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Analysis of the Impact of Financial Markets on Sustainable Development: How Important is Foreign Direct Investment?

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ABSTRACT. This study examines the impact of financial markets on sustainable development in middle-income countries in Asia, with particular attention to the role of foreign direct investment (FDI) in enhancing this relationship. The dataset comprises 26 Asian middle-income countries over the period 2002-2021. Using a Bayesian approach, the estimation results reveal that financial markets play a critical role in promoting sustainable development. Moreover, FDI is found to amplify this effect, representing a novel contribution. These findings highlight the importance for the Asian middle-income countries to further develop their financial markets as a foundation for advancing sustainable development. In addition, greater emphasis should be placed on attracting FDI, which not only supports financial markets in providing resources for sustainable development but also brings advanced technologies and positive signals to host countries. Furthermore, they should implement complementary measures, such as fostering the growth of financial institutions, improving the efficiency of government spending, and stimulating domestic investment.

1. INTRODUCTION

Sustainable development can be defined as the long-term, stable advancement of economic, social, and environmental dimensions [1]. It represents a critical goal toward which most countries are striving. In fact, this can be achieved easily, demanding strong financial resources to support the process [2]. Consequently, the development of financial markets has emerged as an essential solution for those aiming to promote sustainable development.

Financial markets are venues where financial instruments are exchanged and traded. Through them, capital suppliers can directly provide funds to those in need. Hence, they can foster sustainable development across economic, social, and environmental dimensions.

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Specifically, they stimulate economic growth by facilitating capital accumulation and savings, generating and transmitting investment information, and promoting technological advancements [3]. In addition, they contribute to social development by enhancing financial inclusion, enabling individuals to access financial services at reasonable costs [4]. From an environmental perspective, they facilitate environmental protection by providing investors with financial resources to adopt environmentally friendly technologies [5], particularly by promoting the use of renewable energy sources and reducing carbon emissions [6]. These considerations underscore that financial markets constitute a crucial foundation for advancing sustainable development.

In fact, domestic financial resources may be insufficient to meet the requirements of sustainable development, particularly in middle- and low-income countries [7]. Moreover, together with strengthening financial markets, foreign direct investment (FDI) contributes to technology transfer, job creation, export expansion, and reduced dependence on imports, thereby promoting sustainable development [8]. In addition, FDI serves as a positive signal that enhances financial market liquidity and provides a foundation for economic growth [9]. From a practical perspective, it is therefore essential to understand the role of FDI in shaping the impact of financial markets on sustainable development, which is crucial for establishing suitable policies that successfully support the latter. To the best of the author’s knowledge, despite the issue's obvious relevance, very few research has specifically addressed or examined it in this manner. This gap represents an important area for further exploration.

To address this gap, this study investigates the impact of financial markets on sustainable development while clarifying the role of FDI in this effect. The dataset consists of 26 middle-income countries in Asia. This sample was chosen to ensure cross-country comparability, thereby providing meaningful empirical evidence for the region. The findings are particularly valuable since they offer policy implications for promoting financial market development and improving sustainable development in the Asian middle-income countries.

2. LITERATURE REVIEW

2.1. The impact of financial markets on sustainable development

The impact of financial markets on sustainable development can be explained through several theories, most notably endogenous growth theory [10] and Keynesian growth theory [11]. It is evident that financial markets play a significant role in promoting sustainable development, which manifests across economic, social, and environmental aspects.

From an economic perspective, financial markets are key drivers of economic growth [12]. This demonstrated by their capacity to facilitate capital accumulation and savings, create and distribute investment information, and promote technological progress [3]. Furthermore, they

enhance transparency and risk management in investment [13]. The positive effect of financial markets on economic growth has been confirmed in several empirical studies. For instance, Balago [14] reported that stock market capitalization positively influences economic growth. Ngare et al. [13] argued that the financial sector contributes to economic growth in African countries, with stronger effects observed in those with established stock markets. Similarly, Guru and Yadav [15] emphasized that stock market development serves as a key driver of economic growth. In Asia, Setiawan et al. [16] highlighted the significance of financial markets in fostering economic growth, particularly during the post-financial crisis period. Purewal and Haini [17] demonstrated that both financial markets and institutions stimulate economic growth, although the latter seems to have a more significant effect. Obviously, a substantial amount of empirical evidence confirms the positive impact of financial markets on economic growth. Nevertheless, other research warns that the inefficient use of financial resources may hinder economic growth [18].

From the environmental aspect, financial markets can improve environmental quality by assisting investors with financial resources to adopt environmentally friendly technologies [5], especially by lowering carbon emissions and utilizing more renewable energy [6]. Vo and Zaman [19] and Zhao and Yang [20] pointed out that financial sector development contributes to reducing carbon dioxide emissions in many countries. Qin et al. [21] indicated that improvements in the financial sector can mitigate greenhouse gas emissions. Ji et al. [22] suggested that industrial modernization is an essential channel through which financial sector development can minimize carbon emissions. Aneja et al. [23] argued that financial markets can limit the release of greenhouse gas and increase climate change resilience. Yudaruddin et al. [24] confirmed that financial market development can reduce environmental pollution. Teklie and Yağmur [25] and Shobande et al. [26] demonstrated that financial sector development can decrease carbon emissions and foster sustainable development. Conversely, some studies argue that the development of financial markets may degrade environmental quality, which is demonstrated through increased energy consumption and higher carbon emissions [27], [28]. Financial markets may therefore promote excessive investment, enlarge industrial areas, and even damage the green economy [29]. In another study, Sakalsiz and Kiliç [30] revealed that financial markets may negatively affect sustainable development by promoting overinvestment, increasing emissions, and raising energy demand.

From the social aspect, Awdeh et al. [4] found that financial sector development is essential in promoting human development, as it allows citizens to access financial services at a lower cost. Meanwhile, several empirical studies have demonstrated the role of financial markets in affecting the composite indices representing green growth or sustainable development. For instance, Ahmed et al. [31] and Ngo et al. [32] argued that financial sector development plays an

important role in enhancing green growth across different countries. Koirala and Pradhan [33] reported a positive link between financial sector development and sustainable development in 12 Asian countries. Zahoor et al. [34] confirmed the importance of financial development in sustainable development in China. Dutta and Saha [35] affirmed that financial markets are essential for improving environmental quality and economic growth, thereby promoting sustainable development in 143 countries. Zioło et al. [36] stated that this development plays a vital role in fostering European Union countries' sustainable development.

Although there are differing opinions about how financial markets affect sustainable development, the positive effects remain dominant. Therefore, the first research hypothesis is proposed as follows:

Hypothesis H_1: Financial markets have a positive impact on sustainable development in the Asian middle-income countries.

2.2. The role of foreign direct investment in the impact of financial markets on sustainable development

FDI refers to cross-border investment in which foreign investors gain significant control over a company abroad, usually by holding at least 10% of its shares [37]. FDI is regarded as one of the most vital external financial sources for developing countries, contributing to technology transfer, job creation, export expansion, and less dependence on imports, thereby boosting sustainable development [8]. FDI flows are particularly important to low- and middle-income countries since they foster industrial development and promote economic growth. Notably, FDI can supplement domestic financial resources and stimulate domestic investment, which is crucial for economies with limited capital [7]. Given this role, many researchers argue that outward-oriented strategies generate higher economic growth than inward-focused ones, highlighting the importance of FDI. In empirical studies, Bayar [38] found a positive nexus between FDI and economic growth in emerging Asian economies. In another study, Bui and Doan [37] argue that FDI has a positive impact on green GDP in ASEAN-6 countries.

Financial markets have strongly developed as a main channel for mobilizing long-term capital in developing countries [39], thereby promoting sustainable development. Moreover, FDI can drive the development of financial markets, as they typically mirror the strength of the economy and react quickly to economic information [9]. Jeffus [40] confirmed the positive role of FDI in promoting the stock market in Pakistan. Al Samman and Jamil [41] highlighted that FDI exerts a positive effect on the stock markets of six Gulf Cooperation Council countries. Olokoyo et al. [42] argued that FDI can improve the stock market performance in Nigeria. Similarly, Chettri et al. [43] suggested that FDI plays a critical role in the long-term development of stock markets. However, some studies reported that FDI may act as a substitute for financial markets, potentially impeding their development. Specifically, Raza and Jawaid [44] found a negative effect of FDI on

stock market development in Asia, while Ho [45] stated a negative relationship between FDI and stock market capitalization in Malaysia.

Generally, FDI can promote the development of financial markets, particularly by enhancing market liquidity. Therefore, FDI may moderate the impact of financial markets on sustainable development. This issue is consistently evident; however, there are still few empirical studies examining the moderating role of FDI in the relationship between financial markets and sustainable development. This gap underscores the need for further exploration. Thus, the author proposes the following hypothesis:

Hypothesis H_2: FDI may amplify the impact of financial markets on sustainable development in the Asian middle-income countries.

3. METHODOLOGY

The current literature highlights that financial markets play a critical role in sustainable development [25], [26], [33], [34], [35], [36]. Accordingly, the author proposes the first research model as follows:

$$SDI_{it} = \beta_0 + \beta_1 FM_{it} + \beta_2 FI_{it} + \beta_3 GE_{it} + \beta_4 DI_{it} + \varepsilon_{it} \quad (1)$$

In particular, sustainable development (SDI) is measured by the Sustainable Development Index, published by the Sustainable Development Solutions Network (SDSN), in line with the approaches suggested by Koirala and Pradhan [33], Zahoor et al. [34], Dutta and Saha [35], Teklie and Yağmur [25], Shobande et al. [26], and Zioło et al. [36].

Financial market development (FM) is represented by the financial market development index, published by the International Monetary Fund (IMF). This variable is defined following most prior studies, such as Setiawan et al. [16], Purewal and Haini [17], Aneja et al. [23], Dutta and Saha [35], and Yudaruddin et al. [24].

The model also includes control variables which are financial institutions (FI), government expenditure (GE), and domestic investment (DI). Specifically, FI is represented by the financial institution development index as suggested by Chettri et al. [43]. In addition, GE and DI are measured as the ratio of government expenditure to GDP [22], [46] and the ratio of domestic investment to GDP [46], respectively.

Furthermore, FDI may moderate the effect of financial markets on sustainable development, which has been suggested by Bayar [38], Al Samman and Jamil [41], Olokoyo et al. [42], and Chettri et al. [43]. Following this, the author incorporates an interaction term, FMFDI, into Equation (1), which is defined as the interaction between financial markets (FM) and foreign direct investment (FDI). Therefore, the following extended model is proposed:

$$SDI_{it} = \beta_0 + \beta_1 FM_{it} + \beta_2 FMFDI_{it} + \beta_3 FI_{it} + \beta_4 GE_{it} + \beta_5 DI_{it} + \varepsilon_{it} \quad (2)$$

For the estimation method, the Bayesian approach is employed to estimate the models. This emerging method offers a clearer evaluation of the extent of variable impacts on sustainable development, particularly by quantifying the probability of such effects [47].

For the data, the sample consists of 26 Asian middle-income countries over the period 2002-2021. The data are collected from the databases of the IMF, SDSN, and the World Bank.

4. EMPIRICAL RESULTS

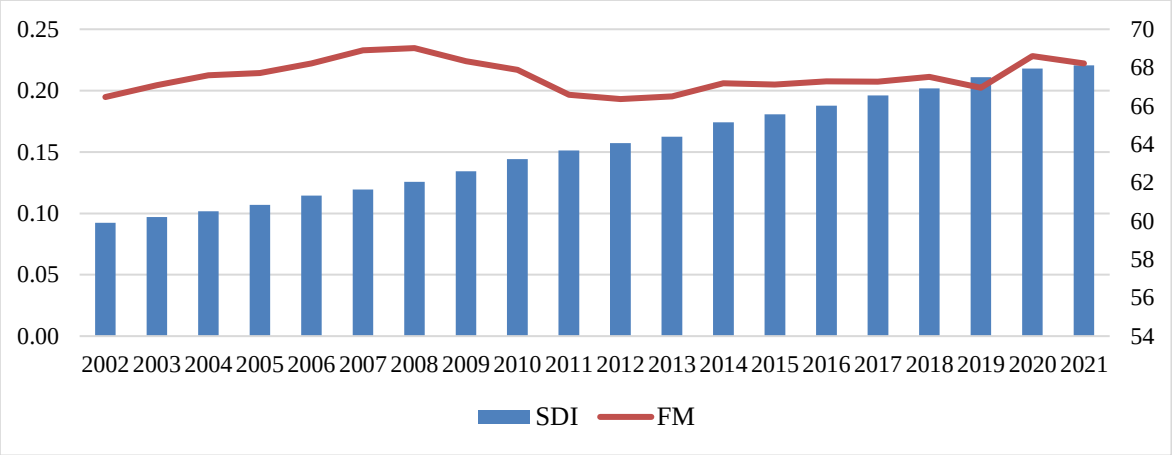

Figure 1. Financial markets and sustainable development in the Asian middle-income countries

The sample includes 26 Asian middle-income countries over the period 2002-2021. Figure 1 illustrates that sustainable development has increased significantly during the study period, whereas financial market development has experienced considerable fluctuations. Specifically, financial markets in these countries grew rapidly prior to the global financial crisis (by 2008), then dropped sharply after that. Nevertheless, financial markets have recently experienced a recovery and a subsequent uptrend in growth.

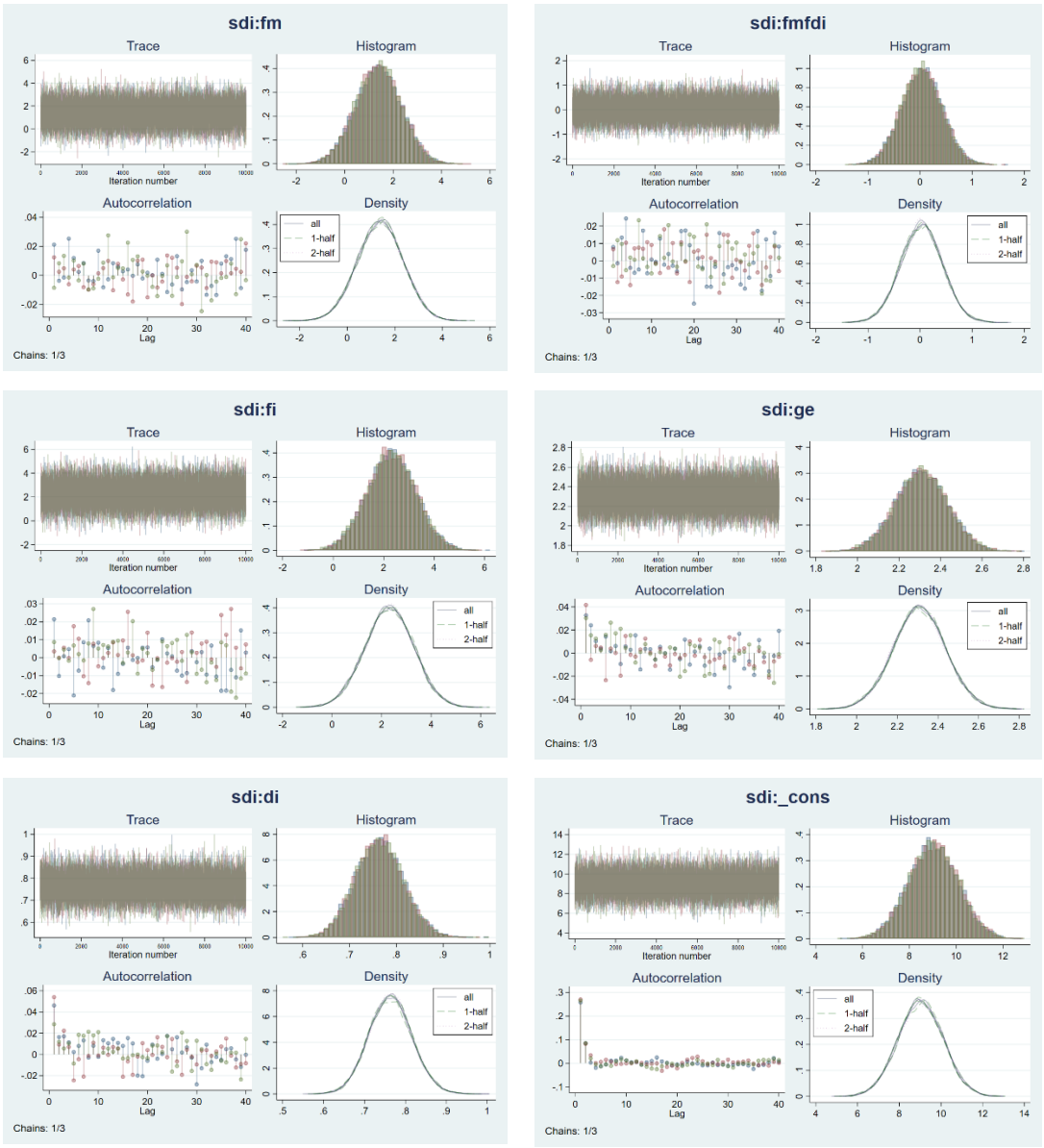

Figure 2. Convergence diagnostics

As shown in Figures 2 and 3, the variables satisfy the convergence criteria, confirming their validity for this analysis. Specifically, the Trace Plots appear relatively stable, the Autocorrelation plots show low levels of autocorrelation (mostly below 0.02), and both the Histogram and Density plots resemble the shape of a normal distribution.

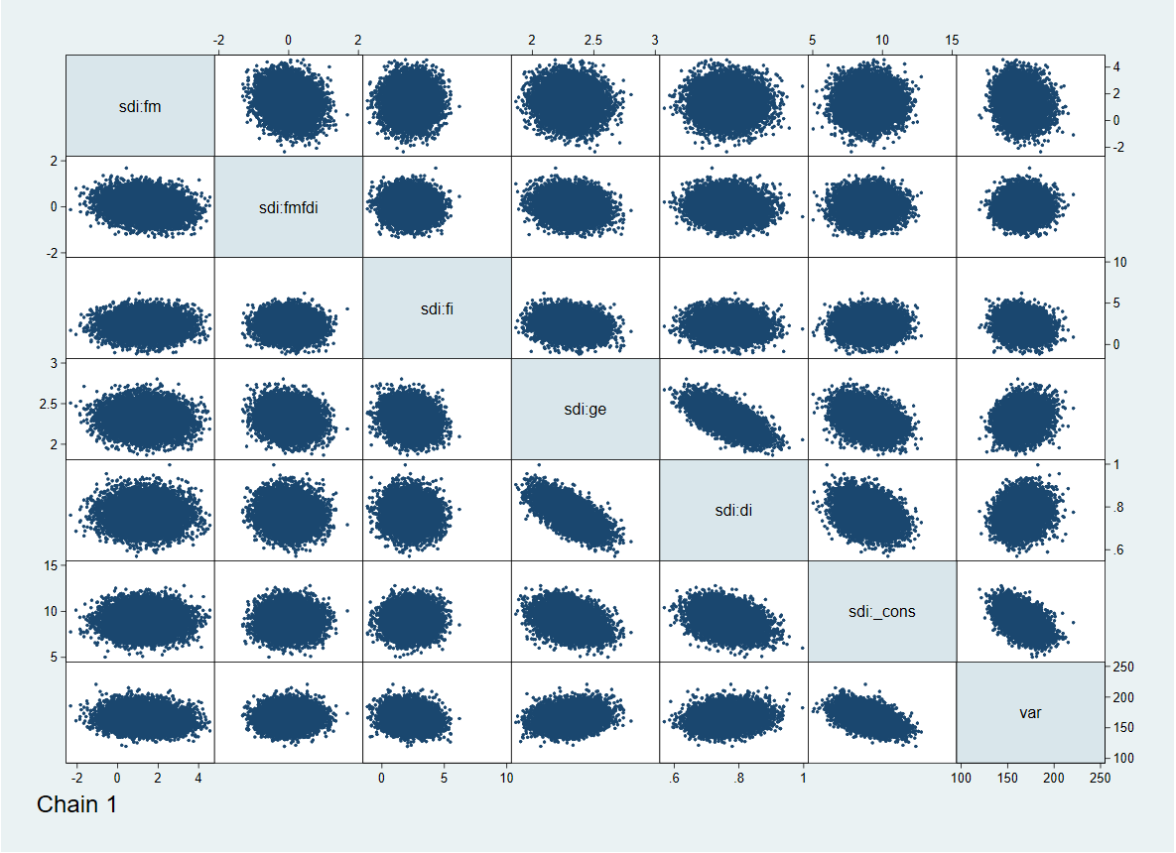

Figure 3. Bayesgraph matrix

Table 1. Correlation matrix

Variable	SDI	FM	FMFDI	FI	GE	DI
SDI	1.0000					
FM	0.0960	1.0000				
FMFDI	0.1450	0.5011	1.0000			
FI	0.3936	0.5693	0.2283	1.0000		
GE	0.4034	0.1033	0.1512	0.3526	1.0000	
DI	0.1291	-0.0035	0.1220	0.0681	0.2466	1.0000

As can be demonstrated in Table 1, the variables are positively correlated with sustainable development. Subsequently, the Bayesian approach is utilized to estimate the models, thereby providing a clearer understanding of the extent of variable effects. The estimation results are presented in Table 2.

Table 2. Bayesian estimation results

SDI	Model 1		Model 2	
	Mean	MCSE	Mean	MCSE
FM	1.3988	0.0054	1.3884	0.0056
FMFDI			0.0290	0.0023
FI	2.3131	0.0058	2.3035	0.0057
GE	2.3108	0.0008	2.3092	0.0008
DI	0.7626	0.0003	0.7636	0.0003
_cons	9.0548	0.0083	9.0231	0.0082
Avg acceptance rate	1		1	
Avg efficiency: min	0.5484		0.5689	
Max Gelman-Rubin Rc	1		1	

Table 2 indicates that the Bayesian estimation results are valid, with all diagnostic tests satisfied. Specifically, the average acceptance rate, the minimum effective sample size, and the maximum Gelman-Rubin Rc are all satisfactory. Besides, the Monte Carlo Standard Error (MCSE) for all parameters is very small (below 1%), implying that the explanatory variables exert a substantial influence on sustainable development.

Table 3. Results of Interval

Interval tests	Model 1		Model 2	
	Mean	MCSE	Mean	MCSE
prob: {SDI:FM} > 0	0.9328	0.0014	0.9267	0.0015
prob: {SDI:FMFDI} > 0			0.5323	0.0029
prob: {SDI:FI} > 0	0.9909	0.0005	0.9907	0.0006
prob: {SDI:GE} > 0	1	0	1	0
prob: {SDI:DI} > 0	1	0	1	0

The impact of financial markets on sustainable development: The estimation results show that financial markets (FM) have a positive impact on sustainable development (SDI) in the Asian middle-income countries (Table 2), with a very high probability and consistency across both models (Table 3). This finding is consistent with most previous studies [25], [26], [33], [34], [35], [36]. These results highlight the key role of financial markets in promoting sustainable development in these countries, which is evident across economic, social, and environmental aspects. Accordingly, financial markets play a critical role in promoting the economic dimension of sustainable development by supporting savings and capital formation, spreading investment information, and encouraging technological innovation. Furthermore, financial markets promote the social dimension of sustainable development by fostering financial inclusion, which facilitates citizens' access to essential and affordable financial services. In the environmental dimension, they further contribute to sustainable development by channeling financial resources to investors, thereby enabling the adoption of eco-friendly technologies. This is particularly evident in the deployment of renewable energy sources and the mitigation of carbon emissions.

The role of FDI in the impact of financial markets on sustainable development: The estimation results reveal that the interaction term (FMFDI) exerts a positive influence on sustainable development (SDI) in the Asian middle-income countries (Table 2). As presented in Table 3, the estimated probability of this specific effect is 53.23%. Although this value may not meet significance thresholds, it indicates a practical possibility, representing a noteworthy divergence from prior research. Thus, FDI can complement financial markets by boosting sustainable development, particularly by providing additional financial resources to these nations in their pursuit of sustainability. Furthermore, FDI promotes sustainable development by facilitating technology transfer, generating employment opportunities, increasing export volumes, and reducing import dependence. This process also sends a positive signal for enhancing financial market liquidity. While earlier studies [38], [41], [42], [43] have examined the moderating role of FDI in the impact of financial markets on sustainable development, this paper is the first to undertake a detailed analysis, particularly by clarifying the probability of such effects within the research models.

The impact of control variables on sustainable development: Table 2 indicates that Sustainable Development (SDI) is positively affected by the control variables: financial institutions (FI), government expenditure (GE), and domestic investment (DI). Crucially, the probability of these effects occurring is notably high (Table 3). Accordingly, to maximize sustainable development outcomes, these nations must not only prioritize the development of financial markets and the enhancement of FDI inflows but also implement comprehensive solutions to reinforce domestic foundations. Specific domestic imperatives include promoting the

growth of financial institutions, optimizing the efficiency of government expenditure, and substantially boosting domestic investment.

5. CONCLUSION

This study effectively elucidated how financial markets affect sustainable development across the Asian middle-income countries. Moreover, it reveals the critical role of FDI in amplifying this impact, which is a notable contribution compared to previous studies. By employing the Bayesian method, the estimation results confirm that financial markets play a crucial role in promoting sustainable development. Furthermore, foreign direct investment can strengthen this effect, which is a novel finding of this research. The findings highlight that financial markets and FDI are fundamental drivers of sustainable development among these countries. In addition, their sustainable development is also significantly influenced by the control variables, including the development of financial institutions, government expenditure, and domestic investment.

The findings indicate that sustainable development in these countries is positively influenced by financial markets, while FDI can amplify this effect. Moreover, it also is significantly affected by the control variables, specifically the development of financial institutions, government expenditure, and domestic investment. These results provide a reliable foundation for these nations to formulate appropriate solutions for promoting sustainable development. From the perspective of financial markets, these countries should focus on fostering sustainable and stable financial market development. In particular, more efforts should be directed toward promoting green capital markets and aligning financial market growth with sustainable development. Furthermore, they should aim to upgrade their financial markets coupled with international standards, especially by integrating advanced technology into financial market development. Regarding FDI, these countries should prioritize attracting investment in green and sustainable sectors, particularly those that match their national advantages. Moreover, FDI inflows should be closely linked with the stable development of domestic financial markets. Beyond these, they need to adopt comprehensive measures to foster sustainable development, specifically those related to financial institutions, government expenditure, and domestic investment. In particular, financial institutions should continue to play a leading role in providing capital for the economy, with an emphasis on expanding green credit and applying modern technology in institutional development. Also, governments should improve the efficiency of public expenditure and domestic investment, especially by prioritizing green infrastructure and social welfare.

While this study successfully addressed its objectives, it is subject to certain limitations. For instance, the employment of composite indices to represent both financial markets and

sustainable development, though advantageous for providing an overall assessment, does not allow an in-depth analysis of individual aspects through their respective component indicators. Moreover, the analysis is conducted using a pooled dataset of the Asian middle-income countries. Obviously, each country may have distinct characteristics, so this analysis might fail to capture these country-specific features comprehensively. Finally, concerning the control variables, the study primarily relies on those established in prior literature. Nonetheless, other potentially relevant control variables may exist but were not considered in this study. Consequently, future investigation can leverage these limitations to explore promising research directions.

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