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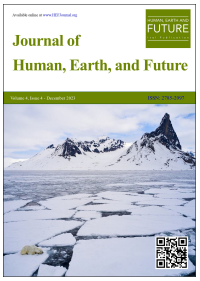

Private Investment and Economic Development: Ensuring Sustainability in the Future

Dinh Trong An [1*]

[1] *Thai Nguyen University of Economics and Business Administration (TUEBA), Thai Nguyen, Viet Nam.*

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Abstract

Objectives: The objectives of this study are 1) to examine the role of private investment in economic development towards sustainability in Vietnam by utilizing provincial-level data from the period 2000–2022 and 2) to construct an economic development index based on four main pillars: economy, science and technology, energy models, and multidimensional poverty. *Methods/Analysis*: The study employed the CS-ARDL estimation method to investigate the short- and long-term relationships between private investment and economic development. Furthermore, to address issues related to slope heterogeneity, endogeneity, and cross-sectional dependence, the study applied the AMG and CCEMG models to assess this relationship in the long term. *Findings*: The study identified a positive long-term relationship between private investment and economic development. Additionally, investment in science and technology, agricultural land urbanization, vocational training for labor, trade openness, and private sector finance exhibited significant associations with private investment. *Novelty/Improvement*: The study successfully developed an economic development index and elucidated the relationship between private investment and economic development. The research underscores two critical strategies for attracting and promoting private sector investment: improving the workforce through training and expanding export markets. The effective implementation of these strategies can address subsequent challenges and expedite sustainable economic development progress.

Keywords: Private Investment; Economic Development; EDI; Long-Term Impact.

1. Introduction

Economic development towards sustainability is not only a concern for developed countries but also a subject of significant attention in developing nations, aiming at achieving a prosperous economy, improving the well-being, and protecting the environmental resources of both present and future generations [1]. However, rapid population growth and economic expansion are leading to increased demands, making energy resources scarcer and posing threats to the global economy, environmental degradation, and severe depletion of natural resources [2]. The concept of economic development serves as a foundation for an ecological system where modern economic development occurs within the limits of natural resource availability [3]. Hence, nations must focus on implementing selectively screened economic development goals, evaluated through criteria such as advancements in science and technology, the utilization of renewable energy, the gradual reduction of traditional energy consumption, fostering connectivity, and stimulating green product development while safeguarding the environment [4, 5].

* Corresponding author: dinhtrongan@gmail.com

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Many countries have pursued rapid economic development, often relying heavily on natural resources, especially fossil fuels, or investing inadequately in new technologies and environmental protection. This has resulted in the disruption of natural ecosystems and severe pollution in many areas. As a response, governments in numerous countries have implemented policies aimed at fostering a sustainable development future, with a specific emphasis on transitioning to green energy sources as a prerequisite. However, the implementation of these policies poses several challenges for private enterprises, particularly in terms of initial capital investment and the selection of appropriate technologies to meet conditions such as reduced pollution, enhanced energy efficiency, and the creation of eco-friendly products [6, 7]. With efficient management of input factors and government support, private enterprises have progressively rationalized expenses, creating a stable and sustainable financial source. Additionally, in developed nations, product standards on the market are tightly controlled, including factors such as the CO2 emission rate, renewable energy utilization rate, and environmental pollution prevention. This has encouraged private enterprises to shift from conventional technologies to adopting new technologies and creating new products, thereby expanding their market reach [1, 5, 8, 9].

In the context of limited input resources and rising production costs, private enterprises are constantly seeking efficient methods of production and the use of cost-effective raw materials to remain competitive in the market. To achieve this, they often focus on reducing production costs. With supportive policies promoting scientific and technological research, private enterprises can access low-cost capital for investment in technological advancements [10]. Furthermore, product life cycles are becoming increasingly shorter, and private enterprises must continually innovate and develop new products to meet customer demands and adhere to the ever-stringent standards of potential markets. These dynamics have spurred private enterprises to invest increasingly in research and development, transforming research ideas into market-relevant products [11, 12]. State-owned enterprises are often significantly influenced by administrative procedures and tend to concentrate their business operations in specific industries. These are less competitive sectors that hold a crucial position in a country's economy. Consequently, these enterprises face less pressure to innovate their products to align with market trends. Additionally, within these enterprises, capital management is often inefficient and corruption rates are high. Therefore, private enterprises present a viable option for researching and developing new products. These enterprises implement the best management practices and efficiently utilize available resources, thereby reducing costs associated with research and production improvements. Moreover, in many countries, governments have established long-term contracts, procuring goods from private enterprises at premium prices, especially those with scientific and environmental benefits, such as renewable energy sources and reduced dependence on fossil fuels. This approach serves to further encourage private enterprises to actively participate in research and innovation [5, 13].

In addition to economic development goals, governments in various countries also need to address multidimensional social issues. The multifaceted nature of economic development encompasses not only economic growth but also social well-being, addressing inequality, and caring for vulnerable populations [7, 14, 15]. Currently, in developing countries, there is a significant disparity between the rich and the poor, with impoverished individuals lacking not only financial resources but also access to essential services such as employment, healthcare, education, housing, clean water, and information. Therefore, when assessing the indicators of economic development, it is essential to consider multidimensional poverty issues [8, 16, 17]. To address these challenges, many governments have invested in improving the quality of their labor force, providing microfinancial support, enhancing community healthcare, and more. This approach not only contributes to economic development but also supports impoverished individuals [18, 19]. Furthermore, private enterprises play a significant role in enhancing the effectiveness of these policies by creating a substantial number of jobs, increasing incomes, and improving labor welfare [20]. Additionally, in the increasingly competitive private sector, where product quality is on the rise and costs are being reduced, private enterprises are contributing significantly to government finances through fees, taxes, and other means. This additional revenue empowers governments to invest in infrastructure, especially in remote and underprivileged areas, and improve education and living conditions for vulnerable populations [1, 21, 22].

Economic development is a complex category. It not only ensures sustainable economic development but also reflects the significant improvement in the spiritual and material lives of the population in the future. Therefore, building a comprehensive assessment framework should be based on robust principles and tailored to the specific characteristics and nature of the Vietnamese economy. The constructed indicators represent various aspects, including economic, scientific, and technological development, energy models, and multidimensional poverty, to offer an overview of the economic development process in Vietnam and address immediate and future challenges.

Previous studies have often focused on assessing the impact of private investment on economic growth, yet none have examined the comprehensive relationship between private investment and economic development to provide a more holistic perspective on the role of private investment. To address this gap, the study initially formulated economic development indices tailored to the characteristics of the Vietnamese economy. In order to explore the relationship between private investment and economic development, various econometric models, including CS-ARDL, AMG, and CCEMG, were applied. The findings reveal a positive, long-term relationship between private investment and economic development. Additionally, to offer compelling evidence for policies aimed at fostering private investment, the study

conducted causality tests to scrutinize the relationship between private investment and other variables within the model. In summary, this research established economic development indices, presented arguments concerning the impact of private investment on economic development, employed suitable econometric models for robust estimates, and concluded with policy implications for Vietnam.

2. Material and Methods

The development of the theoretical framework for the study commenced with the collection of secondary data, followed by the utilization of estimation models to analyze the relationships among variables within the research model.

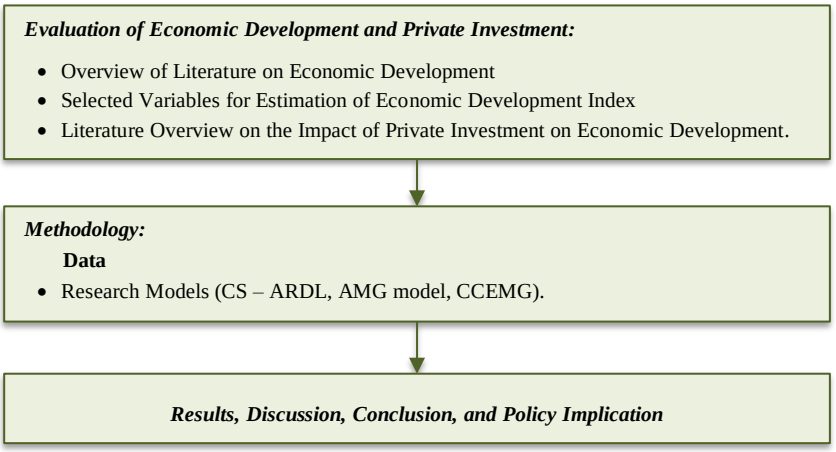

Figure 1. Research methodology flowchart

2.1. Evaluation of Economic Development and Private Investment

2.1.1. Overview of Literature on Economic Development

The initial concepts of economic development were initially viewed from the perspective of sustainable growth in output over time, and later, the focus shifted to the issue of welfare, which was considered an indicator of economic efficiency. During the classical era, economic development was primarily seen as sustained growth in the output of the economy over time. Thus, these perspectives did not address economic growth due to population growth or the real income growth of the economy over an extended period. According to Triantis & Meier's research [23], economic development was defined as the long-term increase in national income. Similarly, Todaro [24] asserted that economic development represented stable growth and a sustained annual growth rate of 5% to 7% or higher.

During the 1950s and 1960s, in many developing countries, there was a phenomenon where GNP growth rates were high but the living standards of the population were declining. This led to a reconsideration of the concept of economic development, shifting the focus away from stable output growth. Schumpeter & Swedberg [25] argued that the concept of economic development should concentrate on the poverty of the people, even though there were significant improvements in the economic sector. This perspective prompted many scholars to advocate for a more humane concept of economic development, focusing on per capita income with the aim of eradicating poverty, reducing illiteracy, improving healthcare, and enhancing the overall quality of life. Hicks & Streeten [26] are believed to be among the first to address improving the living conditions of low-income individuals, eradicating poverty, reducing illiteracy, and lowering mortality rates due to disease. Additionally, research emphasized the structural transformation of the economy from agriculture to industry and the organization of the economy towards efficient operation without discrimination among economic components.

Drewnowski [27] argued that economic development involved not only increasing the per capita income of a nation but also the development of education, healthcare, the reduction of social inequality, and the enhancement of people's well-being. In alignment with this perspective, Seers [28] proposed criteria for evaluating economic development based on indicators such as poverty, unemployment, and inequality. A country is considered to have achieved economic development when all three criteria are low. In cases where one or two criteria remain high, it is not considered economic development, even if per capita income is high. Furthermore, to provide a comprehensive perspective on sustainable economic development, Zailani et al.'s [17] research emphasizes the need to consider multidimensional poverty, including aspects such as employment, healthcare, education, housing, water supply, sanitation, and information. It can be observed that economic development encompasses not only increasing economic output but also addressing the well-being and living standards of the population. With this viewpoint, the livelihoods of the people will be uplifted, and social inequality will be reduced, narrowing the gap between different strata of society [29].

Additionally, as economies continue to develop, nations become increasingly dependent on energy, which transforms into a strategic commodity. Consequently, the development of the energy sector holds high economic efficiency because a rise in energy prices can have cascading effects on the prices of other commodities in the market, potentially negatively impacting the economy [13]. Therefore, the utilization of energy resources has garnered significant attention from governments worldwide, as it is considered an essential component of sustainable development strategies. However, many energy sources are finite and can have adverse effects on the environment and public health [10]. Consequently, many governments have invested substantial sums in research and transitioning to renewable energy sources to enhance energy security, combat climate change, and positively impact economic development through the creation of new, environmentally friendly products [11].

Economic development is a complex process that involves transitioning from a lower state to a more advanced state, where the quality of life improves and an array of goods and services cater to human needs [30]. Achieving these successes heavily relies on scientific and technological contributions, which transform ideas from theory into tangible products that improve daily life [31]. In times of systemic change, scientific advancements help economies undergo complete transformations. During such periods, dormant economic potential is awakened, social trends shift significantly, and economic efficiency is elevated [29]. Science and technology not only accommodate growing human needs as natural resources become scarcer but also address widespread environmental pollution and complex climate change. Consequently, science and technology serve as a robust foundation for implementing timely solutions to counteract nature's adverse impacts on human life. Furthermore, they facilitate the development and widespread use of new environmentally friendly products [32].

Using GDP as a measure to assess economic development is considered inadequate because it fails to capture the surplus or harmful aspects of numerous goods and services. Moreover, it cannot adequately reflect income distribution, social issues, environmental protection, or the efficient use of natural resources [13]. Therefore, there is a need to establish a more complex system of measurements, possibly incorporating algorithms, to create a comprehensive metric. These indices should describe the economic benefits that people are currently enjoying. For developing countries, the consideration of multidimensional poverty is crucial to revealing disparities in living standards among different demographic groups [33–36]. Furthermore, sustainability is demonstrated through the use of energy science and technology, serving as the foundation for propelling both the economy and the well-being of the population towards new developments. This also highlights the varying levels of development quality, transitioning from quantity to quality, contributing to environmental protection, and addressing climate change, which many countries are currently prioritizing and working towards in the foreseeable future [9].

2.1.2. Selected Variables for Estimation of Economic Development Index

Firstly, variable selection: the interrelationship between desired output variables was examined and assessed to select key indicators for economic development. Economic development involves a myriad of positive and negative relationships within a nation or region. Consequently, measuring economic development is a complex and contentious issue. Previous studies have argued that integrating variables related to economic development would be a reliable metric for assessment and comparison. Furthermore, this study focuses on evaluating the economic development in Vietnam, necessitating the selection of specific variables that are suitable for the research context. Therefore, after compiling variables for assessing economic development, the author engaged in discussions with experts to make informed choices aligned with Vietnam's practical circumstances. The selected variables encompass the economy, science and technology, energy models, and multidimensional poverty (Table 1). Secondly, variable classification: variables selected have been classified based on predetermined criteria for indicators estimation. Thirdly, index valuation: The Z-score synthesis technique has been employed to construct the composite index, calculated using the formula below (Equation 1).

$$\mathrm{EDI}_{ic} = \frac{X_{ic} - \mathrm{Min}\ (X_{ic})}{\mathrm{Max}\ (X_{ic}) - \mathrm{Min}\ (X_{ic})} \quad (1)$$

where EDI_{ic} is standardization-index for i^{th} variable; c is cross-sectional regions. $\mathrm{Min}\ (X_{ic})$ and $\mathrm{Max}\ (X_{ic})$ are the lowest and highest values respectively in each series of a variable across countries/ regions. Thus, the value of the EDI index falls within the range of 0 to 1, and the index has provided a reliable basis for comparisons among entities.

Table 1. Partial indicators

Symbol	Variable	Description	Authors
		Economy	
EDI 1	Real GDP per capita growth	Percentage change on previous year	Jędrzejczak-Gas et al. [1] Nkoro & Kelvin Uko [6] Singh et al. [16]
EDI 2	Real GDP growth	Percentage change on previous year	
EDI 3	Investment rate	Percentage of gross domestic product (GDP)	
EDI 4	General government debt	Percentage of gross domestic product (GDP)	
EDI 5	Environmental tax revenues	Percentage of gross domestic product (GDP)	
EDI 6	Exports of goods and services	Percentage of gross domestic product (GDP)	

	Science and Technology		
EDI 7	Human resources in science and technology (HRST)	Percentage of active population	Jędrzejczak-Gas et al. [1] Nnadozie & Jerome [7], Cypher et al. [8] Singh et al. [16]
EDI 8	R&D personnel	Percentage of active population—numerator in full-time equivalent (FTE).	
EDI 9	Gross domestic expenditure on R&D)	Percentage of gross domestic product (GDP)	
EDI 10	Government support to agricultural research and development	VND per inhabitant	
EDI 11	Patent accepted	Per million inhabitants	
EDI 12	Enterprises spend on R&D	Percentage of enterprises spending on R&D	
	Energy model		
EDI 13	Energy productivity	Purchasing power standard (PPS) per kilogram of oil equivalent	Jędrzejczak-Gas et al. [1] Nnadozie & Jerome [7], Cypher et al. [8], Singh et al. [16]
EDI 14	Primary energy consumption Tons of oil equivalent (TOE) per capita	Tons of oil equivalent (TOE) per capita	
EDI 15	Share of renewable energy in gross final energy consumption	Percentage of the gross final energy consumption	
EDI 16	Greenhouse gas emissions intensity of energy consumption	Index, 2000 = 100	
EDI 17	Average CO2 emissions per km from new passenger cars	g CO_2 per km	
EDI 18	Renewable energy sources in transport	Percentage	
	Multidimensional Poverty		
EDI 19	Income poverty	Percentage of the population below the income threshold of 3.20 USD per day.	Zailani et al. [17] Tran et al. [19] Cao et al. [34] Balasubramanian et al. [35]
EDI 20	Unemployment	Percentage of the labor force aged 15 and above who are unemployed.	
EDI 21	Healthcare scarcity	Percentage of the population not receiving medical care.	
EDI 22	Educational insufficiency	Percentage of the population aged 16 and above who are illiterate.	
EDI 23	Housing inadequacy	Percentage of the population without housing	
EDI 24	Lack of access to clean water and sanitation	Percentage of the population lacking access to clean water and sanitation	
EDI 25	Information deficiency	Percentage of the population not using information devices.	

If the specific variable is negatively associated with output than EDI is estimated as (Equation 2):

$$EDI_{ic} = \frac{X_{ic} - Max\ (X_{ic})}{Min\ (X_{ic}) - Max\ (X_{ic})} \quad (2)$$

2.1.3. Literature Overview on the Impact of Private Investment on Economic Development

Many previous studies only partially evaluated the impact of private investment on economic development. In Keynes's [37] study on the multiplier model of investment, an increase in investment led to an increase in a nation's economic output. At that time, investment was viewed from the perspective of aggregate supply, meaning it was related to the output of production. Therefore, any change in investment would result in changes in a nation's gross national income. Furthermore, in subsequent studies, economists such as Harrod [38] in the UK and Domar [39] in the US introduced a model known as the Harrod-Domar growth model, explaining the relationship between economic growth and unemployment in developed countries. Additionally, later studies, such as Solow's [40] neoclassical growth model, examined the role of investment in economic growth. However, these early studies mainly focused on capital formation through savings and did not evaluate the transfer of capital between regions or countries. Furthermore, these studies did not consider other factors, such as technological progress and externalities. During the early stages of research, when statistical data were less developed, it was challenging to distinguish between public and private investment [10].

Every type of investment plays a specific role in economic development. In developing countries, public and private investments have a positive relationship, whereas in developed countries, public investment tends to dominate over private investment due to the various incentives it receives, creating a scarcity of resources for private sector involvement [3, 10]. Additionally, public investment is greatly influenced by administrative procedures, lacks innovation, and often produces products that do not meet market demands, thus making it economically inefficient. As a result, many countries have clearly defined functions and responsibilities for each type of investment [41]. Public investment concentrates on developing infrastructure and addressing societal issues, while private investment primarily seeks profitability [42]. Nevertheless, these two types of investments are closely related. As societal development progresses, improvements in infrastructure will attract private investment, enhancing its efficiency. Private investment, in turn, generates profits, resolves significant labor issues, produces competitive products, and meets customer demands and preferences. Private enterprises, after generating profits, contribute a substantial portion to the state through taxes and fees. Consequently, public investment can take new developmental steps [43, 44].

Currently, many nations are giving significant attention to the use of green and renewable energy. This has a substantial impact on private investment decisions, as the costs associated with such energy sources are often high due to modern technologies [12]. In pursuit of sustainable economic development, many governments have implemented policies to encourage private enterprises to invest in and transition to the use of renewable energy [45]. Additionally, numerous countries have incorporated the use of green energy into their import policies to contribute to combating climate change, which is intensifying worldwide. Therefore, businesses seeking to export their goods to potential markets must meet these standards. According to Bürer & Wüstenhagen's [46] study, as many countries mandate reductions in CO_2 emissions, they also provide support, such as financial support for investments in new energy technologies. This support has enabled private enterprises to access additional resources, reduce production costs per unit, enhance competitiveness in the market, and create employment opportunities. Furthermore, many countries emphasize environmental protection, including increased fees on CO_2 emissions, waste disposal charges, and environmental protection taxes [47]. With such policies, governments not only promote the use of clean energy by private businesses but also incentivize private investment in renewable energy projects such as wind and solar power generation. Governments offer investment incentives and favourable electricity purchase prices through long-term contracts, often set higher than production costs [11]. With high profits and stability, these factors act as strong incentives for private enterprises to invest in clean energy.

In the context of an increasingly expanding market economy, investing in the development of science and technology will be a crucial key for businesses to better meet customer demands. State-owned enterprises often operate in exclusive, less competitive sectors, with low investment in science and technology [10]. According to Plank & Doblinger's study [11], state-owned enterprises' investments in science and technology are often ineffective for several reasons, such as limited funding and corruption. Additionally, investments in the new technology sector are often risky and expensive. Private enterprises, facing market pressure, changing product life cycles, and evolving customer preferences, must allocate a significant amount of capital to support scientific endeavours to stay competitive. In response to this reality, governments in many countries offer support to private enterprises through equipment procurement, tax incentives, and financial assistance [48]. These measures serve as significant incentives to attract increasing private investment into science and technology, translating research findings into widely applicable products [49]. Furthermore, as science and technology advance, private entrepreneurial enterprises experience rapid development, achieving substantial revenue and profits in a short timeframe and establishing a dominant market position [31]. Moreover, products have become increasingly environmentally friendly, reducing the consumption of fossil fuels and CO_2 emissions and effectively catering to the demands of discerning yet economically viable markets.

One of the crucial elements in a nation's economic development is sustainable poverty reduction, improving the lives of its citizens while ensuring social equity and reducing wealth and poverty disparities within society [50]. According to the Organization for Economic Cooperation and Development (OECD) [51], private enterprise plays a significant role in poverty reduction and economic development. Firstly, private investment capital is increasingly being directed into various industries and sectors, creating many new employment opportunities [52]. Small and medium-sized private enterprises, in particular, have been established in growing numbers, generating numerous jobs, especially in economically disadvantaged regions, thus alleviating unemployment pressures in each country [44]. Secondly, private enterprises always seek to maximize profits, leading to increased competitiveness. This benefits the economy in multiple ways: reduced product prices, improved product quality, and product diversification, which in turn enhance the living standards of the poor [53]. Thirdly, multinational corporations continually seek new investment markets, providing additional opportunities for nations to access science and technology, creating employment opportunities, and driving domestic products to become more competitive with foreign companies. As a result, low-income individuals have access to affordable products [51]. Moreover, in economically challenged regions, especially in developing countries, the poverty rate tends to be disproportionately high. Many residents lack access to essential services in their daily lives, and with a lower level of education, finding new employment opportunities becomes difficult. Therefore, the development of the private economy is considered one of the most effective measures to reduce multidimensional poverty rates. Government support in terms of scientific and technical assistance, as well as financial aid, enables the expansion of production capabilities for citizens, leveraging their strengths and creating employment opportunities locally instead of necessitating migration to urban areas or industrial zones in search of employment.

Despite the positive contributions of private investment to the poverty reduction process, it also has negative impacts. Private enterprises often aim to maximize profits, and one common approach is to reduce labor costs, which can significantly hinder poverty reduction efforts [54]. Additionally, domestic enterprises, particularly those in developing countries, may face severe competition from multinational corporations due to their financial and market strengths. This competition can result in a substantial number of unemployed workers, especially those with lower skill levels and residing in economically challenged regions [55]. Furthermore, in some developing economies, the number of private enterprises is quite limited, generating fewer jobs and lower wages compared to other types of businesses [56]. Therefore, governments need to allocate resources sensibly to simultaneously promote economic growth and poverty reduction. This entails ensuring the legitimate rights of workers, providing unemployment support, ensuring fair and adequate wages, and improving worker benefits. State-owned enterprises should support private enterprises, leveraging the advantages of each business type with the overarching goal of reducing poverty and societal inequality [57, 58].

2.2. Methodology

2.2.1. Data

Our study utilizes provincial-level data collected from all 63 provinces and municipalities of Vietnam spanning from 2000 to 2022. Regarding the data used to assess private investment, the authors collected this information from the General Statistics Office of Vietnam (GSO) [59]. Second, the study's variables data was gathered from the same source, the General Statistics Office of Vietnam, and was subsequently categorized and computed. The definitions and measurements of these variables are described in Table 2.

Table 2. Description of Variables in the Model

Variable	Symbol	Description	Authors
Economic Development Index	EDI	Computed by the authors	Computed by the authors
Private Investment	PI	Private Investment/GDP (%)	Deleidi et al. [10], Coccia [31], Nwakoby & Alajekwu [42], Shabbir et al. [43], Quang & Hong Van [60]
Investment in Science and Technology	IST	Investment in Science and Technology/GDP (%)	Tuan & Dung [52], Tri & Hoa [61], Klingler-Vidra & Wade [62], Tung & Binh [63]
Agricultural Land	AL	Agricultural Land Area/Total Land Area (%)	Quang & Hong Van [60]
Urbanization	UR	Urban Population/Total Population (%)	Cu & Nguyen [18], Tran et al. [19], Tuan & Dung [52]
Vocational Training for Labor	VTL	Skilled Labor through Training/Total Labor Force (%)	Cu & Nguyen [18], Tuan & Dung [52], Do et al. [64]
Trade Openness	TO	Total Trade (Exports + Imports)/GDP (%)	Hung et al. [65], Duong et al. [66]
Private Sector Finance	PSF	Credit to the Private Sector/GDP (%)	Vo [21], Tri [61], Klingler-Vidra & Wade [62]

2.2.2. Cross-Sectional Dependence (CSD) Test

In this study, the authors employed panel data analysis to examine the impact of private investment on economic development. Therefore, it is essential to conduct a test for Cross-Sectional Dependence (CSD). Currently, the expanding trend of globalization has led to increasing interdependence among the variables in the research model, and this issue needs to be carefully addressed. Failure to address this could result in unreliable estimation outcomes. The Cross-Sectional Dependence Test, introduced by Pesaran [67], has been utilized in this study. The formula for the Cross-Sectional Dependence Test is as follows (Equation 3):

$$\mathrm{CSD_{tn}} = \left[\frac{tn(n-1)}{2}\right]^{1/2} \widehat{\partial_n} \tag{3}$$

where, $\widehat{\partial_n}$ term represents the pair-wise correlation coefficient, t is the number of time periods, and "n" is the number of cross-sectional units.

2.2.3. Slope Heterogeneity (SH) Test

For models using panel data, it is essential to consider slope heterogeneity as it can lead to imprecise estimation results. Slope Heterogeneity arises from variations between the data inputs and the structure of the economy. This slope heterogeneity results in different parameters of interest across cross-sections. To assess the slope heterogeneity, Pesaran & Yamagata [68] provided the following formula (Equation 4, 5):

$$\tilde{\Delta}_{\mathrm{sh}} = \mathrm{n}^{1/2}(2\mathrm{k})^{-1/2}\left(\frac{1}{\mathrm{n}}\tilde{\mathrm{s}} - \mathrm{k}\right) \tag{4}$$

$$\tilde{\Delta}_{\mathrm{ash}} = (\mathrm{n})^{1/2}\left[\frac{2\mathrm{k}(\mathrm{t}-\mathrm{k}-1)}{\mathrm{t}+1}\right]^{-1/2}\left(\frac{1}{n}\tilde{\mathrm{s}}\text{-}\mathrm{k}\right) \tag{5}$$

$\tilde{\Delta}_{\mathrm{sh}}$, $\tilde{\Delta}_{\mathrm{ash}}$ denote delta tilde and adjusted delta tilde, respectively.

2.2.4. Panel Unit Root Test

To assess the stationarity of the variables used in the panel data model with cross-sectional dependence, Pesaran [69] introduced the Cross-Sectional Augmented Dickey-Fuller (CADF) and Cross-Sectional Im-Pesaran-Shin (CIPS) unit root tests. The formula for the CADF test is presented as follows (Equation 6):

$$\Delta \mathrm{Y_{i,t}} = \mu_{\mathrm{i}} + £_{\mathrm{i}}\mathrm{Y_{i,t-1}} + \varepsilon_{\mathrm{i}}\frac{1}{\mathrm{n}}\sum_{\mathrm{i=1}}^{\mathrm{n}}\Delta \mathrm{Y_{i,t}} + \mathcal{J}_{\mathrm{i}}\frac{1}{\mathrm{n}}\sum_{\mathrm{i=1}}^{\mathrm{n}}\mathrm{Y_{i,t-1}} + \Sigma_{\mathrm{i,t}} \tag{6}$$

The CIPS test is represented as follows (Equation 7):

$$\mathrm{CIPS} = \frac{1}{\mathrm{n}}\sum_{\mathrm{i=1}}^{\mathrm{n}}\mathrm{CADF_i} \tag{7}$$

where $\mathrm{CADF_i}$ indicates the CADF statistic in Equation 7.

2.2.5. Panel Cointegration Test

There are several methods for testing cointegration in panel data, including Pedroni [70] and Kao [71]. However, when dealing with panel data that exhibits cross-sectional dependence, these tests can produce biased results. To address this issue, Westerlund [72] proposed a cointegration test based on error correction models, which can be expressed as follows (Equation 8):

$$\Delta Y_{i,t} = ϛ_i d_t + ə_i(Y_{i,t-1} - \acute{\beta}_i X_{i,t-1}) + \sum_{j=1}^{k} \eta_{i,j}\Delta Y_{i,t-j} + \sum_{j=1}^{k} \varepsilon_{i,j}\Delta X_{i,t-j} + \upsilon_{i,t} \quad (8)$$

where $ə_i$ represents the error term for the i-th individual.

The null hypothesis of Westerlund's test assumes no cointegration. Furthermore, Westerlund introduces four statistical indicators, namely G_t, G_a , P_t , P_a. Among these, G_t and G_a assess the presence of cross-sectional dependence in one or more units along the cross-sectional dimension. Meanwhile, P_t và P_a investigate the phenomenon of cross-sectional dependence across the entire panel. The formulas for calculating these statistical indicators are as follows (Equations 9 to 12)

$$G_t = \frac{1}{n}\sum_{i=1}^{n} \frac{\hat{ə_i}}{SE(\hat{ə_i})} \quad (9)$$

$$G_a = \frac{1}{n}\sum_{i=1}^{n} \frac{T\hat{ə_i}}{1-\sum_{j=1}^{k}\hat{ə_{i,j}}} \quad (10)$$

$$P_t = \frac{\hat{ə}}{SE(\hat{ə})} \quad (11)$$

$$P_a = T\hat{ə} \quad (12)$$

2.2.6. Panel Causality Tests

Testing the causal relationship for panel data, the study used the D-H test introduced by Dumitrescu & Hurlin [73]. The equation for the Dumitrescu-Hurlin (D-H) causality test is as follows (Equation 13):

$$Y_{i,t} = Ɛ_i + \sum_{k=1}^{k} \varepsilon_{i,j} Y_{i,t-k} + \sum_{k=1}^{k} ə_{i,j} X_{i,t-k} + \upsilon_{i,t} \quad (13)$$

where $Ɛ_i$ is individual fixed effects, $\varepsilon_{i,j}$ and $ə_{i,j}$ represent the lag parameters and slope parameters, respectively, k is lag length.

The null hypothesis of the Dumitrescu-Hurlin (D-H) causality test is that there is no causal relationship. Alternative hypotheses show causality in the smallest cross-section element. Dumitrescu and Hurlin have presented a Wald test statistic as follows (Equation 14):

$$\overline{W} = \frac{1}{n}\sum_{i=1}^{n} W_i \quad (14)$$

where W_i denotes the individual Wald statistics for each cross-section unit at time t.

2.2.7. Model Analysis

To examine the long-term relationship between variables in the model, the study employs the CS-ARDL model because: (1) the CS-ARDL model can estimate at different order of integration levels, (2) The model addresses endogeneity and heterogeneity issues, (3) This estimation method effectively controls for the correlation problem between cross-sectional units [74]. The CS-ARDL equation (Equation 15):

$$\Delta Y_{i,t} = \mu_i + £_i (Y_{i,t-1} - \beta_i X_{i,t-1} - \Omega_{1i}\bar{Y}_{t-1} - \Omega_{2i}\bar{X}_{t-1}) + \sum_{j=1}^{p-1} \varepsilon_{i,j}\Delta Y_{i,t-j} + \sum_{j=1}^{q-1} ə_{i,j}\Delta X_{i,t-j} + \rho_{1i}\Delta\bar{Y}_t + \rho_{2i}\Delta\bar{X}_t + ə_{i,t} \quad (15)$$

where $\Delta Y_{i,t}$ is the dependent varriable, $X_{i,t}$ are long-run independent variables.

The research results need to ensure the robustness of the long-term relationship between the variables in the CS-ARDL model. Therefore, the study continues to employ the Augmented Mean Group (AMG) model introduced by Eberhardt & Bond [75] and the Common Correlated Effect Mean Group (CCEMG) model proposed by Pesaran [76]. With these two estimation tools, the study will address issues of slop heterogeneity, endogeneity, and cross-sectional dependence. According to Khan et al. [77], these two methods are capable of controlling the correlation among cross-sectional units well.

The AMG is represented as follows (Equation 16):

$$\Delta Y_{i,t} = \mu_i + £_i \Delta x_{i,t} + \varepsilon_i f_t + \sum_{i=1}^{t} \theta_t D_t + ϛ_{i,t} \quad (16)$$

where $Y_{i,t}$ is explained variable, $X_{i,t}$ represents a vector of explanatory variables.

Considering $£_{2,t}$ the general form of the AMG model can be obtained as follows (Equation 17):

$$AMG_{estimator} = \frac{1}{n}\sum_{i=1}^{n} \widehat{£_{\iota}} \quad (17)$$

The CCEMG equation is as follows (Equation 18):

$$Y_{i,t} = Э_i + \beta_i X_{i,t} + C_i F_t + Y_i \frac{1}{n}\sum_{i=1}^{n} X_{i,t} + Ƨ_i \frac{1}{n}\sum_{i=1}^{n} Y_{i,t} + e_{i,t} \quad (18)$$

where β_i is the parameters of the regressors, $e_{i,t}$ and $Э_i$ are the error and constant terms correspondingly, and F_t connotes common factors that are not observed.

3. Results and Discussion

3.1. Private Investment in Vietnam

Following the 6th Party Congress in 1986, Vietnam introduced a multi-sectoral economic policy. Consequently, private enterprise in the country saw various impediments gradually removed, and it began to play a vital role in Vietnam's economy. To operationalize this policy, Vietnam first enacted the Law on Private Enterprises in 1990. This legal framework paved the way for private businesses to have increased opportunities for development and fair competition, along with other economic components. However, during the implementation, numerous difficulties were encountered in adhering to regulations, with administrative procedures being cumbersome and posing significant challenges for newly established private enterprises. Consequently, from 1990 to 1999, only 14,500 private enterprises were established [78].

Entering the 21st century, Vietnam's economy is increasingly integrated with the global economy. Consequently, Vietnam needed to adapt to emerging global trends in a timely manner. In 2000, Vietnam promulgated the Law on Private Enterprises, which was subsequently revised and supplemented in 2004, 2014, and 2017. These legal adjustments expanded the scope of eligible entities for establishing private enterprises, streamlined administrative procedures, and introduced numerous investment incentives for private enterprises. Additionally, in 2017, during the 7th Party Congress, the private economy was recognized as a vital pillar of Vietnam's economy. As a result, the number of private enterprises has experienced remarkable growth, with over 1 million private enterprises established by the end of 2017 [78]. Despite the challenges posed by the COVID-19 pandemic in recent years, the private sector has continued to exhibit astonishing growth. By the end of 2022, a total of 148,533 new enterprises had been established [59].

In addition to implementing policies to attract domestic private investment, Vietnam has also placed significant emphasis on attracting foreign private investment. In 1987, Vietnam, for the first time, passed the Foreign Investment Law. Subsequently, within the span of two years, from 1988 to 1990, Vietnam issued permits for 213 investment projects with a total registered capital of nearly USD 1.8 billion [59]. However, disbursement of investment capital was slow, as investors were waiting for changes and commitments from the Vietnamese government.

Since 1991, the process of opening up has gained momentum, with a surge in foreign direct investment into Vietnam. Positive signals from the evolving relationship between Vietnam and the United States began to emerge, and in 1995, Vietnam officially normalized its relations with the United States. Over the past 35 years of attracting foreign investment, Vietnam's economy has achieved significant success. From 1986 to 2022, Vietnam attracted approximately USD 438.7 billion in foreign private investment, of which USD 274 billion has been disbursed [59]. This represents a crucial supplementary source of capital for Vietnam's economic development in the coming years. Vietnam continues to make timely adjustments to attract even more foreign private investment, thereby playing an essential role in economic development (Figure 2).

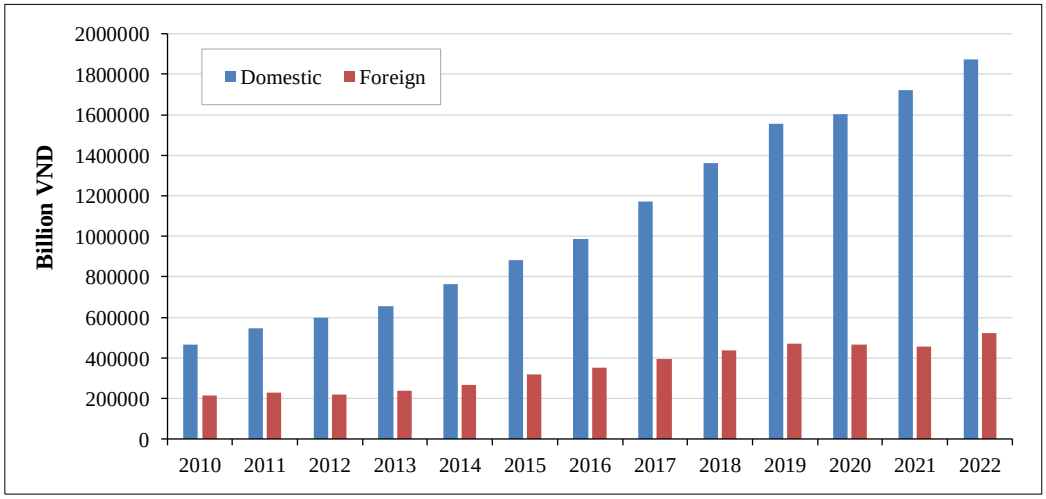

Figure 2. Domestic and Foreign Private Investment in Vietnam: General Statistics Office of Vietnam

In recent years, Vietnam has identified the goal of economic development through sustainable, green growth, with a focus on developing industries that apply advanced science and technology while also prioritizing environmental protection. To concretize this objective, the Prime Minister of the Government of Viet Nam issued Decision No. 403/QD-TTg approving the National Action Plan on Green Growth for the 2014–2020 period, as well as Decision No. 1658/QD-TTg approving the National Strategy on Green Growth for the 2021–2030 period, with a vision towards 2050. Furthermore, Vietnam has established a list of investment incentives for high-tech projects, clean energy projects, and projects utilizing renewable energy sources, all aimed at promoting sustainable economic development. These policies are of great interest to private enterprises, which are keen to understand and comply with the requirements set forth by the Vietnamese government.

To encourage the development of private enterprises and ensure compliance with legal regulations, specific measures have been implemented, such as reducing corporate income tax, import tax, value-added tax, and exempting or reducing land lease fees for projects investing in high technology and environmentally friendly initiatives. Additionally, environmental protection taxes enable state management agencies to monitor resource exploitation activities, guide enterprises towards using renewable resources, and minimize environmental pollution. Enterprises investing in these sectors can access preferential interest rates from the Environmental Protection Fund or the green credit market managed by the Vietnamese state.

Through Figure 3, the proportion of private investment in science and technology is not high, ranging from a minimum of 1.3% in 2010 to a maximum of 2.1% in 2014 [59]. The results of scientific and technological research by private enterprises primarily involve process improvements, material conversion, and cost-saving measures rather than substantial contributions to environmental protection or the development of environmentally friendly products. This situation can be attributed to the limited investment capital available to private enterprises, which mainly rely on pre-existing technologies, and the limited added value of their products. Faced with this challenge, Vietnam enacted the Science and Technology Law of 2013, allowing enterprises to allocate 10% of their pre-tax income to establish a science and technology development fund. The Ministry of Science and Technology issued Circular No. 05/2022/TT-BKHCN, and the Ministry of Finance issued Circular No. 67/2022/TT-BTC, enabling private enterprises to increase their investment in science and technology, particularly in green economic sectors, environmentally friendly product research, and the utilization of renewable resources.

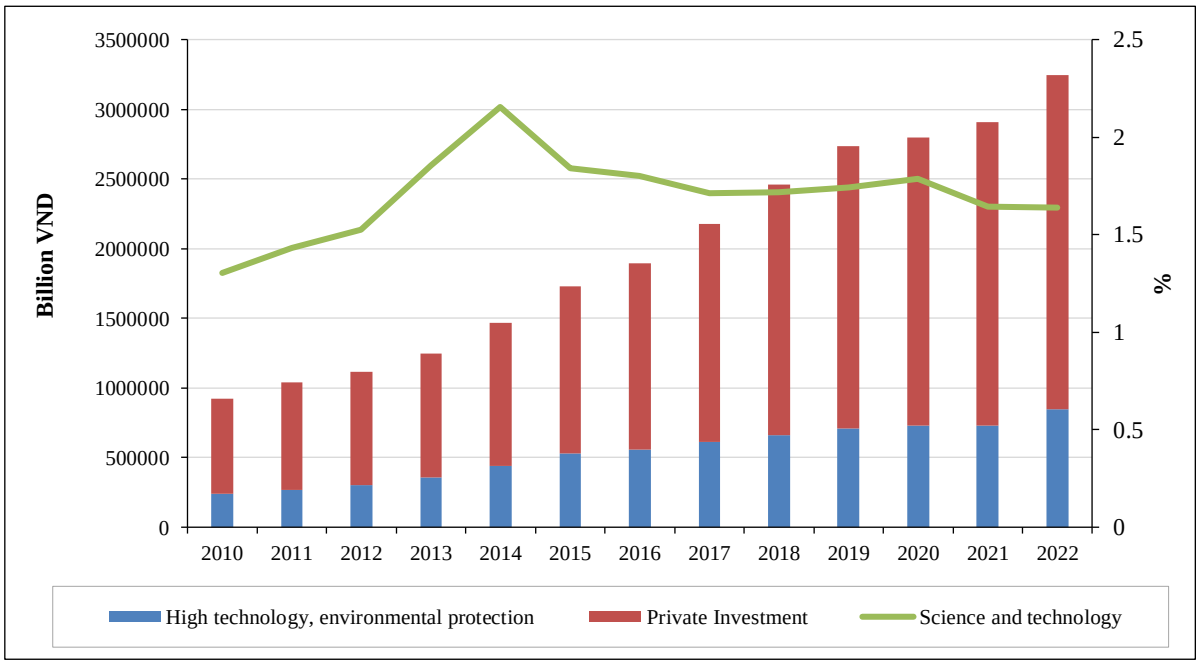

Figure 3. Sustainable Private Investment: General Statistics Office of Vietnam

3.2. Model Results and Discussion

3.2.1. Results of Cross-Sectional Dependence Test

The first step in estimating panel data is to examine whether Cross-Sectional Dependence (CSD) exists in the collected dataset. This step is crucial as it determines the suitability of the subsequent estimation method. The results of the CSD test are presented in Table 3, following Pesaran's recommendations [67].

Table 3. Results of CSD test

Variables	CSD- test	p-value	Corr	Abs(corr)
EDI	19.103	0.000	0.09	0.19
PI	18.410	0.000	0.09	0.19
IST	19.697	0.000	0.09	0.19
AL	12.887	0.000	0.06	0.18
UR	17.538	0.000	0.08	0.19
VTL	8.427	0.000	0.04	0.17
TO	19.631	0.000	0.09	0.20
PSF	22.236	0.000	0.10	0.20

The test results indicate that all hypotheses are significant at a level below 1%. This implies that Cross-Sectional Dependence (CSD) exists in Economic Development, Private Investment, Scientific and Technological Investment, Vocational Training Rate, Urbanization Rate, Agricultural Land Ratio, Trade Openness, and Private Sector Financials. Therefore, the conditions for estimating the model have been satisfied.

3.2.2. Results of Slope Homogeneity Test

The next step involves checking for heterogeneity in terms of slopes in the collected data, as proposed by Pesaran & Yamagata [68]. This is shown in Table 4:

Table 4. Synopsis of Slope of Homogeneity result

H0: slope coefficient is homogenous			
Δ	P-stats	Δ Adjusted	P-stats
14.480	0.000***	19.021	0.000***

Note: *, **, *** represents significance level at 10%, 5%, and 1%.

The results of the test show that the values of delta and adjusted delta are statistically significant. This means that the data collected has the problem of slope heterogeneity.

3.2.3. Results of Panel Unit Roots

After identifying the issues of cross-sectional dependency (CSD) and heterogeneity in data slopes, we proceeded to perform panel unit root tests. In our study, we applied the CADF and CIPS tests as proposed by Pesaran [69]

The results of the tests in Table 5 indicate that all variables are stationary at the first difference.

Table 5. Results from stationary properties in the panel

Variables	CIPS		CADF	
	Level	1st difference	Level	1st difference
EDI	-2.103	-5.955***	-2.001	-3.112***
PI	-1.973	-5.909***	-1.905	-3.007***
IST	-2.258	-5.953***	-2.008	-3.080***
AL	-1.992	-5.926***	-1.914	-3.114***
UR	-2.085	-5.828***	-1.937	-3.065***
VTL	-1.984	-5.941***	-2.006	-3.136***
TO	-2.015	-5.947***	-2.010	-3.145***
PSF	-2.121	-5.912***	-1.974	-3.123***

Note: *, **, *** represents significance level at 10%, 5%, and 1%.

3.2.4. Results of Panel Cointegration Test

To assess the long-term relationship between the independent and dependent variables, this study employs three cointegration methods: Pedroni [70], Kao [71], and Westerlund [72].

According to the cointegration tests conducted using the Kao and Pedroni methods as shown in Table 6, it can be concluded that there exists a long-term relationship between the independent and dependent variables. Furthermore, the Westerlund test [72] results presented in Table 7 indicate that all the Gt, Ga, Pt, and Pa statistics are statistically significant, meaning that the null hypothesis (no cointegration) is rejected. Therefore, based on all the cointegration test results, it can be inferred that there is a long-term relationship between the independent and dependent variables.

Table 6. Results of Pedroni and Kao Panel Cointegration

Estimates	Statistic	p-value
Pedroni test for cointegration		
Modified Phillips–Perron t	8.6991	0.0000
Phillips–Perron t	-13.7782	0.0000
Augmented Dickey–Fuller t	-11.3461	0.0000
Kao test for cointegration		
Modified Dickey–Fuller t	-42.6243	0.0000
Dickey–Fuller t	-31.4853	0.0000
Augmented Dickey–Fuller t	-18.5144	0.0000
Unadjusted modified Dickey–Fuller t	-47.4608	0.0000

Table 7. Results of Westerlund bootstrap panel cointegration

Statistics	Value	p –value	Robust p-value
G_t	-9.484	0.0000	0.0000
G_a	-10.712	0.0000	0.0000
P_t	-8.525	0.0000	0.0000
P_a	-12.463	0.0000	0.0000

3.2.5. Results of CS-ARDL, AMG, and CCEMG Estimations

The estimation results of the CS-ARDL, AMG, and CCEMG models are presented in Table 8. The estimation outcomes reveal that the direction of the impact of independent variables on economic development remains constant. However, the significance levels differ across various estimations. As previously elucidated, the CS-ARDL model is considered a reliable tool for cases involving cross-sectional dependence (CSD) and slope heterogeneity (SH). Furthermore, to assess the long-term reliability of the estimation results, the study continues to employ the AMG and CCEMG models to address the issues of CSD and SH.

Based on the data presented in Table 8, it can be observed that private investment has a positive impact on economic development at a significance level of 1%. Vietnam is currently transitioning from a centrally planned economy to a market-oriented one. State-owned enterprises appear to be weaker compared to private enterprises due to administrative obstacles, a lack of innovation, and limited adaptation to the market, resulting in lower economic efficiency. Recognizing the significant role of private investment in Vietnam's economic development, the Vietnamese government has introduced various policies aimed at promoting economic growth, particularly in the private sector. These policies include streamlining administrative procedures, providing assistance to businesses in challenging times, easing import and export processes, and encouraging involvement in scientific and technological fields. Private enterprises, through effective management practices and efficient resource utilization, have effectively addressed various challenges in achieving sustainable economic development [65, 79].

Table 8. Long-Term Estimation Results

Variables	CS-ARDL (Short-run)	Long run estimates		
		CS-ARDL	AMG	CCEMG
ECM (-1)	-0.99926***	-	-	-
PI	0.08526***	0.04274***	0.05912***	0.07376***
IST	0.01300**	0.00649**	0.01548***	0.01288***
AL	-0.00896	-0.00450	-0.02682***	-0.01246
UR	0.09509	0.04746	0.13659***	0.11663**
VTL	0.011491***	0.00574***	0.01417***	0.01149***
TO	0.21291***	0.10651***	0.23694***	0.22438***
PSF	0.01542***	0.00769***	0.00966***	0.01321***

Note: *, **, *** represents significance level at 10%, 5%, and 1%.

In some countries, economic development has relied on natural resources such as coal and oil exports. While this has provided a significant source of revenue for the state budget and led to rapid economic growth, it has not been sustainable [12]. Widespread environmental pollution and the gradual depletion of resources have contributed to the resurgence of poverty in many nations [45]. Recognizing the importance of sustainability for the future, during the early stages of economic development, Vietnam has also focused on harnessing its energy and resources to generate capital without depending on foreign aid [2]. Vietnam has effectively utilized capital investment and combined it with scientific and technological research. This forms a strong foundation for attracting private capital and diversifying investments across various sectors and fields. Particularly, there is strong encouragement for private sector investment in science and technology. Private projects, such as wind energy, solar energy, and hydroelectric power, are gradually replacing traditional thermal power plants and proving to be effective. One somewhat unexpected finding in the research is inadequate planning to meet development needs. Many renewable energy projects have gone unused due to an overloaded energy transmission system. For green products, which often have high production costs, government support is provided through subsidies. However, when there are too many producers, it can strain the state budget and, at times, work against economic development. Therefore, the critical issue here is to develop policies that align with the current situation and avoid over-reliance on state support [61, 63].

From Table 8, it can be observed that labor training has a positive impact on the short-term and long-term economic development of Vietnam. In recent years, Vietnam has consistently emphasized the development of modern education. For laborers in remote areas, the government provides various forms of support, such as educational subsidies and living allowances. This has facilitated many workers' access to advanced scientific knowledge, leading to higher-paying job opportunities. As a result, economically challenged regions are gradually improving, and many households are escaping poverty. In economically developed areas, the workforce is trained based on an advanced education system, ready to supply the economy with a high-quality labor force [22]. Currently, Vietnamese businesses are adapting well to market demands by producing high-quality and competitively priced products. Products are manufactured with consideration for environmental impact, utilizing fewer fossil fuels in the production process. Therefore, businesses are increasingly demanding a higher quality of labor [64, 65]. Additionally, laborers are not only inputs in the production process but also consumers of products. As education levels rise, the demand for quality of life also increases. This underscores the robust relationship between labor training and economic development, aiming toward future sustainability.

The financial sector of private enterprises has a positive impact on the economic development of Vietnam. As the private economic sector expands, there is an increased demand for capital. The Vietnamese government has opened doors to encourage the establishment of private banks and has called upon foreign banks to invest in Vietnam. This represents a substantial source of capital for the economy, fostering the development of new projects and facilitating the transition from fossil fuel-based production to carbon-neutral production technologies. Therefore, economic development is gradually becoming less dependent on natural resources [3]. Additionally, with an abundant capital supply, scientific research activities thrive, transforming business ideas into tangible products in daily life. Moreover, numerous individuals living in poverty have the chance to secure low-interest capital, which acts as a motivating factor for them to engage in investment activities and expand their production. In Vietnam, numerous impoverished households, after obtaining loans and receiving support from local authorities, have shifted their business practices, created local specialties, and increased income for themselves and their families, thereby generating more job opportunities [21, 61].

Scientific and technological investment has a positive impact on economic development, both in the short and long term. This underscores the efficacy of scientific research results and technology transfer. Vietnam consistently considers science and technology as crucial elements for future economic development [11]. Despite challenges in the state budget, the Vietnamese government consistently allocates a specific budget for science and technology. Furthermore, Vietnam encourages private sector involvement in scientific research to enhance labor productivity and product competitiveness. Additionally, the government is willing to procure products with high scientific value, such as advanced energy research products and technologies [31]. The government is ready to implement various support programs, including tax incentives, financial support for research, and technology transfer. Recognizing startups as hubs for innovative research and rapidly growing profits, the government enacted a law in 2017 to support small and medium-sized enterprises. This law has undergone several adjustments to align with the current situation [63].

Estimated results show that urbanization has a positive impact on economic development in Vietnam. This signifies an elevation in the quality of life for urban residents. Businesses and factories concentrated in urban and industrial areas have absorbed a significant portion of local and regional labor [64]. Consequently, the swift transition from agricultural to industrial labor and from rural to urban environments is underway. This has resulted in an available and enhanced labor force for enterprises, accompanied by improved wages and access to healthcare, education, and social welfare services, ultimately lowering the proportion of impoverished households [18, 80]. Furthermore, local governments consistently pay attention to the lives of citizens, particularly those in poverty or vulnerable situations, in urban areas through proactive measures such as vocational training support, job placement assistance, and the construction of social housing. Social inequality has decreased, and the percentage of the population lacking basic services in large urban areas is tending to decline. This demonstrates that the Vietnamese government prioritizes the well-being of its citizens as a crucial objective in tandem with economic growth.

In recent years, Vietnam has participated in and signed numerous free trade agreements, expanding the international market [79]. This presents an opportunity for domestic businesses to expand their production and scale. To meet capital needs, not only have domestic credit institutions participated, but foreign credit institutions have also joined in, leading to intense competition. Banks have continuously reduced interest rates, simplified procedures, and lowered borrowing costs, making it easier for private enterprises to access credit resources [21]. Furthermore, as Vietnam opens up its market, it must adhere to international standards, such as reducing CO_2 emissions, producing products that meet international standards, and being environmentally friendly. This enables Vietnamese products to enter demanding markets such as the EU, Japan, and the United States [79].

3.2.6. Results of the Dumitrescu and Hurlin Causality Test

To examine the causal relationship between the variables in the model and private investment, the study employed the Dumitrescu and Hurlin Causality Test. The results from Table 9 indicate that the variables IST, AL, UR, VTL, TO, and PSF have an impact on the variable PI.

Table 9. Findings of pairwise Dumitrescu and Hurlin panel causality test

Null hypothesis	W-bar	Z-bar	p-value	Conclusion
IST does not homogenously cause PI	3.7325	6.5463	0.0000	IST→PI
AL does not homogenously cause PI	3.1252	4.4322	0.0000	AL→PI
UR does not homogenously cause PI	3.2534	4.7364	0.0000	UR→PI
VTL does not homogenously cause PI	2.6374	2.4625	0.0186	VTL→PI
TO does not homogenously cause PI	2.9374	3.4263	0.0008	TO→PI
PSF does not homogenously cause PI	2.9374	3.4524	0.0007	PSF→PI

Research and development investment has a significant positive impact on private investment in Vietnam. In recent years, the Vietnamese economy has experienced remarkable growth, not only witnessing an increase in the number of domestic private enterprises but also a substantial rise in foreign businesses' presence. Consequently, competition among private enterprises has intensified [65]. In this context, Vietnamese private enterprises are willing to invest in new machinery and equipment, producing high-quality products at lower costs. The product life cycle is short, necessitating investments in research and development to meet customer demands [52, 63].

The private sector's financial environment in Vietnam has expanded significantly, providing a stable foundation for the development of the private sector in the economy. Notably, many foreign banks have entered the market, readily offering substantial capital to private enterprises. Furthermore, the Vietnamese government has implemented numerous credit programs with preferential interest rates and loan durations for private enterprises engaged in production and green, sustainable energy conversion, encouraging the development of environmentally-friendly products and complying with international standards for CO2 emissions. [21, 61, 62].

The trend toward industrialization has been robust, accompanied by a notable reduction in the proportion of agricultural land. The Vietnamese government has encouraged newly established private enterprises to recruit labor at the local level, particularly among families who have lost their land. This has created opportunities for households undergoing land conversions to transition to new occupations, securing employment at the local level. Consequently, the livelihoods of the population have improved, generating new employment opportunities [60].

The urbanization rate in Vietnam has increased significantly in recent years, driven in part by the development of the economy, which has attracted a large labor force from rural areas to urban centers in search of employment opportunities [2]. This influx of labor has provided a substantial workforce for factories and private enterprises. However, a pressing issue concerning these laborers is their low skill levels and challenging living conditions, leading many businesses in Vietnam to implement various policies. These policies include relocating workers within a 40-kilometer radius, providing financial assistance for housing rentals, or constructing housing for workers, as well as offering pre-employment training [52]. Additionally, local governments in industrial zones have developed infrastructure facilities such as schools, hospitals, and social housing to improve the living conditions of these workers. Nevertheless, there is still a gap in meeting the increasing demands of laborers within industrial zones today [18].

Education is a matter of paramount importance in Vietnam's development agenda. In order to supply the economy with a skilled and competitive labor force, Vietnam has been expanding vocational training programs. These programs continuously update knowledge to meet the demands of the labor market. Here, learners have access to new knowledge, technology, and labor market trends [18]. However, with the rapid advancements in science and technology, many businesses, both in general and private enterprises, have found it necessary to provide additional training for their employees as the recruited workforce often does not meet their requirements [52]. Consequently, the Vietnamese government encourages businesses to participate in vocational training programs or collaborate with educational institutions to address labor quality issues effectively [64].

In recent years, Vietnam has actively participated in numerous international trade organizations and expanded its free trade agreements. As of August 2023, Vietnam has joined 16 agreements, with negotiations ongoing for three more [81]. Domestic private enterprises will have more opportunities to expand their markets and contribute significantly to the overall development of the nation. The government will serve as a bridge between domestic enterprises and foreign partners, participating in various trade promotion conferences in major global markets to seek potential customers. Additionally, Vietnam has adjusted its market-opening regulations, such as reducing export-import taxes and aligning product standards, and enhanced its legal framework to strengthen competition among domestic and foreign enterprises [65, 66].

4. Conclusion and Policy Implications

Vietnam has achieved notable economic development success while ensuring sustainability for the future. The quality of life for its citizens has improved with increased income levels and the fulfillment of basic human needs. One of the crucial contributing factors to this development is private sector investment, which encompasses both domestic and foreign private enterprises. This study represents the first research endeavor to examine the impact of private investment on sustainable economic development. We utilized provincial-level data from the General Statistics Office of Vietnam, covering the period from 2000 to 2022. Our research employed the CS-ARDL model to address issues of non-stationarity, endogeneity, and cross-sectional dependence. Subsequently, we used the AMG and CCEMG models to estimate the long-term relationships between private investment and economic development. After establishing robust evidence of these relationships, we further employed the Dumitrescu and Hurlin panel causality test to examine the causal relationships between private investment and other variables within the model.

According to the General Statistics Office of Vietnam [59], the private sector employs over 70% of the labor force in the country, a figure expected to continue its rapid growth in the coming years. Furthermore, over 96% of private enterprises in Vietnam are of small to medium scale, and there is a noticeable increase in the number of startup businesses. This foundation has enabled Vietnam to achieve rapid progress in sustainable economic development. It underscores the fact that policies promoting private investment contribute not only to economic growth but also to advancements in science and technology, environmental protection, and, notably, sustainable poverty reduction.

Our study demonstrates that a labor force developed through education plays a vital role in driving private investment and, consequently, sustainable development, including poverty reduction. Therefore, education policies should aim to improve access to education, particularly for individuals living in remote and economically disadvantaged regions of Vietnam. An important subsequent challenge to further stimulate private investment is expanding export markets. However, Vietnam's exports currently face multiple challenges, including foreign technical barriers such as clean energy transitions and low-carbon production. Additionally, the impact of the COVID-19 pandemic has reduced market demand, leading to increased inflation rates in many countries. Urgent solutions include government-backed preferential credit packages to facilitate investment and enhance competitiveness, support green projects to address waste and chemical reduction, and meet technical requirements in emerging markets. Moreover, the government must continue its negotiations for more free trade agreements, ensuring the faithful implementation of these commitments. Once these issues are addressed, they will pave the way for addressing other concerns, such as financial market development, labor force training, and investments in science and technology.

It is important to acknowledge that our research is not without limitations, primarily concerning data availability. These constraints may impact the accuracy and generalizability of our findings. We emphasize that the main barrier to our study was data collection. The results obtained from this research can serve as a basis for future studies that employ alternative statistical methods and diversify economic development assessment indicators.

5. Declarations

5.1. Data Availability Statement

The data presented in this study are available in the article.

5.2. Funding

The author received no financial support for the research, authorship, and/or publication of this article.

5.3. Institutional Review Board Statement

Not applicable.

5.4. Informed Consent Statement

Not applicable.

5.5. Declaration of Competing Interest

The author declares that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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