

DETERMINANTS OF GREEN FDI: A CASE STUDY OF TOP FOREIGN COUNTRY INVESTORS IN INDONESIA

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Abstract

This study investigates the determinants of Green Foreign Direct Investment (Green FDI) in Indonesia by examining the effects of energy subsidies and the globalization index on Green FDI inflows. Panel data from six major investor countries during the 2020–2024 period were employed to test the research hypotheses. The results indicate that both energy subsidies and the globalization index have a positive and significant effect on Green FDI in Indonesia. These findings suggest that government policies supporting renewable energy and facilitating global economic integration play a key role in attracting environmentally sustainable investment. The study provides policy implications for decision-makers aiming to promote renewable energy development and advance Indonesia's transition toward a low-carbon economy.

Keywords: *Green FDI, Energy Subsidies, Globalization Index*

INTRODUCTION

Green Foreign Direct Investment (Green FDI) has increasingly been recognized as a major driver in supporting the global transition toward sustainable development. Unlike traditional investment, Green FDI provides a dual impact: it brings foreign capital inflows that strengthen domestic economic capacity while simultaneously facilitating the transfer of environmentally friendly technologies, creating green employment opportunities, and contributing to carbon emission reduction (UNCTAD, 2022; OECD, 2021). This dual role positions Green FDI as a crucial instrument for achieving a low-carbon development agenda, particularly for developing countries that require substantial funding to expand their renewable energy sectors.

Although global Green FDI flows have shown an upward trend, their distribution remains highly uneven. Developed countries are generally more successful in attracting green investments due to strong regulatory frameworks, fiscal incentives, and institutional certainty. In contrast, developing countries often face a gap between renewable energy potential and actual realized investments. Indonesia illustrates this condition clearly. Despite its abundant renewable energy resources—ranging from solar, geothermal, wind, to hydropower—Green FDI inflows remain relatively limited. A large portion of foreign capital continues to flow into fossil-based and conventional industries, while investment in green sectors remains small (Hasna, 2023; UNCTAD, 2023). This phenomenon raises a critical question: what factors truly determine Indonesia's ability to attract Green FDI?

Two key factors that are highly relevant in answering this question are energy subsidies and the degree of globalization. Energy subsidies serve as a domestic policy instrument that directly affects investment costs and profitability, while globalization functions as an external framework that shapes Indonesia's integration into international markets and global investment flows. Together, these two factors interact in creating either a conducive or a restrictive investment climate for Green FDI. The first determinant, energy subsidies, has long been regarded as one of the most influential yet controversial policy tools. On the one hand, fossil fuel subsidies can suppress domestic prices and provide short-term benefits to consumers; on the other hand, they reinforce dependence on carbon-intensive energy sources, thereby undermining long-term sustainability goals (Valentyna, Sergei, & Oksana, 2022). A shift in subsidy design toward renewable energy is therefore essential. Subsidies that are properly targeted at clean energy projects reduce initial financial risks, shorten payback periods, and enhance investor confidence in long-term policy stability (Faraz et al., 2022; Du, Li, & Wang, 2023). In this sense,

renewable energy subsidies act as strong signals of governmental commitment to sustainability, increasing Indonesia's attractiveness to foreign investors. Nevertheless, their effectiveness depends heavily on governance and transparency. Poorly allocated or non-transparent subsidies risk creating market distortions and may discourage rather than encourage Green FDI (Belyak *et al.*, 2023). Thus, reforming energy subsidies into well-targeted and transparent schemes is a strategic prerequisite to strengthening Indonesia's green investment appeal. The second determinant, globalization, also plays a central role in influencing Green FDI inflows. Globalization facilitates economic interconnectedness through trade, capital flows, technology transfer, and integration into global value chains. A higher degree of globalization signals greater openness to international cooperation and investment, thereby expanding opportunities for sustainable projects (Riad, 2023; Phung, 2022). In the renewable energy context, globalization promotes the inflow of green technologies, eases access to international financing, and fosters cross-border collaborations. For foreign investors, a globally integrated country is often perceived as more reliable in terms of regulatory stability and alignment with international standards (Azam, Khan, & Abdullah, 2021). However, globalization is not automatically beneficial. Without strong domestic environmental regulations and institutional capacity, openness may instead attract investments in carbon-intensive sectors, running counter to sustainability objectives (Kumari & Sharma, 2020). This implies that the benefits of globalization can only be maximized when complemented by consistent domestic policies that channel openness toward sustainable outcomes.

In Indonesia's case, the limited realization of Green FDI reflects both the incomplete reform of energy subsidies and the suboptimal role of globalization in attracting environmentally friendly investments. Redirecting subsidies toward renewable energy in a transparent and well-structured manner would provide direct incentives for foreign investors. At the same time, strengthening global integration through green trade agreements, international cooperation, and participation in sustainability frameworks would reinforce Indonesia's position in the global green investment landscape. The combination of these two strategies can bridge the gap between Indonesia's renewable energy potential and its actual Green FDI inflows. Therefore, examining the role of energy subsidies and globalization in influencing Green FDI in Indonesia is highly relevant. Such analysis not only contributes to the academic literature on the determinants of Green FDI in developing economies but also carries practical implications for policymaking. By reforming energy subsidy schemes and optimizing the benefits of globalization, Indonesia can enhance its attractiveness as a green investment destination, accelerate its transition toward a low-carbon economy, and achieve its sustainable development goals (SDGs).

LITERATURE REVIEW

Green Foreign Direct Investment

Green Foreign Direct Investment (Green FDI) has emerged as a strategic issue for Indonesia in its efforts to accelerate the transition toward sustainable development. Unlike traditional FDI, which is often directed toward extractive and carbon-intensive sectors, Green FDI is characterized by its dual role: providing capital inflows while simultaneously driving environmental benefits such as emission reduction, clean energy expansion, and green technology transfer (UNCTAD, 2022; OECD, 2021). For a developing country like Indonesia, where energy consumption continues to grow alongside rapid economic expansion, Green FDI is viewed as a pathway to balance economic and environmental objectives. The inflows of such investment can play a decisive role in financing renewable energy infrastructure, introducing advanced technologies that are not yet widely available domestically, and signaling international confidence in Indonesia's long-term sustainability agenda. However, despite this potential, the realization of Green FDI in Indonesia remains limited. Recent investment data reveal that the share of FDI directed toward renewable energy is still marginal compared to the dominant flows into fossil fuel industries, mining, and conventional manufacturing (Hasna, 2023; UNCTAD, 2023). This situation reflects a structural challenge: while Indonesia's natural endowments in renewable energy are vast—covering solar, geothermal, wind, and hydro—foreign investors still perceive higher risks and lower returns in green projects compared to traditional sectors. Scholars argue that this gap is not merely technical but rooted in the broader policy framework and institutional environment of the country. Without coherent and consistent policies, Indonesia risks being trapped in a paradox: rich in renewable resources, yet underperforming in attracting the very investments needed to exploit them sustainably.

Energy Subsidies

One of the most frequently cited explanations in the literature for Indonesia's weak Green FDI inflows is its long-standing reliance on energy subsidies. Fossil fuel subsidies have been a central feature of Indonesia's fiscal

policy for decades, originally introduced to stabilize domestic prices and protect household purchasing power. While these subsidies may serve short-term social objectives, they generate negative externalities for investment in renewable energy. By artificially lowering the cost of fossil fuels, the subsidies distort market signals, making renewable energy appear relatively more expensive and less competitive (Valentyna, Sergei, & Oksana, 2022). The International Energy Agency (IEA, 2023) has repeatedly highlighted that such subsidies not only hinder energy diversification but also discourage foreign investors from entering Indonesia's renewable sector, given the reduced incentives and weakened policy credibility. The literature further emphasizes that fossil subsidies are fiscally unsustainable and environmentally counterproductive. They divert public resources away from long-term investments in sustainable energy and undermine Indonesia's international commitments under the Paris Agreement. In contrast, redirecting subsidies toward renewable energy projects is shown to significantly enhance Green FDI inflows. Faraz *et al.* (2022) provide evidence that renewable subsidies reduce upfront risks, improve the financial viability of green projects, and act as long-term incentives for multinational companies. Similarly, Du, Li, & Wang (2023) argue that consistent and transparent subsidy frameworks increase investor confidence by signaling clear government commitment to sustainability. In Indonesia, however, the literature notes that subsidy reforms remain partial and fragmented. Frequent policy shifts, inconsistent implementation, and limited targeting have led to skepticism among foreign investors (Belyak *et al.*, 2023). As a result, while Indonesia recognizes the importance of subsidy reform, its execution has yet to fully align with the expectations of global green investors.

Globalization

Beyond subsidies, the literature identifies globalization as another determinant of Green FDI in Indonesia. Globalization reflects the degree to which a country is integrated into the world economy through trade, capital mobility, technology diffusion, and participation in global value chains. A higher globalization index indicates a country's openness, which is generally associated with improved access to foreign capital, technology transfer, and international cooperation (Azam, Khan, & Abdullah, 2021). In the context of Green FDI, globalization enhances the likelihood that multinational corporations will consider Indonesia as an investment destination because openness reduces transaction costs, increases transparency, and connects domestic industries with international green standards (Riad, 2023). For Indonesia, greater global integration can create opportunities to tap into international climate finance, access advanced renewable technologies, and participate in cross-border clean energy projects.

Empirical studies confirm the importance of globalization in shaping investment patterns. Phung (2022) finds that Asian developing economies with higher degrees of globalization are better positioned to attract renewable energy investments compared to those that remain inward-looking. Globalization allows these countries not only to import technology but also to align their domestic markets with international demand for sustainable products and energy. However, globalization is not inherently beneficial. Kumari & Sharma (2020) caution that without strong domestic regulations and institutional safeguards, increased openness may attract environmentally harmful investments in sectors such as mining or fossil energy, undermining sustainability goals. For Indonesia, this means that while participation in global agreements and regional trade frameworks enhances its visibility as an investment destination, the actual inflows of Green FDI depend on whether the openness is matched by credible environmental governance.

Taken together, the literature reveals that Green FDI inflows to Indonesia are shaped by the interaction between domestic policy instruments—particularly energy subsidies—and external structural factors such as globalization. The persistence of fossil subsidies weakens Indonesia's competitiveness in attracting green investment, while the opportunities presented by globalization remain underutilized due to weak regulatory frameworks. Reforming subsidies toward renewable energy and strategically managing globalization through alignment with international environmental standards are thus viewed as complementary strategies. When implemented simultaneously, these approaches can strengthen Indonesia's attractiveness to foreign investors, close the gap between renewable potential and actual investment, and accelerate the country's transition toward a low-carbon economy.

METHOD

This study employs a quantitative research design using panel data regression to analyze the determinants of Green FDI in Indonesia. The objects of analysis are six major investor countries—Japan, Germany, South Korea, Singapore, Norway, and Denmark—covering the period 2020–2024. These countries were selected because of their consistent role as key contributors to Green FDI with varied levels of investment flows.

The data used in this study are secondary, obtained from international institutions such as UNCTAD, OECD, World Bank, and the International Energy Agency (IEA), as well as national data from BKPM. The dependent variable in this study is Green FDI inflows, while the independent variables consist of energy subsidies and the globalization index. Energy subsidies are used to capture the effect of government policy incentives on investment attractiveness, while the globalization index reflects Indonesia's level of integration into the global economy and its potential influence on foreign investment decisions. Data were collected through documentation and literature review, focusing on quantitative secondary datasets. The analysis applied panel data regression with three alternative models: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The appropriate model was selected using the Chow Test, Hausman Test, and Lagrange Multiplier Test. Hypothesis testing was conducted using the t-test to evaluate the significance of individual variables, while the coefficient of determination (R^2) was employed to measure the explanatory power of the model in explaining variations in Green FDI inflows.

Table 1. Sample Selection Criteria

No	Sample Selection Criteria	Total
1	Total Green FDI investor countries in Indonesia (2020–2024)	15
2	Countries without complete data	9
	Final Sample	6

Source: Processed Data, 2025

Japan, South Korea, and Singapore represent Asian economies that have consistently been among the largest contributors to Green FDI in Indonesia. Their investment patterns reflect not only strong economic ties with Indonesia but also their increasing commitment to supporting renewable energy projects in the region. On the other hand, Germany, Norway, and Denmark were selected to represent advanced European economies that are globally recognized for their strong environmental commitments. Interestingly, however, their direct Green FDI contributions to Indonesia remain relatively small compared to their Asian counterparts (OECD, 2022; UNCTAD, 2023). This contrast makes the selection of these six countries particularly relevant, as it allows the study to capture the heterogeneity of Green FDI inflows between high-contributing and low-contributing investor countries.

RESULTS AND DISCUSSION

Panel Data Regression Results

Panel regression analysis was conducted to examine the effects of energy subsidies and the globalization index on GFDI in Indonesia across six major investor countries. Prior to estimation, model selection tests—including the Chow test, Hausman test, and Lagrange Multiplier (LM) test—were performed to determine the most appropriate panel data model. The results indicated that the Fixed Effect Model (FEM) is the best fit for this study, as it accounts for unobserved heterogeneity across investor countries that remain constant over time. By using FEM, the analysis can capture country-specific characteristics, such as regulatory frameworks, investment preferences, and institutional quality, which could influence GFDI inflows and might be overlooked by other models like the Random Effect Model or Pooled OLS.

The estimation results show that energy subsidies and the globalization index have a significant and positive influence on GFDI, while inflation and exchange rate are statistically insignificant. The positive coefficient for energy subsidies suggests that higher government support for renewable energy reduces investment risk and production costs, thereby encouraging foreign investors to allocate more capital to Indonesia's green projects. The globalization index's positive effect indicates that greater integration into global markets facilitates technology transfer, international cooperation, and easier market access, all of which enhance Indonesia's attractiveness as a destination for sustainable investment. The model demonstrates a high goodness-of-fit, with a coefficient of determination (R^2) of 0.945070, or 94.50%. This indicates that the selected independent variables collectively explain a substantial portion of the variation in GFDI inflows across the six investor countries, highlighting the robustness of the model.

Table 2. Panel Regression Estimation (Fixed Effect Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-40.98730	17.39132	-2.356767	0.0293
ES	0.019494	0.007700	2.531560	0.0203
GI	0.612860	0.269968	2.270118	0.0350
R-squared	0.964011	Mean dependent var		2.431333
Adjusted R-squared	0.945070	S.D. dependent var		0.619024
S.E. of regression	0.145082	Akaike info criterion		-0.746463
Sum squared resid	0.399926	Schwarz criterion		-0.232691
Log likelihood	22.19695	Hannan-Quinn criter.		-0.582103
F-statistic	50.89438	Durbin-Watson stat		1.058310
Prob(F-statistic)	0.000000			

Source: Processed Data, 2025

Discussion

The results of this study indicate that energy subsidies and the globalization index are the two macroeconomic variables that significantly influence the inflows of Green Foreign Direct Investment (Green FDI) into Indonesia. This finding highlights that foreign investors in renewable energy sectors prioritize long-term structural and policy-related factors, as well as the country's degree of integration into the global economy, over short-term economic fluctuations such as temporary inflation or exchange rate volatility. The implications of these results extend to both policy design and strategic planning for attracting sustainable investment in Indonesia. Energy subsidies emerge as the most influential determinant of Green FDI in Indonesia. The positive and significant relationship observed in this study underscores the critical role of government intervention in encouraging investments in renewable energy. Subsidies serve as a direct financial incentive, reducing project-related risks and lowering the initial capital requirements for investors. In sectors such as solar, wind, hydro, and other renewable energy technologies, the initial investment is often substantial, and uncertainties related to project returns can deter foreign capital. By providing well-targeted energy subsidies, the Indonesian government reduces these financial barriers, making renewable energy projects more attractive to international investors.

Beyond the immediate financial benefits, energy subsidies also serve as a signal of policy commitment. When foreign investors perceive that the government consistently supports sustainable energy initiatives, they are more likely to engage in long-term projects, confident that regulatory and fiscal frameworks will remain favorable. In Indonesia, energy subsidies not only incentivize foreign investment but also align with broader national objectives, such as reducing dependence on fossil fuels, promoting a low-carbon energy transition, and fostering sustainable economic development. Effective subsidy programs, however, require careful design and transparency. Subsidies that are poorly targeted, excessive, or inconsistent could inadvertently lead to inefficiencies or support less sustainable energy sources, potentially undermining the long-term credibility of the government's sustainability agenda. Hence, the impact of energy subsidies on Green FDI is closely tied to the quality of policy implementation and institutional governance.

The second significant determinant is the globalization index, which captures Indonesia's integration into the global economy through trade openness, capital mobility, and international cooperation. The positive influence of globalization on Green FDI reflects the fact that foreign investors in renewable energy prefer countries that are not only economically open but also connected to international markets and knowledge networks. Greater global integration facilitates technology transfer, access to global financing, and international partnerships, all of which are crucial for the development and implementation of renewable energy projects. In the Indonesian context, deeper integration with global markets signals to investors that the country is committed to international standards and best practices. Participation in global climate initiatives, adherence to environmental agreements, and involvement in green finance mechanisms enhance investor confidence, as they demonstrate the country's alignment with global sustainability norms. Furthermore, globalization creates opportunities for Indonesia to attract not only capital but also expertise and innovation from leading international firms in the renewable energy sector. This dynamic is particularly important in green technologies, where access to advanced equipment, technical know-how, and project management expertise can significantly improve the feasibility and efficiency of renewable

energy projects. Despite its positive effects, the benefits of globalization on Green FDI are not automatic. The degree to which global integration translates into tangible investment inflows depends heavily on domestic institutional quality. Transparent regulatory frameworks, efficient bureaucratic processes, and reliable legal systems are essential to ensure that international capital can flow smoothly into the renewable energy sector. Without these supportive institutions, the potential advantages of globalization—such as technology transfer, knowledge sharing, and cross-border partnerships—may be limited, reducing the country's attractiveness to environmentally conscious investors. Therefore, fostering both global connectivity and strong domestic institutions is key to maximizing the positive impact of globalization on Green FDI.

Taken together, these findings indicate that the attraction of Green FDI in Indonesia is primarily driven by structural and policy-oriented factors rather than short-term macroeconomic fluctuations. Energy subsidies provide a direct financial and strategic incentive for investors, while globalization enhances access to international markets, knowledge, and partnerships, strengthening the overall investment environment. Short-term variations in inflation or exchange rates appear less decisive, suggesting that investors in renewable energy are more concerned with long-term predictability and the reliability of policy and institutional frameworks. From a policy perspective, these results suggest several actionable strategies. First, Indonesia should continue to strengthen and strategically target energy subsidies toward high-potential renewable energy sectors, ensuring transparency and efficiency in their allocation. Such measures not only lower financial risks for investors but also reinforce the government's credibility in pursuing a low-carbon energy transition. Second, the country should pursue policies that enhance global integration, including participation in international sustainability initiatives, facilitation of cross-border investment flows, and promotion of partnerships with global renewable energy firms. These measures, combined with strong domestic institutions and regulatory consistency, will help create an environment that is highly conducive to Green FDI.

Moreover, the interplay between subsidies and globalization should not be overlooked. Well-designed subsidies can be more effective when complemented by strong global connectivity, as international investors are more likely to respond positively when financial incentives coincide with clear pathways for market access, technology adoption, and compliance with international environmental standards. By integrating these two key drivers into a coordinated investment strategy, Indonesia can maximize its potential to attract environmentally sustainable foreign investment.

CONCLUSION

This study analyzed the determinants of Green Foreign Direct Investment (Green FDI) inflows to Indonesia by focusing on two key macroeconomic variables: energy subsidies and the globalization index, using panel data from six major investor countries during the 2020–2024 period. The results indicate that not all macroeconomic factors exert the same influence on Green FDI, and that investors in renewable energy sectors are more responsive to long-term structural and policy-oriented incentives than to short-term economic fluctuations. The findings reveal that both energy subsidies and globalization have a positive and significant impact on Green FDI in Indonesia. Energy subsidies are particularly crucial as they reduce investment risks, lower initial project costs, and signal the government's commitment to renewable energy development. These policy instruments enhance investor confidence in the long-term feasibility of projects, especially in capital-intensive sectors such as solar, wind, and other renewable energy technologies.

Furthermore, the positive effect of globalization highlights the importance of Indonesia's integration into international markets. Trade openness, cross-border partnerships, and knowledge transfer facilitate technology adoption, improve access to international financing, and strengthen the overall investment climate for green projects. Global integration not only provides capital opportunities but also enhances the quality and competitiveness of renewable energy initiatives in Indonesia. On the other hand, variables such as inflation and exchange rate were found to be insignificant. This suggests that foreign investors in the green sector are less concerned with short-term macroeconomic volatility and place greater emphasis on long-term structural factors, policy stability, and institutional transparency. These findings are consistent with previous studies showing that a stable and consistent policy framework is more influential in attracting Green FDI than short-term economic fluctuations. From a policy perspective, these results underline the importance of maintaining and strengthening targeted energy subsidy programs that are transparent, well-allocated, and focused on high-potential renewable energy sectors. At the same time, policies that encourage deeper global integration, such as facilitating international partnerships, participating in global sustainability initiatives, and aligning domestic standards with international best practices, can further enhance Indonesia's attractiveness to environmentally conscious investors.

Improving institutional quality, governance, and regulatory frameworks is also essential to ensure that the benefits of subsidies and globalization translate into tangible investment inflows. In conclusion, this study demonstrates that the inflow of Green FDI to Indonesia is primarily driven by long-term policy support and global integration, rather than by short-term economic fluctuations. By strategically strengthening energy subsidies and promoting international connectivity, Indonesia can not only attract greater environmentally sustainable investment but also accelerate its transition toward a low-carbon economy. This research contributes empirical evidence to the growing literature on Green FDI in developing countries with substantial renewable energy potential but limited realized investment. Future studies may expand the scope by including additional institutional or regulatory variables, broader investor samples, or longer time horizons to better understand how developing nations can optimize policies to attract sustainable foreign investment and support their green economic transition.

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