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The impact of public investment on economic growth in Vietnam

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Abstract: This paper examines the role of public investment in promoting economic growth in Vietnam, providing a theoretical and empirical framework for understanding its impact. It seeks to evaluate the effectiveness of public investment in stimulating long-term economic development and to propose policy recommendations for improving its efficiency. Accordingly, the research utilizes time-series data from 1995 to 2019 and applies the autoregressive distributed lag (ARDL) model to assess both the short-term and long-term effects of public investment on economic growth. The study also conducts an extensive review of domestic and international literature to establish the theoretical basis for analysis. The findings indicate a significant positive relationship between public investment and Vietnam's economic growth. However, while public investment contributes to long-term economic expansion, its short-term effects appear less pronounced compared to private and foreign direct investments. Inefficiencies in resource allocation and governance issues are identified as key challenges limiting the effectiveness of public investment. Public investment plays a vital role in sustaining Vietnam's economic growth, but its efficiency must be enhanced through improved governance, strategic project selection, and effective allocation of resources. Strengthening institutional frameworks and promoting public-private partnerships are crucial to maximizing the benefits of public investment. In addition, the study provides valuable insights for policymakers, emphasizing the need for policy reforms to enhance the efficiency and impact of public investment. Recommendations include legal improvements, decentralization of budget allocation, better financial planning, and increased transparency in investment projects to support sustainable economic development.

Keywords: *Economic Growth, Public Investment, Sustainable Growth, Vietnam.*

1. Introduction

The Vietnamese government's pursuit of increased public investment efficiency is vital for reaching its economic targets. From enhancing project management to reducing inefficiencies, these efforts are pivotal. Over time, Vietnam has shifted towards a more balanced investment model, incorporating private and foreign capital to complement state-led infrastructure projects. Public investment has always been a significant component of Vietnam's economic strategy, contributing extensively to GDP. From 1995 to 2019, the nation witnessed a surge in total social investment, rising from 72,447 billion VND in 1995 to over 2 trillion VND in 2019, averaging a growth rate of 14.89% per year. Notably, the non-state sector expanded rapidly, growing 47.1 times, while FDI grew 21.34 times, and the state sector 20.85 times. Despite economic downturns like the 2008 financial crisis, public investment growth persisted, largely driven by government initiatives.

The state sector's dominance in social investment peaked at 59.81% in 2001, tapering off to 33.68% by 2019, reflecting a broader pivot towards private sector investment. By 2015, private investments overtook state contributions. This shift was further propelled by Vietnam's WTO membership in 2007,

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which boosted FDI and diversified the investment landscape. Public investment, however, continued to focus on critical infrastructure and socio-economic development projects, playing an essential role in maintaining economic stability. Nearly 39.5% of public investment from 2005 to 2019 was allocated to infrastructure sectors, underscoring the government's commitment to infrastructure-driven growth. Investments in education, healthcare, and research have also grown, aligning with sustainable development goals.

In summary, public investment has long been a driver of economic efficiency; however, inefficiencies and unsustainable growth patterns underscore the necessity of reassessing its role. Analyzing the impact of public investment on Vietnam's economic growth from 1995 to 2019 using the ARDL model is crucial. The results of this research will serve as a foundation for policy recommendations aimed at enhancing the efficiency of public investment, thereby contributing to Vietnam's economic growth and sustainable development objectives up to 2030. The findings of this study are intended to inform more effective public investment strategies aligned with the country's long-term development goals.

2. Research Overview

2.1. Human Capital and its Role in Economic Growth

Easterly [1] critiques the oversimplified view of a direct link between human capital and economic growth, stressing the need to consider factors like political stability, institutional quality, and economic structures. He argues that ignoring these complexities leads to incomplete conclusions. While proxies like life expectancy and educational attainment are commonly used to measure human capital, they fail to account for quality. For instance, Cervellati and Sunde [2] highlight that life expectancy overlooks educational quality. Similarly, the World Bank's Human Capital Index faces criticism for its lack of focus on qualitative aspects like skills. Barro [3] which suggests poorer nations can catch up by investing in human capital, also overlooks local conditions that affect returns on investment. The literature often prioritizes formal education while neglecting vocational training and informal learning. The OECD emphasizes the need for policies that include health interventions and non-formal skill development to maximize human capital's potential. Additionally, the long-term benefits of human capital investments, such as early childhood education, are often delayed, making short-term assessments inadequate. Integrating health and education investments, such as school health programs, is crucial to improving educational outcomes and economic productivity.

2.2. The Role of the Financial Sector

The "crowding out" theory, explored Barro [3] posits that increased government borrowing raises interest rates, potentially limiting private sector access to capital. However, empirical evidence shows that crowding-out effects are not uniform and depend on various conditions. As economies expand, government spending may not always restrict private investment, especially when competition for loans is minimal. Most studies emphasize interest rates as the key mechanism for crowding out, but this overlooks critical factors like investor confidence and overall market conditions. For instance, during times of uncertainty, even low interest rates may not stimulate private investment due to perceived risks. While Safdar and Malik [4] stresses the importance of domestic credit, excessive government debt can hinder long-term growth by reducing private sector investment crucial for innovation. Additionally, poor fiscal management can worsen crowding-out effects, while strong governance can mitigate them. Many studies also fail to integrate the financial sector's role with other areas like labor markets and technology. More comprehensive analyses are needed to understand how different economic sectors contribute to growth across varying development stages.

2.3. Foreign Direct Investment (FDI) and International Trade

Zhang [5] found a positive relationship between FDI and economic growth, though subsequent research suggests this link is not universally applicable. The World Bank emphasizes that FDI alone does not ensure growth, highlighting the need for complementary factors such as human capital and

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financial development to realize its full potential. Borensztein, et al. [6] and Almfraji and Almsafir [7] argue that a well-developed financial sector enhances FDI's positive impact, while underdeveloped systems may limit these benefits. Carkovic and Levine [8] warns that over-reliance on FDI can stifle local industry and entrepreneurship, threatening long-term sustainability. Critics also note that export-led growth strategies, reliant on FDI, are vulnerable to external shocks, such as trade barriers or fluctuations in global demand. Furthermore, a country's absorptive capacity, including its human capital and institutional strength, significantly influences its ability to benefit from FDI [9]. Therefore, while FDI offers growth potential, understanding local conditions and long-term effects is essential to fully harness its benefits

2.4. Public Investment and its Role in Economic Development

Munnel [10] proposed that public investment could drive economic growth, though empirical studies show mixed results. While Munnel [10] found a positive link, Barro [3] argued that excessive public spending might crowd out private investment by raising interest rates or competing for resources. The impact of public investment thus depends on factors like governance, project selection, and implementation effectiveness. Efficient fiscal management plays a key role, with stronger frameworks yielding greater benefits. Moreover, the effectiveness of public investment differs across contexts, as emerging economies may experience different dynamics from advanced economies [11]. Additionally, short-term demand stimulation, as suggested by Keynesian theory, may not always translate into long-term growth [12]. Finally, measurement challenges, including data limitations, complicate assessments of public investment's growth effects, necessitating a nuanced approach that accounts for variability and governance quality.

2.5. Public Investment in Emerging Economies

Unnikrishnan and Kattookaran [13] found a positive link between public investment and economic growth. This inconsistency complicates the establishment of a clear causal relationship. Tanzi and Davoodi [14] also highlight the risk of public investment crowding out private investment, as increased government spending can drive up interest rates or create resource competition. The effects of public investment further depend on regional factors like institutional quality, governance, and economic structure. Studies by Wang [15] and Andraz and Pereira [16] emphasize infrastructure investment in East Asia and Southern Africa, but these findings may not be applicable to regions with different challenges, such as Latin America or Sub-Saharan Africa.

2.6. Crowding Out vs. Crowding In: A Critical Debate

Barro [3] contends that public spending can divert resources away from the private sector, potentially limiting its growth. However, empirical evidence on this issue remains mixed, creating uncertainty about the overall impact of public investment on private sector development. Aschauer [17] observed significant productivity gains from public investment in developed economies, but critics like the US Congressional Budget Office [18] argued that private investment may have a more substantial effect on output. In contrast, Khan and Kumar [19] stressed the importance of public investment in developing economies, where infrastructure deficits are more severe. This variation complicates the effort to generalize about public investment's effect on growth. Empirical studies often face challenges in measuring the impact of public investment, with factors such as data quality, time lags between investment and observable results, and external economic conditions distorting findings. The distinction between short-term and long-term effects is frequently unclear. Inefficiencies in public spending, often driven by poor financial management or governance, can hinder the growth potential of investment, yet this aspect is often overlooked in studies that focus primarily on direct effects. Lastly, financing public investment through debt raises sustainability concerns, particularly in emerging economies with high debt levels, which are often not adequately addressed in discussions of the benefits of public investment.

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3. Research Methodology and Data

3.1. Research Model

This study builds on the work of Bukhari, et al. [20] combining the neoclassical growth theory of Solow, which states that output growth depends on three main factors: capital (K), labor (L), and total factor productivity (A). Since measuring total factor productivity is difficult, the production function will have the following general equation: Y = f (K, L)

To examine the impact of public investment specifically on economic growth, the capital investment factor is divided into three components: public investment (GOV), private investment (PRI), and foreign direct investment (FDI). The production function then becomes: Y = f (GOV, PRI, FDI, GL) (1)

Rewriting equation (1): GGDPt = α0 + α1 *GOVt* + *α2* PRIt + α3 *FDIt* + *α4* GLt (2)

The equation above shows that the economic growth rate (GGDP) depends on the variables: the growth rate of public investment (GOV), the growth rate of private sector investment (PRI), the growth rate of foreign direct investment (FDI), and the annual growth rate of the labor force (GL). The signs of all coefficients α1, α2, α3, and α4 are expected to be positive. The Autoregressive Distributed Lag (ARDL) model in this study can be written as follows:

$$GGDP_t = \alpha + \sum_{i=1}^{p0} \beta_{i0}\, GGDP_{t-i} + \sum_{j=0}^{p1} \beta_{j1}\, GOV_{t-j} + \sum_{k=0}^{p2} \beta_{k2}\, PRI_{t-k} + \sum_{l=0}^{p3} \beta_{l3}\, FDI_{t-l} + \sum_{m=0}^{pn} \beta_{mn}\, GL_{t-m} + \varepsilon_t$$

3.2. Data Source

This study uses time-series data with an annual frequency from 1995 to 2019. The Gross Domestic Product (GDP) data is collected from the World Bank's database. The growth rate variables for public investment (GOV, %), private sector investment (PRI, %), foreign direct investment (FDI, %), and annual labor force growth (GL, %) are collected from the General Statistics Office of Vietnam (GSO) for the period from 1995 to 2019.

3.3. Regression Methodology

To assess the influence of public investment growth on economic growth, this study employs the ARDL model. By combining the strengths of the Vector Autoregressive (VAR) model and Ordinary Least Squares (OLS) regression, ARDL is highly adaptable and effective for time-series analysis. Its key advantages include: (i) its suitability for small sample sizes, (ii) the ability to estimate a single equation, unlike systems of equations used in Engle-Granger or Johansen tests, (iii) its application with variables that have different lag structures, whether stationary at I(0), I(1), or both, and (iv) its short-term estimation capability through an ECM model that retains degrees of freedom [21].

The process of applying the ARDL model in this research involves several steps: (i) Unit Root Test: This initial test checks the stationarity of variables, ensuring they are either stationary at level (I(0)) or at first difference (I(1)). Failure to account for stationarity can lead to misleading regression outcomes if non-stationary data is regressed with stationary data [22]. The Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test are used to examine the stationarity of the variables. The null hypothesis (H0) of non-stationarity is rejected or accepted based on the t-statistic of the lag length and the t-statistic value itself; (ii) ARDL Bounds Test: This test includes two main procedures. First, an ARDL equation is estimated using OLS to check for a long-term relationship between the variables. An F-test is then conducted to test the joint significance of the lagged coefficients. The null hypothesis (H0) posits no long-term relationship, while the alternative hypothesis (H1) suggests such a relationship exists. Cointegration is determined by comparing the computed F-statistic to critical values, with the presence of cointegration indicated if the F-statistic exceeds the upper bound; (iii) Estimation of Long-Run and Short-Run Coefficients: After confirming long-term relationships, the long-run and short-run coefficients are estimated. The error correction term (ECM) reflects how changes in explanatory

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variables and deviations from long-term equilibrium affect the dependent variable [23]; (iv) Diagnostic Tests: The ARDL model's reliability is ensured through tests for stationarity, optimal lag length, autocorrelation, heteroscedasticity, and model specification issues [22]. These tests are vital to validate the model's robustness during regression analysis.

Main reasons for choosing the ARDL model:

(i) Flexibility in data processing: The ARDL model efficiently handles time series data of different lengths. It allows analyzing the relationship between economic variables in both the short and long run. Unlike some other methods, it does not require all variables to have the same level of integration.

(ii) Addressing the limitations of traditional models: The ARDL model solves the endogeneity problem between variables. It effectively solves the problems of autocorrelation and heteroscedasticity. It allows estimating both short-term and long-term impacts simultaneously.

Suitable for the characteristics of Vietnam's economic data: The period from 1995 to 2019 witnessed significant economic fluctuations. It allows examining the multivariate relationships between public investment and other economic indicators. The model can be adjusted to reflect the unique development trends of Vietnam.

(iii) Statistical advantages: It allows to check the stability of economic relationships. It minimizes problems related to model reliability. It helps to reduce errors in impact estimation.

(iv) Forecasting ability: It provides reliable forecasting results. The model allows to analyze the spillover effects of public investment. It supports economic policy planning.

The application of the ARDL model in this study is not only a technical choice but also a scientific approach to deeply understand the relationship between public investment and economic growth in Vietnam during the important period from 1995 to 2019. This choice is very suitable to provide a comprehensive and accurate perspective on the role of public investment in Vietnam's economic development.

4. Model Results and Discussion

4.1. Model Results

4.1.1. Unit Root Test

The study employs the Dickey-Fuller test to check the stationarity of the variables. The results (Table 1) show that the variables GOV and GL are stationary at level (I(0)), while GDP, PRI, and FDI are stationary at the first difference (I(1)) at the 5% significance level. According to Pesaran and Shin [24] and Hamuda, et al. [25] when variables have different orders of integration, I(1) or I(0), the ARDL method is the most suitable for empirical research. The GDP variable has a statistical value of -1.280, indicating that it is non-stationary. The variables D(GDP), GOV, and D(FDI) have statistical values below -3.0, indicating that these variables are stationary. The PRI variable has a statistical value of -0.603, showing that it is non-stationary. However, D(PRI) has a statistical value of -2.869, suggesting that it is stationary. The FDI variable, with a value of -3.470, indicates non-stationarity, while the GL variable, with a statistical value of -3.750, suggests that it is stationary. These results reflect the complex interaction between different macroeconomic variables and their statistical significance. The fact that GDP is non-stationary, while D(GDP) is stationary, suggests that although the overall level of GDP may not require intervention, the rate of GDP growth is an important factor that should be monitored and possibly adjusted. This underscores the importance of analyzing both the level and dynamics of key economic indicators. Similarly, the difference between PRI (non-stationary) and D(PRI) (stationary) shows that although the current level of PRI may be acceptable, the rate of change is concerning and requires attention. This highlights the need to consider both the current state and the trajectory of economic variables when formulating policy. Furthermore, the contrast between FDI (non-stationary) and D(FDI) (stationary) suggests that while the level of foreign direct investment may be stable, the rate of change in FDI is a matter of concern that policymakers should address.

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Table 1.
Results of testing the stationarity of variables.

Variable	Statistical value t	Result	Appropriate level
GDP	-1.280	Don't stop	
D(GDP)	-3.825	Stop	I(1)
GOV	-4.332	Stop	I(0)
PRI	-0.605	Don't stop	
D(PRI)	-2.869	Stop	I(1)
FDI	-3.470	Don't stop	
D(FDI)	-3.603	Stop	I(1)
GL	-3.750	Stop	I(0)

4.1.2. ARDL Bounds Test

According to Pesaran, et al. [21] the ARDL bounds test is a procedure used to determine whether a long-run relationship or cointegration exists between the variables. The test has two hypotheses: Null hypothesis (H0): $\lambda 1 = \lambda 2 = \lambda 3 = \lambda 4 = \lambda 5 = 0$, indicating that there is no cointegration relationship between the variables, meaning no long-term relationship exists; Alternative hypothesis (H1): $\lambda 1 \neq 0$; $\lambda 2 \neq 0$; $\lambda 3 \neq 0$; $\lambda 4 \neq 0$; $\lambda 5 \neq 0$, indicating the existence of a cointegration relationship, meaning a long-term relationship exists between the variables.

The F-test is performed for the elasticities of the variables at their lags. If the F-statistic exceeds the upper bounds critical value of I(1) at the 5% significance level, the null hypothesis (H0) is rejected, and the variables are concluded to have a cointegration. If the F-statistic falls between the upper bounds (I(1)) and lower bounds (I(0)), no definitive conclusion can be drawn about the existence of cointegration. The error correction term (ECT) will help determine the cointegration relationship. If the F-statistic is below the lower bounds of I(0) at the 5% significance level, the null hypothesis (H0) is accepted.

The results of the bounds test (Table 2) show that the F-statistic is greater than the upper bounds critical value of I(0) at both the 5% and 2.5% significance levels, with values of 4.01 and 4.49, respectively. Therefore, we can conclude that there is a cointegration relationship between the dependent variable (GDP) and the independent variables.

Table 2.
ARDL envelope test results.

Number of steps	Value F-statistic	Limit values of the contours			
k	F statistics	90%	95%	97.5%	99%
		I(0) I(1)	I(0) I(1)	I(0) I(1)	I(0) I(1)
4	5.02389	2.45 3.52	2.86 4.01	3.25 4.49	3.74 5.06

4.1.3. Selection of ARDL Model Lag Order

Based on the AIC and SBC criteria, the optimal lag length for the ARDL model is (1, 1, 1, 1, 1).

4.1.4. Estimation of Long-Run Coefficients of the ARDL Model

Table 3 presents the results of estimating the long-run coefficients of the ARDL model (1, 1, 1, 1, 1). The long-run impact calculations from the ARDL model show that public investment growth (GOV), private sector investment growth (PRI), and foreign direct investment growth (FDI) all have a significant positive impact on economic growth (GDP) in the long run. However, the growth of the labor force (GL) has an inverse effect compared to the expected sign. specifically, the impact coefficient is (-0.92900), and it is significantly significant at the 10% level.

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Table 3.
Estimated long-run coefficients of the ARDL model.

Variable	Coefficient	Standard deviation	Statistics	P-value
GOV	0.04764*	0.02317	2.05541	0.0596
PRI	0.05435**	0.02098	2.58996	0.0224
FDI	0.02179*	0.01146	1.90131	0.0763
GL	-0.92900*	0.48708	-1.90727	0.0788

Note: ***, **, * represent significance levels of 1%, 5% and 10% respectively.

4.1.5. Estimation of Short-Run Coefficients of the ARDL Model

Table 4 presents the results of estimating the short-run coefficients from the error correction model (ECM) based on the ARDL approach with the selected lag order. The results show that the impact of public investment on Vietnam's economic growth in the short run is not significant. Meanwhile, the impact of private investment and foreign investment remains significant, with the coefficients being positive and significantly significant at the 10% and 5% levels, respectively. The coefficient for labor force growth still shows a negative value and is significantly significant at the 10% level. The coefficient of the error correction term ECM(-1) is significantly significant at the 1% level, ensuring that the study confirms the existence of a long-run cointegration relationship as identified in the boundary test section.

Table 4.
Results of short-term impact calculation using the error correction model (ECM) based on the ARDL approach.

Variable	Coefficient	Standard deviation	Statistics	P-value
C	0.04334	0.00782	5.54031	0.0001
D(GOV)	0.01342	0.01299	1.03289	0.3205
D(PRI)	0.01957*	0.01010	1.93648	0.0749
D(FDI)	0.01391**	0.00494	2.81614	0.0146
D(GL)	-0.49599*	0.27988	-1.77204	0.0998
ECM (-1)	-0.67864***	0.11840	-5.7136	0.0001
R-Squared	0.76854	Adjusted R-squared	0.70046	

Note: ***, **, * represent significance levels of 1%, 5% and 10% respectively

4.1.6. Diagnostic Tests

To ensure the reliability of the model, diagnostic tests for model shortcomings were conducted, including the RESET test for model misspecification, the Lagrange multiplier test to check for autocorrelation, and the heteroskedasticity test (Table 5). The results of these tests indicate that the model is reliable and valid for estimating both long-run and short-run coefficients.

Table 5.
Diagnostic tests.

Inspection	Statistical	Statistical value	P-value
Function form	F-statistic	0.11089	0.7449
Autocorrelation	F-statistic	1.618511	0.2420
Variance of error	F-statistic	1.26258	0.3404

Additionally, diagnostic tests on the residuals were conducted. The Cumulative Sum of Recursive Residuals (Figure 1) and the Cumulative Sum of the Square of Recursive Residuals (Figure 2) both fall within the standard range corresponding to a 5% significance level. Therefore, it can be concluded that the residuals of the model are stable, and as a result, the model is stable.

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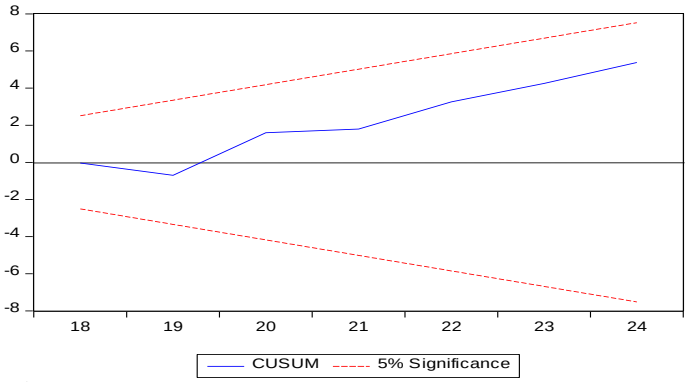

Figure 1.
Cumulative Sum of Residuals (CUSUM) Test.

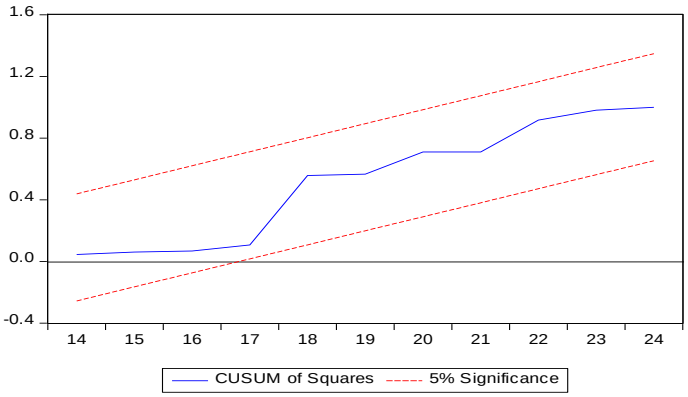

Figure 2.
Cumulative sum adjusted residuals test (CUSUMSQ).

4.2. Discussion of Results

The results from the quantitative analysis in this study underscore the significant role that public, private, and foreign investments play in fostering long-term economic growth. Consistent with the findings of Khan and Kumar [19] and Unnikrishnan and Kattookaran [13] which emphasize the pivotal role of public investment in stimulating economic growth, this research supports the notion that public investment remains a crucial driver of economic expansion, particularly in developing economies. These prior studies highlight how public investments, especially in infrastructure, can create an enabling environment for sustained economic development.

The study found that a 1% increase in public investment results in a 0.047% increase in economic growth, while a 1% increase in private investment leads to a 0.054% growth rate. This indicates that while public investment is essential for long-term economic growth, private investment tends to have a slightly more pronounced effect. This finding mirrors the broader literature on the importance of enhancing both public and private investments to ensure sustainable development. The positive impact of public investment on economic growth in Vietnam is aligned with previous studies, including Nguyen and Trinh [26] all of which highlight the positive relationship between public investment and economic growth. However, a key distinction in this study is the nuanced explanation provided for the limited short-term effects of public investment, which previous research had not fully explored.

One critical factor identified in this study is that public investment primarily focuses on long-term infrastructure projects. These projects typically require extended periods to complete and start yielding economic returns. This time lag accounts for the observed short-term insignificance of public investment's impact on growth. This explanation offers a more comprehensive understanding compared

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to earlier studies, which did not delve into the reasons behind the delayed effects of public investment on economic growth. In contrast, private and foreign direct investments, which often target shorter-term projects, tend to have more immediate economic impacts.

The study also offers additional insights compared to previous research, particularly in its emphasis on the allocation of resources and the efficiency of public investment. While Khoi and Thanh [27] focus on the varying impact of public investment across different sectors, our findings suggest that the inefficiency of resource allocation can significantly diminish the potential benefits of public investment. Poor financial management and a lack of transparency in the allocation process are critical factors that can undermine the effectiveness of public investment. This observation expands upon prior studies by highlighting the need for better governance and oversight to ensure that public investment delivers the desired results.

Furthermore, this study considers the impact of public debt on the sustainability of public investment, a concern raised by Tran and Nguyen [28]. Their research emphasizes the risks associated with relying on public debt to finance public investment, as excessive debt can reduce the capacity to fund future investments and create long-term financial burdens. Similarly, Hoang and Nguyen [29] point out that the effectiveness of public spending varies across regions and depends on factors such as governance and resource management. This paper agrees with those findings, underscoring that the quality of public investment management, including effective governance and private sector participation, is essential for improving its efficiency and impact.

Another important contribution of this study is its comparison of public investment with private investment and FDI. While prior research suggests that private investment and FDI have a more immediate effect on economic growth, our study demonstrates that public investment, although slower to produce results, is integral to long-term growth by fostering improvements in infrastructure and the broader business environment. This distinction emphasizes the complementary roles of different types of investment and the need for a balanced approach to economic policy.

In light of these findings, the study concludes that while public investment is a key contributor to long-term economic growth, its effects are less evident in the short term compared to private and foreign investments. This suggests the importance of carefully designing public investment policies that strike a balance between short-term needs and long-term objectives. To sustain economic growth, policymakers should prioritize investments in technology, productivity, and infrastructure, especially in a context where labor force growth is slowing. This approach will be crucial for maintaining Vietnam's economic trajectory in the coming years.

Ultimately, this study contributes to the broader understanding of how public investment influences economic growth, offering new insights into the timing of its effects, the role of efficient resource allocation, and the importance of governance in maximizing the impact of public spending. These findings provide a valuable foundation for future policy decisions aimed at fostering sustainable economic development in Vietnam and other developing economies facing similar challenges.

5. Conclusion and Limitations

5.1. Conclusion

The results indicate that while public, private and foreign investment positively affect long-term economic growth, the impact of public investment is less pronounced than the contribution of the private sector. Notably, the short-term impact of public investment is insignificant, possibly due to the long duration of public infrastructure projects. In contrast, private and foreign investment tend to yield faster returns, underscoring their pivotal role in economic performance. These findings highlight the need for policy reforms to improve the efficiency of public investment. To address this, state agencies must adopt market-oriented principles, take advantage of technological innovations and promote public-private partnerships (PPPs). By encouraging private sector participation in infrastructure and public services, Vietnam can leverage the strengths of both sectors, ensuring mutual benefits and sustainable outcomes. However, public investment management faces significant challenges. Limited state resources

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and growing demands require efficient allocation and use of funds. This is compounded by the complexity of evaluating public investment projects, which are mainly financed through the state budget rather than direct capital investment by implementing agencies. This highlights the urgency of reforming the public investment management model to improve efficiency and outcomes. To optimize public investment, several strategies are recommended.

Firstly, continue to improve the legal framework, minimize overlap and lack of synchronization between laws related to public investment. To enhance the legal framework for public investment, it's essential to reduce overlap and inconsistencies among related laws. The legal system for public investment has gradually been improved, particularly with the 2019 amendments to the Public Investment Law. These changes introduced significant administrative reforms, addressing overlapping regulations, decentralizing authority, and establishing a transparent, unified process for managing public investment. The allocation of capital is now aligned with development goals at both national and regional levels, ensuring a more strategic approach. Despite these advances, ongoing reviews of public investment laws and policies are necessary to ensure they remain effective and adaptable to changing realities. The government should continue refining legal guidelines and issue timely decrees to fully support the Public-Private Partnership Law. Clear legislative frameworks help foster trust among investors by ensuring consistency and legal clarity. Moreover, legal documents must emphasize practicality and feasibility, taking into account feedback from relevant stakeholders, including non-governmental entities. Streamlining procedures and fostering regional cooperation, while curbing group interests, are crucial for optimizing public investment and driving balanced development.

Second, perfect the assignment and decentralization of the allocation of the State Budget, gradually reduce the situation of equal division, and increase the initiative of local budgets to carry out socio-economic tasks. The government should strengthen leadership and direction, emphasizing decentralization and clear assignment of roles and responsibilities, while ensuring coordination, supervision, and timely evaluation. Effective public investment management should be based on comprehensive regional development plans that prioritize projects to leverage regional advantages. A firm commitment is needed to reduce the number of new projects, focusing instead on completing approved, ongoing projects. Strict control over project numbers and capital allocation timelines, as mandated by the Public Investment Law, will ensure continuity, effectiveness, and achievement of investment goals. Decision-making in public investment should be grounded in balanced financial planning, and decision-makers must be held accountable to minimize errors and risks from the initial project approval stage. Delegation of authority for monitoring, evaluation, and supervision in basic construction management should be increased, ensuring thorough oversight. Additionally, the government could pilot breakthrough mechanisms, assess their effectiveness, and institutionalize successful models into law. Encouraging self-reliance and supporting those who take initiative and responsibility for the common good is essential. Collaboration between government levels and localities in public investment management must be enhanced. The roles of all agencies involved—planning, finance, construction, and project ownership—should be clearly defined to avoid overlap, ensuring a streamlined, effective management process.

Third, complete the work of developing a medium-term financial plan, ensuring that public investment expenditure is limited within resource capacity and consistent with the Government's policy priorities, effectively overcoming the slow disbursement of capital, ensuring the progress of important national projects and key projects. The development of a medium-term financial plan is critical to ensuring that public investment spending aligns with available resources and the government's policy priorities. This approach effectively addresses delays in capital disbursement and ensures the timely completion of key national and priority projects. The medium-term public investment plan, a five-year framework, is integral to the state's overall investment strategy, reflecting comprehensive regional development plans and aligned with annual state budget allocations. This plan provides a balanced resource allocation, allowing flexibility to address urgent projects and integrate additional state budget revenues. It helps prevent the spread of investment across too many projects, focusing instead on completing critical ones. Effective

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management of the medium-term public investment plan should emphasize long-term socioeconomic goals, ensuring timely capital allocation to important projects while penalizing delays in disbursement. Public investment management should include project operation and maintenance as part of the overall investment process, holding project owners accountable for the performance and quality of their projects. Future project approvals should be tied to past performance, and any changes in the value of public assets during operation should be closely monitored. There should also be strict oversight throughout project execution, including budgeting for operational and maintenance costs, and enforcing penalties for non-compliance in construction supervision, acceptance, and financial settlement.

Fourth, it is essential to accelerate the restructuring of public investment, enhancing its role as a catalyst to attract private sector investments, creating new opportunities and driving sustainable socioeconomic development. Public investment is essential for promoting sustained economic growth and driving development. For public investment to be effective, it must be carefully planned, selected, and executed. Priority should be placed on key national programs and projects that offer significant contributions to the country's economic and social progress. Investments should focus on areas such as infrastructure, education, healthcare, and social welfare to strengthen human capital and improve public sector management. Reforming public investment involves reducing its share in total societal investment and enhancing the quality and efficiency of spending. A comprehensive review is needed to eliminate ineffective projects and concentrate resources on those that can generate lasting benefits. Proper planning and execution are crucial to avoid changes during implementation, ensuring that projects meet legal and strategic objectives. Strict oversight, including audits and accountability measures, is necessary to prevent misuse of funds and guarantee transparency. Public funds should be allocated to projects that the private sector cannot handle, avoiding duplication and ensuring alignment with national priorities. To further optimize investment, the government should encourage private sector involvement, particularly through public-private partnerships (PPPs). These partnerships can help improve efficiency by utilizing private resources, innovation, and expertise, especially in infrastructure and social services. For PPPs to succeed, they must offer returns for private investors, with projects selected through competitive bidding. The government may need to provide financial support to ensure these projects are viable, sharing risks with investors and ensuring the proper allocation of state resources to maintain trust and encourage further private sector engagement.

Fifth, it is necessary to strengthen inspection, monitoring, and evaluation of the implementation of public investment plans to ensure transparency and accountability throughout the project implementation process. This not only helps to detect early violations or shortcomings but also creates a clear and open environment, thereby improving the effectiveness of public investment resource utilization and protecting the common societal interests. Public investment must be continuously monitored, audited, and evaluated independently and transparently throughout the process, from planning to construction and operation. This helps avoid closed, opaque practices in investment projects. All inspection, auditing, and monitoring results must be evaluated, concluded, and propose corrective measures, including timelines and outcomes. Projects that exceed budget or are delayed by more than three months must be reported to the competent authorities and addressed before further implementation. Some proposals to improve public investment management include enhancing transparency and monitoring, improving the public disclosure of investment projects so that communities and independent organizations can participate in oversight, reducing budget leakage, and promoting sustainable growth. It is also necessary to establish clear criteria for assessing the results and effectiveness of projects after completion, including factors such as social benefits, environmental impacts, costs, and the ability to recover investment. Additionally, independent consulting organizations should be used, and public audits should be conducted to assess project quality, with audit results publicly reported to the National Assembly. This approach will make public investment processes more effective and sustainable.

5.2. Limitations

This research focuses on assessing the role of public investment in driving economic growth but

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does not take into account private and foreign investments, which are also critical to the economy. The dataset used only extends to 2019, meaning the analysis does not reflect the significant economic disruptions caused by the Covid-19 pandemic from 2020 to 2023. This omission is a considerable limitation, as the pandemic has profoundly affected economic dynamics, reshaping industries and investment patterns. To offer a more thorough understanding of how investment influences economic growth, future research should broaden its scope to include private and foreign investments, along with the pandemic's economic impacts. Expanding the analysis in this way would yield more comprehensive insights, ultimately supporting the formulation of more adaptive and effective economic policies in the evolving global landscape.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Author contributions:

Writing – review & editing: TMNL, TTNH, MNN; Writing – original draft: TMNL, TTNH, QCT; Visualization: QCT, DLN; Validation: TMNL, MNN; Supervision: TMNL, TTNH; Software: TMNL, TTNH; Resources: TMNL, TTNH; Project administration: TMNL, TTNH; Methodology: TTNH, MNN, QCT; Investigation: TTNH, QCT, DLN; Funding acquisition: TMNL, TTNH; Formal analysis: TTNH, MNN, QCT; Data curation: TMNL, TTNH, MNN; Conceptualization: TMNL, TTNH. All authors have read and agreed to the published version of the manuscript.

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