Journal of Contemporary Macroeconomic Issues **https://doi.org/10.36923/jcmi.v5i1.602**
Vol. 5(1). PP: 142-158

Estimating The Effect of Macroeconomic Volatility on Different Types of FDI

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Abstract

Using panel data from 111 countries from 2003 to 2021, the study attempts to analyze the effect of macroeconomic volatility on different types of FDI (Foreign Direct Investment) inflows. GARCH variances of GDP per capita are used to model the macroeconomic volatility and to further estimate the effect of this volatility on different types of FDI. The study utilized the system GMM (Generalized Method of Moments). The results indicate that macroeconomic volatility has a negative and significant impact on the total stock of FDI, FDI through mergers and acquisitions, and greenfield investment. We have also found that macroeconomic volatility is non-linearly related to various types of FDI in different groups of countries according to their trade openness. The findings suggest that policymakers need to promote a stable economic environment to avoid macroeconomic volatility and, consequently, the curtailing of FDI inflows.

Keywords: FDI, macroeconomic volatility, GARCH, GMM, trade openness

Information

Received: 29 March, 2024

Revised: 14 April, 2024

Accepted: 27 May 2024

Published: 15 June, 2024

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Cite this article as

Btool, Z., Riaz, M. F., Ali, S., & Shehzadi, A. (2024). Estimating The Effect of Macroeconomic Volatility on Different Types of FDI. *Journal of Contemporary Macroeconomic Issues*, *5*(1), 142-158. https://doi.org/10.36923/jcmi.v5i1.602

1 Introduction

Foreign direct investment (FDI) is an important source of capital inflows, particularly for developing countries, because it can foster technological innovation and capital accumulation and thereby support economic growth. In some economies, FDI inflows represent a substantial share of gross fixed capital formation, making them an important component of international capital movements. Furthermore, the globalization of manufacturing and marketing has influenced the attractiveness of developing countries as investment destinations. Empirical studies indicate that the contribution of FDI to economic growth is multifaceted and may involve employment, productivity, competitiveness, and technological spillovers (Borensztein et al., 1998; Blonigen, 2005; Markusen & Venables, 1999). Foreign investors may also contribute to the development of international production networks, particularly when domestic enterprises can establish supplier relationships with multinational firms. However, the size and distribution of these benefits depend on the economic environment in which investment takes place. For this reason, examining the conditions that attract and sustain FDI remains important for both investment policy and research on economic development. Distinguishing among investment modes is also relevant because creating new facilities, acquiring existing enterprises, and maintaining foreign investment positions may have different consequences for host-country economic activity.

In least-developed countries, foreign direct investment (FDI) can expand access to finance, support exports, introduce production techniques, and strengthen links with international markets (Smarzynska, 2002). Nevertheless, the ability to attract investment differs across regions. For example, Western Balkan economies, including Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia, have struggled to attract sustained foreign investment despite their human and natural resources (Jusufi & Lubeniqi, 2019; Lubeniqi, 2020). Furthermore, exposure to economic conditions in major source countries can transmit external shocks to investment destinations. The global financial crisis of 2008–2009 reduced financing opportunities and weakened international investor confidence. Therefore, investment decisions should be understood in relation to both host-country fundamentals and fluctuations in the wider international economy.

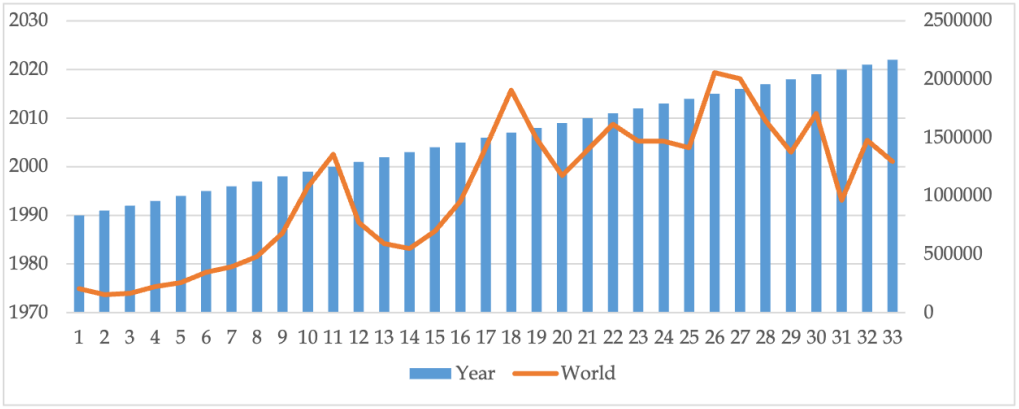


Figure 1: Global trend of FDI inflows

Source: UNCTAD

Figure 1 illustrates changes in global FDI inflows over the period represented in the UNCTAD series. The international financial crisis pressured cross-border investment through tighter credit conditions, declining corporate profitability, and heightened uncertainty about future demand. Consequently, multinational enterprises reassessed expansion plans, including greenfield investment and cross-border acquisitions. Investment subsequently recovered unevenly, with fluctuations across countries and years. In addition, the COVID-19 shock disrupted international production, business operations, and investment decisions in 2020. The descriptive trend offers context for examining macroeconomic volatility; however, the figure alone cannot establish whether changes in global FDI were caused by

GDP volatility. The study investigates these relationships through the empirical models presented later.

Foreign direct investment can generate both benefits and costs for host economies. Its potential benefits include capital formation, access to technology, managerial learning, employment opportunities, and stronger competitive pressures in domestic markets (Borensztein et al., 1998; Markusen & Venables, 1999). However, these outcomes are not automatic or uniformly distributed. Their magnitude may depend on domestic firms' absorptive capacity, local institutions, and conditions affecting the investment climate (Alfaro et al., 2004; Busse & Hefeker, 2007). Moreover, investment concentrated in particular regions or industries may have different distributional consequences from investment spread across the economy. The relationship between FDI and economic performance is therefore conditional, not uniformly positive. In addition, uncertainty about economic policy, exchange rates, and future demand can influence the financing and implementation of foreign projects. These considerations justify separating the different forms of FDI when examining their responses to macroeconomic volatility.

Foreign direct investment has a complex, two-way relationship with macroeconomic volatility in host countries. FDI can contribute to capital formation, employment, and technology transfer; therefore, these channels may help improve economic performance and the competitiveness of domestic industries (Alfaro et al., 2004; Markusen & Venables, 1999). However, FDI does not necessarily eliminate the risks associated with economic crises, and its benefits may vary across industries and locations. In addition, changes in exchange rates, business cycles, global economic conditions, and policy uncertainty may influence investment decisions and the distribution of investment benefits. FDI inflows may also interact with exchange-rate movements and trade balances, which reinforces the need to examine the relationship between investment and macroeconomic volatility rather than assuming that either variable is uniformly stabilizing (Aizenman & Noy, 2006). In practical terms, uncertainty can influence investors through several related channels. For example, unpredictable changes in economic conditions can affect the projected demand for output, the cost of imported equipment, and the value of earnings subsequently transferred abroad. At the same time, investors may adjust the scale, destination, or timing of proposed projects instead of abandoning investment entirely. These responses make it useful to investigate whether observed associations differ between greenfield projects and acquisitions. They also indicate why the stock of past investment should be assessed separately from new investment activity, since existing positions need not respond immediately to changes in uncertainty.

Macroeconomic volatility refers to fluctuations in key economic indicators over time and the uncertainty associated with those fluctuations. Greater volatility may make it difficult for investors to estimate future returns and plan long-term projects. In this study, macroeconomic volatility is proxied using the conditional variance derived from GDP per capita, which is intended to reflect fluctuations in economic activity. Increased uncertainty may discourage FDI by raising the perceived risk of investment (Sharifi-Renani & Mirfatah, 2012). However, the response may differ across countries because market size, available resources, and institutional conditions also affect investment decisions (Asiedu, 2002; Blonigen, 2005). Economic crises can increase uncertainty and influence trade and capital flows (Aizenman & Noy, 2006). Similarly, multinational corporations may use geographic diversification and investment flexibility to manage uncertainty across host economies (Kogut & Kulatilaka, 1994). The selection of a volatility measure is therefore consequential for the interpretation of the study. GDP-related conditional variance is intended to capture uncertainty in macroeconomic activity, but it does not separately identify exchange-rate volatility, inflation uncertainty, or unexpected changes in government policy. The estimated coefficients should consequently be described as relationships with the particular GDP-based measure used here, rather than interpreted as effects of every possible source of macroeconomic instability. Furthermore, the scale of a variance series can affect coefficient magnitudes and nonlinear turning points. Comparisons across country groups should therefore consider both the construction of the volatility indicator and the units of each FDI outcome.

Macroeconomic volatility may affect both the timing and structure of cross-border mergers and acquisitions (M&A). Acquiring an existing business can provide immediate access to local assets and markets; however, uncertainty complicates the valuation of target firms, negotiation of purchase prices, and assessment of future cash flows. In addition, exchange-rate movements may alter the relative costs of acquiring foreign assets. The literature on acquisition activity emphasizes that financing conditions and investment opportunities can influence merger waves (Harford, 2005), while differences in institutions and international strategy shape multinational investment decisions (Hitt et al., 2006). Greenfield projects, by contrast, require the development or expansion of facilities and may involve substantial commitments before revenues are generated. Such commitments can make the timing of entry particularly important under uncertainty. The choice between acquisition and greenfield entry therefore has implications for how volatility affects FDI, especially when trade openness and the institutional environment differ across host countries (Buckley et al., 2007; Liargovas & Skandalis, 2012).

Macroeconomic volatility may have different effects on different forms of FDI because purchasing an existing foreign business through mergers and acquisitions (M&A) involves investment decisions and adjustment costs that differ from those associated with establishing a new greenfield project. High economic uncertainty may discourage new foreign investment; however, the strength and direction of this relationship may depend on the investment mode and the host country's trade openness. Previous research has linked uncertainty and exchange-rate volatility with FDI decisions (Sharifi-Renani & Mirfatah, 2012; Ullah et al., 2012). Nevertheless, comparatively less attention is given in this study's framing to the differences between M&A-related FDI, greenfield investment, and accumulated FDI stock across groups of countries distinguished by trade openness. Therefore, the study investigates these relationships while retaining its focus on the effects of macroeconomic volatility. The study's specific objectives are as follows:

- To scrutinize the influence of macroeconomic volatility on three key FDI categories: FDI stock, FDI through mergers and acquisitions, and greenfield investments.
- To analyze how macroeconomic volatility affects FDI stock, FDI via mergers and acquisitions, and greenfield investments within diverse economic environments, categorized by a country's level of trade openness.
- To formulate policy recommendations aimed at mitigating macroeconomic volatility and fostering an increase in FDI stock within host countries.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature and develops the study's conceptual background. Section 3 describes the data, variable definitions, and econometric methodology. Section 4 presents and discusses the empirical findings, while Section 5 concludes with the policy implications of the results.

2 Literature Review

Foreign direct investment (FDI) contributes to the economic development of host countries through capital, technology, and managerial expertise (Alfaro et al., 2004; Borensztein et al., 1998). However, the location and type of investment are influenced by several economic and institutional conditions, including the degree of macroeconomic volatility. Fluctuations in inflation, exchange rates, and economic growth can affect investors' expectations of future profitability and the risks associated with long-term commitments. In addition, greenfield investment and cross-border mergers and acquisitions (M&A) may respond differently to uncertainty because they involve distinct modes of entry, asset acquisition, and exposure to local conditions (Buckley et al., 2007; Luu, 2016). Therefore, this literature review considers differences across FDI types, host-country development levels, and trade-openness groups in order to clarify the relationships investigated empirically. The study also addresses a distinction that is important to international business research: investment mode may influence how firms adjust to uncertain conditions. A multinational enterprise establishing a greenfield facility must decide when to undertake construction and when to begin production, whereas a firm

entering through acquisition must evaluate the price and potential integration of an existing business. In both cases, uncertainty matters, but the associated expenditure, flexibility, and exposure to host-country conditions can differ. Moreover, accumulated FDI stock reflects earlier investment decisions as well as subsequent changes in investment positions. This conceptual distinction motivates the use of three dependent variables rather than relying on a single aggregate indicator.

FDI stock represents the value of accumulated direct investment positions, whereas FDI inflows represent investment transactions over a specified period. This distinction is important because an existing stock can remain comparatively persistent even when new investments react sharply to economic shocks. The literature suggests that foreign investment decisions are influenced by market conditions, policy credibility, and expected profitability (Agarwal, 1980; Blonigen, 2005). During periods of macroeconomic instability, changes in inflation, exchange rates, and economic activity may alter investors' expectations of future returns. However, the response of accumulated FDI positions need not be identical to the response of annual investment flows or project announcements. Therefore, interpreting the stock estimates requires attention to the units and construction of the dependent variable. Similarly, the inclusion of a lagged dependent variable captures the persistence of investment positions, while macroeconomic volatility measures variation in the economic environment. The analysis thus treats FDI stock as a distinct outcome rather than as an interchangeable measure of current inflows.

Greenfield investment involves establishing a new enterprise or expanding productive facilities in the host economy. Compared with acquiring an existing business, a greenfield project may require substantial expenditure on construction, equipment, recruitment, and organizational development before production begins. Therefore, the timing and expected duration of the project can affect how investors respond to uncertainty. Greater macroeconomic volatility can complicate forecasts of demand, financing requirements, and returns, particularly when the associated expenditures cannot be readily recovered. However, some enterprises may continue investing where strategic market access, production capabilities, or long-term opportunities are sufficiently attractive (Buckley et al., 2007; Helpman et al., 2004). Furthermore, the relative importance of volatility may depend on the availability of infrastructure, the quality of institutions, and access to international markets. The present study examines greenfield investment separately to determine whether its association with volatility differs from that of M&A activity and accumulated FDI stock across trade-openness groups.

Mergers and acquisitions (M&A) constitute another channel through which foreign investors enter host economies. Rather than establishing operations entirely from the beginning, an investor acquires an ownership interest in an existing enterprise. This may provide an established workforce, productive assets, and market relationships, but it also exposes the investor to uncertainty concerning valuation, financing, integration, and future profitability. Research on merger waves indicates that changes in economic and financial conditions influence acquisition opportunities (Harford, 2005). Similarly, international investment decisions reflect differences in firms' strategic objectives and host-country circumstances (Buckley et al., 2007). Nevertheless, the assumption that M&A activity is always more resilient than greenfield investment should not be treated as universal. Under some conditions, uncertainty may delay acquisitions; under other conditions, changes in asset valuations may create investment opportunities. Consequently, the direction and magnitude of the relationship are empirical questions, and the nonlinear specifications used in this study are especially relevant to their interpretation.

The relationship between macroeconomic volatility and FDI may differ between developed and developing countries. Developing economies can face constraints involving financial depth, institutional capacity, and regulatory predictability, while developed economies may offer greater access to financing and established investor protections (Busse & Hefeker, 2007; Globerman & Shapiro, 2002). However, no group of countries is insulated from external financial disturbances or changes in international investment conditions. In addition, natural-resource endowments and market potential can attract foreign capital even when other aspects of the investment environment

are less favourable (Asiedu, 2002). It is therefore important not to presume that all developing economies experience identical responses to volatility. Country-specific conditions may alter investment risks, strategic opportunities, and the availability of alternative investment locations. These differences help motivate a cross-country analysis that controls for economic and institutional characteristics.

Developed economies may possess more established financial markets, administrative systems, and policy frameworks that reduce some of the uncertainty encountered by foreign investors. However, economic stability cannot be inferred solely from a country's level of development. Major financial and demand shocks can still influence investment choices, especially when projects involve long planning horizons and substantial capital commitments. Similarly, the effect of volatility may differ between sectors and between investment modes, because acquisition transactions and greenfield projects involve different costs, implementation schedules, and strategic motives. The empirical literature on institutions and FDI highlights the relevance of governance and the quality of the investment environment (Busse & Hefeker, 2007; Globerman & Shapiro, 2002). Therefore, the effects of volatility should be evaluated alongside these factors rather than interpreted as a uniform feature of either developed or developing economies.

Trade openness may condition the relationship between macroeconomic volatility and FDI. Greater integration with international markets can improve access to customers, inputs, and cross-border production networks, thereby making a host economy more attractive to foreign investors (Helpman et al., 2004; Liargovas & Skandalis, 2012). However, openness can also transmit disturbances from trading partners and expose domestic activity to fluctuations in external demand. The implications for foreign investment are therefore not necessarily linear or uniform. In less-open economies, domestic-market opportunities and restrictions on international transactions may shape investors' choices differently from those in highly integrated economies. Similarly, intermediate levels of openness can combine market-access benefits with distinctive exposure to external shocks. Accordingly, this study compares countries with low, medium, and high trade openness rather than assuming that one common volatility coefficient applies to every investment destination.

The literature indicates that the relationship between macroeconomic volatility and FDI may vary by investment type and host-country characteristics. Developed countries may have institutional and financial mechanisms that help mitigate uncertainty, whereas developing economies may face greater constraints when volatility rises (Busse & Hefeker, 2007; Globerman & Shapiro, 2002). Furthermore, trade openness can increase access to international markets while also exposing economies to external shocks (Aizenman & Noy, 2006; Liargovas & Skandalis, 2012). These competing mechanisms provide a rationale for examining FDI stock, greenfield investment, and M&A activity separately and for comparing the effects of volatility across different levels of trade openness. Furthermore, comparisons across investment modes should recognise differences in the measurement of FDI stock, the number or value of transactions, and the timing of project implementation. Consequently, the study emphasises the need to evaluate nonlinear patterns across trade-openness categories rather than treating all measures of investment as direct substitutes. These distinctions are particularly important for translating the estimates into policy implications, because initiatives encouraging new productive facilities may operate differently from measures affecting foreign acquisitions and the retention of existing foreign capital. This perspective also helps interpret why the relation between uncertainty and FDI may be nonlinear. At relatively low levels of volatility, firms may continue investing where prospective returns, market access, and strategic opportunities remain attractive. As uncertainty intensifies, however, difficulties in estimating future income or financing long-lived projects may become more important. The resulting pattern cannot be assumed in advance, and its form may vary across entry modes and openness categories. Accordingly, including volatility and squared volatility in the estimated equations allows the study to examine whether the association changes across the range of observed conditions. Interpretation must nonetheless consider the combined terms and the actual scale of the data.

3 Data and Methodology

This study investigates the effects of macroeconomic volatility on foreign direct investment (FDI) stock, greenfield investment, and FDI through mergers and acquisitions, as well as the roles of relevant macroeconomic and institutional control variables. The analysis uses a panel dataset covering 111 countries from 2003 to 2021. The data were drawn from the United Nations Conference on Trade and Development (UNCTAD), the World Development Indicators (WDI), and the Worldwide Governance Indicators (WGI). These sources provide the FDI, macroeconomic, and governance measures required for the comparative analysis.

First, the study uses generalized autoregressive conditional heteroskedasticity (GARCH) conditional variances of GDP per capita as a proxy for macroeconomic volatility. Subsequently, it employs a dynamic-panel generalized method of moments (GMM) approach to estimate the relationship between volatility and each form of FDI. The GMM framework is intended to address potential endogeneity arising from dynamic dependence and possible simultaneity among explanatory variables. However, the reliability of these estimates depends on the instruments' validity and the assumptions of the chosen specification. Panel data also allow examination of variation across countries and over time, although unobserved country characteristics may otherwise confound the relationships under investigation. Because the empirical design includes a lagged dependent variable, a dynamic-panel estimator is relevant to the possibility that investment activity in one period is associated with investment activity in subsequent periods. Nevertheless, the use of GMM does not by itself guarantee that endogeneity concerns have been resolved. Appropriate lag selection, instrument validity, and the treatment of country-specific and time-related influences remain important. In particular, the reported tests for serial correlation and the validity of overidentifying restrictions are necessary for assessing the credibility of model specifications. Thus, the empirical results should be presented together with sufficient diagnostics to distinguish estimated associations from stronger causal interpretations.

3.1 Econometric Models

Based on the literature reviewed above, the study estimates three econometric models using the GMM approach. Each model represents a different FDI outcome, thereby allowing the estimated association with macroeconomic volatility to be examined separately while accounting for the included controls.

$$FDI_instock = \beta_0 + \beta_1(VOL)_{it} + \beta_2(Squ_vol)_{it} + \beta_3(inf)_{it} + \beta_4(voice)_{it} + \beta_5(resource)_{it} + \beta_6(time)_{it} + \beta_7(pop)_{it} + \beta_8(openness)_{it} + \beta_9(saving)_{it} + \mu_{it} \quad (1)$$

$$FDI_MA_s = \beta_0 + \beta_1(Vol)_{it} + \beta_2(Squ_vol)_{it} + \beta_3(inf)_{it} + \beta_4(voice)_{it} + \beta_5(resources)_{it} + \beta_6(time)_{it} + \beta_7(pop)_{it} + \beta_8(openness)_{it} + \beta_9(saving)_{it} + \mu_{it} \quad (2)$$

$$FDI_GF_{number} = \beta_0 + \beta_1(Vol)_{it} + \beta_2(Squ_vol)_{it} + \beta_3(inf)_{it} + \beta_4(voice)_{ti} + \beta_5(resource)_{it} + \beta_6(time)_{it} + \beta_7(pop)_{it} + \beta_8(openness)_{it} + \beta_9(saving)_{it} + \mu_{it} \quad (3)$$

Table 1 presents the study variables together with their definitions and data sources. In addition, the variables are used to examine the association between macroeconomic volatility and each FDI outcome across the country groups included in the analysis.

Table 1: Variables' Description

Variable	Sources	Definition
FDI_instock	UNCTAD	It is used to define the aggregate amount of foreign investment received by one country into another country.
FDI_MA	UNCTAD	The term "MA sellers" is often used in M&A analysis and reporting to identify and understand the entities changing ownership as a result of these transactions. The term "MA sellers" is often used in M&A analysis and reporting to identify and understand the entities changing ownership as a result of these transactions.

Variable	Sources	Definition
FDI_GF	UNCTAD	It includes launching a new business or expanding current actions in a foreign country, constructing new facilities or operations from the ground up.
Vol	By Author	Macroeconomic volatility is measured by making a GARCH variance series using different countries. Macroeconomic volatility analyses the degree of variability and uncertainty or trend.
Squ-vol	By Author	Economic analysis shows that uncertainty exists due to means deviating from the origin over time, so the squaring value is used to get more significant results in estimations.
Saving	WDI	It is an important indicator for determining a country's economic health and its capacity for investment and future growth.
Pop	WDI	The "population aged 16-64 total" denotes the working-age population in a country or region, including individuals aged 16 and 64 who are predicted to be employed or actively seeking employment.
Trade	WDI	Trade openness is a measure of a country's economic activity, based on factors such as exports and imports, trade-to-GDP ratio, tariffs and trade barriers, and foreign direct investment (FDI).
Inf	WDI	Inflation is an economic indicator that reflects the continuing rise in the overall price levels of goods and services within an economy over time, leading to a reduction in the purchasing power of a currency
Resource	WDI	Mining activities are the source of mineral rent, oil extraction is the source of oil rent, and forest rent is the utilization of forest resources.
Time	WDI	The "Time required to start a new business (days)" indicator assesses the efficiency of business registration processes, which indirectly influences governance and political participation.

Source: by the author

4 Results and Discussion

This section begins with descriptive statistics and then presents the estimated relationships between macroeconomic volatility and the different FDI outcomes. The discussion also compares the results across countries with low, medium, and high levels of trade openness. Table 2 reports the descriptive statistics for the variables included in the empirical analysis. The results are discussed in the same order as the main dependent variables in the regression tables. Greenfield investment is considered first because it represents investment in new or expanded productive facilities. M&A activity is then examined as a distinct route of foreign entry involving the acquisition of existing businesses. Finally, the accumulated FDI stock is analysed as an investment-position measure rather than a direct count of new projects. This ordering clarifies the interpretation of the reported coefficients and helps avoid conflating changes in investment transactions with changes in the stock of foreign capital. Comparisons are then made between the full sample and the three trade-openness groups.

Table 2: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
FDI_MA	2,090	35.318	91.402	-2	868
FDI_GF	2,071	94.283	205.822	-13	1626
FDI_instock	2,109	120825.5	277474	-2073.42	2634202
Vol	2,105	1.21	4.15	0.000	1.82
Vol-sqr	2,105	1.72	7.28	3.43	3.33
Pop	2,109	3.50	1.21	57.344	9.88
Resource	2,109	7.312	10.944	0	65.163

Variables	Obs	Mean	Std. Dev.	Min	Max
Openness	2,052	101.664	191.079	-217.348	2543.79
Time	2,071	33.277	56.037	-32	713
Voice	2,096	-0.23	0.972	-2.259	1.751
Inf	2,033	7.130	22.831	-36.699	557.201

Source: by the author

Table 2 presents the reported descriptive statistics for the variables included in the analysis. The measures of macroeconomic volatility indicate variation across country-year observations. The study uses GARCH models to construct the volatility series and employs GMM estimation to examine the relationship between volatility and FDI while addressing potential endogeneity associated with the included regressors. The subsequent regression tables report separate estimates for the full sample and for the groups defined by trade openness. Because the volatility variables and several other descriptive statistics require consistency checks against their reported ranges, interpret the numerical values with reference to the underlying dataset and estimation output.

Table 3: Effect of Macroeconomic Volatility on FDI Through Greenfield Projects

Variables	Model 1 FDI_GF	Model 2 FDI_GF	Model 3 FDI_GF	Model 4 FDI_GF
FDI_GF(-1)	0.832***	0.609***	0.761***	0.520***
	78.78	17.04	43.72	34.07
Vol	-1.085*	10.65***	-2.28	-3.265***
	(-2.25)	5.26	(-1.24)	(-7.36)
Vol-squ	0.022	-0.369**	0.445**	0.112***
	1.08	(-2.79)	2.77	5.03
Saving	0.016	1.124**	0.452*	0.038
	0.21	2.89	2.08	1.71
Population	-0.000**	-0.000*	8.26E-07	-5E-07
	(-3.21)	(-2.53)	0.92	(-0.42)
Resource abundance	0.637***	4.157***	-1.267***	0.471***
	6.36	6.62	(-4.61)	7.58
Openness	0.0173***	0.430***	1.603***	-1E-05
	7.12	8.27	7.75	(-0.01)
Time	-0.0167	-0.041	-0.268*	-0.024*
	(-0.41)	(-0.25)	(-2.39)	(-2.02)
Voice	4.57	-34.66**	14.04	-8.713*
	1.55	(-3.10)	1.18	(-2.29)
Inflation	0.009	0.084*	0.066	0.391***
	0.75	2.33	1.12	14.62
_cons	19.51***	-14.3	-121.6***	-6.206
	3.78	(-0.42)	(-4.85)	(-1.05)
N	1734	580	555	599
AR (1)	-2.51	-1.72	-2.5	-2.72
AR (2)	1.19	0.87	-0.06	-1.25

Source: by the author

Table 3 reports the greenfield-investment estimates. Model 1 presents the full-sample results, whereas Models 2, 3, and 4 present the estimates for countries with low, medium, and high trade openness, respectively. The positive coefficients on lagged greenfield investment indicate persistence in the number of greenfield projects across the specifications. However, the estimated effect of macroeconomic volatility is not identical across groups: the linear coefficient is negative in the full sample, positive in the low-openness group, negative but not statistically significant in the medium-

openness group, and negative in the high-openness group. These differences are consistent with the importance of host-country conditions in investment decisions (Asiedu, 2002; Blonigen, 2005). In addition, openness may be associated with technology diffusion and changing incentives for international production (Helpman et al., 2004). The presence of a squared-volatility term is particularly important for interpreting these estimates. Where the linear and squared coefficients have different signs, the marginal association can change as the value of volatility changes. Therefore, one coefficient should not be described as the complete relationship without considering the other. Furthermore, the number of observations differs between the full-sample and subgroup regressions, so comparisons should consider sample composition and the definitions used to form the openness categories. The persistence shown by the lagged investment variable also indicates that current activity is associated with past project activity, which should be acknowledged alongside the estimated association with volatility.

Table 3 indicates that the relationship between macroeconomic volatility and greenfield investment differs across the trade-openness groups. In the full sample, the linear volatility coefficient is negative (−1.085), whereas the corresponding coefficient is positive for the low-openness group (10.65), negative but not marked as statistically significant for the medium-openness group (−2.28), and negative for the high-openness group (−3.265). However, the squared-volatility coefficients also differ across specifications. Therefore, the sign of the linear term alone does not describe the complete estimated relationship when the model includes both volatility and its square. The signs of the other controls vary across groups and should be interpreted with reference to their reported significance levels. For example, openness has positive coefficients in the full, low-, and medium-openness specifications, but the coefficient reported for the high-openness specification is approximately zero. The estimates are consistent with heterogeneity in investment behaviour, although the precise economic effects depend on variable units and the implied nonlinear marginal effects. Such heterogeneity is relevant to discussions of investment location choices and host-country conditions (Blonigen, 2005; Buckley et al., 2007).

The estimates for the other explanatory variables provide additional evidence that greenfield investment is associated with several dimensions of the host-country environment. Savings and resource abundance generally have positive coefficients in the low-openness specification, while the coefficients for the governance measure and the time required to start a business are negative. In the medium-openness group, savings and trade openness have positive coefficients, whereas resource abundance has a negative coefficient. In the high-openness group, resource abundance and inflation have positive coefficients, while the coefficient for the time variable is negative. However, individual effects should not be described as statistically established when the table does not report significance for them. Previous research has examined the importance of entry regulation, institutional conditions, and investment-location characteristics (Busse & Hefeker, 2007; Djankov et al., 2002; Wheeler & Mody, 1992). In addition, the large coefficient on the lagged dependent variable suggests persistence in greenfield activity across specifications. The reported AR statistics require p-values to assess the diagnostic tests, and their unlabelled numerical values should not be interpreted as regression coefficients or direct evidence of serial correlation.

Table 4: Effect of Macroeconomic Volatility on FDI Through Mergers and Acquisitions

	Model 1 FDI_MA	**Model 2 FDI_MA**	**Model 3 FDI_MA**	**Model 4 FDI_MA**
FDI_MAs (-1)	0.775***	0.567***	0.599***	0.117***
	74.15	18.51	40.14	4.56
Vol	-0.465*	2.928***	-7.989***	-1.368***
	(-2.29)	7.97	(-6.92)	(-9.01)
Vol- squ	0.059***	-0.069**	1.022***	0.118***
	3.63	(-3.37)	9.17	6.92
Saving	0.091**	0.509***	0.968***	0.181***

	Model 1 FDI_MA	Model 2 FDI_MA	Model 3 FDI_MA	Model 4 FDI_MA
	3.19	3.55	7.85	9.5
Population	3.32E-08	-1.56E-08	1.24E-06	-0.000*
	0.38	(-0.12)	1.4	(-2.21)
Resource	0.159**	0.487***	-0.722***	-0.097*
	2.91	3.55	(-7.88)	(-2.41)
Openness	0.002**	0.118***	0.340***	-0.003**
	1.98	5.92	9.03	(-3.34)
Time	0.018	-0.003	0.021	0.009*
	1.38	(-0.10)	0.26	1.71
Voice	1.069	-2.516	9.733*	-14.19***
	0.83	(-0.82)	1.76	(-11.95)
Inflation	-0.016	0.031**	0.002	0.018
	(-1.49)	2.77	0.09	1.52
Cons	11.26*	-34.87**	-30.80*	-9.735*
	2.61	(-2.94)	(-2.59)	(-2.66)
N	1751	596	572	583
AR (1)	-2.21	-2.64	-1.59	-2.33
AR (2)	-0.85	0.63	0.17	-1.74

Source: by the author

Table 4 reports the estimated relationship between macroeconomic volatility and FDI through mergers and acquisitions (M&A). Model 1 presents the full sample, whereas Models 2, 3, and 4 correspond to low, medium, and high levels of trade openness, respectively. The positive coefficients on lagged M&A activity indicate persistence in investment decisions across all four specifications. Furthermore, the linear volatility coefficient is negative in the full sample and in the medium- and high-openness groups, but positive in the low-openness group. The findings suggest that the investment response may differ across economic settings. Existing work indicates that firm-level strategic considerations and the market environment are relevant to cross-border acquisition decisions (Buckley et al., 2007; Harford, 2005). Cross-border acquisitions may respond to economic uncertainty through changes in the valuation of target firms as well as through the availability of acquisition finance. These mechanisms can operate in different directions, particularly where a change in asset prices increases potential opportunities for some buyers while discouraging others from undertaking transactions. As a result, a positive coefficient should not automatically be interpreted as evidence that economic instability is beneficial, just as a negative coefficient should not be treated as proof that all transactions decline. The specification's nonlinear terms, the characteristics of the country group, and the broader investment environment all matter for assessing the economic interpretation of the estimates.

The M&A estimates in Table 4 also indicate substantial differences across trade-openness groups. The volatility coefficient is negative for the full sample (−0.465), positive for the low-openness group (2.928), and negative for the medium- and high-openness groups (−7.989 and −1.368, respectively). Nevertheless, the squared-volatility coefficient is positive in the full sample, negative in the low-openness group, and positive in the medium- and high-openness groups. Accordingly, a simple statement that volatility always reduces M&A activity would not adequately represent the estimated nonlinear relationships. The positive linear coefficient in the low-openness group could be compatible with investment opportunities arising under some uncertain conditions, but this interpretation remains conditional on the squared term and the range of observed volatility. Furthermore, acquisition decisions depend on financing conditions, valuations, and strategic opportunities (Buckley et al., 2007; Harford, 2005). Therefore, the appropriate conclusion is that the estimated association between volatility and M&A differs by trade openness and is potentially nonlinear, rather than uniformly negative across all countries.

The remaining coefficients in Table 4 point to further differences in the determinants of M&A activity. Savings and trade openness have positive coefficients in the low- and medium-openness specifications, although the trade-openness coefficient turns negative in the high-openness group. Resource abundance is positive in the low-openness group but negative in the medium- and high-openness groups. Similarly, the estimated governance coefficient is positive for medium-openness countries and negative for highly open countries, while statistical significance is not uniform. These results should be discussed with reference to the actual coefficient signs and reported tests rather than by assuming that every variable has the same effect across specifications. Prior work suggests that institutions, market accessibility, and local economic conditions influence cross-border investment (Blonigen, 2005; Busse & Hefeker, 2007; Liargovas & Skandalis, 2012). Moreover, the positive coefficients on lagged M&A activity indicate persistence. Nevertheless, the reported AR(1) and AR(2) statistics cannot establish the validity of the dynamic-panel instruments without the corresponding p-values and additional overidentification diagnostics.

Table 5: Effect of Macroeconomic Volatility on FDI Stock

	Model 1 **FDI_Instock**	**Model 2** **FDI_Instock**	**Model 3** **FDI_Instock**	**Model 4** **FDI_Instock**
FDI_Instock (-1)	0.943***	0.991***	0.933***	0.986***
	197.94	38.69	95.02	174.23
Vol	-446.7*	-2127.3*	8311.3***	-662.5**
	-2.08	-2.06	8.55	-2.96
Vol-squ	90.18***	220.5**	-463.5***	64.73**
	4.88	2.73	(-5.70)	2.87
Saving	178.4***	-608.4**	-251.3**	190.8***
	5.66	-3.17	-3.42	9.61
Pop	0.000***	-7.2E-05	-0.000	0.001*
	3.57	(-0.34)	-1.15	2.18
Resource	30.36	396.2**	1078.7***	15.84
	0.65	2.76	9.46	0.29
Time	-3.57	-85.45	-108.4	-6.586
	-0.40	-0.69	(-1.66)	(-0.78)
Openness	-10.48***	-94.75**	-359.4***	2.342*
	(-4.85)	(-2.96)	(-5.63)	2.25
Inflation	-0.987	-40.12	-256.4***	-496.2***
	(-0.54)	(-1.62)	(-4.70)	(-12.30)
Voice	-5955.8***	30458.0*	-18152.3**	1149.9
	(-3.69)	2	(-3.36)	1.47
_cons	22254.5***	36351.5***	21890.0***	-2732.6
	-10.13	-3.87	-4.1	(-0.70)
N	1836	597	572	599
AR (1)	-2.53	-1.83	-1.34	-1.43
AR (2)	-0.41	-1.81	0.28	0.25

Source: by the author

Table 5 reports the dynamic-panel estimates for FDI stock. Model 1 presents the full-sample results, whereas Models 2, 3, and 4 report the estimates for countries with low, medium, and high trade openness, respectively. The positive coefficients on lagged FDI stock indicate strong persistence in accumulated foreign investment. However, the relationship between volatility and FDI stock differs across the trade-openness groups. This finding is consistent with the argument that institutional conditions, investment opportunities, and access to international markets may interact with investment uncertainty (Blonigen, 2005; Globerman & Shapiro, 2002; Liargovas & Skandalis, 2012). Unlike the greenfield and M&A specifications, the FDI-stock regressions concern accumulated direct investment positions. Consequently, the high coefficients on the lagged dependent variable are

important, since changes in the current stock may partly reflect the persistence of previous investment. Furthermore, a high degree of persistence can make it difficult to isolate short-run responses to a macroeconomic disturbance from longer-term patterns of capital accumulation. For this reason, describe the results carefully when comparing the three outcomes. The distinction also matters for policy because attracting new investments and retaining an existing stock of foreign-owned productive assets are related but not identical objectives.

Table 5 concerns FDI stock rather than annual FDI inflows, and the interpretation should preserve that distinction. In the full-sample specification, the linear coefficient on volatility is negative (−446.7) and the squared-volatility coefficient is positive (90.18). This combination is consistent with a relationship whose marginal association changes with volatility, although the location of any turning point depends on the units of the volatility series and the observed data range. The low- and high-openness groups also have negative linear coefficients, whereas the medium-openness group has a positive linear coefficient and a negative squared term. Therefore, the estimates indicate a potentially nonlinear pattern that differs across trade-openness categories. The lagged FDI-stock coefficient is positive and close to one in every specification, suggesting substantial persistence in accumulated investment positions. In addition, other covariates change sign and statistical significance across country groups. The findings should consequently be interpreted as conditional associations estimated by the specified dynamic-panel models, rather than as proof that macroeconomic volatility alone determines investment outcomes. The relevance of investment-climate conditions and institutional factors is consistent with the broader FDI literature (Agarwal, 1980; Blonigen, 2005; Globerman & Shapiro, 2002).

5 Conclusion and Policy Suggestions

This study examines the relationship between macroeconomic volatility and three foreign direct investment (FDI) outcomes—FDI stock, greenfield investment, and cross-border mergers and acquisitions—using panel data for 111 countries from 2003 to 2021. The analysis combines conditional volatility measures from GARCH models with dynamic-panel GMM estimation and compares countries by trade openness. The findings indicate that the estimated association between macroeconomic volatility and FDI varies across investment types and openness groups. In the full-sample specifications, the linear coefficients on volatility are negative for each investment outcome; however, the inclusion of squared-volatility terms indicates that the relationships may be nonlinear. In addition, the group-specific estimates reveal different coefficient signs and patterns. These differences suggest that investment decisions depend not only on changes in the macroeconomic environment but also on the form of investment and the characteristics of host economies. Accordingly, policies intended to attract foreign capital should promote predictable macroeconomic conditions, effective institutions, and transparent investment procedures while recognising that the responses of new projects, acquisitions, and accumulated investment positions may differ. Similarly, an improved investment climate may help firms assess risk and plan long-term commitments. Future research could test the robustness of these relationships using alternative volatility measures, clearly specified openness thresholds, and additional institutional controls. The interpretations presented here remain subject to the reported model specifications and the need to verify instrument validity and the consistency of descriptive statistics.

Acknowledgment: The authors thank all participants and reviewers for comments that helped complete this manuscript.

Conflicts of interest: There are no conflicts of interest.

Funding statements: No internal or external grants for this research.

Data availability statement: Data are available online.

Ethical statement: Not applicable

AI Declaration Statement: ChatGPT was used for proofreading. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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