DOES PUBLIC INVESTMENT STIMULATE ECONOMIC GROWTH IN VIETNAM? AN ARDL APPROACH TO TEST KEYNES THEORIES

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ABSTRACT

Globally and in Vietnam, the short- and long-term impacts of public investment on economic development continue to be fiercely debated. This study employs an autoregressive distributed lag (ARDL) model to analyze the effect of public investment on Vietnam's economic development over the years 1995 to 2019 in order to augment empirical evidence on this topic. According to the empirical results, increasing public, private, and foreign investment all have a long-term positive influence on economic development. However, the short-term effect of public investment has not been confirmed. Furthermore, the effect of public investment on economic growth is less than that of private investment. Based on empirical analysis, policy recommendations for improving the effectiveness of public investment in Vietnam are proposed.

Keywords: public investment; private investment; foreign investment; economic growth; Vietnam

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INTRODUCTION

The intervention of the government is necessary, according to Keynes' theory, in order to tackle the economic crisis and unemployment. This would boost overall economic demand, bolster consumer spending, and inspire entrepreneurs to make investments and start businesses. In the majority of emerging countries, public policies are intended to correct the market's shortcomings and promote healthy operations. They are frequently employed to improve public sector investment and productivity (Muqorrobin, 2015; Awode, 2019; Nguyen & Darsono, 2022). According to the theory of economic growth, the growth rate is dictated by capital formation; thus, fiscal policy is crucial (Topcu et al., 2020; Asandului et al., 2021). In addition, the degree of the spending multiplier determines the extent to which public expenditures may boost total demand and contribute to output growth (Cwik & Wieland, 2011).

The opinion of Keynes is congruent with Vietnam's model of economic development, which has been characterized as the *"development of a multi-component commodities economy, operating according to the market mechanism, with state administration*." After more than three decades of Doi Moi, Vietnam has achieved many remarkable achievements, moving from being an underdeveloped economy to a developing nation that can be classified as a middle-income country. Those accomplishments can be

attributed to a rise in the volume of public investment, which has served as a significant driving factor in encouraging development and economic reform processes in recent years. In Vietnam, public investment has consistently accounted for a higher proportion of GDP than non-state investment and the FDI sector throughout the 2010-2020 period. Public investment is the main direct channel through which the government can invest in the development of national socio-economic infrastructure, promote industrialization and modernization, and contribute to solving social problems such as poverty and unemployment. The Incremental Capital Output Ratio (ICOR) is a basic economic statistic that demonstrates how much additional investment capital is necessary to increase one unit of GDP. The ICOR of public investment in Vietnam went down from 2015 to 2020; more precisely, the ICOR in the period from 2016-2019 was 6.1, which was lower than the level of almost 6.3 that was seen in the period from 2011-2015. Consequently, the demand for public investment in Vietnam is still significant, but the efficiency of public investment has deteriorated, which enhances the necessity for study on the short- and long-term relationships between public investment and Vietnam's economic development in the current period.

Public investment and economic development is a controversial topic with varying opinions and findings from studies conducted throughout the world. The Keynesian, classical, and neoclassical approaches take opposing viewpoints on the general causality between public investment and economic growth. Keynes' theory asserts that government expenditure causes economic growth, but the classical and neoclassical schools contend that this causality actually runs the opposite way. Numerous research into emerging nations indicates that public investment influences private investment and economic development, constituting the first trend. The second tendency, which has effects opposite to the first trend, is mirrored in the findings of several studies conducted in industrialized nations, which assert that public investment predominates over private investment and has little or no influence on economic development, or even has a negative impact. In order to add to the discussion, this study assesses the effectiveness of Vietnam's public investment from 1995 to 2019. This assessment provides empirical evidence on the role of government investment with regards to economic development, and therefore might demonstrate the validity of Keynesian theory in the context of Vietnam.

The rest of this paper proceeds as follows. There is a review of the literature in Section 2. The study's methodology is highlighted in Section 3. Section 4 provides a summary of the main findings. In section 5, conclusions are presented.

LITERATURE REVIEW

In the 1930s' Great Depression, economist John Maynard Keynes argued for the critical importance of public investment in supporting economic growth in his famed book "The General Theory of Employment, Interest, and Money." Economic growth, as seen in aggregate supply and demand, is significantly influenced by public investment. Public investment directly affects aggregate demand as government spending, and aggregate supply as a production function, through the capital factor. Public investment has an indirect effect on aggregate demand through stimulating private investment, and on aggregate supply by attracting private investment. According to Munnell (1992), public investment increases productive capacity by raising resource availability and improving the productivity of already-existing resources. Additionally, public investment is crucial for the creation of public goods that cannot be provided by markets (Aschauer, 1990).

According to Perotti (2007), there are two incompatible transmission mechanisms for public investment into production. On the one hand, the neoclassical theory of the fiscal policy transmission mechanism asserts that an increase in public expenditure after a deficit would cause a drop in private consumption and real wages. In particular, as government spending rises, typical families have higher tax costs, which have a negative impact on their wealth. Current consumption is reduced in anticipation of future tax increases, but workforce supply and production are increased. Modern Keynesian models, on the other hand, suggest that government expenditure may increase the overall labor demand. Labor demand growth might be strong enough to effectively balance the real pay loss caused by a boom in labor supply, boosting the real wage.

The results of empirical studies on the influence of public investment on economic development are still inconsistent and can be either positive, negative, or have no effect. The causes of this discrepancy could be due to different theoretical perspectives, study methodologies, issues with endogeneity and non-linearity in statistical data analysis, and crowding-out or attracting impacts of public spending. Public investment has a favorable impact on economic development, as shown in research by Aschauer (1989), Munnell and Cook (1990), Khan and Kumar (1997), Zou (2006), Bukhari et al. (2007), Afonso and Aubyn (2008), and Meyer (2019). Other studies, such as the works of Ghali and Khalifa (1998) and Phetsavong and Ichihashi (2012) reveal that public investment slows economic expansion. Meanwhile, Swaby (2007) and Unnikrishnan and Kattookaran (2020) find no connection between government spending and growth in their economies. Additionally, investigations by Odedokun (1997) and Ellahi and Kiani (2011) demonstrate that public investment has a short-term negative impact on growth, but a favorable impact over the long term.

In the case of Vietnam, a number of studies have examined the impact of public investment on economic growth in both the short and long term. Typical empirical investigations are those by To (2011), Tran and Le (2014), and Nguyen and Trinh (2018). To (2011) estimated the response functions for the variables of public investment, private investment, and GDP for the period 1986–2010 using the error correcting vector model VECM. The research concludes that both private and public investment have a positive and statistically significant influence on production, although private investment has a greater impact than public investment. Tran and Le (2014) used a distributed lagged autoregression (ARDL) model to analyze the impact of public investment on Vietnam's economic development from 1988 to 2012. Their research demonstrates that the short-term impact of government investment on economic growth is not statistically significant but has a positive influence on growth over the long run. The research of Nguyen and Trinh (2018) provides consistent evidence of the favorable benefits of governmental and private investment on GDP development in Vietnam by sector. Their results indicate that public investment not only encourages private investment, but also improves GDP over time.

The findings of previous research on this subject are quite varied, and the issue needs to be investigated more in the specific settings of particular countries. As a result, the aim of this study was to provide more evidence of the influence of public investment on economic development in both the short term and the long term within the context of Vietnam. Simultaneously, the effect of governmental investment is compared with the influence of private investment and foreign investment. Under the backdrop of Keynesian theory, the researchers contend that government intervention in the market via investment influences Vietnam's economic development. Thus, the following are the study's hypotheses:

H1: Public investment positively affects economic growth in the short run.

H2: Public investment positively affects economic growth in the long run

EMPIRICAL MODEL

Model specification

Besides inheriting previous studies by Bukhari et al, (2007), Kandenge (2010), and Ellahi and Kiani (2011), this study is based on Solow's neoclassical economic growth theory in which output growth depends on three main factors: capital (K), labor (L), and total factor productivity (A) (Mankiw, 2009). The author temporarily leaves out the productivity of aggregate factors, which is difficult to measure. The production function will have the following general equation:

$$Y = f(K, L)$$

To investigate the impact of public investment on economic growth, the investment capital factor will be broken down into three components: public investment capital (GOV), private investment capital (PRI), and foreign direct investment capital (FDI). With GL representing the labor force growth rate, the production function thus becomes:

$$Y = f(GOV, PRI, FDI, GL) \quad (1)$$

Alternatively:

$$GGDP_t = \alpha_0 + \alpha_1 * GOV_t + \alpha_2 * PRI_t + \alpha_3 * FDI_t + \alpha_4 * GL_t \quad (2)$$

The above equation shows that the economic growth rate (GGDP) depends on the growth rate of public investment capital (GOV), the growth

rate of non-state investment capital (PRI), the growth rate of FDI (FDI), and the annual labor force growth rate (GL). The signs of coefficients α1, α2, α3, α4 are all expected to be positive. The autoregressive distributional delay (ARDL) model in the study can be written in the following form:

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

Data

This study uses time series data with annual frequencies for the period 1995-2019. Gross domestic product data (GDP) is collected from the World Bank database. The variables, including public investment capital growth rate (GOV, %), non-state investment growth rate (PRI, %), foreign direct investment growth rate (FDI, %) and annual labor force growth rate (GL, %) are obtained from the General Statistics Office of Vietnam (GSO).

Estimation technique

This study uses an autoregressive distributional lag (ARDL) model to assess the impact of public investment growth on economic growth. Considered a combination of the vector autoregression (VAR) and least squares regression (OLS) models, ARDL offers great flexibility and usability when it comes to analyzing time series data. The ARDL model possesses certain advantages over other models. In particular, it is (i) suitable for a small sample size, (ii) estimates one equation instead of a system of equations like the Engle- Granger and Johansen test, (iii) can be done with variables of different lags, regardless of the order of difference (I(0), I(1), or both), and (iv) performs short-term calculation with the ECM model by linear transformation without losing degrees of freedom (Pesaran et al., 2001). Applying the ARDL model to our study includes the following steps.

Unit root test

The unit root test is a crucial initial step in ARDL model estimation. It is used to determine if the variables are stationary at the unit root (I(0)) or the first difference (I(1)). If a stationary series of data is regressed on non-stationary data without this test, the model may provide erroneous regression results.

To test the stationarity of the variables, we use both the Augmented Dickey-Fuller unit root test (ADF) and the Phillips Perron unit root test (PP). Acceptance or rejection of the null hypothesis (H0) that the variable is nonstationary is determined by the t-test of the lagged values of the variables and the t-statistic. The null hypothesis of a unit root's existence is accepted if the t-test of the lag is less than the critical value.

ARDL bound test

According to Pesaran et al. (2001), the ARDL bounds test determines whether a cointegration relationship exists between variables. The first stage consists of estimating the ARDL equation using an ordinary least squares estimator to confirm the presence of a long-run connection. Subsequently, the F-test is conducted at a combined significance level for the coefficients of the variables in their relative lag states. The null hypothesis is: *H0*: λ1 = λ2 = λ3 = λ4 = λ5 = 0, there is no co-integration relationship between the variables.

The critical values lead to a cointegration test when the variables are stationary at the unit root I(0) or the first difference I(1). A lower bound is assumed when the order of the integration of the independent variables is 0, or I(0), and an upper bound is assumed when it is 1, or I(1). When the calculated F-statistic is greater than the upper bound, there is a cointegration between the two variables; that is, the null hypothesis (H0) of no relationship between the variables is rejected. In contrast, if the F-statistic is less than the value of the lower limit I (0) at the 5% significance level, the null hypothesis H0 will be accepted. When the F-statistic lies between the lower and upper bounds, whether a cointegration relationship exists cannot be concluded.

Estimating long-run and short-run coefficients

After establishing the long-run relationships, the following step is to estimate the long-run and

short-run coefficients. The error term in some cointegration variables indicates that the change in the dependent variable is affected by both the imbalance in the cointegration relationship (shown by the ECM) and the change between the independent variables. This indicates that any variation in the short run from the long run equilibrium will be mirrored in changes to the dependent variable, resulting in the process returning to its long-run equilibrium.

Diagnostic tests

To ensure the reliability and robustness of the ARDL model, time series variables need to be stationary and have a definite optimal lag. At the same time, the model should have no autocorrelation, heteroskedasticity, and have a suitable production function (Gurajati et al, 2017). These standards will be rigorously tested for the regression model.

RESULT AND DISCUSSION

Regression results

Unit root test

The Dickey-Fuller unit root test is used to test the stationarity of the variables. The results in Table 1 reveal that the GOV and GL variables are stationary at I(0) while GDP, PRI, and FDI are at the 5% significance level at the first difference. According to Pesaran and Shin (1996), Mehrara and Musai (2011), and Hamuda et al. (2013), ARDL is the best applicable model for investigation if the variables have various cointegration orders of I(1) and I(0).

Table 1: Unit root test results

Variable	t-statistics	Result	Order
GDP	-1.280	Non-stationary	
D(GDP)	-3.825	Stationary	I(1)
GOV	-4.332	Stationary	I(0)
PRI	-0.605	Non-stationary	
D(PRI)	-2.869	Stationary	I(1)
FDI	-3.470	Non-stationary	
D(FDI)	-3.603	Stationary	I(1)
GL	-3.750	Stationary	I(0)

D(GDP), D(PRI), D(FDI) represent first difference of GDP, PRI and FDI, respectively.

ARDL bounds test

The ARDL bounds test shows that the F-statistic is greater than the upper bound value I(0) both at the standard 5% significance level and the 2.5% level at 4.01 and 4.49, respectively. Therefore, there is a cointegration relationship between the dependent variable (GDP) and the independent variables.

Table 2: ARDL bounds test results

Degree	F-statistics	Critical value							
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

Determining optimal lag selection

Based on the AIC and SBC criteria, the optimal lags of the ARDL model are (1, 1, 1, 1, 1).

Estimating long-term coefficients

Table 3 presents the long-term estimated coefficients of the ARDL model (1, 1, 1, 1, 1). Growth in all three types of investment, including public investment (GOV), private investment (PRI), and foreign direct investment (FDI) has a statistically significant positive impact on economic growth (GDP) in the long run. The effect of labor force growth (GL), however, is contrary to what was expected; in particular, the coefficient is -0.92900 and is only statistically significant at the 10% significance level.

Table 3: Estimation of long-term coefficients

Variable	Coefficient	Standard deviation	t-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: ***, **, * represents statistical significance level at the 1%, 5%, 10%, respectively.*

Estimating the short-term coefficients

Error Correcting Model (ECM) estimation becomes mandatory when there is a long run relationship between variables. The ECM model measures the dynamics of the short-run pattern and the rate at which the model is adjusted to equilibrium whenever a shock occurs. Table 4 presents the short-term coefficients from the error correction model based on the ARDL approach with the optimally selected lags, according to which the effect of public investment on Vietnam's economic growth is not statistically significant in the short run. Meanwhile, the coefficients for private investment and FDI are both positive and statistically significant at the 10% and 5% levels, respectively. Thus, the positive impact of these two types of investment is confirmed. The coefficient of labor growth is still negative and statistically significant at the 10% level of significance. The coefficient of the adjusted error ECM (-1) is statistically significant at the 1% level. This ensures that there exists a co-integration relationship as found in the test according to Pesaran (1997).

Table 4: Estimation of short-term coefficients from the error correction model (ECM) based on the ARDL approach

Variable	Coefficient	Standard deviation	t-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: ***, **, * represents statistical significance level at the 1%, 5%, 10% respectively.*

D(GDP), D(PRI), D(FDI), D(GL) represent first difference of GDP, PRI, FDI and GL, respectively.

Diagnostic tests

To ensure the reliability of the model, multiple diagnostic tests were performed to identify certain model defects, including the Ramsey Regression Equation Specification Error Test (RESET) to examine possible malformations of the model, the Lagrange multiplier test to check the validity of the model, and autocorrelation and covariance tests. The results of these tests, as displayed in table 5, show that the model is reliable enough to estimate both short-run and long-run coefficients.

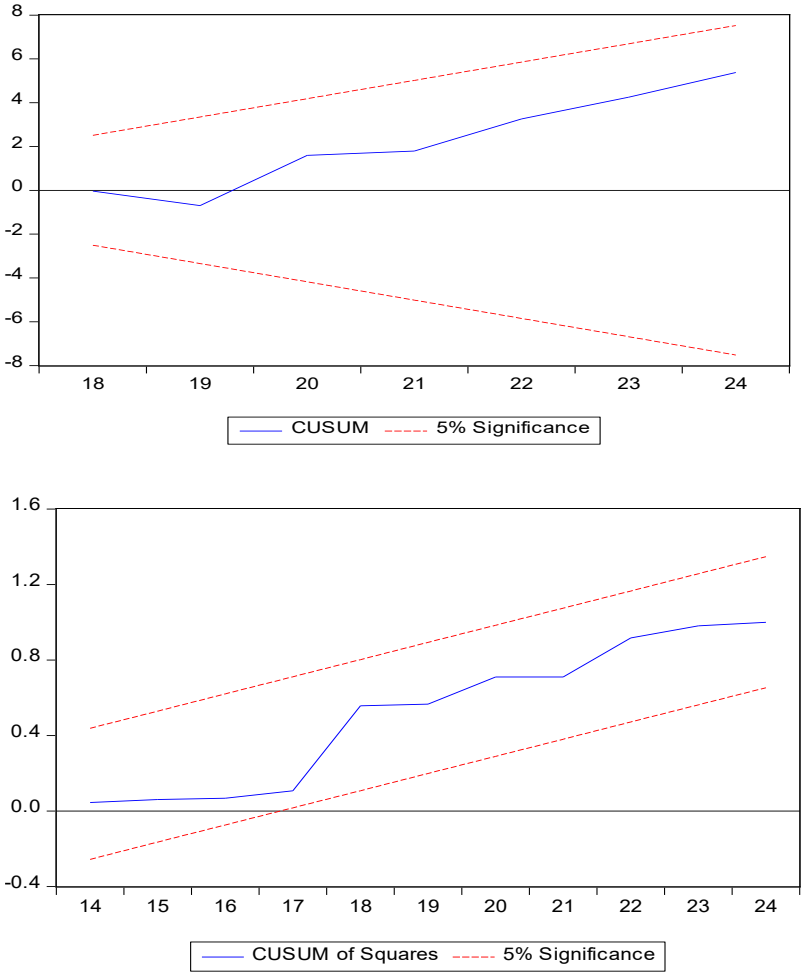
Table 5: Diagnostic tests

No	Test	Statistic	Value	P-value
1	Ramsey RESET	F-statistic	0.11089	0.7449
2	Autocorrelation	F-statistic	1.618511	0.2420
3	Heteroskedasticity	F-statistic	1.26258	0.3404

Additionally, tests on residuals are also performed. The Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Square Residuals (CUSUMSQ) are both within the standard range at the 5% significance level. The

model's residuals are stable; thus, the model itself is also reliable.

Figure 1: Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Square Residuals (CUSUMSQ)



DISCUSSION

The results of the quantitative model demonstrate that improvements in public, private, and foreign investment all have a beneficial long-term influence on economic growth. These findings support Keynes' theory that government spending is critical to social prosperity. As such, boosting public investment in general, and social investment in particular, is vital to stimulate economic growth. Long-term economic growth is positively impacted by public investment, according to the research findings; however, this influence is less substantial than that of investment from the domestic private sector. The study's findings show that a rise of one percentage point in public investment capital results in an increase of around 0.047% in the economic growth index, while the influence of the non-state sector is 0.054%.

The findings also indicate that the short-term effect of public investment on Vietnam's economic development is not statistically significant. The short-term effects of private and foreign investment growth are still being investigated. Different investment sectors may be used to illustrate this. Public investment often focuses on infrastructure projects, which have been in place for a while and will take time to provide significant growth. Private and foreign investment, however, are focused on projects with shorter life cycles and have the potential to contribute to rapid development.

During the study period of 1995–2019, variable labor growth had both a short- and long-term detrimental influence on Vietnam's economic

development. This differs significantly from the findings of prior investigations. In reality, the Vietnamese workforce growth rate has been reduced over time since the population growth rate has peaked and is declining. However, Vietnam's economic development has been sustained or accelerated over the last several years. Furthermore, rather than just adding more people, current economic expansion is increasingly dependent on the growth of investment capital, the advancement of science and technology, and the enhancement of labor productivity. Additionally, prior research has demonstrated that the effects of labor growth vary significantly by location and depend on the research era, particularly in the years before and after 2010.

The model's findings thus demonstrate that while the short-term effects of public investment on Vietnam's economic growth are unknown, the long-term effects are shown to be significant. Overall, the findings of the study are highly compatible with the findings of other international studies (Nazmi & Ramirez, 1996; Khan & Kumar, 1997; Nannan & Jianing, 2012; Unnikrishnan & Kattookaran, 2020). In the instance of Vietnam, the study's findings are in line with those of other scholars (To, 2011; Tran et al., 2014, Nguyen & Trinh, 2018). These studies conclude that the short-term effect of public investment on economic growth is not statistically significant, but that it has a positive influence on economic growth over the long term. Moreover, this long-term effect is the least significant when compared to other types of investment.

CONCLUSION AND POLICY IMPLICATIONS

This research presents empirical evidence on the significance of public investment in economic development, demonstrating the validity of Keynesian theory in terms of Vietnam's development. The long-term impact of governmental investment on economic development in Vietnam is favorable, although it is less substantial than the influence of investment capital from the local private sector. In addition, the short-term effect of public investment on Vietnam's economic development is not statistically significant. Meanwhile, the short-term effect of private and foreign investment growth remains important. These disparities may be attributable to the fact that public investment often prioritizes infrastructure projects, which are long-term endeavors that need years to stimulate economic development. On the other hand, private investment and FDI are centered on projects with shorter life cycles.

Based on the research findings, this paper offers a variety of recommendations to improve the short- and long-term efficiency of Vietnam's public investment. In the short term, one of the most significant approaches to mitigating the negative economic effects of the COVID-19 pandemic is to strengthen the role of public investment. As a result, the government and local authorities must accelerate the distribution of infrastructure investment while also eliminating unneeded public investment projects in order to have resources to assist enterprises and maintain a balanced budget. In particular, money must be focused on essential, urgent, large-scale initiatives that have a direct, rapid influence on the development of industries, sectors and regions. To accelerate the implementation schedule, the government must expedite the settlement of investment procedures for backlogged projects and new projects, as well as adjust public investment plans for delayed projects towards those for other projects with good disbursement progress that demand additional capital. Decreasing unproductive expenses while concurrently raising, or at least not lowering, productive investment would be the most desirable approach (Guliyeva, 2021).

On a long-term basis, the National Assembly needs to continue to enhance the legislative framework, minimizing overlap and lack of synchronization between legislative measures that govern public investment. Simultaneously, the government needs to improve the assignment and decentralization of state budget allocation, progressively lower average allocation, and boost initiatives for local budgets to fulfill socioeconomic responsibilities. The government requires a strategic long-term investment strategy to lessen the uncertainty of public investment to make it a reliable and motivating element. This action will aid in transforming public investment into a springboard for private sector investment, which is the nation's key growth driver. Because the influence of the private sector on economic growth is more evident and effective than that of government investment, providing conditions to

stimulate the private sector and support the socialization of investment operations is essential. In addition to moving investment areas to the private sector, promoting public-private partnerships in investment execution is vital.

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