GROWTH AND INEQUALITY: THE ROLE OF PUBLIC INVESTMENT IN VIETNAM

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Abstract: In an effort to seek for policy instruments to simultaneously promote economic growth and equity in Vietnam, this paper investigates effects of public investment by using a panel of Vietnam's 63 provinces in the period 2015-2022. Empirical evidence supports the role of public investment in enhancing economic growth and reducing inequality with the extent depending on the scope of pubic investment. The findings of this paper also suggest the necessity of reallocating government spending towards investment and human development in Vietnam's ongoing restructuring of the State budget. It then explores challenges in financing public investment, discusses the promotion of PPPs as a solution for infrastructure development and uses lessons from Japan as recommendations for Vietnam.

1. INTRODUCTION

Although equity and economic growth are two important goals of fiscal policy in many countries, policymakers may face challenges to achieve them both. One of the main reasons is that efforts to reduce inequality lead to redistributive policies which are supposed to be detrimental to economic growth. Empirical findings also provide evidence on a trade-off between growth and inequality, but public investment is the fiscal policy that could tackle this trade-off (Muinelo-Gallo and Roca-Sagalés, 2011; Muinelo-Gallo and Roca-Sagalés, 2014; Ostry, Berg and Tsangarides, 2014; Fournier and Johansson, 2016). Public investment in infrastructure, education and health contributes to the development of physical and human capital as well as growth across sectors of the economy. In turn, such development improves access to resources and reduces inequality.

Vietnam has achieved high economic growth and remarkable reduction in poverty since "Doi Moi" (Innovation) in 1986. However, rapid growth tends to go along with a widening gap between the richest and poorest quintiles. High inequality has occurred in rural and economically disadvantaged areas. Meanwhile, there are empirical studies indicating the negative effects of inequality on growth in Vietnam, particularly in the medium to long term (Le and Nguyen, 2016; Tran et al., 2022). In order to maintain the sustained growth, Vietnam should focus on policies that could enhance both equity and efficiency. And public investment could be an effective instrument as suggested by literature on the relationship between growth and inequality.

Public investment is one of the main components of public spending and has made an essential contribution to infrastructure development in Vietnam. State budget expenditure remained relatively stable at nearly 30% of GDP in the recent decade, in which, investment accounted for about 26% of total investment. At the same time, the vast majority of

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investment in infrastructure also came from the public sector with the share of 70-80%. With such importance, it is worth assessing whether public investment can enhance simultaneously growth and equality in Vietnam.

Using a panel of Vietnam's 63 provinces in 2015-2022, empirical results indicate that public investment has statistically significant growth-enhancing and inequality-reducing effects within the extent depending on components of the public sector. Provincial government investment has a positive effect on economic growth in the short run and medium run, and a negative effect on inequality in medium run. However, public investment at a broader scope (as measured by State investment with the component of SOEs) is able to foster growth, but has no effect on inequality. This implies the provision of free (or at very low price) infrastructure and public utilities benefit the poor more than proportionally. It is also necessary to reallocate government spending towards investment and human development to both enhance growth and lower inequality. The paper then explores challenges in financing public investment, discusses the promotion of PPPs as a solution for infrastructure and suggests lessons from Japan that should be learnt.

The remainder of this paper is organized as follows. Section 2 is the literature review on theoretical impacts of public investment on growth and inequality. Section 3 provides an overview of economic growth, income inequality and public investment in Vietnam. Section 4 is devoted to empirically investigate the role of public investment in Vietnam in terms of fostering growth and reducing inequality. Section 5 is to discuss challenges and make recommendations for Vietnam. Finally, the conclusion is given in Section 6.

2. A REVIEW OF LITERATURE ON EFFECTS OF PUBLIC INVESTMENT ON GROWTH AND INEQUALITY

The role of public investment in spurring economic growth and improving equality has received attention in recent literature. Public investment has been used by governments to stimulate the economy in recessions and sustain growth in the long term. There have been numerous theoretical and empirical studies investigating its effect on growth in various channels. By contrast, the literature, particularly theoretical frameworks, on the relationship between public investment and inequality is not as many as that on public investment and growth. Therefore, this paper devotes more space to review studies on the relationship between public investment and inequality.

Public investment and growth

Literature explains the growth-enhancing effect of public investment mainly via its contribution to the formation of public capital. In earlier literature, public capital stock has been modeled as a direct additional input in production function. This approach contains the implicit assumption that services of public capital are a pure, non-rival public good and proportional to the stock of capital. However, such an assumption may not be realistic since many infrastructure services are provided as private goods when the use of services by one person reduces the provision of services to others, and these services are not accessible to everyone, i.e., they are both rival and excludable (Romp and De Haan, 2007). Alternatively,

public capital may enter the production function as a determinant of aggregate total factor production (TFP) by lowering production costs (Duggal et al., 1999). Aside from its role in the production function, public capital may foster economic growth indirectly through complementarity effects on private labor and capital. By lowering production costs and raising the marginal productivity of private labor and capital, public capital may stimulate private physical capital formation. For example, Agenor (2011) studies the allocation of public spending between education services and infrastructure investment by developing a Lucas-type endogenous growth model of a developing economy with the key feature that the production of human capital requires not only government spending on education services but infrastructure capital as well.

Empirical evidence shows consensus on the positive impact of public investment on economic growth. Aschauer (1989) is the pioneer in using a production function approach to empirically analyze the impact of public investment on economic growth in recent years. Using US annual data, his estimate of the production function provide a productive elasticity of output with respect to public expenditure of 0.39. However, his study led to criticisms in terms of both the empirical approach and magnitude of the elasticity. One of the major arguments is that the potential reverse causality in estimating production function may cause an overestimated impact of public investment on growth. There is a great deal of subsequent studies attempting to solve the problem of endogeneity and provide the elasticity of output to public capital estimated to be between 0.1 and 0.2 (Bom and Ligthart, 2014).

However, the growth-enhancing role of public investment depends on its level and how it is financed. Excessive public investment may have "crowding out" effects on the use of other inputs, particularly private investment. The expected net rate of return to private capital is reduced when public investment is financed by an increase in distortionary taxes. On the other hand, if excessive public investment is financed by borrowing on domestic financial markets, it may lead to higher domestic interest rates and increase the cost of private capital.

Public investment and inequality

Conceptually, inequality-reducing effects of public investment comes from the development of infrastructure which helps enhance the connectivity of disadvantaged areas of the economy to the cores of economic activity, allowing access to additional productive opportunities as well as facilitating access to health and education services (Muinelo-Gallo and Roca-Sagalés, 2011). Improvement in such accesses is highly important in the presence of capital market imperfections with credit constraints preventing poor households from making human-capital investments that offer relatively high rates of return (Barro, 2000). Earlier studies attempt to model the relationship between public investment and inequality in an environment with capital market imperfections. Ferreira (1995) builds a model of wealth distribution dynamics with a capital market imperfection and a production function with private-public capital complementarity. In this model, public services are provided free of charge to every household-firm in the economy, while private alternatives to public services are only affordable to higher-income individuals. It is shown that productive public investment (e.g., in infrastructure, education and health) can alleviate inequality among entrepreneurs. Getachew (2010) proposes a two-sector model in an economy with heterogeneous agents,

taking into account the contribution of public capital to both human capital accumulation and goods production. When there are credit constraints and a diminishing marginal rate of return on private investment, inequality is detrimental to growth. Certain public services and investment may benefit the poor more than proportionally, improving both the distribution of income and economic growth (indirectly).

Other than its role in production and human capital, recent studies consider impacts of public capital on inequality in other dimensions like labor-leisure choice (Chatterjee and Turnovsky, 2012; Turnovsky, 2015) and skill premium (Pi and Zhou, 2012; 2014). Chatterjee and Turnovsky (2012) emphasize that impacts of public investment on growth and inequality depend on how it is financed. In the numerical simulation of his model, income distribution improves both in the short and long run by capital tax-financing, while public investment financed by non-distortionary taxes have temporary distributional effects.

Empirically, panel studies show evidence supporting its effectiveness in enhancing both efficiency and equity simultaneously. Muinelo-Gallo and Roca-Sagalés (2011) estimate two individual equations explaining growth and inequality with different fiscal policies included as the key determinant, using an unbalanced panel of 43 upper-middle and high-income countries for the period 1972-2006. Their structural regressions find that public investment has a negative and statistically significant effect on inequality, and at the same time it has a positive and statistically insignificant effect on economic growth. With a panel of over 100 countries covering the years 1960-2000, Calderón and Servén (2004) build aggregate indexes to measure quantity and quality of infrastructure and show that infrastructure stock has a significant positive effect on long-run economic growth. Both quantity and quality of infrastructure are significant in reducing income inequality. The impact of reallocating public investment in total government spending is considered by Doumbia and Kinda (2019) using data on 83 countries across all income groups. This paper provides findings that lower inequality is obtained by reallocating government spending towards social protection and infrastructure, particularly when defense spending is cut to finance such reallocation.

Evidence on inequality-reducing effects of public investment is also found in literature on specific countries. In a VAR analysis, Muinelo-Gallo and Roca-Sagalés (2014) show that public investment can break the trade-off between growth and inequality in Uruguay. Contribution of public investment to regional inequality reduction in rural China is analyzed in Zhang and Fan (2004).

In addition to total investment, some studies consider other aspects of public investment affecting its interaction with inequality. One example is the role of infrastructure quality (Calderón and Servén, 2004; World Bank, 2006). Excessive public investment worsens income inequality (Artadi and Sala-i-Martin, 2003). Different types of public investment produce different effects on income distribution. Zhang and Fan (2004) point out that investments in rural education and agricultural R&D have the largest and most favorable impacts on reducing regional inequality in China's western region. Khandker and Koolwal (2007) find a limited distributional impact of access to paved roads in rural Bangladesh.

3. AN OVERVIEW OF GROWTH, INEQUALITY AND PUBLIC INVESTMENT IN VIETNAM

Vietnam has been maintaining high economic growth since "Doi Moi" (Innovation) in 1986, which has improved income and people's living. GDP growth rate achieved an average of 6% per year in the past decade, and even reached above 7% in 2018-2019. Under the impacts of the COVID-19 pandemic, growth fell down to 2% in 2020-2021, but it was still high compared to other countries. With continuous increases in GDP per capita, Vietnam became a middle-income country in 2011. High economic growth also has contributed to poverty reduction. According to multi-dimensional poverty standards applied since 2016, the poverty rate in Vietnam decreased from 9.2% in 2016 to 4.3% in 2022.

Figure 1. Vietnam's economic growth and GDP per capita, 1991-2022
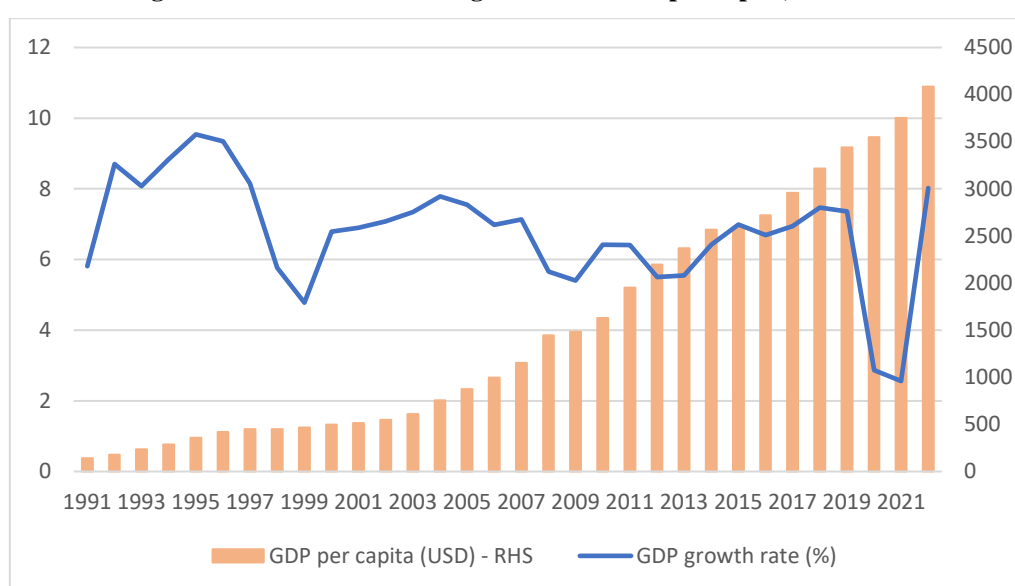
Source: General Statistics Office of Vietnam

However, high growth in recent years tends to go along with an increase in income inequality in some aspects. Calculated from the Standardized World Income Inequality Database (SWIID) published in 2023, Vietnam had a GINI index in 2021 (0.37) significantly lower than the average of 73 countries considered (0.46). Although inequality as measured by the GINI coefficient seems to be in the low group compared to other countries, the income gap between the richest and poorest quintiles (Q5/Q1) has gradually widened, implying that equality is mainly in the second low income (Q2) and upper medium income (Q4) groups. In 2010, the income of the highest group was 9.2 times that of the lowest group. This ratio continuously increased to the peak of 10.2 in 2019. On the other hand, the income share of the two lowest income groups in the total income of the entire population had a downward trend from 14.96% in 2010 to 14.38% in 2019. Different measures of inequality consistently show higher inequality in rural areas than in urban areas (Table 1). The highest inequality occurs in economically disadvantaged regions like the Northern Mountains and Central Highlands. In addition, the slowdown in GDP growth during the years affected by COVID-19 was accompanied by improvement of equality by all measures and in all regions, implying a reverse relationship between growth and inequality.
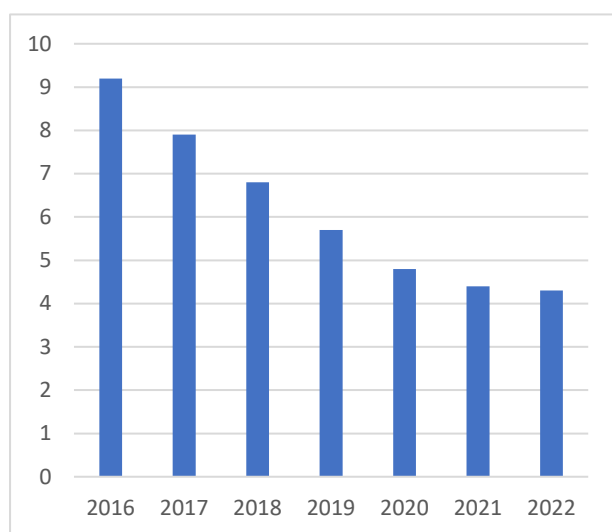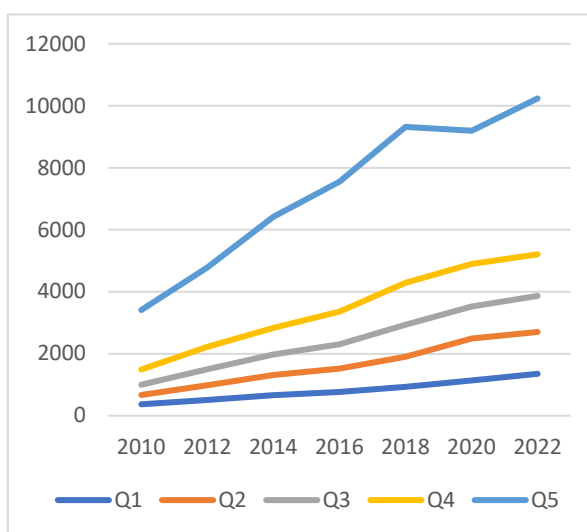
Figure 2. Poverty rate in Vietnam, 2016-2022 (%)

Note: Poverty rate is measured according to multi-dimensional poverty standard

Figure 3. Average income per capita per month by quintile (Million VND)

Source: General Statistics Office

Table 1. Poverty and income inequality in Vietnam, 2016-2022

	2012	2014	2016	2018	2020	2021	2022
GINI							
Whole country	0.424	0.430	0.431	0.425	0.373	0.374	0.375
Urban	0.385	0.397	0.391	0.373	0.325	0.335	0.354
Rural	0.399	0.398	0.408	0.408	0.373	0.374	0.364
The income gap between the richest and the poorest (Q5/Q1)							
Whole country	9.34	9.72	9.79	10.00	8.07	7.97	7.57
Urban	7.1	7.4	7.32	6.94	5.44	5.44	6.06
Rural	8	8.2	8.46	8.64	7.98	7.96	7.24
Share of the 2 lowest income quintiles in income distribution (Ratio of 40%)							
Whole country	14.96	14.97	14.76	14.65	17.09	17.36	17.35
Urban	17.55	17.38	17.41	20.58	20.05	19.91	19.23
Rural	16.05	16.16	15.68	15.33	16.85	16.68	17.33

Source: General Statistics Office of Vietnam and author's calculation

Ensuring social security and promoting economic development are both important objectives in allocating government expenditure in Vietnam. Calculations from national statistical data show the important role of public investment in Vietnam's economy. Investment spending has been maintained at 7.6% as percentage of GDP, accounting for 26% of total government expenditure. The public sector contributed roughly 2/3 to the investment in economic infrastructure (e.g., transport, irrigation, power, telecommunications, and water supply and sanitation). The vast majority of investment in education and health also came from the

public sector with the share of 70-80% in the last decade. Public investment has been considered as an essential policy to promote economic growth, particularly under the context of COVID-19.

The goals of promoting growth and alleviating inequality are obviously presented in the criteria for allocating public investment by fields and regions in recent years. Projects which are essential for the socio-economic development of the whole country, as well as bringing about great inter-regional connection and spillover, have obtained the top priority in allocating public investment. By region, spending allocation also has prioritized mountainous areas, border areas, islands, ethnic minority areas, disadvantaged and extremely difficult areas. In implementing the medium-term public investment plan for the period 2016-2020, economically difficult areas such as the Northern Mountains and Central Highlands regions accounted for nearly 1/3 of the country's public investment. Figure 5 suggests that there seems to be a positive correlation between local economic growth and local government investment. In the next section, this paper empirically explores the effectiveness of public investment on simultaneously realizing the goals of growth and equality in Vietnam.

Figure 4. Vietnam's inequality measured by GINI, average 2012-2022
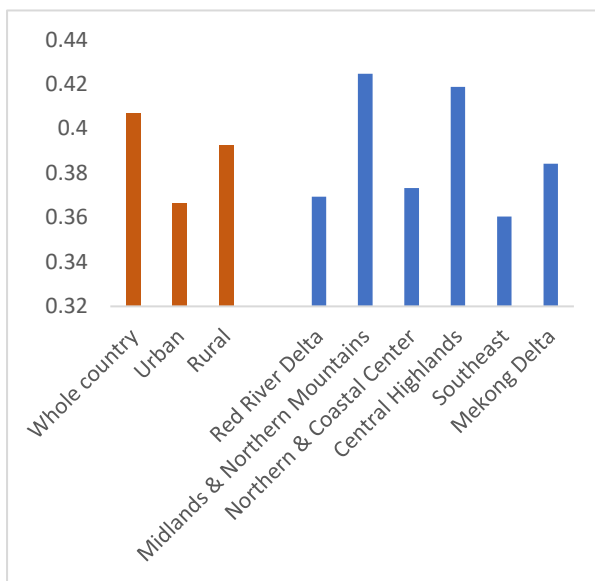
Figure 5. Government investment allocation by localities and GDP growth, average 2015-2021
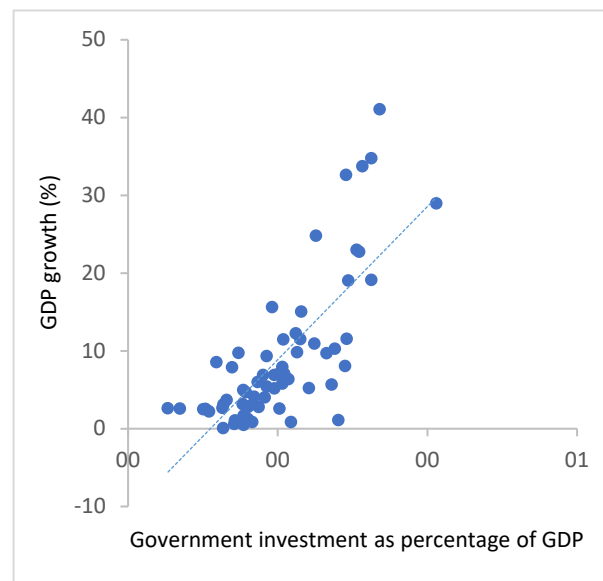
Source: General Statistics Office of Vietnam and author's calculation

4. EMPIRICAL EVIDENCE

4.1. Methodology

Theoretically, public investment is a determinant of growth both in the short run and long run, while the relationship between public investment and inequality is likely to appear in the medium to long run. However, in the context of rare studies on the redistributive role of public investment, it is worth considering its empirical effects on inequality in the short run as a contribution to the relevant literature. Hence, this paper empirically investigates the short-run and medium-run impacts of pubic investment on economic growth and income

inequality by regressing the following reduced-form equations with panel data of Vietnam's 63 provinces in the period of 2015-2022:

Growth equations:

Short run: $GROWTH_{t,i} = \alpha_{t,i} + \beta PUBLIC\_INVESTMENT_{t-2,i} + \theta Z_{t-2,i} + u_{t,i}$ (1)

Medium run: $\overline{GROWTH}_{(t,t+4),i} = \alpha_i + \beta PUBLIC\_INVESTMENT_{t,i} + \theta Z_{t,i} + u_{t,i}$ (2)

Inequality equations:

Short run: $INEQUALITY_{t,i} = \gamma_{t,i} + \lambda PUBLIC\_INVESTMENT_{t-2,i} + \omega S_{t-2,i} + e_{t,i}$ (3)

Medium run: $\overline{INEQUALITY}_{(t,t+4),i} = \gamma_i + \lambda PUBLIC\_INVESTMENT_{t,i} + \omega S_{t,i} + e_{t,i}$ (4)

where Z and S are sets of control variables selected by common determinants of economic growth and inequality, respectively. In short-run equations, both PUBLIC_INVESTMENT and other explanatory variables are taken in 2 lags to avoid reverse causality. In medium-run equations, GROWTH and INEQUALITY are calculated by the moving average in 5 years. Explanatory variables are measured in the first year of the 5-year period. Such a formation of variables is to reduce endogeneity, maintain degrees of freedom and capture the medium to long run relationship among public investment, growth and inequality.

Regarding the forms of panel data estimators, in order to take into account individuality of provinces, each equation is regressed in fixed effects (in short run equations, time fixed effects are also both included[2]) and random effects. Then, the Hausman test is applied to decide between fixed effects or random effects models. In all equations, the Hausman test rejects the null hypothesis of no correlation between the individual effects and the error term, indicating that fixed effects models are more appropriate and better off being used.

The procedure of estimation is started with the baseline by estimating public investment as the only policy variable in both growth and inequality equations. The analysis is then extended to compare the role of public investment with other fiscal policies. Particularly, variables of current spending are added to regressions. Current spending is disaggregated by redistributive and non-redistributive components. The former includes expenditures on social security, education and health, which are the 3 items commonly supposed to target human development and inequality reduction. The non-redistributive component is the remaining amount of current spending. Finally, impacts of public investment and current expenditures on each income quintile are considered.

4.2. Data and variables

All the provincial data is obtained from the source of the General Statistics Office of Vietnam. Details of variables are described in Table 2. Regarding the main variables of interest, GROWTH is measured by the annual percentage change in gross regional domestic product at constant price (GDP_G). In the inequality equations, there are 3 measures of INEQUALITY considered to check the consistency, including: (i) GINI index at market

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[2] In the medium-run equations, it is unnecessary to have time fixed effects since the time-length is short due to the formation of variables.

income (GINI), (ii) the income ratio of the richest income quintile divided by the poorest one (Q5/Q1), and (iii) income share of the 2 lowest income quintiles (LOW_INC). INEQUALITY included in the growth equations is measured by the GINI index.

PUBLIC_INVESTMENT entering both growth and inequality equations as the key explanatory variable, is measured: (i) at a narrow scope, by provincial government investment (GOV_INV), and (ii) at a broader one, by State investment (INV_PUB) which covers not only provincial government investment but also other components of the public sector which are mainly constituted by SOEs. Hence, it is reasonable to proxy the investment of SOEs (INV_PUB_OT) by the difference between INV_PUB and GOV_INV. For the growth-enhancing role, public investment variables are expected to be positively correlated with GDP_G. For the inequality-reducing role, the expected correlation depends on measures of inequality. Specifically, public investment variables are expected to be negatively correlated with GINI and Q5/Q1, but positively correlated with LOW_INC.

Table 2. Definition of variables

Variables	Definition/Measurement	Growth equations	Inequality equations
Economic growth			
GDP_G	Growth rate of gross regional domestic product at constant price (%)		✓
Inequality and income			
GINI	GINI index	✓	✓
Q5/Q1	Ratio of the richest income divided by the poorest income		✓
LOW_INC	Share of the 2 lowest income quintiles in income distribution (Ratio of 40%)		✓
Q1, Q2, Q3, Q4 and Q5	Share of each quintile from the poorest to the richest in income distribution (%)		X
Public investment			
GOV_INV	Government investment as percentage of GDP	✓	✓
INV_PUB	Investment of State sector as percentage of GDP (INV_PUB = GOV_INV + INV_PUB_OT)	✓	✓
INV_PUB_OT	Investment of SOEs as percentage of GDP		
Other variables			
LGDP_C	Gross regional domestic product at constant price in log form	✓	✓
INV_OT	Private investment as percentage of GDP (including domestic private sector and FDI)	✓	
GOV_HUM	Redistributive current spending (measured by government spending on social security, education and health as percentage of GDP)	X	X
GOV_OT	Non-redistributive current spending (measured by the other current government spending as percentage of GDP)	X	X
LAB_G	Growth rate of labor force (%)	✓	
T_LAB	Ratio of trained labor as percentage of labor force (used as a proxy for education)	✓	✓
URBAN	Ratio of urbanization (measured by the share of urban population in total population)	✓	✓

Note: "X" indicates the variable is included in the extended estimation

4.3. Empirical results

Since fixed effects models are better than random effects as indicated by the Hausman test, this section focuses on results of fixed effects estimation to interpret the relationship between public investment, growth and inequality. There are 2 main specifications considered, consisting of: (1) Baseline estimation with public investment as the only policy variable, and (2) Extended estimation with government current spending added in explanatory variables to make a comparison with the role of public investment.

Baseline estimation

Growth equations: Fixed effects estimation shows that public investment has significantly positive effects on economic growth both in the short run and medium run. The results are consistent regardless of measures of public investment. As indicated by the magnitude of coefficients, a one percentage point increase in government investment as percentage of GDP (GOV_INV) raises economic growth (GDP_G) by 0.16 percentage points in the short run and 0.07 percentage points in the medium run. When it is measured by state investment (INV_PUB), the size of the coefficient reduces to 0.1 in the short run but still remains at 0.07 in the medium run. Public investment also has larger impacts on growth compared to private investment (INV_OT) which is only significant in the short run.

Table 3. Baseline estimation of growth equations (FEM)

Dependent variable: GROWTH				
Measure of public investment	GOV_INV		INV_PUB	
Time of effects	Short run	Medium run	Short run	Medium run
PUBLIC_INVESTMENT	0.1622	0.0726	0.1064	0.0740
	(1.6800)*	(1.7800)*	(2.6700)**	(2.5400)**
LGDP_C	-14.6183	-4.7725	-13.3103	-3.4472
	(-3.2100)**	(-3.4600)**	(-2.9100)**	(-2.9300)**
GINI	-0.0477	-0.1015	-0.0325	-0.1007
	(-0.7300)	(-1.4800)	(-0.5000)	(-1.4500)
INV_OT	0.0352	-0.0013	0.0415	-0.0005
	(1.9100)*	(-0.0900)	(2.5300)**	(-0.0300)
LAB_G	0.0894	0.0127	0.0841	0.0262
	(1.3100)	(0.2300)	(1.3000)	(0.5300)
T_LAB	0.1672	-0.1183	0.1314	-0.1077
	(1.5700)	(-2.0800)**	(1.2100)	(-1.9700)*
URBAN	0.0831	0.8331	0.0706	0.8762
	(1.0600)	(4.4300)**	(0.9100)	(4.7900)**
R^2	0.4682	0.3300	0.4745	0.3769

Note: Values in parentheses are t-statistics;
** and * indicates 5% and 10% significance, respectively

To better understand the impact of the components of state investment, the growth equations are re-estimated with INV_PUB separated into investment from provincial government (GOV_INV) and SOEs (INV_PUB_OT). It shows that the two components have positive

impacts on economic growth. GOV_INV has greater coefficients compared to INV_PUB_OT both in the short run and medium run[3].

Table 4. Baseline estimation of inequality equations in the short run (FEM)

Dependent variable: INEQUALITY						
Measure of public investment	GOV_INV			INV_PUB		
Measure of inequality	GINI	Q5/Q1	LOW_INC	GINI	Q5/Q1	LOW_INC
PUBLIC_INVESTMENT	0.1828	0.0582	-0.0743	-0.0492	-0.0110	0.0026
	(1.3200)	(1.3200)	(-1.1300)	(-0.6800)	(-0.5900)	(0.0700)
LGDP_C	-0.0389	-1.2855	1.6521	-1.3706	-1.6379	1.9275
	(-0.0100)	(-0.9600)	(0.8200)	(-0.3200)	(-1.1600)	(0.9000)
GDP_G	-0.1085	-0.0335	0.0429	-0.0990	-0.0304	0.0390
	(-1.5300)	(-1.1400)	(1.2500)	(-1.4600)	(-1.0700)	(1.1800)
T_LAB	-0.0132	-0.0274	-0.0009	-0.0341	-0.0348	0.0105
	(-0.0900)	(-0.5300)	(-0.0100)	(-0.2500)	(-0.6600)	(0.1600)
URBAN	0.0416	0.0397	-0.0372	0.0428	0.0397	-0.0361
	(0.5300)	(1.3900)	(-0.9900)	(0.5300)	(1.3800)	(-0.9500)
R^2	0.3874	0.3454	0.4013	0.3846	0.3419	0.3976

Note: Values in parentheses are t-statistics;
** and * indicates 5% and 10% significance, respectively

Inequality equations: Public investment has no clear effects on income inequality in the short run since both GOV_INV and INV_PUB are insignificant. Regarding the sign and magnitude of coefficients, they imply that GOV_INV may increase GINI, widen the gap between Q1 and Q5 (Q5/Q1), and reduce the income share of the 2 bottom quintiles (LOW_INC). Although the coefficients of INV_PUB indicate inconsistent effects on measures of inequality, they are small enough to be ignored. Hence, it is likely that public investment may potentially make inequality worse in the short run, but it is necessary to have more studies on this issue.

In the medium run, provincial government investment is negatively correlated with inequality. An increase of one percentage point in GOV_INV lowers GINI and Q5/Q1 by 0.25 and 0.11, respectively; it also enhances LOW_INC by 0.11 percentage points. All these coefficients are significant at 5%, showing supportive evidence on the existence of the medium to long run relationship between public investment and inequality. When public investment is measured by INV_PUB, the sign of coefficients also imply reducing effects, but they are statistically insignificant and small. A possible explanation is that SOEs provide infrastructure and public utilities by charging user fees, which have no impacts on inequality. The estimation of Equations (3) and (4) with INV_PUB decomposed by GOV_INV and INV_PUB_OT shows the result supporting such an explanation since only provincial government investment has significant impact on inequality[4].

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[3] Estimation results are presented in Table A1 of Appendix

[4] Estimation results are presented in Table A2 of Appendix

Table 5. Baseline estimation of inequality equation in the medium run (FEM)

Dependent variable: INEQUALITY						
Measure of public investment	GOV_INV			INV_PUB		
Measure of inequality	GINI	Q5/Q1	LOW_INC	GINI	Q5/Q1	LOW_INC
PUBLIC_INVESTMENT	-0.2506	-0.1074	0.1063	-0.0335	-0.0032	0.0127
	(-4.7800)**	(-3.3300)**	(4.0100)**	(-0.8300)	(-0.2300)	(0.6400)
LGDP_C	-4.6270	-0.9611	1.9129	-5.5030	-1.1426	2.2581
	(-2.8000)**	(-2.0000)**	(2.4900)**	(-3.1300)**	(-2.1200)**	(2.7200)**
GDP_G	0.0184	0.0077	-0.0070	0.0123	0.0061	-0.0045
	(1.2500)	(1.5000)	(-1.0300)	(0.8800)	(1.2200)	(-0.7200)
T_LAB	-0.1200	-0.0283	0.0729	-0.1202	-0.0272	0.0728
	(-1.2500)	(-1.0800)	(1.7200)*	(-1.0800)	(-0.8400)	(1.5100)
URBAN	-0.5315	-0.0848	0.2241	-0.6282	-0.1230	0.2646
	(-1.6500)	(-0.6300)	(1.5900)	(-1.6900)*	(-0.7800)	(1.6200)
R^2	0.3704	0.2963	0.3274	0.2936	0.1405	0.2619

Note: Values in parentheses are t-statistics;
** and * indicates 5% and 10% significance, respectively

Extended estimation

The analysis is expanded to compare the role of public investment with current government spending. Particularly, there are 3 policy variables included in the specifications, which are public investment, redistributive current expenditure (for health, education and social security) and non-redistributive current expenditure.

Roles of public investment and current government spending on growth and inequality

Growth equations: Since INV_PUB performs better in significance level compared to GOV_INV in the baseline, INV_PUB is used as the measure of public investment in the extended estimation of growth equations. When GOV_HUM and GOV_OT are added in Equations (1) and (2), INV_PUB still has positive coefficients of 0.1 in the short run and 0.07 in the medium run. They are statistically significant and strongly consistent with the baseline results. Regarding the role of redistributive current expenditure, GOV_HUM is only significant in the medium run with a coefficient of 0.07. Meanwhile, non-redistributive current expenditure (GOV_OT) is insignificant both in the short and medium run. There are 2 implications that could be obtained from the results of GOV_HUM and GOV_OT. Firstly, current government consumption has no effects on economic growth in the short run. This finding is in line with Muinelo-Gallo and Roca-Sagalés (2011) and Gnangoin et al. (2019). Secondly, since GOV_HUM is constituted by expenditures for health, education and social security, it suggests that government spending on human development can boost economic growth in the medium run. Additionally, the coefficients of INV_PUB and GOV_HUM have a similar size, which indicates that spending on human capital development is as important as physical accumulation in enhancing growth.

Table 6. Extended estimation of growth equations (FEM)

Dependent variable: GROWTH		
Measure of public investment: INV_PUB		
Time of effects	Short run	Medium run
INV_PUB	0.0984	0.0732
	(2.3900)**	(2.6300)**
GOV_HUM	0.0121	0.0726
	(0.2000)	(1.8500)*
GOV_OT	0.1278	-0.0876
	(0.7900)	(-1.0600)
INV_OT	0.0401	0.0000
	(2.4300)**	(0.0000)**
LGDP_C	-12.6631	-2.8891
	(-2.7100)**	(-2.7600)**
GINI	-0.0241	-0.0868
	(-0.3600)	(-1.1400)
LAB_G	0.0955	0.0500
	(1.5300)	(1.1500)
T_LAB	0.1441	-0.0812
	(1.3500)	(-1.5200)
URBAN	0.0735	0.9051
	(0.9400)	(4.4100)**
R^2	0.4766	0.4147

Note: Values in parentheses are t-statistics;
   ** and * indicates 5% and 10% significance, respectively

Inequality equations: As a recap of the baseline results, only provincial government investment has statistically significant inequality-reducing effects in the medium run. Hence, the extended estimation focuses on the medium-run role of public investment measured by GOV_INV. Table 7 shows that an increase of one percentage point in GOV_INV significantly lowers GINI by 0.15, narrows Q5/Q1 by 0.05 and improves LOW_INC by 0.05. These effects are also consistent with the baseline. GOV_HUM produces similar coefficients to GOV_INV, emphasizing the importance of human development in alleviating inequality. The result of GOV_HUM is consistent with findings on the roles of current expenditure for education, health and social protection in previous studies (Holzner, 2010; Doumbia and Kinda, 2019).

In contrast to GOV_INV and GOV_HUM, GOV_OT has largely worsening impacts on inequality. Particularly, an increase in GOV_OT significantly leads to higher GINI and Q5/Q1 with coefficients of 0.26 and 0.13, respectively. Accordingly, inequality-reducing effects of GOV_INV and GOV_HUM are offset by the inequality-worsening effect of GOV_OT.

Table 7. Extended estimation of inequality equation in medium run (FEM)

Dependent variable: INEQUALITY			
Measure of public investment: GOV_INV			
Measure of inequality	GINI	Q5/Q1	LOW_INC
GOV_INV	-0.1548	-0.0509	0.0519
	(-2.1600)**	(-2.4600)**	(1.7200)*
GOV_HUM	-0.1399	-0.0750	0.0584
	(-2.8200)**	(-5.7100)**	(2.6900)**
GOV_ OT	0.2617	0.1282	-0.0743
	(2.5200)**	(2.8700)**	(-1.3400)
LGDP_C	-5.6660	-1.5773	2.5155
	(-3.3400)**	(-3.5600)**	(3.0600)**
GDP_G	0.0115	0.0039	-0.0038
	(0.7800)	(0.9200)	(-0.5600)
T_LAB	-0.1479	-0.0446	0.0884
	(-1.4700)	(-1.6300)	(2.0400)**
URBAN	-0.6447	-0.1447	0.2690
	(-2.0500)**	(-1.2700)	(2.0200)**
_CONS	117.6526	29.8952	-19.0981
	(7.2900)**	(5.9700)**	(-2.2700)**
R^2	0.4147	0.4375	0.3782

Note: Values in parentheses are t-statistics;
** and * indicates 5% and 10% significance, respectively

Distributional effects of public investment and current spending by income quintiles

Following the general analysis of the redistributive effects of public investment and current expenditures, this section steps further by decomposing their impacts on each income quintile. As can be seen in Table 8, GOV_INV is only negatively correlated with the richest quintile (Q5), while it is positively correlated with other quintiles. However, the coefficients are statistically significant in the cases of Q2, Q3 and Q5, implying that public investment obtains its redistributive effects by increasing the income shares of Q2 and Q3, at the same time reducing the share of Q5. Although GOV_HUM has similar signs of effects on income quintiles to those of GOV_INV, its coefficients are statistically significant in the case of Q1 and Q5. This means that GOV_HUM reduces inequality by raising the income share of Q1 and lowering that of Q5. By contrast, GOV_OT worsens inequality by promoting the share of Q5 at 5% significance level. Also its insignificantly negative signs in the cases of Q1 to Q4 imply potential reducing effects on these income shares. Impacts of public investment and redistributive current spending decomposed by income quintiles suggest that they should be complementary policies in solving inequality. Public investment targets better to Q2 and Q3, meanwhile redistributive current expenditure directly targets the poorest.

Table 8. Impacts of public investment and current expenditure on income quintiles (FEM)

Dependent variable: Income quintiles					
Measure of public investment: GOV_INV					
Income quintile	Q1	Q2	Q3	Q4	Q5
GOV_INV	0.0217	0.0496	0.0609	0.0331	-0.1652
	(1.0200)	(1.8900)*	(2.2400)**	(1.3700)	(-2.1900)**
GOV_HUM	0.0364	0.0258	0.0272	0.0134	-0.1028
	(2.6300)**	(1.6100)	(1.4600)	(0.9800)	(-2.0300)**
GOV_OT	-0.0537	-0.0314	-0.0626	-0.0734	0.2211
	(-1.4400)	(-1.0600)	(-1.2900)	(-1.5900)	(1.8500)*
LGDP_C	0.8316	1.4619	1.7078	1.6399	-5.6412
	(2.2800)**	(3.0400)**	(4.1100)**	(3.3700)**	(-3.9500)**
GDP_G	0.0056	-0.0032	-0.0075	-0.0042	0.0093
	(1.6000)	(-0.6700)	(-1.5900)	(-0.7600)	(0.6800)
T_LAB	0.0526	0.0769	0.0401	-0.0121	-0.1574
	(1.9500)*	(2.4500)**	(1.0700)	(-0.4000)	(-1.5200)
URBAN	0.0115	0.1038	0.1886	0.1351	-0.4390
	(0.1300)	(1.2500)	(1.7000)*	(0.7700)	(-1.2000)
R^2	0.2385	0.3620	0.4193	0.2776	0.4245

Note: Values in parentheses are t-statistics;
      ** and * indicates 5% and 10% significance, respectively

Highlight of key findings

Estimation of public investment as a determinant of economic growth and inequality by using panel data of 63 provinces from 2015 to 2022 provides empirical evidence on the role of public investment in Vietnam and implications as follows:

(i) Public investment is an effective policy tool in achieving both efficiency and equity goals in Vietnam with the extent depending on the scope of public investment. Government investment from provincial budget shows its ability of promoting economic growth in the short run and medium run. It can also reduce inequality in the medium run. Redistributive effects of provincial government investment are obtained by increasing the income shares of Q2 and Q3, while reducing the income share of Q5. Regarding public investment at a broader scope as measured by state investment, it is able to foster growth, but has no effect on inequality. This suggests the expansion of free infrastructure and public utilities benefit the poor more than the rich.

(ii) In the extended estimation, current government spending is added to make a comparison with public investment in terms of policy effects. The results imply that government investment should be used with redistributive current expenditure as a supplement policy in alleviating inequality since government investment has effects on Q2 and Q3, while redistributive current expenditure targets better to the poorest.

Moreover, the findings emphasize the importance of spending on human development in both enhancing growth and lowering inequality in the medium run.

(iii) On the other hand, empirical results on other current government expenditure suggest a concern. They not only have statistically insignificant effects on growth, but also make inequality worse. Therefore, effectiveness of government investment and redistributive current expenditure in reducing inequality is offset by other current expenditure. This shows the necessity of reallocating government spending towards investment and human development in Vietnam's ongoing restructuring of the State budget.

5. LOOKING FORWARD

What are the future challenges?

Government spending on infrastructure and public services is empirically found to benefit both economic growth and equality in Vietnam. With the high dependence of infrastructure development on public investment, there are challenges for financing infrastructure due to difficulties in mobilizing public financial sources. The main challenges are as follows:

- **Government revenue is the main source for public investment, but it is difficult to maintain the financing capacity in the medium to long run.** Government revenue is currently containing unsustainable components. For example, the proportion of revenues other than taxes and fees (such as revenues from divestment, SOE's dividends, and land use fees, etc.) accounted for about 20% of total revenue in recent years, with half of this share coming from land use fees. However, revenue from land use fees is forecast to decrease in the medium and long term because of finite land supply. In addition, revenue from import taxes is decreasing on the way towards fully implementing Vietnam's commitments on tariff reduction in FTAs.

  Meanwhile, the needs on social security spending are forecast to be large in the context of an aging population. There are also many types of fiscal risks appearing with increasing scale and intensity due to the effects of climate change and natural disasters. This situation may narrow the share of state budget allocated for investment.

- **Financing public investment by domestic borrowings is constrained by the size of the domestic capital market as well as the financial capacity of institutional investors.** In the context of rising costs from external borrowings, Vietnam has recently restructured the public debt towards more reliance on the domestic capital market. Issuance of government bonds[5] has achieved progress in lengthening maturity[6] and reducing dependence on the banking sector[7]. However,

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[5] The size of government bond market compared to GDP increased from 7.4% in 2011 to 28.3% in 2020.

[6] Long-term government bonds have been prioritized for issuance to extend the average maturity of the government debt portfolio since 2014. Therefore, the remaining term of the domestic government bond portfolio increased from 3.18 years in 2011 to 13.5 years in 2020.

increasing the size of the government bond market by raising the holding rate of domestic long-term institutional investors other than banks is not an easy task. In particular, Vietnam's Social Insurance Fund, the largest domestic institutional investor, has invested about 85% of its portfolio in government bonds. The size of insurance enterprises and securities companies is still relatively small. As of 2019, the insurance business system owned the total assets equivalent to 6.9% of GDP; system of securities investment funds and fund management companies managed a volume of assets equivalent to 4.7% of GDP.

▪ **Foreign borrowings have been narrowing in scale and increasing in cost.** Since Vietnam became a middle-income country (in 2011) and graduated from the World Bank's International Development Association (IDA) program (in 2017), its ability to access loans eligible for ODA has been gradually decreasing. It has been replaced by loans that are less preferential or closer to market conditions. Accordingly, ODA as percentage of GDP fell from 8.8% in the period of 2011-2015 to 4.7% in the period of 2016-2019. The contribution of ODA and concessional loans to total government investment also decreased from 38.8% to 27.3%, respectively, in the 2 periods.

Is Public-Private Partnership (PPP) a foremost and long-term solution?

There is a large financial gap between infrastructure needs and the government's financial capacity in Vietnam. The gap is forecast to widen from US$20 billion in the period 2025-2029 to US$54 billion in the period 2025-2029 (World Bank, 2020). In this context, there has been more attention in promoting PPPs in Vietnam, which is considered as an important solution to reduce fiscal burdens and fill the financial gap.

In practice, PPPs have been implemented in Vietnam since the Government issued the Decree 77/CP dated June 18, 1997, on investment regulations in the form of BOT contracts for domestic investors. Through many amendments and supplements to gradually approach international practices, Vietnam's PPP legal framework has been improved towards specifying regulations, diversifying financial resources and simplifying procedures. More importantly, the Law on Investment by Public-Private Partnerships was issued in 2020 and took effect from January 1st, 2021.

According to statistics compiled by the Government of Vietnam, as of January 2019, the total number of PPP projects was 336 with a total investment capital of about 1,600,000 billion VND. Transport and energy are two sectors taking the largest shares regarding both the number of PPPs and investment value. Particularly, 220/336 projects in 2019 were in the transport sector accounting for 42% of investment value by PPPs, while there were 18 energy projects with the share of 53.3%. In large cities, namely Hanoi and Ho Chi Minh City, there

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[7] Commercial banks were the main investors in the government bond market with a holding rate of 70%-80% in 2011-2013, causing the concern of the crowding out effect on private investment when resources were attracted to the public sector through government bonds. Since 2014, the proportion of government bonds held by commercial banks gradually decrease from 79.7% in 2014 to about 51.1% in 2018. By 2020, insurance sector became the largest investors in the government bond market with a holding rate of 54%.

were PPP projects in other areas such as water supply and drainage, and environmental protection, etc.

Although promoting PPPs has received considerable attention, many shortcomings have been exposed. 95% of PPP projects were in Build - Operate - Transfer (BOT) and Build - Transfer (BT) contracts (Vietnam Chamber of Commerce and Industry, 2020). While the BT method was stopped and removed from the Law on PPPs in 2020 due to problems in contract payments, failures in transport BOT projects has been on the rise. Common reasons can be mentioned like some projects failed to find private investors; private partners were unable to ensure financial capacity to carry out the contract; and bankruptcy occurred after completing construction due to unfeasible financial plans. Such failures have led to fiscal burdens on both local and central state budgets as well as welfare inefficiencies.

Some problems that need to be considered

- ▪ ***There is high reliance on the private sector in BOT projects.*** Data in 2019 shows that 140/336 PPP projects were in the form of BOT contracts. Participation of the private sector in PPPs is considered as important financial resources to reduce the fiscal burden. However, the financial capacity of the private sector in Vietnam is generally limited. The private sector often has difficulty accessing medium- and long-term capital because of the underdevelopment of the capital market as well as regulations on capital adequacy ratios of the banking system that limit them from providing long-term credit. In reality, private investors in many projects cannot mobilize financial resources to carry out contracts as committed. On the other hand, in order to reduce risks, competent state agencies set bidding document requirements that are too difficult to be met by the private sector. In fact, there have been projects that cannot call for investors to submit bids.

- ▪ ***Many projects are built with poor financial plans and implemented with low discipline.*** While PPPs are long-term projects and come with large transaction costs, Vietnam's State agencies have limited human capacity in building, negotiating and monitoring PPP contracts. Recently, there have been PPPs facing bankruptcy after completing construction due to poor demand estimates and unfeasible capital recovery plans. In addition, due to low discipline in implementation, many projects encountered capital overruns and did not achieve the expected quality and progress. Some PPP projects cannot maintain stable and reasonable user fees while user fees matter in the inequality-reducing effect of government spending on infrastructure as implied by the empirical findings in the previous section. In some cases, user fees were raised through different forms, leading to criticism from people. Besides, some projects quickly deteriorated after completion, reflecting ineffective project supervision.

- ▪ ***There is a lack of strategies to create a PPP market and the public sector's readiness to cooperate with the private sector.*** While PPP project contracts often last 20 - 30 years, PPP regulations are considered by investors to be unstable. Due to the risk of policy changes, many investors have requested government guarantees, higher profit levels and longer capital recovery periods. This has increased project

costs and social costs to implement PPPs. Although the Law on PPPs has been promulgated and took effect from 2021, ministries are still slow to issue detailed instructions, causing fear in participating in PPPs for both localities and the private sector. In addition, regulations on the roles and responsibilities of competent State agencies and investors are ambiguous. There have been inconsistencies and inadequacies in mechanisms on risk sharing and dispute resolution between parties involved in PPPs.

What could be learnt from Japan?

In Japan, the Act on Promotion of Private Finance Initiative (PFI Act) was enacted in July 1999, stipulating procedures and regulations for the smooth implementation of PFI projects. With more than 20 years of experiences, as of March 2021, there were 875 PFI projects implemented under the PFI Act and a cumulative contract value of approximately US$61 billion (7 trillion yen). The PFI method has been used in various business sectors, mainly for social infrastructure development.

Table 9. The number of PFI projects by field in Japan (as of March 2021)

Fields	Number of projects
Educational and cultural facilities (social education facilities, cultural facilities, etc.)	292
Urban development (roads, parks, sewerage facilities, port facilities, etc.)	220
Health and environment (medical facilities, waste disposal facilities, funeral halls, etc.)	131
Government buildings and dormitories (office buildings, civil servants' dormitories, etc.),	76
Industry (tourism facilities, agricultural development facilities, etc.)	27
Security (police, firefighters, etc.)	26
Living and welfare (welfare facilities, etc.)	25
Other fields (complex facilities, etc.)	78
Total	875

Source: PPP/PFI Promotion Office[8], Japan

Regardless of the differences between Vietnam and Japan in terms of the context and sectors with participation of PPPs, there are useful lessons that Vietnam could learn from Japan. Some of them should be emphasized such as the following:

- *The scope of the private sector should be within the extent that they can manage and control risks.* In Japan, risks are taken by the private sector and are limited since the majority of PFI projects in Japan is in BTO (Build Transfer and Operate)[9] and

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[8] https://www8.cao.go.jp/pfi/en/projectprofile/projectprofile.html

[9] In the BTO method, the private sector designs and constructs a facility (Build) and transfers ownership (Transfer) to the public immediately after completion. Then the private sector maintains and operates the facility (Operate).

service purchase types[10]. It is often applied for constructing public facilities such as government buildings, schools, and public housing, etc., where it is difficult to generate revenue from the project. For high-risk or difficult-to-profit projects, there should be incentives to call for the participation of private partners. Another way is to decompose the project into core and non-core functions. Accordingly, the private partners taking on the non-core component are insulated from the risks from the core component.

In more than 20 years implementing PPPs in Japan, some failures are inevitable and bring about lessons. In fact, there were several cases of failure in Japan due to project structure design with heavy reliance on the private sector[11]. Risks and bankruptcy happened when the private sector had high exposure to market risks. These failures in some cases forced local governments to spend their budget to address them.

- ***It is necessary to have strong promotion and support from the government.*** The PPP/PFI Promotion Office, Cabinet Office, Government of Japan, is the agency responsible for promoting PPP/PFI in Japan. The office develops specific measures for promoting PPP/PFI, such as the "Action Plan for PPP/PFI promotion"[12] and prepares guidelines, manuals, case studies, etc., as tools to facilitate the introduction and smooth the implementation of PPP/PFI methods. In order to support local governments and other organizations engaged in PPP/PFI projects, the office organizes seminars and implements a system to dispatch experts with specialized knowledge, know-how, and experience. Besides, each ministry, agency, prefecture, and ordinance-designated city also prepares its own guidelines to provide guiding principles, etc.

- ***Strict discipline in implementing PPPs is critical to project progress and efficiency***. Contracts are built with terms and conditions set so that private contractors cannot change the tariff at their own will. Japanese contractors commonly have strong capacity in carrying out construction work with fixed budgets and fixed schedules. In order to ensure affordability for users, tariffs must be kept at reasonable levels. If

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[10] This is a type of PFI in which the national or local government pays a "service purchase fee" as compensation for the public service provided by the PFI operator, and this fee becomes the PFI operator's revenue.

[11] The case of Kochi Medical Center Hospital PFI is an example. This is a project of construction and maintenance of a new hospital with 648 beds in Kochi city. It is under a 30 year BTO (for hospital building) and BOT (for staff lodgment) and was opened in March 2005 with the cost of 213.4 billion yen and IT system of 4.6 billion yen. This project had an extended and challenging scope for a PFI contractor. The private contractor had to face the reduction of clinical revenue while the costs of medical goods were rising and there was the burden of depreciation. Since it was a huge investment, the private entity was under the pressure of interest and principal repayment for the construction loan portion. As a result, the project has accumulated losses and cash flow shortage. Although there was funding support by the prefecture/city, it was insufficient. It then led to growing distrust between public and private parties, leading to voluntary contract cancellation.

[12] It is a comprehensive plan for the government to improve the necessary environmental arrangements, provide support to local governments, and develop systems by compiling the necessity of institutional responses and specific measures to be newly implemented. The priorities in this plan are reviewed and improved every fiscal year by the PPP/PFI Promotion Office to the progress made with the major measures taken previously.

there are problems to affordability, there should be other mechanisms (such as subsidies) to deal with them instead of increasing the price of services.

6. CONCLUSION

By investigating the effects of public investment on economic growth and income inequality, this paper provides helpful implications for policymakers in Vietnam. Firstly, public investment is not only a pro-growth policy as being supposed, it also has an effect on mitigating Vietnam's inequality in the medium run. However, such a reducing-inequality effect only occurs when public investment is measured by provincial government investment. Secondly, public investment from SOEs enhances growth, but does not mitigate equality, implying the expansion of free (or at very low price) infrastructure and other public utilities benefit the poor more than the rich. Thirdly, distributional effects of government investment on the upper-low and low-middle income quintiles suggest it should be used as a supplement to redistributive current expenditure which is found to target directly to the poorest. Fourth, spending on human development is as important as on infrastructure in promoting both growth and equality in the medium run. Fifth, restructuring of the State budget in Vietnam should focus on increasing government investment and spending on human development.

With such proof on contributions of public investment in Vietnam, however, it is confronting a decline in fiscal resources for public investment and there is a large financial gap between infrastructure needs and the government's financial capacity. In that context, PPPs are being promoted as an important solution to fill the financial gap and provide infrastructure. Within the limited space, my study identifies some problems related to the development of PPPs that need attention in Vietnam. Among them, the problem related to inequality is the inability to maintain stable and reasonable service prices of some PPP projects, while the price of public infrastructure services is relevant to inequality reduction. It then recommends several lessons of Japan that should be learnt including scopes of the private sector, strong promotion and support of the government, and the importance of strict discipline.

Finally, my study contains some unanswered issues that suggest further research. There should be an explanation of the impact channels of public investment on Vietnam's economic growth and inequality. This could include disaggregating public investment in more detail, for example by sector or financial sources. Besides, there is a need for studies on the macroeconomic impacts of PPPs, in which inequality is an aspect to consider.

References

Agénor, P.R. (2011) "Schooling and Public Capital in a Model of Endogenous Growth", Economica 78, 108–132.

Artadi, E.V., Sala-i-Martin, X. (2003) "The economic tragedy of the XXth century: Growth in Africa". NBER Working Paper 9865.

Aschauer, D. (1989) "Is Public Expenditure Productive?" Journal of Monetary Economics 23, 177-200.

Barro, R. 2000. "Inequality and Growth in a Panel of Countries." Journal of Economic Growth 5 (1): 5–32.

Bom, P. and J. Ligthart (2014) "What have we learned from three decades of research on the productivity of public capital?" Journal of Economic Surveys, forthcoming.

Calderon, C. and L. Servén (2014) "Infrastructure, growth, and inequality: An overview," World Bank Policy Research Working Paper Series 7034.

Calderón, C. and L. Servén (2004) "The effects of infrastructure development on growth and income distribution", World Bank Policy Research Working Paper 3400.

Chatterjee, S. and S.J. Turnovsky (2012) "Infrastructure and inequality." European Economic Review 56, 1730-1745.

Doumbia, D. and Kinda, T. (2019) "Reallocating Public Spending to Reduce Income Inequality: Can it Work?" IMF Working Paper No. 19/188.

Duggal, V., C. Saltzman and L. Klein (1999): "Infrastructure and productivity: a nonlinear approach", Journal of Econometrics 92, 47-74.

Fan, S., and X. Zhang (2004) "Infrastructure and regional economic development in rural China." China Economic Review 15, 203– 214.

Ferreira, F.H.G. (1995) "Roads to Equality: Wealth Distribution Dynamics with Public-Private Capital Complementarity", LSE-STICERD Discussion Paper TE/95/286 (London).

Fournier, J.M., and Å. Johansson (2016) "The Effect of the Size and the Mix of Public Spending on Growth and Inequality". OECD Economics Department Working Papers, No. 1344, OECD Publishing.

Gnangoin, Y. T. B., Du, L., Assamoi, G., Edjoukou, A. J., & Kassi, D. F. (2019) "Public spending, income inequality and economic growth in Asian countries: A panel GMM approach". Economies, 7(4), 115.

Getachew, Y.Y. (2010) "Public capital and distributional dynamics in a two-sector growth model." Journal of Macroeconomic 32, 606-616.

Holzner, M. (2010): Inequality, Growth and Public Spending in Central, East and Southeast Europe, wiiw Working Paper, No. 71, The Vienna Institute for International Economic Studies (wiiw), Vienna

Khandker, S., Koolwal, G. (2007) "Are pro-growth policies pro-poor? Evidence from Bangladesh". Mimeo, The World Bank.

Le, H.P.L., and Nguyen, N.A.T. (2016) "Tác động của bất bình đẳng đến tăng trưởng kinh tế Việt Nam giai đoạn 2002-2021" [Impact of inequality on economic growth in Vietnam during the 2002-2012 period]. Ho Chi Minh City Open University Journal of Science, Vol. 11 (2) 2016.

Muinelo-Gallo, L., and O. Roca-Sagales (2011) "Economic Growth and Inequality: The Role of Fiscal Policies". Australian Economic Papers50 (2–3): 74–97.

Muinelo-Gallo, L., and O. Roca-Sagalés (2014) "Is the Fiscal Policy Increasing Income Inequality in Uruguay?" Journal of Economics and Development Studies. Vol. 2, No. 3, pp. 137-156 ISSN: 2334-2382 (Print), 2334-2390 (Online).

Ostry, J. D., A. Berg, and S. Kothari (2018) "Growth-Equity Trade-offs in Structural Reforms". IMF Working Paper 18/5, International Monetary Fund, Washington, DC.

Ostry, J.D., Berg, A. and Tsangarides, C.G. (2014) "Redistribution, Inequality and Growth". IMF Staff Discussion Note SDN/14/02. Washington, DC: International Monetary Fund.

Pi, J. and Y. Zhou (2014) "Foreign capital, public infrastructure, and wage inequality in developing countries," International Review of Economics & Finance, Elsevier, vol. 29(C), pages 195-207.

Pi, J. and Y. Zhou (2012) "Public infrastructure provision and skilled–unskilled wage inequality in developing countries." Labour Economics 19(6), 881-887.

Romp, W. and J. DeHaan (2007) "Public Capital and Economic Growth: A Critical Survey", Perspektiven der Wirtschaftspolitik 8 (s1), 6–52Rud, Juan Pablo (2012) "Electricity Provision and Industrial Development: Evidence from India." Journal of Development Economics 97, 352-367.

Solt, Frederick (2020) "Measuring Income Inequality Across Countries and Over Time: The Standardized World Income Inequality Database." Social Science Quarterly 101(3):1183-1199. SWIID Version 9.6, December 2023.

Tran, T.T, Dinh, N.L., and others (2022) "Tác động của bất bình đẳng đến tăng trưởng kinh tế ở Việt Nam" [Effects of income inequality on economic growth in Vietnam]. Research of National Institute for Finance, Ministry of Finance of Vietnam.

Turnovsky, Stephen J., (2015). "Economic growth and inequality: The role of public investment," Journal of Economic Dynamics and Control, Elsevier, vol. 61(C), pages 204-221.

Vietnam Chamber of Commerce and Industry (2020) "Một số quan điểm của khu vực tư nhân về quan hệ đối tác công tư tại Việt Nam" [Some views of the private sector on public-private partnerships in Vietnam], available at https://vcci-ppp.vn/media/jehfnzny/ppp-green-book_vn130520.pdf

World Bank (2020) "Vibrant Vietnam Forging the Foundation of a High-Income Economy Main Report". Development Policy Review.

World Bank (2006) "Inclusive growth and service delivery: Building on India's success". Development Policy Review.

Appendix. Impacts of public investment by component

Table A1. Estimation of growth equations (FEM)

Dependent variable: GROWTH		
Measure of public investment: INV_PUB and INV_PUB_OT		
Time of effects	Short run	Medium run
GOV_INV	0.1907	0.1376
	(2.0600)**	(2.9700)**
INV_PUB_OT	0.0940	0.0746
	(2.0300)**	(2.5100)**
INV_OT	0.0395	-0.0014
	(2.4100)**	(-0.0900)
LGDP_C	-13.3141	-3.4856
	(-2.9600)**	(-2.9500)**
GINI	-0.0376	-0.0965
	(-0.5700)	(-1.4000)
LAB_G	0.0857	0.0238
	(1.3100)	(0.4800)
T_LAB	0.1431	-0.1143
	(1.3000)	(-2.0800)**
URBAN	0.0739	0.8437
	(0.9600)	(4.6900)**
R^2	0.4755	0.3883

Note: Values in parentheses are t-statistics;
** and * indicates 5% and 10% significance, respectively

Table A2. Estimation of inequality equation in medium run (FEM)

Dependent variable: INEQUALITY			
Measure of public investment: INV_PUB and INV_PUB_OT			
Measure of inequality	GINI	DIFF	LOW_INC
GOV_INV	-0.2689	-0.1051	0.1111
	(-3.9800)**	(-3.4100)**	(3.3700)**
INV_PUB_OT	-0.0213	0.0026	0.0056
	(-0.5200)	(0.2100)	(0.2700)
LGDP_C	-4.9993	-0.9147	2.0111
	(-2.9500)**	(-1.8500)*	(2.5000)**
GDP_G	0.0165	0.0079	-0.0065
	(1.1500)	(1.5500)	(-1.0200)
T_LAB	-0.1206	-0.0282	0.0730
	(-1.2600)	(-1.0700)	(1.7200)*
URBAN	-0.5377	-0.0840	0.2257
	(-1.6500)	(-0.6300)	(1.5800)
R^2	0.3732	0.2968	0.3284

Note: Values in parentheses are t-statistics;
** and * indicates 5% and 10% significance, respectively