalization has emerged as a key driver reshaping FDI patterns by transforming business models and global value chains. It refers to the application of digital technologies across economic sectors [11], enabling firms to improve efficiency and reduce operational costs [12]. Prior studies suggest that digitalization facilitates FDI by allowing firms to operate with reduced reliance on physical assets while expanding cross-border activities [13]. In the context of the VUCA world, digitalization enhances firms' adaptability and resilience, with supportive policy frameworks further strengthening its positive effects on FDI inflows [14]. Moreover, the expansion of the digital economy has altered the behavior of MNEs, enabling more flexible market entry strategies and reducing dependence on traditional investment structures [15]. Through improvements in operational efficiency, logistics, and product performance, digitalization helps firms mitigate the adverse effects of global uncertainty, thereby supporting FDI growth.

In parallel, the EU's commitment to sustainability under the European Green Deal has accelerated the adoption of greening policies aimed at achieving net-zero emissions by 2050. While these policies create new opportunities for investment in renewable energy and sustainable technologies, they may also impose additional costs on firms, particularly in pollution-intensive industries. This raises concerns regarding the potential relocation of such industries to countries with less stringent environmental regulations, consistent with the Pollution Haven perspective. Nevertheless, evidence suggests that developed economies, including EU member states, continue to attract a significant share of global green investments, with over 60% of climate-related investment flows directed toward these countries [10]. Existing research on the relationship between FDI and environmental regulation has predominantly focused on developing economies, often emphasizing pollution-intensive investment patterns, thereby overlooking the more complex dynamics observed in developed regions that function as both sources and destinations of FDI.

Building on these observations, this study seeks to investigate the combined effects of digitalization and greening on FDI inflows, while incorporating the moderating role of the political environment within the VUCA context. Specifically, the study addresses the following research questions: (1) Does greening significantly affect FDI inflows? (2) Does digitalization significantly affect FDI inflows? and (3) Does the political environment, as a proxy for the VUCA context, moderate the effects of greening and digitalization on FDI?

This study contributes to the existing literature in several ways. First, it develops an integrated analytical framework that simultaneously examines digitalization and greening as

dual transformation processes influencing FDI in the EU, thereby extending prior studies that have largely treated these dimensions separately. Second, it incorporates the political environment as a moderating factor, providing a more nuanced understanding of how institutional conditions shape the effectiveness of these transformations under uncertainty. While the VUCA framework encompasses multiple dimensions, this study focuses specifically on its institutional–political aspect, which plays a critical role in shaping investment decisions. Third, the findings offer policy-relevant implications for EU member states by highlighting how to balance digital and green transitions without undermining FDI attractiveness, thereby supporting sustainable development objectives in an increasingly uncertain global environment.

2. LITERATURE REVIEW

2.1. Theoretical background

This study draws on three core theoretical perspectives to explain the relationships between digitalization, greening, and foreign direct investment (FDI), as well as the moderating role of the political environment: the Pollution Haven Hypothesis, Institutional Theory, and Dynamic Capabilities Theory.

2.1.1. Institutional Theory

Institutional Theory, developed by DiMaggio and Powell, emphasizes the role of formal and informal institutions in shaping organizational behavior and economic outcomes. According to this perspective, firms are influenced by regulatory frameworks, governance structures, and societal expectations, which collectively define the institutional environment in which they operate [16].

In the context of this study, Institutional Theory explains how the political environment (PLE) influences both FDI inflows and the effectiveness of digitalization and greening policies. A stable and transparent institutional framework can enhance investor confidence, reduce uncertainty, and support the implementation of digital and environmental initiatives. Conversely, weak or unstable institutions may increase perceived risks and hinder investment decisions. Therefore, Institutional Theory provides the foundation for examining the moderating role of PLE in shaping the relationships between digitalization, greening, and FDI.

2.1.2. Dynamic Capabilities Theory

Dynamic Capabilities Theory focuses on firms' ability to adapt, integrate, and reconfigure internal and external resources in response to rapidly changing environments. This perspective is particularly relevant in contexts characterized by technological change and environmental transformation.

Within this study, Dynamic Capabilities Theory helps explain how firms respond to digitalization and greening pressures. Firms with strong dynamic capabilities are better able to adopt digital technologies, implement sustainable practices, and adjust their strategies in response to evolving regulatory and market conditions. These capabilities enhance firms' competitiveness and increase their attractiveness as recipients or drivers of FDI.

Moreover, in uncertain environments, firms that can effectively align their digital and environmental strategies with institutional conditions are more likely to sustain investment and expand across borders. Therefore, Dynamic Capabilities Theory complements Institutional Theory by providing a firm-level explanation for how digitalization and greening influence FDI decisions under changing economic conditions.

2.1.3. The Pollution Haven and Porter Hypotheses

The Pollution Haven Hypothesis (PHH), developed by Copeland & Taylor, provides a foundational framework for understanding the relationship between environmental regulation and international investment flows. The theory suggests that differences in environmental regulation across countries can influence the location decisions of firms, particularly those in pollution-intensive industries. Under conditions of trade liberalization, firms facing stringent environmental regulations in developed economies may relocate their production activities to countries with more lenient environmental standards, thereby reducing compliance costs.

This relocation process is often facilitated through foreign direct investment (FDI), which enables firms to exploit regulatory differences across countries. As a result, countries with weaker environmental regulations may attract pollution-intensive investments, effectively becoming "pollution havens" [17]. In the context of this study, the PHH provides a theoretical basis for the expected negative relationship between greening and FDI, particularly when stricter environmental policies increase operational costs for foreign investors.

2.2. Empirical research

Prior research identifies digitalization as a critical determinant of foreign direct investment (FDI) inflows. Digitalization refers to the application of digital technologies and infrastructures across economic and social activities [11], enabling firms to transform production processes, enhance operational efficiency, and reduce transaction costs [12]. Traditionally, FDI decisions have been driven by factors such as market size, resource availability, and production costs [13]. However, in the digital economy, these conventional determinants are increasingly complemented—if not partially replaced—by the importance of intangible assets, digital infrastructure, and technological capabilities.

Digitalization reshapes FDI patterns by enabling new forms of cross-border investment and reducing reliance on physical assets. For instance, digital fundraising platforms facilitate direct financing, while blockchain technologies improve the speed, cost-efficiency, and security of international financial transactions [13]. As firms increasingly operate through digital platforms, FDI structures adapt accordingly, allowing more flexible and scalable market entry strategies. Empirical evidence suggests that digitalization enhances both firm performance and consumer engagement, particularly when barriers to online transactions are reduced. Furthermore, digital systems contribute to lower labor and production costs, thereby accelerating industrialization processes. By reducing trade barriers and expanding logistics and distribution channels, digital transformation creates new opportunities for international investment [13], [15]. From an institutional perspective, digitalization also improves the ability of governments to attract FDI by increasing transparency, facilitating information flows, and supporting investment promotion strategies. Accordingly, digitalization is expected to positively influence FDI inflows.

H1: Digitalization promotes the inflows of foreign direct investment.

However, the effectiveness of digitalization in attracting FDI is contingent upon the institutional and political environment in which it operates. In the context of a VUCA world, characterized by heightened uncertainty and complexity, institutional quality becomes a critical moderating factor. Effective regulatory frameworks, governance quality, and human capital readiness are essential for the successful implementation of digital technologies [18]. For instance, e-government initiatives can enhance transparency and reduce corruption, thereby increasing investor confidence [19]. Conversely, weak institutional environments and political instability may hinder digital transformation efforts and reduce the attractiveness of host countries to foreign investors [20].

In this study, the political environment is employed as a proxy for the institutional–political dimension of the VUCA context. While VUCA encompasses multiple dimensions, including economic volatility and technological disruption, institutional conditions represent a key channel through which uncertainty affects investment decisions. Under such conditions, digitalization may become even more valuable, as firms rely on technological capabilities to navigate uncertainty and exploit emerging opportunities. Therefore, the positive relationship between digitalization and FDI is expected to be strengthened in more stable and supportive political environments.

H2: The political environment moderates the relationship between digitalization and foreign direct investment.

In parallel, the literature on environmental regulation and FDI provides mixed evidence regarding the impact of greening on investment flows. On the one hand, environmental policies can stimulate innovation and enhance long-term productivity [21]. On the other hand, stricter environmental regulations may increase compliance costs and reduce the short-term attractiveness of host countries for foreign investors. Governments often face a trade-off between environmental protection and investment attraction, with some countries relaxing environmental standards to attract FDI, while others adopt stricter regulations to achieve sustainability goals [22].

Empirical evidence supports the view that environmental regulation can have a negative impact on FDI inflows, particularly in pollution-intensive industries, consistent with the pollution haven hypothesis. Stricter environmental regulations may discourage investment by increasing production costs and regulatory burdens [23]. These findings are consistent with previous studies [24], [25], which suggest that firms may relocate to jurisdictions with more lenient environmental standards. Although developed economies continue to attract green investment, the short-term effects of greening policies on overall FDI inflows remain ambiguous.

Based on this cost-based perspective, greening is expected to reduce FDI inflows in the short run.

H3: Greening reduces the inflows of foreign direct investment.

The relationship between greening and FDI is further influenced by the broader institutional context. In a VUCA environment, characterized by uncertainty and policy ambiguity, stringent environmental regulations may be perceived by investors as additional risks. While greening policies aim to promote sustainability, they may simultaneously increase regulatory complexity and uncertainty, thereby discouraging investment. Empirical studies suggest that governance quality plays a crucial role in shaping the outcomes of environmental policies, with stronger institutions supporting renewable energy development and improving the effectiveness of FDI [26].

These findings imply that the impact of greening on FDI is conditional on the institutional environment. In more stable and predictable political contexts, the negative effects of environmental regulation may be mitigated, whereas in uncertain environments, such effects may be amplified. Therefore, the political environment is expected to moderate the relationship between greening and FDI.

H4: The political environment moderates the relationship between greening and foreign direct investment.

3. METHODOLOGY

This study employs both static and dynamic panel data models to analyze the determinants of foreign direct investment (FDI) inflows. Static approaches, including fixed

effects and random effects models, provide baseline estimates while controlling for unobserved heterogeneity across countries. However, as FDI inflows are typically persistent over time [27], a dynamic specification is required. The inclusion of lagged dependent variables captures this persistence but introduces endogeneity due to correlation with the error term, leading to biased estimates in conventional models [28]. In addition, potential reverse causality between FDI and key explanatory variables such as digitalization and greening further complicates estimation.

To address these issues, the study applies the Generalized Method of Moments (GMM) estimator [29], which uses lagged variables as internal instruments to correct for endogeneity and simultaneity bias [30]. The differenced GMM approach is employed to eliminate unobserved country-specific effects and obtain consistent estimates. Given the relatively small sample (27 countries, 2018–2023), instrument validity and model specification are carefully controlled. Diagnostic tests, including the Arellano–Bond test for autocorrelation and the Hansen test for overidentifying restrictions, confirm the absence of second-order autocorrelation and the validity of the instruments.

Overall, the dynamic GMM framework provides a robust approach for examining the relationships between digitalization, greening, and FDI by accounting for persistence, endogeneity, and unobserved heterogeneity.

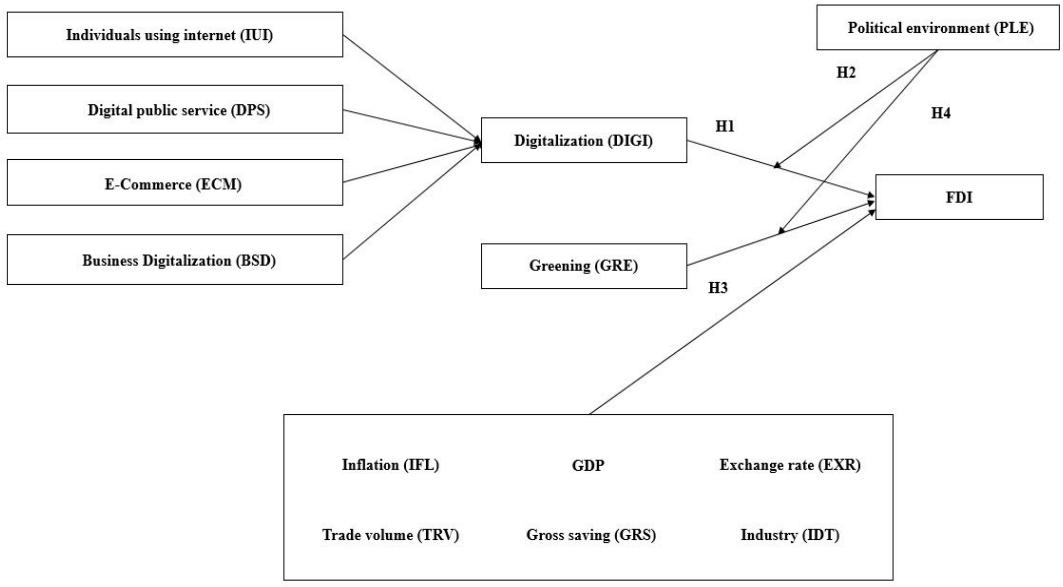

Figure 1. Research model. Source: Authors' own elaboration.

3.1. Model Specification

3.1.1. Static Panel Data Model (Baseline)

The study first estimates a static panel regression model to establish baseline relationships. This model does not include the lagged dependent variable and is specified as follows:

$$FDI_{i,t} = \alpha_0 + \beta_1 DIGI_{i,t} + \beta_2 GRE_{i,t} + \beta_3 PLE_{i,t} + \beta_4 DIGI * PLE_{i,t} + \beta_5 GRE * PLE + \beta_6 IFL_{i,t} + \beta_7 GDP_{i,t} + \beta_8 TRV_{i,t} + \beta_9 GRS_{i,t} + \beta_{10} EXR_{i,t} + \beta_{11} IDT_{i,t} + \varepsilon_{i,t}$$

The static model is estimated using Ordinary Least Squares (OLS), the Fixed Effects Model (FEM), and the Random Effects Model (REM) to account for potential unobserved heterogeneity across the 27 EU member states.

3.1.2. Dynamic Panel Data Model (Main Analysis)

The second model incorporates a dynamic component by including a lagged dependent variable $FDI_{i,t}$ to account for the persistence and inertia of FDI inflows. The dynamic model is specified as:

$$FDI_{i,t} = \alpha_0 + \rho FDI_{i,t-1} + \beta_1 DIGI_{i,t} + \beta_2 GRE_{i,t} + \beta_3 PLE_{i,t} + \beta_4 DIGI * PLE_{i,t} + \beta_5 GRE * PLE + \beta_6 IFL_{i,t} + \beta_7 GDP_{i,t} + \beta_8 TRV_{i,t} + \beta_9 GRS_{i,t} + \beta_{10} EXR_{i,t} + \beta_{11} IDT_{i,t} + \varepsilon_{i,t}$$

This model aims to investigate the same relationships as the static model but includes the lagged FDI variable $\rho FDI_{i,t-1}$ to capture the dynamic effects of previous FDI flows on current FDI. The inclusion of this lagged term addresses potential dynamic endogeneity and allows for a better understanding of the time-dependent nature of FDI inflows. The dynamic model is estimated using the Generalized Method of Moments (GMM), which is specifically designed to address endogeneity issues by including lagged values of the dependent variable and instrumental variables.

3.2. Model Specification

- FDI (Dependent Variable): Foreign Direct Investment inflows, measured by the net liabilities in current U.S. dollars.
- DIGI (Independent Variable): Digitalization index, calculated as the average of four core pillars: individuals using the internet, business digitization, digital public services, and e-commerce.
- GREEN (Independent Variable): Greening, measured by the share of primary energy consumption from renewable sources (hydropower, solar, wind, etc.).
- PLE (Moderating Variable): Political Environment, proxied by the Democracy Index (ranging from 0 to 10), representing the institutional stability of the VUCA world.
- Control Variables: * *Inflation (INF):* Annual percentage change of the GDP deflator.
    - *GDP Growth (GDP):* Annual percentage change in capital growth.
    - *Trade Volume (TRA):* Proportion of GDP representing trade openness.
    - *Gross Saving (SAV):* Gross savings as a percentage of GDP.
    - *Exchange Rate (EXC):* Local currency units per U.S. dollar.
    - *Industry (IND):* Value added of the industrial sector to GDP.

The data illustrate the economic performance of 27 EU countries during the 2018–2023 period. Data sources include the World Development Indicators (WDI), Our World in Data, and the Digital Economy and Society Index (DESI).

3.3. Variable Description

The authors have collected data of European Union countries in the period from 2018 to 2023 with 162 observations. The group displays statistical findings in charts with the following precise details:

Table 1. Descriptive statistics results

Variable	Obs	Mean	Std. dev.	Min	Max
FDI	161	8.68E-11	1	-3.4336	4.67216
IUI	161	84.68683	8.26678	60.78	97.97
BSD	160	35.47185	9.64715	14.3	57.2
DPS	162	74.76239	13.7871	44.2418	100
ECM	140	11.39	5.14028	2	29
PLE	162	-2.22E-09	1	-1.7019	1.77741
GRE	150	4.91e-09	1	-1.3437	3.082
IFL	162	4.146392	3.42323	-3.4779	16.5587
GDP	161	1.991028	4.52343	-11.6	17.9574
TRV	162	-7.47E-10	1	-1.1705	3.46042
GRS	162	-4.45E-09	1	-0.6384	4.34007
EXR	161	14.43363	60.1349	0.84549	372.596
IDT	162	22.40922	6.11122	10.3967	41.4856

Source: Authors' own elaboration.

4. DISCUSSION

4.1. Correlation matrix

Table 2 presents the correlation matrix among the independent variables, the moderating variable, and the interaction terms. The analysis of these coefficients provides preliminary insights into the relationships between the constructs and ensures the structural integrity of the model.

Table 2. Pearson correlation coefficients matrix results

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) FDI	1.000											
(2) DIGI	0.187	1.000										
(3) GRE	-0.006	0.257	1.000									
(4) PLE	0.251	0.701	0.472	1.000								
(5) DIGI*PLE	0.002	0.026	0.143	-0.010	1.000							
(6) GRE*PLE	-0.085	0.123	0.570	0.262	0.251	1.000						
(7) IFL	-0.026	-0.162	-0.134	-0.314	0.092	0.013	1.000					
(8) GDP	0.028	-0.175	-0.088	-0.187	0.034	-0.035	0.122	1.000				
(9) TRV	0.131	0.375	-0.365	0.149	0.120	-0.262	0.112	0.053	1.000			
(10) GRS	0.370	0.001	-0.004	0.335	-0.291	-0.096	-0.161	-0.089	-0.271	1.000		
(11) EXR	-0.061	-0.241	-0.215	-0.288	0.183	0.197	0.287	0.049	0.090	-0.108	1.000	
(12) IDT	-0.196	-0.192	-0.054	-0.089	-0.090	0.152	0.175	0.160	-0.042	0.073	0.065	1.000

Source: Authors' own elaboration.

As illustrated in Table 2, the variables Inflation (IFL), Exchange Rate (EXR), and Industry (IDT) exhibit negative correlation coefficients with the dependent variable (FDI). Conversely, the remaining variables, including Digitalization (DIGI), Greening (GRE), and the Political Environment (PLE), show positive correlations with FDI inflows.

Regarding the model's structural validity, while some independent variables are correlated, all correlation coefficients remain below the critical threshold of 0.70. According to international academic conventions, these values suggest the absence of substantial multicollinearity, indicating that the chosen variables are distinct and suitable for simultaneous inclusion in the regression models. This statistical foundation confirms that the multi-variable panel data analysis can proceed without the risk of distorted estimates due to collinearity.

4.2. Regression Results

Table 3 presents the estimated results from the Pooled Ordinary Least Squares (OLS), Fixed Effects Model (FEM), Random Effects Model (REM), and Feasible Generalized Least Squares (FGLS). These models serve as a preliminary analysis to identify potential structural issues such as endogeneity, heteroskedasticity, or autocorrelation.

Table 3. Regression results from OLS, FEM, REM, FGLS

	OLS (1) FDI	FEM (2) FDI	REM (3) FDI	FGLS (4) FDI
Variables	Coefficient 1 (t-value 1)	Coefficient 2 (t-value 2)	Coefficient 3 (t-value 3)	Coefficient 4 (t-value 4)
DIGI	0.0687	0.0336	0.0687	0.0594
	[0.57]	[0.13]	[0.57]	[0.46]
GRE	0.0519	-0.0872	0.0519	0.0467
	[0.43]	[-0.20]	[0.43]	[0.34]
PLE	-0.0123	-0.487	-0.0123	0.00411
	[-0.08]	[-0.73]	[-0.08]	[0.03]
DIGI*PLE	0.0758	0.0121	0.0758	0.0665
	[0.99]	[0.04]	[0.99]	[0.77]
GRE*PLE	0.0122	0.0549	0.0122	0.00506
	[0.14]	[0.16]	[0.14]	[0.05]
IFL	0.0211	-0.0138	0.0211	0.0144
	[0.87]	[-0.33]	[0.87]	[0.58]
GDP	0.0235	0.0166	0.0235	0.0295*
	[1.33]	[0.71]	[1.33]	[1.81]
TRV	0.265**	0.586	0.265**	0.242*
	[2.14]	[0.61]	[2.14]	[1.73]
GRS	0.500***	2.025**	0.500***	0.484***
	[4.99]	[2.02]	[4.99]	[4.29]
EXR	-0.000542	0.00079	-0.000542	-0.000376
	[-0.37]	[0.07]	[-0.37]	[-0.23]
IDT	-0.0420***	0.0782	-0.0420***	-0.0379**

	[-2.88]	[0.81]	[-2.88]	[-2.29]
cons	0.823**	-1.842	0.823**	0.745*
	[2.37]	[-0.82]	[2.37]	[1.89]
N	159	159	159	159
R-sq.	0.270	0.091		
t statistics in brackets				
* p < 0.1	** p < 0.05	*** p < 0.01		

Source: Authors' own elaboration.

This section presents the baseline estimation results using static panel data models, including Pooled Ordinary Least Squares (OLS), Fixed Effects Model (FEM), Random Effects Model (REM), and Feasible Generalized Least Squares (FGLS). These models serve as preliminary benchmarks for assessing the relationships between digitalization, greening, political environment, and foreign direct investment (FDI) before addressing potential econometric issues.

Table 3 reports the estimation results across the four specifications. Overall, the coefficients of the key explanatory variables—Digitalization (DIGI) and Greening (GRE)—are generally positive in the OLS, REM, and FGLS models, while GRE becomes negative under the FEM specification. However, despite the relatively consistent directional patterns, most of these coefficients are statistically insignificant across all models. Similarly, the moderating effects captured by the interaction terms (DIGI×PLE and GRE×PLE) remain insignificant, suggesting that the static models do not provide strong empirical support for the proposed hypotheses.

Among the control variables, only a limited number exhibit statistical significance. Specifically, trade openness (TRV) and gross savings (GRS) show positive and statistically significant effects on FDI in several specifications, while institutional distance (IDT) is negatively associated with FDI. These findings are broadly consistent with conventional determinants of FDI, but they do not alter the overall conclusion that the main variables of interest lack statistical significance in the static framework.

The weak statistical significance of the key variables raises concerns regarding the adequacy of static panel estimators in capturing the underlying relationships. One possible explanation is that FDI inflows are inherently dynamic and persistent, implying that current investment decisions depend on past values. Static models, which do not explicitly account for such dynamics, may therefore produce biased or incomplete estimates.

Moreover, the presence of endogeneity cannot be ruled out. As noted by [29] the inclusion of lagged variables and the potential correlation between explanatory variables and the error term can lead to biased estimates in conventional panel regressions. In this context, variables such as digitalization and greening may be jointly determined with FDI, giving rise to reverse causality. Additionally, omitted variable bias and unobserved heterogeneity may further distort the estimated relationships.

The FGLS results, although designed to address heteroskedasticity and autocorrelation, do not resolve these fundamental endogeneity concerns, as reflected in the continued lack of statistical significance. This suggests that the underlying model assumptions may not be fully satisfied, and that the estimated coefficients may not accurately reflect the true causal relationships.

Given these limitations, the study refrains from drawing definitive conclusions based on the static estimations. Instead, these results highlight the need for a more robust econometric approach capable of addressing endogeneity, dynamic persistence, and unobserved

heterogeneity. Therefore, the analysis proceeds to the application of the Generalized Method of Moments (GMM), which provides a more appropriate framework for obtaining consistent and reliable estimates in dynamic panel settings [26], [30].

4.3. Detecting endogeneity bias

To formally detect the presence of endogeneity among the regressors, the study employs the Durbin–Wu–Hausman test, following the procedures established by [31], [32]. Theoretically, for OLS estimates to be consistent, the explanatory variables must be uncorrelated with the error term. If this assumption is violated (i.e., the variables are endogenous), superior estimation techniques such as Two-Stage Least Squares (2SLS) or GMM are required.

The hypotheses for the test are defined as follows:

$H0$: The variables are exogenous (no endogeneity).

$H1$: The variables are endogenous.

The results are presented in the table below:

Table 4. Two Stage Least Square (2SLS) result

	GRS	TRV
R-squared	0.029	0.024
Wald chi2	4.64	3.747
Prob>chi2	0.461	0.586
Durbin(score) chi2	0.0022	0.0000
Wu-hausman	0.0024	0.0000
Conclusion	H0	H0

Source: Authors' own elaboration.

As presented in Table 4, the Wu-Hausman test values for Gross Saving (GRS) and Trade Volume (TRV) are 0.0024 and 0.0000, respectively. Since both p-values are significantly lower than the 5% threshold, we reject the null hypothesis (H0) and conclude that these variables are endogenous.

The identification of endogeneity in these key control variables confirms that Pooled OLS and static panel models are inadequate, as they produce biased and inconsistent estimates. This finding necessitates the use of a more rigorous framework—System GMM—to address reverse causality and simultaneity bias, ensuring the reliability of the relationship between digitalization, greening, and FDI inflows.

Understanding the nature of endogenous variables

Understanding the nature of endogenous variables is essential for ensuring the reliability of the estimated results. In this study, Gross Savings (GRS) and Trade Volume (TRV) are identified as potentially endogenous variables due to their bidirectional relationships with foreign direct investment (FDI) and their possible correlation with the error term. From an economic perspective, Gross Savings (GRS) may influence FDI by reflecting the domestic capacity for investment, as higher levels of savings can support infrastructure development and enhance the overall investment environment. At the same time, FDI inflows may contribute to increased income levels and productivity, which in turn can lead to higher national savings. This simultaneity suggests a two-way causal relationship between GRS and FDI, thereby violating the exogeneity assumption required for consistent estimation. Similarly,

Trade Volume (TRV) exhibits a close and potentially endogenous relationship with FDI. On the one hand, higher trade openness can attract foreign investors by improving market accessibility and facilitating participation in global value chains. On the other hand, increased FDI inflows often stimulate trade activities, as multinational enterprises expand cross-border production and distribution networks. This mutual interaction implies the presence of reverse causality between TRV and FDI.

In addition to simultaneity, both GRS and TRV may be jointly determined with FDI through common macroeconomic factors, such as economic growth, exchange rates, and inflation. If these underlying factors are not fully captured in the model, omitted variable bias may arise, further contributing to endogeneity. These considerations highlight an important limitation of the random-effects (REM) model. While REM is effective in controlling unobserved heterogeneity across countries, it relies on the assumption that explanatory variables are strictly exogenous. In the presence of simultaneity and reverse causality, this assumption is unlikely to hold, leading to biased and inconsistent estimates [33]. Moreover, FDI inflows are inherently dynamic, as current investment decisions are influenced by past investment patterns. Static panel models, including REM, are not well suited to capture such dynamic persistence, particularly when lagged dependent variables are introduced and become correlated with the error term.

Therefore, the presence of endogenous regressors and the dynamic nature of FDI necessitate the use of more advanced estimation techniques. This provides further justification for the application of dynamic panel estimators, such as the Generalized Method of Moments (GMM), which can effectively address endogeneity by employing internal instruments and accounting for the persistence of FDI over time.

4.4. Two-step system of GMM and comparisons

To address these concerns, we proceed with a Generalized Method of Moments (GMM) estimation, which is more robust in handling endogeneity issues. The key difference between random-effects estimation and GMM is that GMM allows us to incorporate lagged dependent variables (past FDI inflows) as instruments, thereby capturing the dynamic effects of digitalization and greening on FDI inflows in the EU during the VUCA era.

Table 5. Regression results from SGMM

FDI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	SSig
FDI							
L1.FDI	-2.28e+09	4.67e+08	-4.89	0.000	-3.24e+09	-1.32e+09	***
DIGI	3.15e+10	2.46e+09	12.8	0.000	2.64e+10	3.65e+10	***
GRE	-9.48e+09	3.23e+09	-2.94	0.007	-1.61e+10	-2.82e+09	***
PLE	5.71e+09	2.40e+09	2.38	0.026	7.53e+08	1.07e+10	***
DIGI*PLE	1.88e+10	1.93e+09	9.77	0.000	1.48e+10	2.28e+10	***
GRE*PLE	-8.07e+09	2.12e+09	-3.81	0.001	-1.24e+10	-3.69e+09	***
IFL	1.15e+09	3.57e+08	3.22	0.004	4.11e+08	1.88e+09	***
GDP	5.60e+08	1.47e+08	3.70	0.001	2.56e+08	8.64e+08	***
TRV	-2.00e+10	2.93e+09	-6.82	0.000	-2.60e+10	-1.39e+10	***
GRS	omitted	.	.	.	.	.	
EXR	2.90e+07	1.66e+07	1.75	0.093	-5240920	6.32e+07	*

IDT	-2.93e+08	1.07e+8	-2.75	0.011	-5.13e+08	-7.35e+08	**
Constant	omitted						

Number of obs	124	F-test	350.65

*** p<0.01, ** p<0.05, * p<.1

AR (1)	0.044
AR (2)	0.241
Hansen	0.197

Source: Authors' own elaboration.

Table 5 reports the estimation results obtained from the dynamic panel Generalized Method of Moments (GMM) model. The validity of the model is first assessed through standard diagnostic tests. The p-value of the AR (1) test is statistically significant at the 5% level, while the AR (2) test is not significant at conventional levels, indicating the presence of first-order autocorrelation but no evidence of second-order serial correlation. This pattern is expected in dynamic panel models and supports the validity of the moment conditions.

In addition, the Hansen test of overidentifying restrictions yields a p-value above the 10% significance level, suggesting that the instruments used in the model are valid and not correlated with the error term. Similarly, the Sargan test results support the overall validity of the instrument set. Taken together, these diagnostic tests indicate that the GMM specification is appropriate and that the estimated coefficients are reliable.

Turning to the regression results, several control variables are found to be statistically significant. Inflation (IFL), Gross Domestic Product (GDP), and Exchange Rate (EXR) exhibit positive effects on FDI inflows, whereas Trade Volume (TRV) and Industry (IDT) show negative associations. These findings suggest that macroeconomic conditions play an important role in shaping FDI dynamics in the EU.

With regard to the main variables of interest, the GMM results indicate that digitalization (DIGI) has a positive and statistically significant impact on FDI inflows, while greening (GRE) exerts a negative and significant effect. These results contrast with the static panel estimations reported in Table 3, where most coefficients were statistically insignificant. This divergence highlights the importance of accounting for endogeneity and dynamic persistence in the analysis. Failure to address these issues may lead to biased estimates, which likely explains the weak results obtained from the static models [29].

The magnitude of the estimated coefficients appears relatively large (e.g., 3.15e+10 and -9.48e+09), which is primarily due to the scale of the variables used in the model, particularly FDI measured in absolute terms. However, these coefficients also carry important economic meaning. Specifically, the SGMM estimates indicate that a one-unit increase in digitalization is associated with an increase of approximately 3.15e+10 units in FDI inflows, suggesting a substantial economic impact of digital transformation on investment attractiveness in the EU. Conversely, a one-unit increase in greening is associated with a reduction of approximately -9.48e+09 units in FDI inflows, indicating that environmental policies may impose significant short-term cost burdens on foreign investors.

The positive effect of digitalization on FDI is consistent with previous studies [34], [18], which emphasize the role of digital infrastructure in enhancing investment attractiveness. Digitalization improves efficiency, reduces transaction costs, and facilitates cross-border operations, thereby making EU countries more attractive to multinational enterprises. However, some studies suggest that digital technologies may also generate adverse effects under certain conditions, particularly when associated with social or organizational disruptions

[9], [35]. Despite these concerns, the empirical evidence in this study supports the overall positive contribution of digitalization to FDI inflows, thereby supporting Hypothesis H1.

In contrast, the negative effect of greening on FDI supports the Pollution Haven perspective and aligns with prior empirical findings [25], [36], [23]. Stricter environmental regulations may increase compliance costs and reduce short-term profitability, thereby discouraging foreign investors. This effect is particularly relevant for pollution-intensive industries, which may relocate to countries with less stringent environmental standards. These findings provide support for Hypothesis H3, indicating that greening may have short-term adverse effects on FDI inflows in the EU context.

The results also reveal significant moderating effects of the political environment (PLE). The interaction term between digitalization and PLE (DIGI×PLE) is positive and statistically significant, indicating that a favorable political environment strengthens the positive impact of digitalization on FDI. The positive coefficient of the interaction term (DIGI×PLE) suggests that improvements in the political environment amplify the economic gains from digitalization, further increasing FDI inflows by approximately 1.88e+10 units. This finding suggests that institutional quality, regulatory stability, and governance effectiveness enhance the benefits of digital transformation in attracting foreign investment. These results are consistent with prior studies highlighting the role of governance in supporting digital development and investment flows [18].

Conversely, the interaction between greening and PLE (GRE×PLE) is negative and significant, indicating that the political environment amplifies the negative impact of greening on FDI. The negative interaction between greening and the political environment indicates that stronger institutional enforcement intensifies the negative economic impact of environmental regulation on FDI. This suggests that, in the presence of stricter institutional enforcement, the cost implications of environmental regulations become more pronounced, thereby discouraging investment. In uncertain or complex environments, such as those characterized by VUCA conditions, these regulatory burdens may be perceived as additional risks by foreign investors.

From an institutional perspective, these findings are consistent with the view that institutional quality plays a critical role in shaping investment decisions. Strong governance frameworks can both enhance the positive effects of digitalization and intensify the constraints associated with environmental regulation. This is in line with Institutional Theory, which emphasizes the importance of regulatory and policy environments in influencing firm behavior and investment location choices [37]-[39].

Overall, the results provide robust empirical evidence that the effects of digitalization and greening on FDI are not only direct but also conditional on the political environment. While digitalization enhances FDI attractiveness, greening may impose short-term constraints, and these effects are significantly shaped by institutional conditions in the EU.

4.5. Robustness Check: Comparing Static and Dynamic Panel Models

To assess the robustness of the empirical findings, this study compares the results obtained from static panel models (OLS, FEM, REM, and FGLS) with those derived from the dynamic panel System GMM (SGMM) estimator. The objective is to evaluate whether accounting for dynamic effects and endogeneity alters the estimated relationships between Foreign Direct Investment (FDI) and the key explanatory variables, namely Digitalization (DIGI), Greening (GRE), and Political Environment (PLE).

The results from the SGMM model indicate that the lagged dependent variable, FDI(i, t−1), is statistically significant at the 1% level, confirming the presence of persistence in FDI inflows. This finding suggests that current FDI is partially determined by past investment levels, reflecting the path-dependent nature of foreign investment decisions. In contrast, static

panel models do not incorporate this dynamic component, which may lead to model misspecification and omitted variable bias.

Furthermore, the comparison between static and dynamic estimations reveals notable differences in the statistical significance of key variables. In the static models, most core variables, including DIGI, GRE, and PLE, are statistically insignificant, as reported in Table 4. However, once dynamic effects and endogeneity are accounted for using the SGMM approach, these variables become statistically significant with stronger explanatory power. This shift highlights the importance of controlling for both dynamic persistence and endogeneity in panel data analysis.

From a methodological perspective, static panel models are likely to suffer from endogeneity issues arising from simultaneity, reverse causality, and omitted variables. These problems may bias the estimated coefficients when explanatory variables are correlated with the error term. The SGMM estimator addresses these concerns by employing internal instruments, specifically lagged values of the variables, which help to produce more consistent and efficient estimates.

The robustness check therefore confirms that the main findings of the study are sensitive to model specification. In particular, the dynamic panel model provides more reliable and theoretically consistent results by capturing the temporal dependence of FDI and correcting for endogeneity bias. This supports the use of SGMM as the preferred estimation approach in analyzing the determinants of FDI in a VUCA context.

Overall, the evidence suggests that FDI inflows exhibit strong dynamic behavior, and failure to account for this characteristic may lead to misleading conclusions. By incorporating lagged effects and addressing endogeneity, the SGMM model offers a more accurate representation of the underlying economic relationships.

5. CONCLUSION

In the context of increasing global uncertainty, digital transformation and environmental sustainability have become central components of economic development strategies. This study provides empirical evidence on the relationship between digitalization, greening, and foreign direct investment (FDI) inflows in the European Union during the period 2018–2023, with particular attention to the moderating role of the political environment.

The results indicate that digitalization has a positive and statistically significant impact on FDI inflows, suggesting that improvements in digital infrastructure, technological adoption, and digital governance enhance the attractiveness of EU countries to foreign investors. Moreover, the interaction analysis shows that a favorable political environment strengthens this positive relationship, highlighting the importance of institutional quality in supporting digital transformation and investment inflows.

In contrast, greening is found to exert a negative effect on FDI in the short term, which may reflect increased compliance costs and regulatory pressures associated with environmental policies. The moderating role of the political environment further amplifies this negative relationship, indicating that stricter institutional enforcement may intensify the cost burden faced by investors. These findings are consistent with the view that environmental regulation can have mixed effects on investment, depending on the balance between long-term sustainability benefits and short-term economic costs.

Overall, the study demonstrates that the effects of digitalization and greening on FDI are not only direct but also conditional on institutional factors. While digitalization enhances investment attractiveness, greening may impose short-term constraints, and both relationships are significantly shaped by the political environment. Importantly, the results primarily reflect

the institutional–political dimension of uncertainty, rather than the full spectrum of the VUCA framework. This suggests that the impact of digitalization and greening on FDI is fundamentally conditional, reflecting a structural trade-off between technological advancement, environmental regulation, and institutional capacity in uncertain environments

From a policy perspective, the findings suggest that EU policymakers should continue to promote digital transformation as a key driver of FDI, while ensuring that institutional quality and regulatory transparency are maintained. At the same time, the design of environmental policies should carefully balance sustainability objectives with investment competitiveness, particularly by reducing unnecessary compliance costs and providing clear regulatory frameworks to minimize uncertainty for investors.

Limitations and directions for future research

This study has several limitations that should be acknowledged. First, the use of Political Environment (PLE) as a proxy for the VUCA world captures primarily the institutional and political dimensions of uncertainty but does not fully reflect other important aspects such as economic volatility, technological disruption, and global supply chain complexity. Future research could incorporate additional indicators to better represent the multidimensional nature of the VUCA framework.

Second, the empirical analysis is limited to 27 European Union countries over the period 2018–2023. While this provides a relevant context for examining advanced economies, the findings may not be fully generalizable to developing or emerging markets. Future studies could extend the analysis to a broader set of countries with varying levels of economic development and institutional quality.

Third, although the study employs dynamic panel estimation techniques to address endogeneity, the relatively short time span and limited sample size may affect the robustness of the results. Future research could utilize longer time-series data or alternative estimation strategies to further validate the findings.

Finally, this study focuses on macro-level determinants of FDI and does not incorporate firm-level behavior or sector-specific dynamics. Future research could adopt micro-level data or mixed-method approaches to provide deeper insights into how digitalization and greening influence investment decisions across different industries and firm types in uncertain environments.

REFERENCES

[1] P. J. Buckley, “The theory and empirics of the structural reshaping of globalization,” *Journal of International Business Studies*, vol. 51, no. 9, pp. 1580–1592, 2020, doi: https://doi.org/10.1057/s41267-020-00355-5

[2] N. Bennett and G. J. Lemoine, “What a difference a word makes: Understanding threats to performance in a VUCA world,” *Business Horizons*, vol. 57, no. 3, pp. 311–317, 2014, doi: https://doi.org/10.1016/j.bushor.2014.01.001

[3] C. A. Hartwell and T. Devinney, “Populism, political risk, and pandemics: The challenges of political leadership for business in a post-COVID world,” *Journal of World Business*, vol. 56, no. 4, Art. no. 101225, 2021, doi: https://doi.org/10.1016/j.jwb.2021.101225

[4] A. Alesina, S. Özler, N. Roubini, and P. Swagel, “Political instability and economic growth,” *Journal of Economic Growth*, vol. 1, pp. 189–211, 1996, doi: https://doi.org/10.1007/BF00138862

[5] D. Ahlstrom and G. D. Bruton, "Learning from successful local private firms in China: Establishing legitimacy," *Academy of Management Perspectives*, vol. 15, no. 4, pp. 72–83, 2001, doi: https://doi.org/10.5465/AME.2001.5897661

[6] K. Uhlenbruck, P. Rodriguez, J. Doh, and L. Eden, "The impact of corruption on entry strategy: Evidence from telecommunication projects in emerging economies," *Organization Science*, vol. 17, no. 3, pp. 402–414, 2006, doi: https://doi.org/10.1287/orsc.1060.0186

[7] A. Delios and W. J. Henisz, "Political hazards, experience, and sequential entry strategies: The international expansion of Japanese firms, 1980–1998," *Strategic Management Journal*, vol. 24, no. 11, pp. 1153–1164, 2003, doi: https://doi.org/10.1002/smj.355

[8] United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), *Developing Comprehensive Indicators for Assessing the Contribution of Foreign Direct Investment to Sustainable Development*. United Nations, 2021.

[9] L. T. Ha and N. T. T. Huyen, "Impacts of digitalization on foreign investments in the European region during the COVID-19 pandemic," *Development Studies Research*, vol. 9, no. 1, pp. 177–191, 2022, doi: https://doi.org/10.1080/21665095.2022.2074863

[10] UNCTAD, *World Investment Report 2022: International Tax Reforms and Sustainable Investment*. United Nations, 2022. Available: https://unctad.org/webflyer/world-investment-report-2022

[11] E. Autio, S. Nambisan, L. D. Thomas, and M. Wright, "Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems," *Strategic Entrepreneurship Journal*, vol. 12, no. 1, pp. 72–95, 2018, doi: https://doi.org/10.1002/sej.1266

[12] B. Dethine, M. Enjolras, and D. Monticolo, "Digitalization and SMEs' export management: Impacts on resources and capabilities," *Technology Innovation Management Review*, vol. 10, no. 4, 2020, doi: https://doi.org/10.22215/timreview/1344

[13] J. Damgaard, T. Elkjaer, and N. Johannesen, "Piercing the veil," *Finance & Development*, vol. 55, no. 2, 2018, doi: https://doi.org/10.5089/9781484357415.022.A016

[14] H. J. Bardesi, "The impact of digitalization on FDI inflows in Saudi Arabia," *American Journal of Finance and Business Management*, vol. 3, no. 1, pp. 18–40, 2024, doi: https://doi.org/10.58425/ajfbm.v3i1.263

[15] World Economic Forum, "How governments can shape markets towards green and inclusive growth," Jun. 2021. Available: https://www.weforum.org/stories/2021/06/how-governments-can-shape-markets-towards-green-and-inclusive-growth/

[16] P. J. DiMaggio and W. W. Powell, "The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields," *American Sociological Review*, vol. 48, pp. 147–160, 1983, doi: https://doi.org/10.2307/2095101

[17] B. R. Copeland and M. S. Taylor, "North-South trade and the environment," in *International Trade and the Environment*, Routledge, pp. 205–238, 2017, doi: https://doi.org/10.4324/9781315201986-17

[18] N. Dziubanovska and V. Maslii, "Digital economy and foreign investment processes of EU countries: Analytical aspect," *Ekonomichnyy Analiz*, vol. 33, no. 1, pp. 278–287, 2023, doi: https://doi.org/10.35774/econa2023.01.278

[19] K. Kim and J. An, "Corruption as a moderator in the relationship between e-government and inward foreign direct investment," *Sustainability*, vol. 14, no. 9, Art. no. 4995, 2022, doi: https://doi.org/10.3390/su14094995

[20] J. I. Criado and J. R. Gil-Garcia, "Creating public value through smart technologies and strategies: From digital services to artificial intelligence and beyond," *International Journal of Public Sector Management*, vol. 32, no. 5, pp. 438–450, 2019, doi: https://doi.org/10.1108/IJPSM-07-2019-0178

[21] M. E. Porter and C. van der Linde, "Toward a new conception of the environment-competitiveness relationship," *Journal of Economic Perspectives*, vol. 9, no. 4, pp. 97–118, 1995, doi: https://doi.org/10.1257/jep.9.4.97

[22] A. Melega, "The impact of environmental regulations on foreign direct investment: A literature review," *Economy and Sociology*, no. 2, pp. 107–120, 2022, doi: https://doi.org/10.36004/nier.es.2022.2-09

[23] H. Hu, L. Dong, H. Zhang, H. Tang, and D. Yin, "Panel data analysis on the influence of environmental regulations on the inflow of foreign direct investment in China," *International Journal of Sustainable Development and Planning*, vol. 15, no. 7, pp. 1035–1044, 2020, doi: https://doi.org/10.18280/ijsdp.150708

[24] E. Barteková and T. H. W. Ziesemer, "The impact of electricity prices on foreign direct investment: Evidence from the European Union," *Applied Economics*, vol. 51, no. 11, pp. 1183–1198, 2019, doi: https://doi.org/10.1080/00036846.2018.1524983

[25] Y. Xing and C. D. Kolstad, "Do lax environmental regulations attract foreign investment?" *Environmental and Resource Economics*, vol. 21, pp. 1–22, 2002, doi: https://doi.org/10.1023/A:1014537013353

[26] Y. Tan and U. Uprasen, "The effect of foreign direct investment on renewable energy consumption subject to the moderating effect of environmental regulation: Evidence from the BRICS countries," *Renewable Energy*, vol. 201, pp. 135–149, 2022, doi: https://doi.org/10.1016/j.renene.2022.11.066

[27] S. Majumder and B. Nag, "FDI inflows and economic growth in India: A dynamic panel analysis," *The Journal of Developing Areas*, vol. 49, no. 4, pp. 169–190, 2015, doi: https://doi.org/10.1353/jda.2015.0146

[28] B. H. Baltagi, *Econometric Analysis of Panel Data*, 4th ed. Hoboken, NJ, USA: Wiley, 2008, doi: https://doi.org/10.1007/978-3-030-53953-5

[29] M. Arellano and S. Bond, "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," *The Review of Economic Studies*, vol. 58, no. 2, pp. 277–297, 1991, doi: https://doi.org/10.2307/2297968

[30] P. P. Athanasoglou, S. N. Brissimis, and M. D. Delis, "Bank-specific, industry-specific and macroeconomic determinants of bank profitability," *Journal of International Financial Markets, Institutions and Money*, vol. 18, no. 2, pp. 121–136, 2008, doi: https://doi.org/10.1016/j.intfin.2006.07.001

[31] S. Beiner, W. Drobetz, M. M. Schmid, and H. Zimmermann, "An integrated framework of corporate governance and firm valuation," *European Financial Management*, vol. 12, no. 2, pp. 249–283, 2006, doi: https://doi.org/10.1111/j.1354-7798.2006.00319.x

[32] M. B. Wintoki, J. S. Linck, and J. M. Netter, "Endogeneity and the dynamics of internal corporate governance," *Journal of Financial Economics*, vol. 105, no. 3, pp. 581–606, 2012, doi: https://doi.org/10.1016/j.jfineco.2012.03.005

[33] J. M. Wooldridge, *Introductory Econometrics: A Modern Approach*, 5th ed. Mason, OH, USA: Cengage Learning, 2012.

[34] R. Ridwan and H. Ali, "The impact of digitalization on productivity and economic performance in the industrial sector," *Greenation Management and Business Review*, vol. 1, no. 1, pp. 1–8, 2024, doi: https://doi.org/10.38035/gmbr.v1i1.655

[35] D. Zhang, T. A. Masron, and X. Lu, "The impact of digitalization on foreign direct investment inflows into cities in China," *Cogent Economics & Finance*, vol. 12, no. 1, Art. no. 2330458, 2024, doi: https://doi.org/10.1080/23322039.2024.2330458

[36] R. V. Caetano, A. C. Marques, and T. L. Afonso, "Can sustainable development induce foreign direct investment? Analysis of the complex inward and outward flows of investment in European Union countries," *Journal of the Knowledge Economy*, vol. 15, no. 2, pp. 9756–9783, 2024, doi: https://doi.org/10.1007/s13132-023-01473-9

[37] S. Böckem and A. Tuschke, "A tale of two theories: Foreign direct investment decisions from the perspectives of economic and institutional theory," *Schmalenbach Business Review*, vol. 62, pp. 260–290, 2010, doi: https://doi.org/10.1007/BF03396807

[38] T. Alon, "Institutional analysis and the determinants of Chinese FDI," *Multinational Business Review*, vol. 18, no. 3, pp. 1–24, 2010, doi: https://doi.org/10.1108/1525383X201000013

[39] R. Grosse and L. J. Trevino, "New institutional economics and FDI location in Central and Eastern Europe," *Management International Review*, vol. 45, no. 2, pp. 123–145, 2005, doi: https://www.jstor.org/stable/40836044