PUBLIC SPENDING AND ECONOMIC GROWTH:

A GRANGER'S CAUSALITY TEST IN A MULTIVARIATE MODEL FOR THE CASE OF VIETNAM

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Over the past two decades, Vietnam's public spending increases rapidly from 14.2% of GDP in 1991 to 20.2% of GDP in 2010. Additionally, since Vietnam resumed its relations with community of international donors, inflows of ODA have numerously supported government's spending; Vietnam's economic growth rate has reached 7.3% on average. The question is whether the rise in public spending will expedite the national economic growth or the national economic growth will push public spending up.

This paper looks into the causal relationship between public spending and economic growth. The research model is developed from the comprehensive production function wherein public spending is split into two components (i.e. budget spending and ODA spending) with a view to evaluating how efficiently public finance resources are allocated. Simultaneously, trade openness, private investments and labor force are treated as control variables. With the data set of the period 1990-2010 and the Granger causality test in the multivariate VAR model, the research finds that the model is statistically significant and the two-component public spending has a unidirectional causal relationship with economic growth. Another significant finding is that public spending does not have any relationship with private investment. Eventually, based on findings, some solutions and policy implications will be recommended.

Keywords: public spending, ODA, economic growth

1. The government's role in economic growth and previous researches

In the national economy, the government affects GDP through its interaction with the private sector. The development of infrastructure and omission or adjustment of externalities will facilitate business activities and improve the allocation of resources. Transfer payments also help to maintain social harmony and enhance labor productivity. Generally, macroeconomic policies play certain roles in promoting economic growth; yet they are also restricted to some extent due to distortions caused by the government intervention. A rise in public

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spending can cause economic imbalance, raise inflation rate and public debts, and crowd out private investments. Niskanen's theory (1971) states that bureaucrats tend to maximize budget so as to maximize their own benefits. Consequently, the supply of public goods cannot optimally meet the market demands whereas the public sector machine is going to swell up. After the WWII, many theories and empirical researches have looked into public spending in various economies and its impacts on the long-term economic growth.

Wagner's theorem emphasizes that economic growth is the decisive factor of public sector growth. Several subsequent studies in this vein did figure out a significant positive relationship between the public sector growth and economic growth in both developed and developing economies; but some others discovered a negative relationship (Loizides, 2004). The Keynesian economics, meanwhile, strives to illuminate the government's role in economic growth. Many empirical researches on the effect of public spending on economic growth have generated various outcomes (Loizides, 2005).

Within three recent decades, there have emerged many researches on the relationship between public spending and GDP (such as Fischer, 1991; Easterly and Rebelo, 1993; Girer and Tullock, 1989; Kormandi and Meguire, 1985). What makes so many researchers get interested in this issue is the fact that explaining the macro relationship between variables is difficult because their causal relationships tend to be concealed in terms of both direction and nature. Each estimation model always contains certain discrepancies. The Wagner's school states that public spending plays a passive role; meanwhile, the Keynesian school requires that there must be a variable "crucial policy". Apparently, it is needed to be well aware of the actual relationship between government expenditure and economic growth to possibly determine strengths of such relationship and produce significant implications for macroeconomic policies.

Singh and Sahni (1984) employed the Granger's test to explore the causal relationship between public spending and GDP in a two-variable model for the case of India. Their empirical results showed that the relationship between public spending and gross national income is not consistent with conclusions of both Wagner and Keynesian schools. Bohl (1996) applied both cointegration test and Granger's test in the two-variable paradigm, and his findings supported Wagner's theorem for the case of the USA and Canada in the post-WWII period. Ghali (1998) employed the cointegration test to test the active interaction between the size of public expenditure and economic growth in the five-variable model (i.e. GDP growth, gross government expenditure, private investment, import and export). By utilizing the data set collated from 10 OECD members, Ghali showed that public spending has had a Granger causal relationship with economic growth in chosen OECD countries.

In sum, effect of public spending on economic growth is still controversial. Empirical demonstrations of such effects are very mixed while empirical results depend heavily on components of the model. For example, the relationship between public spending and economic growth is negative when it is described as percentage of GDP, and positive when described as changes in the annual percentage (Constantinos, 2009).

2. Research model

Based on researches by Constantinos Alexious (2009), Mesghena Yasin (2003), and Ghali (1998), the neoclassical comprehensive production function is used as a basis for development of an empirical multivariate model of the relationship between public spending and economic growth. Omitting the technical factor (A), the comprehensive production function can be simply rewritten as:

$$Y=f(K,L) \quad (1)$$

where Y denotes the quantity of output, K represents the private investments, and L is labor force.

As Feder (1982), Ram (1986) and Grossman (1988) put it, when the government intervenes in the economy, it is probable to integrate public spending into the comprehensive production function. Effects of public spending (which comprises regular expenditures and investment spending) on economic growth can increase the gross investment and aggregate demand, and thus Equation (1) can be rewritten as:

$$Y=f(K, L, G) \quad (2)$$

In the condition of an open economy and with the FDI inflows, public spending can be financed by domestic budget incomes (G^D, hereunder referred to as budget spending) and ODA (G^F, hereunder referred to as ODA spending). Additionally, the trade openness (Z) is also included in the model as a control variable (Constantinos Alexiou, 2009; Mesghena Yasin, 2003), and therefore the production function will comprise five variables.

$$Y=f(K, L, G^D, G^F, Z) \quad (3)$$

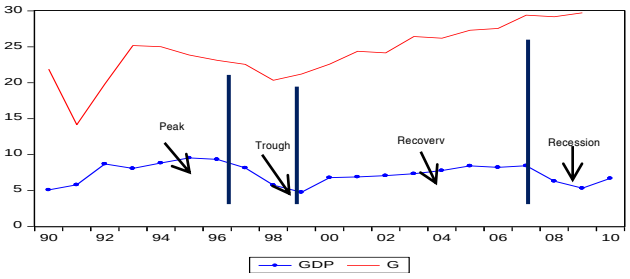
Equation (3) shows that the relationship between government expenditure and economic growth must necessarily be analyzed in connection with other control variables (i.e. private investments and trade openness, etc.). Calculating the derivative of Equation (3) with respect to Y (excluding L), we have Equation (4) below:

$$dY/Y = (\partial Y/\partial K)dK/Y + (\partial Y/\partial L)dL/L + (\partial Y/\partial G^D)dG^D/Y + (\partial Y/\partial G^F)dG^F/Y + (\partial Y/\partial Z)dZ/Y \quad (4)$$

where $\partial Y/\partial K$, $\partial Y/\partial L$, $\partial Y/\partial G^{D,F}$, $\partial Y/\partial Z$ respectively represent the marginal multipliers of capital, labor, public spending, and trade openness. The sign of all partial derivatives is expectedly positive. This means that private investment, labor force, public spending and trade openness are expected to have significant positive effect on economic growth. Trade openness has a significantly positive effect on economic growth because an open economy is bestowed with more opportunities to access to foreign capital sources and markets. The opener the economy is, the higher the economic growth is expected to be.

3. Testing the relationship between public spending and economic growth in Vietnam in 1990-2010

Within two recent decades, Vietnam's economic growth has reached 7.3% on average (highest in 1995 with 10% and lowest in 1999 with 4.8%). Vietnam's business cycle over such period can be described as: growth or peak (1991-1996), recession or trough (1997-2001), recovery (2002-2007) and recession (2007-2010). Apparently, from 1990 till now, Vietnam has experienced different growth phases and its fiscal policies have been adjusted accordingly to weather the business cycle.



Source: ABD (2010), Key Indicators for Asia and the Pacific

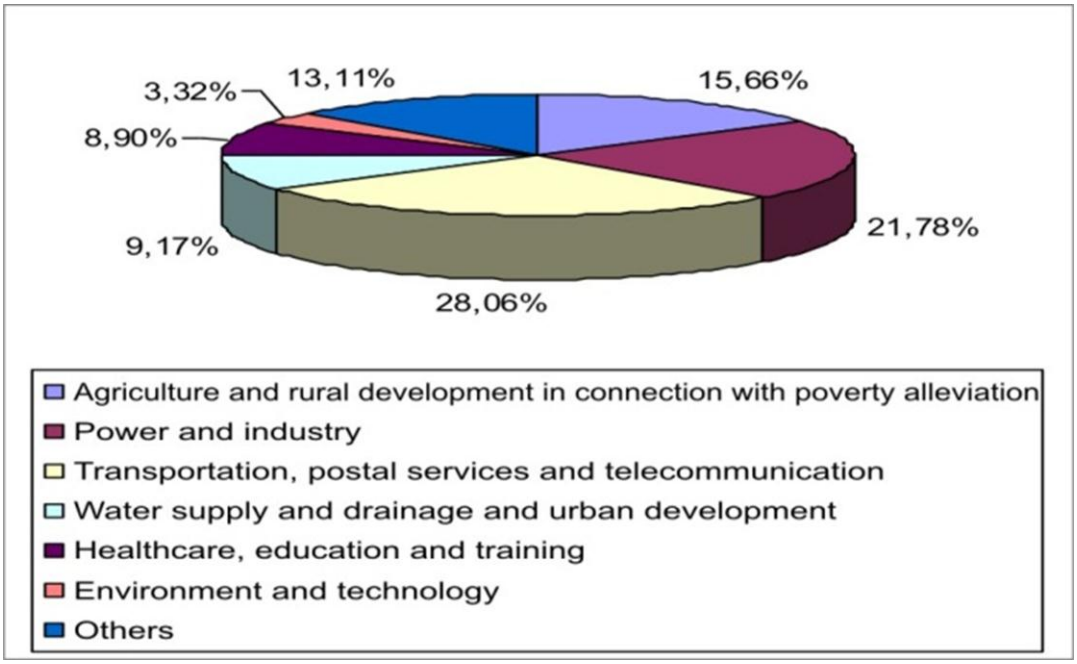
Figure 1: Public spending and economic growth in Vietnam in 1990-2010 (%)

Figure 1 shows that the peak and trough of budget spending is in line with that of GDP, especially in the years 1998-2007. In the early 1990s, budget spending reached a record high in 1993-1996 (i.e. 23% - 25% of GDP) and GDP growth rate varied between 8.0% and 9.5%. After the 1997 financial crisis, the economy fell victim to recession, causing GDP growth to plunge to 4.8% and budget spending to fall to 20.3% of GDP. Then, budget spending incessantly rose from 20% of GDP in 1998 to 27.5% in 2007; simultaneously, the economy showed signs of recovery in the years 1999-2003 and reached an

average high growth rate of 7.5% in the period 2004-2007.

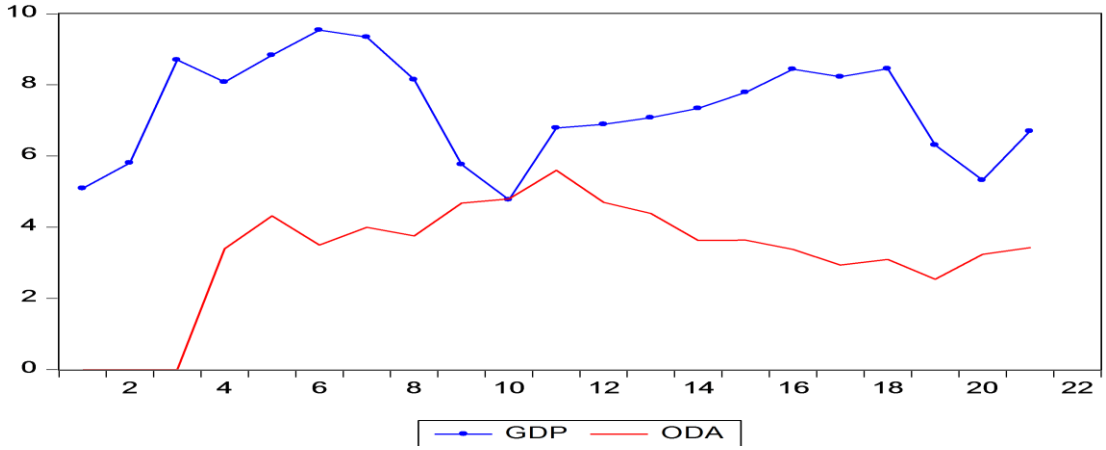
Changes in the size of budget spending are related to the countercyclical fiscal policies such as restricting mobilization of tax revenues via tax reform programs (steps 2 and 3), and especially increasing public investment via demand stimulus programs concentrating on strategic targets (i.e. infrastructural upgradation and poverty alleviation). Nonetheless, after the 2008 global financial crisis, these two variables did not move in the same direction; budget spending, from 27.5%, jumped to 30% in 2010 while economic growth just reached 5.8% on average in the period 2008-2010. In sum, this fact shows that it is very difficult to conclude whether or not budget spending can influence economic growth in Vietnam.

Since Vietnam opened its door to welcome foreign investors, ODA has become a crucial source of capital which is to balance budget overspending. The National Budget Law in 1996 and 2002 prescribes that only budget overspend on investment is accepted. In 1993, Vietnam's economy turned to a new stage when Vietnam has established bilateral and multilateral relationships with the community of international donors – the beginning of the process of attracting and employing ODA sources. According to the MPI, in the period 1993-2010, Vietnam and foreign donors did enter into specific international commitments concerning ODA with the gross capital of approximately US$50 billion, representing 82.98% of the total committed ODA capital. The preferential ODA loans accounted for 80% and non-refundable ODA capital occupied 20%. The size of committed ODA capital has been increasing; yet, the disbursement ratio makes up around 52% of total committed ODA capital and 62.65% of total ODA capitals signed in the period 1993-2010. The ODA disbursement is used for covering budget overspend and financing national strategic targets such as poverty alleviation, power development, infrastructural upgradation, education, and healthcare (see Figure 2). However, the question is that whether or not there exists a relationship between the ODA disbursement and economic growth. Figure 3 shows it is not easy to assert the relationship between these two variables.



Source: MPI (2008)

Figure 2: ODA allotments by field/industry (1993-2008)



Source: ABD (2010), *Key Indicators for Asia and the Pacific*

Figure 3: Relationship between ODA disbursement (as % of GDP) and economic growth in 1993-2010

In sum, the aforementioned points cannot shed light on if public spending influences economic growth. After the 1997 financial crisis, many proactive policies have been adopted to stimulate economic growth such as encouraging the private sector, attracting FDI and expediting international trade, etc. If private investment just equaled 8% of GDP in the 1996-2001 period, it jumped to 14-15% in the 2006-2010 period. In 2010, Vietnam's trade openness reached 152% of GDP, a threefold increase in comparison with the year 1990. Therefore, in order to ascertain the relationship between public spending and economic growth, it is needed to empirically test the time-series data concerning changes and interaction between these two variables.

4. Testing model and research results

a. Testing model:

With $\partial Y / \partial K = \alpha_1$, $\partial Y / \partial L = \alpha_2$, $\partial Y / \partial G^D = \alpha_3$, $\partial Y / \partial G^F = \alpha_4$, and $\partial Y / \partial Z = \alpha_5$, the equation (4) can be explained as follows:

dY/Y = GDP = The annual growth rate of real GDP

dK/Y = I/Y= PI = Private investment (%/GDP)

dL/L= PGR = Annual population fluctuation (%) – Labor force

dG^D/Y = GD/Y = DG = Budget spending (%/GDP)

dG^F/Y = GF/Y = ODA = ODA-financed spending (%/GDP);

dZ/Y = TOP = Total turnover of import and export (%/GDP) – Economic openness

After adjusted, the equation (4) can be rewritten as:

$$GDP_t = \alpha_1 PI_t + \alpha_2 PGR_t + \alpha_3 DG_t + \alpha_4 ODA_t + \alpha_5 TOP_t \quad (5)$$

According to Equation (5), economic growth depends on the private investments ratio (PI), annual fluctuation rate in labor force (PGR), public spending ratio (DG), ODA disbursement ratio, and trade openness (TOP). The following statistical equation is employed to test the model.

$$GDP_t = \alpha_0 + \alpha_1 PI_t + \alpha_2 PGR_t + \alpha_3 DG_t + \alpha_4 ODA_t + \alpha_5 TOP_t + \varepsilon_t \quad (6)$$

The Granger's causality test and the vector autoregression (VAR) model of GDP will be employed to analyze the relationship among variables.

$$GDP_t = \alpha + \beta GDP_{t-1} + \sum_{t=1}^{n} \delta \Delta GDP_{t-1} + \varepsilon \quad (7)$$

b. Data set:

The time-series data are the annual data collected in the period 1990-2010 and from *Key Indicators for Asia and the Pacific 2010* published by the ADB which includes the annual economic growth rate (GDP), the ratio of budget spending to GDP (DG), and the ratio of import

export turnover to GDP (TOP). However, the above-mentioned material just provides Vietnam's economic data up to 2009, the 2010 data will be collated from MPI reports. Data concerning ODA and private investments are respectively collected from the MPI and GSO. Data about the ratio of labor force is retrieved from the website of ILO.

Table 1: Time-series data set

	GDP %	G (%/GDP)	PI (%/GDP)	TOP (%/GDP)	L
1990	5.1	21.9	8.92	54.1	1.9
1991	5.8	14.2	10.89	54.3	2.0
1992	8.7	19.8	14.52	50.8	2.1
1993	8.1	25.2	16.84	49.4	2.1
1994	8.8	25.0	18.74	57.1	2.1
1995	9.5	23.8	18.35	61.4	2.0
1996	9.3	23.1	16.36	70.1	1.8
1997	8.2	22.6	17.47	73.1	1.7
1998	5.8	20.3	14.43	72.4	1.6
1999	4.8	21.2	13.56	77.1	1.6
2000	6.8	22.6	13.99	91.5	1.5
2001	6.9	24.4	14.24	90.5	1.5
2002	7.1	24.2	15.94	98.3	1.6
2003	7.3	26.4	18.37	108.4	1.5
2004	7.8	26.2	21.12	121.5	1.4
2005	8.4	27.3	21.63	127.2	1.4
2006	8.2	27.5	22.54	135.3	1.3
2007	8.5	29.4	29.21	151.3	1.3
2008	6.3	29.2	27.45	151.7	1.3
2009	5.3	29.7	25.40	126.1	1.2
2010	6.7	29.2	25.94	152.55	1.2

c. Stationary test:

The Augmented Dickey – Fuller (ADF) test will be employed to test the stationarity of time-series variables. It is hypothesized that:

$H_0 : \rho = 0$: There is a unit root and the time series is non-stationary.

$H_1 : \rho \langle 0$: No unit root is present and the time series is stationary

The most important criterion is that if the t-statistic for ρ is a negative larger than the tabulated critical value of 5%, then the null hypothesis of $\rho = 0$ is rejected, or variables are stationary, or no unit root is present. Table 2 shows that the time-series data concerning GDP is stationary at the significant level of 5% and the remainders are non-stationary. The first-order difference of those time series is stationary at the significant levels of 1%, 5%, and 10% respectively (Table 2). Because the time-series data concerning ODA is stationary at the significant level of 10%, the Phillips Person (PP) test will also be performed to enhance the accuracy. The result shows that the time-series data of ODA, according to the PP test criteria, is stationary with the significance of the first-order difference at 1%. Accordingly, apart from ODA, the first-order difference of other time series is employed to test the relationship between public spending and economic growth.

After excluding the possibility of the multicollinearity of time series, the lag time of the model will be tested. Based on AIC (Akaike information criterion), SC (Schwarz information criterion), and HQ (Hannan-Quinn information criterion), the optimal lag time opted for the VAR model is 0 (Table 3). Eventually, the model is fit to perform the Granger's causality test for endogenous and exogenous variables.

Table 2: ADF test results

Variable	Lag	t-stat for ρ
GDP	1	-3.3**
dDG	4	-3.0**
dODA	1	-2.8***
dPI	0	-3.5*
dTOP	1	-4.3*
dL	0	-3.4*

NB: *, **, *** denote the statistical significance at 1%, 5% and 10% respectively.

d. Testing results and conclusion:

The research places its focus on testing the relationship between public spending and economic growth. Based on the established

Table 3: Criteria of choosing the lag time

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-172.2626	NA*	5.684880*	18.76449*	19.06273*	18.81496*
1	-140.3433	40.31915	10.85751	19.19403	21.28174	19.54736

model, some control variables are also included to fortify the validity of the model. Results of the test for Granger's causality between endogenous variable (GDP) and exogenous variables (DG, ODA, PI, TOP, L) are summarized in Table 4.

The empirical outcomes show that the model comprising above-mentioned variables generate a value of 16.35 and a significant level of 1%, and therefore the research model is reliable. In the model, the budget spending (DG) has positive impacts on economic growth (Sig.=1%), and this finding is in line with that by Ashauer (1990), Ram (1986), Singh and Sahni (1984). The theoretical implication from this result is in favor of the Keynesian school rather than the Wagner's theorem when the government's role in and fiscal impacts on economic growth are emphasized. There is no causal relationship between budget spending and private investment.

The inflow of ODA used for financing public spending has a sharp impact on Vietnam's economic growth (Sig.=1%), and it is unlike many of other researches which state that ODA does not have any statistical significance to the growth of developing economies (Mesghena Yasin, 2003). A quite interesting finding is that ODA has impacts on PI with the significant level of 10%, which consolidates perspectives on the causal relationship between ODA and economic growth. TOP and PI also influence economic growth (Sig.=5%), and it is implied that development of private businesses and promotion of commercial liberalization have contributed to the Vietnam's economic growth over the past two decades. The effects of labor force on economic growth are smaller and weaker than other variables (Sig.=10%).

Table 4: The Granger's causality test results in the VAR model

From /To	GDP	ddg	doda	DI	dpi	dtop
GDP	/	3.53	1.21	1.25	0.22	0.35
Ddg	**11.4***	/	**15***	0.33	3.79	2.57
Doda	**7.91***	2.93	/	0.35	**4.43*****	1.65
Dpi	6.35**	1.83	0.69	0.28	/	0.012
DI	5.24***	1.39	0.2	/	0.85	1.014
Dtop	7.72**	2.34	0.77	0.60	2.49	/
Total	19.35*	15.79	25.19	5.50	9.60	7.40

NB: *, **, *** denote the statistical significance at 1%, 5% and 10% respectively.

5. Policy implications

Over the past two decades, budget spending has contributed to the Vietnam's economic growth. In the model, the causal relationship between budget spending and private investment is not statistically significant. It implies that budget spending has not raised private investment whereas private investment affects economic growth at a low statistical significance. Therefore, it is possible to assert that Vietnam's economic growth depends heavily on budget spending. The model also reveals many problems that call for correction in the near future.

a. It is necessary to tackle harmoniously the relationship between public spending and economic growth. To do so, it is needed to:

- Define the vision and philosophy of budget spending: In the past, budget spending has risen quickly; public investment went from 5% of GDP in 1990 to 9% in 2008, representing around 40% of total budget spending. Such a large share of public investment in budget spending indispensably leads to cuts in expenditures on public service, culture, education, and healthcare, etc. This is a big problem with the budget income and spending that requires careful analyses. Many surveys have figured out that there is a scattering and overlap of budget-invested capital (Vũ, 2011). It is partly due to wrong perception of government's function. In the market economy, the government acts as a national administrator instead of a direct businessperson.

The restructuring of public investment should aim at changing the government's function. Budget spending as public investment should be directed to infrastructural upgradation, institutional development, and competence enhancement. The private sector should be evolved to facilitate the restructuring and cutback on budget spending. By withdrawing public capital from unnecessary fields, the government can concentrate on planning macroeconomic issues, invest in major infrastructure projects and set up an investment mechanism that supports economic growth and national competitiveness.

- Improve policies on investment in infrastructure: The management of budget investment has been strongly delegated over the past time, which helps to enhance the real power and activeness of local authorities on the ground of effectiveness and concentration on fields beyond the reach of private sector.

For non-budget-financed infrastructural investments, the government has promoted BOT, BTO and BT investment projects, especially essential and important infrastructural ones. Consequently, increases in investment help improve the infrastructure system, thereby enhancing production capacity and encouraging the active and creative management of budget-financed investment projects by local authorities. Allotment of investment capital is suitable to the demand and actual conditions of each locality; and the managerial competence of local cadres is also improved.

Nonetheless, the infrastructure, especially the traffic arteries, has not met demands for economic growth in terms of both quality and quantity; maintenance and management of infrastructure works after completion has not been done well. Flows of investment to BOT and BT projects are limited. For most BOT projects, their investors are appointed, and many of terms and conditions are different from international common standards. Such problem should be corrected in the near future in order to improve and attract the participation of private investors.

- Perfect the mechanism for delegating control over public investment in the direction of sustainable development: Delegation of management of public investment recently has improved competence of local authorities and allocation of public investments. Hence, efficiency of publicly-invested projects is enhanced, and more sources of finance are attracted to serve investment projects.

Nonetheless, there are some drawbacks in the delegation policy: (1) Many decisions on investment by delegating system is not rational

enough; (2) the central government has not coordinated local investment plans; (3) the zoning projects are low-quality and scattered making the ratio of incomplete projects increase; and (4) the control over implementation of projects is poor, causing unnecessary waste and corruption. In order to tackle them, it is needed to enhance the investment management competence of local authorities, tighten and let local communities and experts from research organizations inspect the mobilization and utilization of public investments.

b. Accelerating the budget disbursement and enhancing the use of ODA for sustainable development:

The empirical results show that ODA has a causal relationship with PI and GDP. Despite just representing 3% to 4% of GDP, ODA is a crucial source to finance the development of socioeconomic infrastructure and attract FDI and private investments.

In a new stage of development, ODA capital may have some changes in structure; preferential features of ODA projects may be cut back due to the fact that Vietnam is on its way to a medium-income country. It implies that Vietnam needs to changes its strategies for attracting and using this source of finance. ODA capital, especially less-preferential one, should be used for highly profitable programs or projects. Simultaneously, ODA capital must be possibly accessed by both the public and private sector on the ground of fair public-private partnership. Intermediary levels in ODA management should be eliminated, and ODA capital sources should be transferred to owners and stringently inspected by competent authorities to assure the effective utilization and due payment of debts to donors■

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