Government Size and Economic Growth in Vietnam: A Panel Analysis

SỬ ĐÌNH THÀNH

University of Economics HCMC – dinhthanh@ueh.edu.vn

ARTICLE INFO

Article history:
Received:
June 10, 2014
Received in revised form
July 5, 2014
Accepted:
Sep 30, 2014

Keywords:
government size, economic growth, GMM and PMG estimations.

ABSTRACT

The effect of government relative size on economic growth is a contentious issue. This paper is undertaken to test the relationship between government size and economic growth in Vietnam. The study is a panel data investigation, involving 60 provinces over the period 1997–2012. Various measures of government size are defined: provincial government expenditure as a share of gross provincial product (GPP), provincial government revenue as a share of GPP, real provincial government expenditure per capita, and real provincial government revenue per capita. Empirical estimates are employed by conducting Difference Generalized Method of Moments method proposed by Arellano and Bond (1991) and Pooled Mean-Group method by Pesaran, *et al.* (1999). These tests reveal: *(i)* provincial government expenditure (revenue) as a share of GPP has a significantly negative effect on economic growth; and *(ii)* the real government expenditure (revenue) per capita has a significantly positive effect on economic growth. It is also found that the long-run and short-run coefficients of government expenditure size are significant and negative, that the correction mechanism from the short run disequilibrium to the long run equilibrium is not convergent, and that government employment has a negative correlation with economic growth.

1. INTRODUCTION

There are several approaches to measures of government size. Most empirical studies in this field have employed government expenditure (revenue) as a share of GDP as various determinants of government size (Berry & Lowery, 1984; Gwartney, Lawson *et al.*, 1998; Vedder & Gallaway, 1998; Dar & AmirKhalkhali, 2002; Chen & Lee, 2005; Afonso & Furceri, 2010; Germmell & Au, 2012; Altunc & Aydın, 2013). In recent years there has been considerable interest in the relationship between government size and economic growth. All governments are not bad. No society in the history of mankind has ever obtained a high level of social-economic outcome without a government (Vedder & Gallaway, 1998). Endogenous growth theory provides several mechanisms by which government activity can affect long run growth (Romer, 1986; Barro 1990; Rebelo, 1991). In Barro's model, for example, when government size is relatively small, growth rises with increases in government services and taxation as the positive effects of more government-provided services dominate. However, an increase in government services beyond some point requires increase in tax rate. This reduces the return to investment so long-run growth falls. Many empirical studies have been employed to investigate and explain changes in the scope of public sector activity and government size effects on economic growth (Gwartney *et al.*, 1998; Vedder & Gallaway, 1998; Dar & AmirKhalkhali, 2002; Chen & Lee, 2005; Afonso & Furceri, 2010; Germmell & Au, 2012; Altunc & Aydın, 2013). The existing literature also presents mixed results regarding the relationship between government size and economic growth.

Public sector reform in Vietnam, which was initiated from the 1990s, has aimed to improve the quality of public governance. The main goal of the reform is to build a democratic, strong, clean, professional, modernized, effective and efficient public administrative system, which contributes to economic development (Vasakui *et al.*, 2009; Can, 2013). Nevertheless, there remain challenges that limit the effectiveness and efficiency of government activities in the process of economic restructuring (Can, 2013). First, budget revenue as a share of GDP is the highest in Southeast Asia. It averaged 27% of GDP over the period 2000–2010. Meanwhile, the level of budget revenue in Malaysia, Thailand and even China was still below 20% of GDP in the same period. Secondly, total government expenditure as a share of GDP across countries in the region such as China, Thailand and Indonesia was at the low end with public spending at average 18% GDP, while Vietnam was at the high end with average

26% government expenditure as a share of GDP over the period 2000–2010. With the high government spending ratio, this reflects a desire for a larger government role in the society and economy. In the literature some recent studies have attempted to explain the relationship between government expenditure and economic growth in Vietnam (Hoàng *et al*., 2010; Mai, 2012). However, it is not clear whether the relationship between government size and economic growth is negative or positive.

This study is designed to test the relationship between government size and economic growth for the case of Vietnamese provinces over the period 1997–2012. The literature on empirical growth is transferred to a provincial level to determine how subnational government size impacts the provincial economic growth by examining annual data across provinces. The study is conducted by using Difference Generalized Method of Moments (GMM) method proposed by Arellano & Bond (1991) and Pooled Mean-Group method by Pesaran *et al.* (1999).

The other sections of the paper are as follows: Section 2 briefly reviews the empirical literature existing in this area; Section 3 presents empirical model employed in this study; Section 4 describes the data used in the empirical analysis. In section 5, econometric approach employed to estimate is explained. Section 6 provides empirical results for the model. Section 7 discusses and concludes from the findings.

2. LITERATURE REVIEW

There is vast empirical literature investigating the relationship between government size and economic growth. Previous studies generally have found significant effects, either positive or negative, of government spending or taxation on economic growth.

Based on recent public policy endogenous growth models, Kneller *et al.* (1999) examine the growth effects of fiscal policy for a panel of 22 OECD countries over the 1970–1995 period. Their findings support the predictions of Barro (1990) is predictions with respect to the effects of the structure of expenditure on growth. Dar and AmirKhalkhali (2002) examine the role of government size in explaining economic growth of the 19 OECD countries during 1971–1999. They find that total factor productivity growth and the capital productivity are weaker in countries where government size is larger. The conclusion drawn is that the country where a government sector is small had the greater advantage to increase efficiencies resulting from reducing tax burden and distortion, and to exploit the greater market discipline to improve efficiency of resource distribution and use. Moreover, a small government can potentially be effective in providing the legal, administrative, and infrastructure critical for growth, as well as for offsetting market failures. Over-expanding government needed more taxes to finance government spending, but expanding taxes would be detrimental to economic growth. By employing the quintile regression and using a panel data set for 24 OECD countries, Chen, and Lee (2005) show that the effect of government size on economic growth varies through the quintiles. When the economic growth is low, increasing the size of the government can stimulate economic growth and has a positive effect. However, as the economic growth rate increased highly, increasing the size of the government has a negative effect.

Vedder and Gallaway (1998) infer that government provide many useful functions and therefore, the growth of government in emerging economies tends to increase output. Wu *et al.* (2010) examine the causal relationship between government expenditure and economic growth by testing the panel Granger causality for the panel data of 182 countries over the 1950-2004 period. They find strong evidence for supporting both Wagner's law and the hypothesis that government spending is helpful to economic growth. However, they also point out that except that government spending does not Granger cause economic growth for the developing countries. This might be the fact that the developing countries generally have poor institutions and corrupt governments, causing inefficiency of government spending. Altunc and Aydın (2013) detect the relationship between government expenditure and economic growth for Turkey, Romania and Bulgaria by using the data for the period 1995-2011. The results show that the public expenditure exceeds optimal public expenditure for the three countries. They suggest that these should reduce public expenditure size and increase the effectiveness of public expenditure programs.

The cross-sectional regression approach implicitly assumes that the economic growth process is based on similar structural properties cross-countries in the sample. On the other hand, when utilizing the nation as the unit of analysis for cross-countries, one problem lies in structural differences between countries (politics, institutions and culture, etc.). Structural differences are very difficult to quantify, and thus difficult to incorporate into an econometric test (Auteri & Constantini, 2004; Stansel, 2005). If not taken into account the problems in the analysis are likely to blur the true empirical results. One way to solve this is to analyze subnational units within a single nation. In this case, empirical researchers translate the literature on empirical growth to a subnational level.

Based on production function and applying the panel data for 48 states during the period 1977–1989, Domazlicky (1996) highlights that the growth rate of gross state product (GSP) has no significance to government size and growth rate of GSP per capita had negative significance to government size. Schaltegger and Torgler (2004) concentrate on the relationship between public expenditure and economic growth using the full sample of state and local governments from Switzerland over the 1981-2001 period. They underline the negative relationship between government size and economic growth. Using panel data for 20 Italian regions between 1970 and 1995, Auteri and Constantini (2004) reveal that government investment has positive influence on economic growth but transfer payments are insignificant. Martínez-López (2005) investigates the impacts of fiscal variables on productivity growth for Spanish regions over the period 1965-1997. Their findings show that productivity growth effect of government consumption is significantly negative and productivity growth effect of public investment is not significant.

3. EMPIRICAL MODEL

This study is designed as a panel data investigation. Empirical equation is indicated as follows:

$$y_{it} = \alpha_{it} + \beta_1 X_{it} + \beta_2 Z_{it} + (\mu_i + \varepsilon_{it}) \qquad (1)$$

$$\mu_i \sim i.i.d(0,\sigma_{\mu_i});\varepsilon_{it} \sim i.i.d(0,\sigma_\varepsilon);\ E(\mu_i\varepsilon_{it}) = 0$$

All variables in Eq. (1) are transformed into their nature logarithm to ensure the steady state level of gross provincial product (hereafter GPP) per capita growth. Subtracting y_{it-1} for both sides of Eq. (1), results in the following equation:

$$y_{it} - y_{it-1} = \alpha_{it} + \beta_3 y_{it-1} + \beta_1 X_{it} + \beta_2 Z_{it} + (\mu_i + \varepsilon_{it}) \qquad (2)$$

Eq. (2) is a dynamic model. Variable y is the logarithm of real GPP per capita (*lrgpp*); $dy_{it} = y_{it} - y_{it-1}$ is first difference of y and is a proxy for growth rate of real GPP per capita (*grow_r*). Variable y_{it-1} on the right of Eq. (2) is a proxy for the initial level in growth to control for productive capacity in the spirit of the neoclassical growth theory.

Set *X* involves various measures of government size, namely provincial government expenditure (revenue) as a share of GPP, real provincial government expenditure (revenue) per capita and provincial government employment.

Niskanen (1971)'s theory of bureaucracy postulates that government bureaucrats maximize the size of their agencies budgets in accordance with their own preferences and are able to do so because of the unique monopoly position of the bureaucrat. As a result, government size will increase and government budget is greater than the efficient level. Some empirical studies use this variable as the measure of government size (Durden & Elledge, 1993; Domazlicky, 1996).

Set *Z* includes some following determinants involved in growth convergence models (including *population growth, unemployment*, *private investment and human capital accumulation, infrastructure development, terms of trade, inflation rate*). These control variables are selected based on the existing empirical studies (Romer, 1986; Lucas, 1988; Mankiw, Romer *et al.*, 1992; Bleaney & Greenaway, 2001; Sahoo *et al.*, 2010).

4. DATA

Data for Eq. (2) comes from a panel dataset of 60 provinces over the period 1997-2012. Cross-sections and time series are chosen to accommodate data availability from General Statistics Office of Vietnam. There are three out of 63 provinces eliminated due to the unavailability of relevant data. The definitions and calculations of the variables in Eq. (2), are summarized in Table (1):

Real GPP per capita growth rate ($grow\_r$) = The first deference of log of real GPP per capita (*lrgpp*) in each province. GPP is in nominal terms available from General Statistics Office of Vietnam. In fact, each province has its own individual deflator and cost of living index. However, these are neither readily available nor comparable; it is not feasible to calculate real GPP by province back past the given dataset. Real GPP is calculated instead by deflating nominal GPP in each province using national price deflator for gross domestic product (GDP) measured by ratio of nominal GDP to real GDP. The nominal GDP of a given year is computed using that year's prices, while real GDP of that year is computed using the 1994 year's prices. A measure of real GPP per capita is to divide real GPP by the number of people in a province.

Provincial government size is measured respectively as follows:

Log of the share of provincial government expenditure in GPP (*lgov_exp*). Provincial government expenditures consist of investment expenditures and current expenditures, and expenditures for targeting programs.

Log of the share of provincial government revenue in GPP (*lgov_rev*). Provincial budget revenue includes the tax revenues assigned 100 percent to provincial governments, shared taxes between the central and provincial governments, and transfers/supplementary revenues offered from central budget to provincial budgets.

Log of real provincial government expenditure per capita (*lexp_per*) adjusted for inflation.

Log of real provincial government revenue per capita ($lrev\_per$).

Log of provincial government employment to total provincial labor force (*lgov_emp)*. Provincial government employment consists of officials, staffs and employees managed by local governments, exclusively employees of state owned enterprises.

Population growth rate (*pop_r*) = First difference of log of total population in each province.

Private investment growth ($linv\_priv$) = Log of private investment to GPP in each province.

Capital human accumulation growth (lhum) = Log of enrollment numbers in vocational schools, community colleges and university to total population in each province.

Unemployment growth ($lunemp$) = Log of unemployment rate in each province.

Infrastructure development (linfr_dev) = Log of amounts of telephone lines (both fixed and mobiles) per 1000 population in each province.

Growth of terms of trade ($ltot$) = Log of ratio of export prices to import prices in each province.

Inflation ($lcpi$) = Log of consumption price index in each province.

Table 1: Statistical Description of All Variables

Variables	Obs	Mean	Std. Dev.	Min	Max
Log of real GPP per capita *(grow_r)*	960	1.199	0.639	-0.721	4.068
Real GPP per capita growth rate *(lrgpp)*	960	0.070	0.082	-0.894	0.802
Government size					
Log of the Share of Provincial Government Expenditure in GPP (lgov_exp)	960	3.093	0.634	1.023	4.960
Log of Real Provincial Government Expenditure Per Capita (lexp_per)	960	-0.312	0.671	-1.873	1.380
Log of the Share of Provincial Government Revenue in GPP(lgov_rev)	960	2.502	0.676	0.732	4.291
Log of Real Provincial Government Revenue Per Capita (lrev_per)	960	-0.903	1.044	-3.557	1.919
Government Employment Growth (lgov_emp)	960	3.454	0.517	1.791	5.437
Population Growth Rate *(pop_r)*	960	0.009	0.032	-0.667	0.182
Private Investment Growth *(linv_priv)*	960	6.499	1.081	3.424	10.239
Capital Human Accumulation *(lhum)*	891	-0.970	1.307	-4.536	2.503
Unemployment Growth *(lunemp)*	960	1.539	0.397	-1.753	2.35
Infrastructure Development *(linfr_dep)*	960	4.310	1.290	0.431	7.822
Growth of Terms of Trade *(ltot)*	960	0.558	1.395	-3.256	6.442
Inflation *(lcpi)*	960	4.678	0.066	4.508	5.561

Source: General Statistic Office of Vietnam.

5. ECONOMETRIC APPROACH

5.1 Generalized Method of Moments Approach

When estimating Eq. (2), there is a serious difficulty that arises with fixed effects model in the context of a dynamic panel data model, containing a lagged dependent variable, particularly in the small time dimension (T=16 years), large cross-sectional (N=60) context of this study. Nickell (1981) explains that this problem arises because a technical consequence of the within transformation *N*, the lagged dependent variable (y_{it-1}), is that it increases standard errors by exacerbating any measurement errors. The resulting correlation creates a large-sample bias in the estimates of the coefficient of the lagged dependent variable, which is not mitigated by increasing *N* (Nickell, 1981). If the regressors are correlated with the lagged dependent variable to some degree, their coefficients may also be seriously biased.

Several methods have been proposed in the literature. The most popular is to use a Generalized Method of Moments (GMM) method as proposed by Arellano and Bond (1991). GMM methods are considered superior to the alternatives in handling endogeneity, heteroskedasticity, serial correlation and identification. They are specifically designed to capture the joint endogeneity of some explanatory variables through the creation of a weighting matrix of internal instruments, which accounts for serial correlation and heteroskedasticity. GMM estimator technique requires one set of instruments to deal with endogeneity and another set to deal with the correlation between lagged dependent variable and the error term. The instruments include suitable lags of the levels of the endogenous variables as well as the strictly exogenous regressors. This estimator can easily generate a great many instruments, since by period *T* all lags prior to might be individually considered as instruments.

In GMM estimator, needs careful consideration selection of instruments and regressors in each equation. An equation may be under-identified, exactly identified and over-identified depending on whether the numbers of instruments in that equation are respectively less than, equal to or greater than the regressors to be estimated. There is no guidance in the literature to determine how many instruments are too many (Roodman 2009). Roodman (2009) suggests a rule of thumb that instruments should not outnumber individuals. For this reason, in this study, Arellano-Bond difference GMM is applied because system GMM uses more instruments than the difference GMM.

In GMM, the Sargan test has a null hypothesis of "the instruments are exogenous". Therefore, the higher the *p*-value of the Sargan statistic, the better. The Arellano-Bond test for autocorrelation has a null hypothesis of no autocorrelation and is applied to differenced residuals. The test for AR (2) process in the first differences usually rejects the null hypothesis. The test for AR (2) is more important, since it detects autocorrelation in levels.

5.2 Pooled Mean Group Approach

Pesaran *et al.* (1999) propose an intermediate estimator, which is called Pooled Mean Group (PMG) estimator. This estimator allows the intercepts, short-run parameters and error variances to be heterogeneous between groups while making the long-run coefficients constrained to be homogeneous. The homogeneity of long-run coefficients across groups may be due to budget constraints, or common technologies affecting all groups in a similar way. Moreover, the PMG estimator highlights the adjustment dynamic between the short-run and the long-run because it assumes that short-run dynamics and error variances should be the same tend to be less compelling. Not imposing homogeneity of short-run slope coefficients, the PMG estimator allows the dynamic specification (for example, the number of lags) to differ across groups. The null hypothesis of the homogeneity in the long-run coefficients can be verified with the Hausman test. In general, the PMG estimator allows to: *(i)* estimate long-run coefficients of the panel; *(ii)* estimate the speed of adjustment back to equilibrium for each group; *(iii)* and test robustness of GMM main results.

PMG is estimated by the following equation:

$$\Delta y_{it} = \chi_i S_{it-1} + \sum_{s=1}^{n} \lambda_{is} y_{it-s} + \sum_{j=1}^{m} \delta_{ij} \Delta X_{it-j} + (\mu_i + \varepsilon_{it}) \quad (3)$$

$$S_{it-1} = y_{it-1} - \phi X_{it-1} \quad (4)$$

In which S_{it-1} is the deviation from long run equilibrium at any period for group *i*, and ϕ is error correction coefficient. The short run response of *X* variables is measured by the vector δ_{it}. The variables in *X* are the same as in Eq. (2). However, the selection of the variables into those with long run effects and those with short run short will be guided by the results from GMM estimations, and cointegration test.

6. EMPIRICAL RESULTS

6.1 Difference GMM Results

The estimate results by difference GMM method are presented in Table 1. There are four models for government size variables employed respectively: *lgov_emp* (col. 2), *lgov_exp* and *lgov_emp* (col. 3a), *exp_per* and *lgov_emp* (col. 3a), *lgov_rev* and *lgov_emp* (col. 4a), and *rev_per* and *lgov_emp* (col. 4b).

The findings show that no significant relationship is found between provincial government employment and economic growth. The relationship between government expenditure's share and economic growth is negative and statistically significant at the 1% level (col. 3a). The relationship between government revenue's share and economic growth is negative and statistically significant at the 10% level (col. 4a). These results indicate that increase in various determinants of the share of government size slows provincial economic growth.

Table 2: Effects of Government Size on Economic Growth Rate: Difference GMM Method

(Dependent Variable: Growth rate of real GPP per capita)

Variables (1)	(2)	(3a)	(3b)	(4a)	(4b)
Real GPP Per Capita Growth (-1)	-0.396***	-0.509***	-0.354***	-0.473***	-0.318***
	(-3.39)	(-4.46)	(-3.29)	(-4.08)	(-3.09)
Private Investment Growth	0.039**	0.052***	0.027**	0.045***	0.030**
	(3.14)	(4.30)	(2.45)	(3.66)	(2.59)
Population Growth Rate	-0.924***	-0.877***	-0.904***	-0.874***	-0.964***
	(-7.71)	(-7.55)	(-7.35)	(-7.37)	(-8.26)
Growth of Government Employment	0.009	0.028	-0.004	0.025	-0.009
	(0.22)	(0.67)	(-0.09)	(0.58)	(-0.21)
Human Capital Accumulation Growth	0.034***	0.039***	0.029***	0.037***	0.030***
	(4.26)	(5.09)	(3.75)	(4.72)	(3.84)
Growth of Terms of Trade	0.0005	0.0004	0.0006	-0.0003	0.0017
	(0.13)	(0.09)	(0.14)	(-0.08)	(0.42)

Infrastructure Development	0.043** (3.14)	0.063*** (4.59)	0.027** (2.30)	0.053*** (3.79)	0.030** (2.33)
Inflation	-0.011 (-0.28)	-0.031 (-0.80)	0.002 (0.06)	-0.018 (-0.48)	-0.002 (-0.05)
Unemployment Growth	-0.013 (-1.14)	-0.013 (-1.11)	-0.013 (-1.11)	-0.013 (-1.16)	-0.014 (-1.19)
Government Expenditure’s Share		-0.088*** (-5.86)			
Government Expenditure Per Capita			0.057** (2.94)		
Government Revenue’s Share				-0.014* (-1.88)	
Government Revenue Per Capita					0.019** (2.39)
Obs (N)	788	788	788	788	788
Number of instruments	12	13	13	13	13
AR(2) test	0.783	0.371	0.920	0.301	0.634
Sargen test	0.322	0.403	0.291	0.167	0.454

Note: * p<0.05 ** p<0.01 *** p<0.001; t statistics in parentheses

Interestingly, real government expenditure per capita as well as real government revenue per capita is found to have positive and statistically significant impact on economic growth at the 5% level (col. 3b and col. 4b). It is important to note that the coefficient sign of government expenditure (revenue) per capita is different from those of the share of government expenditure (revenue). This mechanism might be explained by analyzing provincial government expenditure (*G*) as an income function (GPP):

$$G = \alpha GPP^{\beta} \quad (5)$$

with $\alpha > 0$ and $0 < \beta < 1$. By taking logarithms Eq. (5), we get

$$g = \alpha^{'} + \beta y \qquad (6)$$

with g = *lexp_per*, $\alpha^{'} = \log(\alpha)$, y = *lrgpp*. Assuming that there exists a positive relationship between log of real government expenditure per capita and log of real GPP per capita, it requires:

$$\frac{\partial g}{\partial y} = \beta > 0 \qquad (7)$$

Figure (1) depicts positive linear relationship between log of real government expenditure per capita and log of real GPP per capita. The correlation coefficient between two variables is 0.553.

Given log of government expenditure's share and log of real GPP per capita, we get:

$$\frac{\partial\left(g/y\right)}{\partial y} = -\frac{\alpha}{y^{2}} < 0 \text{ with } \alpha > 0 \qquad (8)$$

Where *g/y* = *lgov_exp*. Figure (2) shows negative relationship between log of government expenditure's share and log of real GPP per capita. The correlation coefficient between the two variables is -0.443.

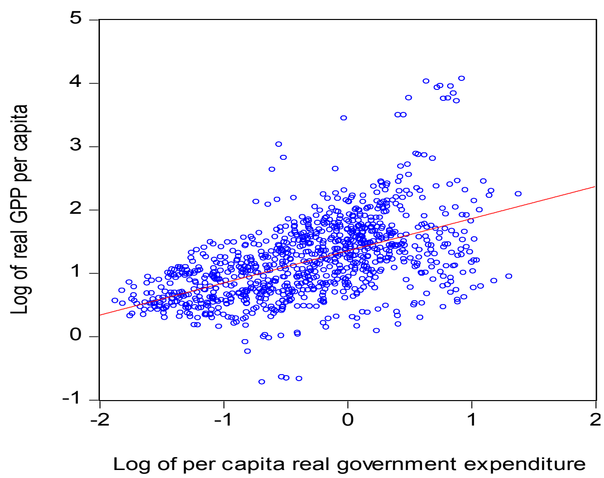

Figure 1: Linear positive relationship between real government expenditure per capita and real GPP per capita

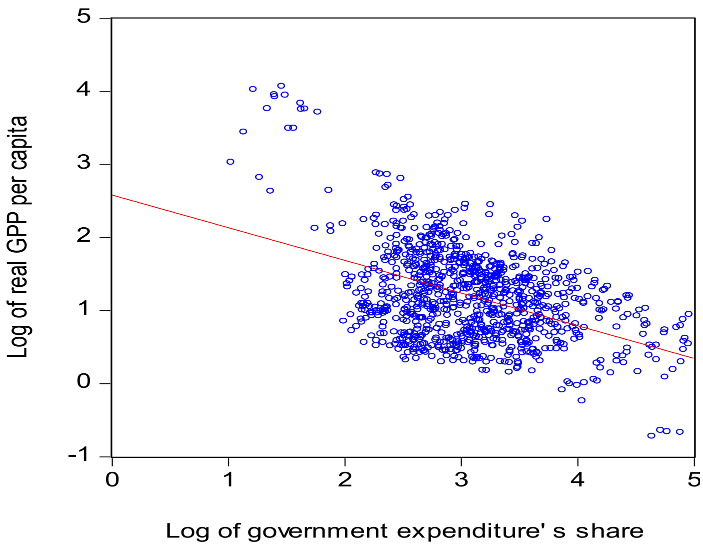

Figure 2: Linear Negative Relationship between Government Expenditure's Share and Real GPP per Capita

In this preset study, other interesting results are also explored. First of all, real per capita GPP growth with lag (-1), which is proxy for initial growth condition, has negative and statistically significant effects on economic growth at the 1% level. This result can demonstrate that rich provinces grow slowly, while poor provinces grow quick. Therefore, there will be convergence in the process of economic development of all provinces in Vietnam. This implies that poor provinces will be able to catch up with richer ones in long run. Secondly, the private investment coefficient has a positive sign that is statistically significant at the 1% and 5% levels, respectively. Endogenous growth models predict that private investment has a positive effect on economic growth. This result suggests that provincial governments should promote economic growth by motivating and mobilizing private capital investment. Thirdly, coefficient sign of population growth is negative and significant at the 1% level. Therefore, the results show a strong support for the argument that higher population growth has a negative impact on per capita growth in the transition to the steady state. Hence, it is recommended that provincial policy markers tightly control and reduce the growth rate of population in order to promote economic growth. Fourthly, a positive and significant relationship exists between human capital accumulation and economic growth. The positive impacts of human capital accumulation are more consistent than those found in cross-national studies, such as findings by Auteri and Constantini

(2004) and Fleisher *et al.* (2010). This finding suggests that policy makers at national and provincial level should concentrate their efforts on improving the quality of education in order to enhance the quality of growth. Lastly, infrastructure development measured by amounts of telephone lines has a positive and significant impact on growth at the 1% level. This result suggests that an increase in infrastructure investment stimulates growth. Provincial governments should aim to implement polices that promote infrastructure development with a maximum impact on economic growth.

6.2. PMG Estimation

Harris and Tzavalis (1999) tests for unit root:

Before the estimation of PMG, It is necessary to verify that all variables are integrated with the same order and then proceed to determine cointegration among variables. Our panel dataset has a number of time periods of 16 years and therefore, existence of unit roots in variables could be a real possibility. However, this is a balanced panel data with large N and relatively small T, so tests whose asymptotic properties are established by assuming that T tends to infinity can lead to incorrect inference. Harris and Tzavalis (1999) develop unit root tests for the AR(1) panel data model with individual-specific intercepts and trends, and serially uncorrelated errors, under the assumption that $\sqrt{N} \rightarrow \infty$ while T is fixed.

In this paper, the fixed T approach by Harris and Tzavalis (1999) is extended to the case where the errors are generated by a stationary AR (1) process, which is based on an unaugmented Dickey-Fuller regression. The extension of uncorrelated errors to AR (1) errors in a panel data context corresponds to that of the DF test to the ADF test in a single time series context. There should be consideration of two models, having a unit root under the null hypothesis, and AR (1) errors. The first model has heterogeneous intercepts and the second model has heterogeneous intercepts and trends. All variables are included to test unit root, only except for human capital accumulation variable because its data is unbalanced, which is not appropriate to Harris and Tzavalis test.

Table 3: Results from Panel Unit Root Test of Harris and Tzavalis (1999)

Variables	Intercept		Intercept and Trend	
	z	p_value	z	p_value
Lrgpp	1.771	0.961	7.783	1.000
Δ *lrgpp or (grow_r)*	-19.787	0.000***	-30.649	0.000***
lgov_exp	1.278	0.899	-3.518	0.0002 ***
Δ *lgov_exp*	-22.245	0.000***	-38.357	0.000***
lgov_rev	-3.581	0.0002 ***	-8.198	0.000 ***
lgov_emp	-1.065	0.143	0.250	0.599
Δ *lgov_emp*	-22.208	0.000***	-38.762	0.000***
pop_r	-19.787	0.000 ***	-36.971	0.000 ***
linv_pri	-4.920	0.000 ***	2.861	0.997
Δ *linv_pri*	-24.134	0.000***	-41.930	0.000***
Lunemp	-9.838	0.000 ***	-1.980	0.023 **
linfr_dev	5.385	1.000	4.021	1.000
Δ *linfr_dev*	-25.028	0.000***	-37.982	0.000***
Ltot	-5.651	0.000 ***	-11.110	0.000 ***
Lcpi	-23.317	0.000 ***	-25.306	0.000 ***

Notes: 1) *** and ** imply levels significance at 1% and 5% respectively. 2) Null hypothesis is that the series contains unit roots.

The results from this test are given in Table (2). The selection of the appropriate lag length is made using the Schwarz Bayesian Information Criterion. Results from unit root tests for the two models suggest that *lrgpp*, *lgov_emp*, *linfr_dev* are non-stationary at level and stationary at first difference; while, *lgov_exp* and *linv_pri* are non-stationary at level for one out of two tests but stationary at first difference. The null hypothesis of non-stationarity is not rejected by any of the two tests for five variables: *lgov_rev*, *pop_r*, *lunemp*, *ltot* and *lcpi*. Therefore, these variables are not included in the cointegration relation, and panel cointegration techniques are then employed for variables: *lrgpp*, *lgov_exp*, *lgov_emp*, *linv_pri*, and *linfr_dev*.

Pedroni (1999) tests for Cointegration:

Cointegration test proposed by Pedroni (1999) is applied. Pedroni's cointegration test takes into account heterogeneity in the intercepts and slopes of the cointegrating equation. Therefore, this method can be considered as a better technique because it is unrealistic to assume that the vectors of cointegration are identical among groups on the panel. This test is based on the estimated residuals from the following long-run model:

$$y_{it} = \alpha_i + \sum_{j=1}^{m} \beta_j X_{it} + \varepsilon_{it} \quad (9)$$

Where i = 1, …, N and t =1, …, T; ε is residuals; y is log of real GPP per capita; and the set X includes log of share of provincial government expenditure, private investment growth, government employment growth, and infrastructure development. The estimation of residuals is structured as follows:

$$\widehat{\varepsilon}_{it} = \rho_i \widehat{\varepsilon}_{it-1} + \widehat{u}_{it} \quad (10)$$

While the null hypothesis is no cointegration, Pedroni (1999) proposes seven alternative statistics to test panel data: four of them are based on the within-dimension (panel tests) test while the other three are based on between-dimension (group tests) approach. For the tests based on "within dimension", the alternative hypothesis is $\rho_i = \rho < 1$ for all i, while with test statistics based on the "between dimension", the alternative hypothesis is $\rho_i < 1$ for all i. Pedroni (2004) also suggests that the two statistics tests, which have small sample properties, be employed: panel-ADF test and group-ADF test. These two statistics tests are more reliable.

Table (3) presents Pedroni's panel cointegration test results in Eq. (9). Except for the *p-stat* test, results of the within-group tests and the between-group tests show that the null hypothesis of no cointegration cannot be rejected at 1% and 5% significant level. Thus there exists a long run relationship between real GPP per capita (*lrgpp*) and government expenditure' share (*lgov_exp*) for the panel of 60 provinces over 1997–2012 period in Vietnam.

Table 4: Pedroni's Panel Cointegration Test Results

Model	Within-dimension (panel) (Weighted)				Between-dimension (group)		
	$v-stat.$	*p*-stat.	PP-stat.	ADF-stat.	*p*-stat	PP-stat	ADF-stat
Lrgpp, lgov_exp, lgov_emp, linv_pri linfr_dev	9.454***	4.247	-2.634**	-3.936***	5.771	-5.529***	-4.286***

Notes: Results with deterministic intercept and trend. (**) and (***) indicate 5% significance level and 1% significance level, respectively.

Pedroni's cointegration test identifies the existence of long run relationship between variables, but does not provide the magnitude of this relationship. Thus, PMG technique is employed to identify the appropriate sign and the size of the coefficient in the long run equation.

Pooled Mean Group estimation results

The PMG technique allows for only one cointegration relation. One main interest in this study is to test a long run between government size and economic growth. Based on the results of cointegration, we PMG estimation of long run relation between government expenditure's share and real GPP per capita proceeds. The results of PMG estimation are presented in Table (4). The estimate on provides interesting results. First of all, the error correction term has the positive sign and significant at the 1% level. This result shows that an adjustment dynamic from short-run to long-run in between government expenditure's share and real GPP per capita is explosive. That means that an adjustment of government expenditure's share to equilibrium of economic growth is divergence across provinces in Vietnam.

Secondly, the long run coefficient of government expenditure's share is negative and significant at the 5% level. Hence, our results from estimated panel cointegration and PMG estimator suggest a negative long run relationship between government expenditure's share and GPP per capita in all Vietnam provinces over the period 1997-2012. Thirdly, the short-run coefficients are statistically significant at the 1 and 5% levels. However, correction mechanism from the short run disequilibrium to the long-run equilibrium is not convergent. A novel finding that is not found by GMM estimation is negative short run effect of government employment on per capita GPP growth.

Lastly, short run outcomes of private investment and infrastructure development are robust compared to the preceding GMM results. The Hausman test indicates that the null hypothesis of common coefficients MG and PMG estimators is not rejected. Hence, PMG estimation is appropriate.

7. DISCUSSION AND CONCLUSIONS

The effect of government relative size on economic growth has remained controversial. In the literature some recent studies have attempted to explain the relationship between government expenditure and economic growth in Vietnam. However, it is not clear whether the relationship between government size and economic growth is negative or positive. Using the panel data for 60 provinces over the period of 1997-2012, this study examines the nexus between provincial government size and economic growth in Vietnam. The dynamic panel model is employed and estimated by difference GMM and PMG estimations, respectively. By employing the difference GMM estimators, this study finds: *(i)* the coefficient of the share of government expenditure (revenue) is negative; and *(ii)* the coefficient of real government expenditure (revenue) per capita is positive. By employing the PMG estimation, the paper finds: *(i)* there exist long run cointegrating relationship between government expenditure's share and economic growth; *(ii)* and long-run and short-run coefficients of government expenditure's share are negative; *(iii)* short run coefficient of government employment is negative.

This study confirms familial influence on economic growth with estimates of government expenditure (revenue)' share and government expenditure (revenue) per capita, respectively, comparable with previous estimates (Durden & Elledge, 1993; Domazlicky, 1996; Schaltegger & Torgler, 2004; Kirchgässner, 2006). The study also indicates that the correction mechanism from the short run disequilibrium to the long run equilibrium is not convergent, and a novel finding is negative effect of government employment.

Positive effects that are statistically significant for real government expenditure (revenue) per capita are obtained. These findings imply that provinces with higher government revenue leading to higher government expenditure per capita, in general, likely expand the size of economic pie. On the other hand, provinces with high economic potential do have advantages of not only raising budget revenue per capita but also providing their people with more and better public services. However, that is not certain. Government expenditure (revenue) per capita growth is restrictively bound by *(i)* per capita output, *(ii)* population growth, and *(iii)* provincial government budget constraint. The paper also finds negative effects of government expenditure (revenue)'s share and population growth on economic growth. These results thus taken together indicate that provincial governments may not increase government expenditure (revenue) per capita to improve better public services.

In conclusion, our findings do not advocate a large government size, which is detrimental to economic growth. A small government size is the essential issue and could be effective in providing public services for economic growth as well as for preventing market failures (Dar and AmirKhalkhali, 2002). These findings also suggest that provincial governments should focus on reducing government expenditure (revenue)'s share and government employment. Moreover, provincial governments should control population growth to increase government expenditure per capita.

Table 5: PMG Estimations

Long run cointegration vectors Normalized variable: Real GPP per capita	PMG estimation	MG estimation
Variables	(2)	(3)
Government expenditure's share	-7.469 (-3.07)**	0.048 (0.07)
Short run dynamics Dependent variable: Real GPP per capita		
Error correction	0.009 (5.11)***	-0.004 (-0.34)
Δ Government Expenditure's Share	-0.168 (-6.14)***	-0.175 (-6.29)***
Δ Private Investment	0.032 (2.79)**	-0.039 (-2.03)**
Δ Government Employment	-0.159	-0.178

	(-3.15)***	(-2.97)**
Δ Infrastructure Development	0.026 (2.56)**	0.027 (1.67)*
Obs	900	
Log Likehood	1741.509	
Hausman Test H0: Difference in coefficients not systematic	$\chi^2 = 0.27$ Pro> χ^2 : 0.991	

Notes: (*), (**) and (***) indicate 10%, 5% and 1% significance level, respectively. Z-values are in parenthesis■

References

Altunc, O. F. & C. Aydın (2013), "The Relationship between Optimal Size of Government and Economic Growth: Empirical Evidence from Turkey, Romania and Bulgaria", *Procedia - Social and Behavioral Sciences*, 92(0): 66-75.

Arellano, M. & S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Study,* 58: 277 - 297.

Auteri, M. & M. Constantini (2004), "Fiscal Policy and Economic Growth: The Case of the Italian Regions", *The Review of Regional Studies*, 34(1): 72-94.

Barro, R. J. (1990), "Government Spending in a Simple Model of Endogenous Growth", *Journal of Political Economy,* 98: 103-125.

Barro, R. J. (1991), "Economic Growth in a Cross Section of Countries", *The Quarterly Journal of Economics*, 106(2): 407-443.

Berry, W. D. & D. Lowery (1984), "The Measurement Size: Implication for the Study of Government Growth", *The Journal of Politics*, 46: 1193-1206.

Bleaney, M. & D. Greenaway (2001), "The Impact of Terms of Trade and Real Exchange Rate on Investment and Growth in Sub-Saharan Africa", *Journal of Development Economics*, (65): 491-500.

Can, N. T. (2013), "Public Administration Reform in Vietnam: Current Situations and Solutions", *Scholarly Journal of Business Administration*, 3(5): 110-116.

Chen, S.T. & C.C. Lee (2005), "Government Size and Economic Growth in Taiwan: A Threshold Regression Approach", *Journal of Policy Modeling*, 27(9): 1051-1066.

Dar, A. A. & S. AmirKhalkhali (2002), "Government Size, Factor Accumulation, and Economic Growth: Evidence from OECD Countries", *Journal of Policy Modeling*, 24(7–8): 679-692.

Domazlicky, B. R. (1996), "Government Size and Regional Economic Growth: Another look", *The Review of Regional Studies*, 26(1).

Durden, G & B. Elledge (1993), "The Effects of Government Size on Economic Growth: Evidence from Gross State Product", *The Review of Regional Studies*, 23: 183-190.

Fleisher, B., H. Li & M.Q. Zhao . (2010), "Human Capital, Economic Growth, and Regional Inequality in China", *Journal of Development Economics*, 92(2): 215-231.

Germmell, N. & J. Au (2012), "Government Size, Fiscal Policy and the Level and Growth of Output: A Review of Recent Evidence", Working Paper in Public Finance (Victoria University of Wellington, New Zealand).

Gwartney, J., R.A. Lawson & R.G. Holcombe (1998), "The Size and Function of Government and Economic Growth", Joint Economic Committee, Washington, DC, 20510, http://www.house.gov/jec/.

Harris, R. D. F. & E. Tzavalis (1999), "Inference for Unit Roots in Dynamic Panels Where the Time Dimension Is Fixed", *Journal of Econometrics*, 91: 201–226.

Hoàng Thị Chinh Thon, Phan Thị Hương & Phạm Thị Thủy . (2010), "Tác động của chi tiêu công tới tăng trưởng kinh tế tại các địa phương ở Việt Nam", Trung tâm nghiên cứu Kinh tế và Chính sách, Trường Đại học Kinh tế, Đại học Quốc gia Hà Nội, 2010.

Kirchgässner, G. (2006), "On the Relation between Government Size and Economic Development: Some Methodological and Economic Remarks", Swiss Institute for International Economic and Applied Economic Research (SIAW-HSG), CESifo and Leopodina.

Kneller, R., M.F. Bleaney & N. Gemmell . (1999), "Fiscal Policy and Growth: Evidence from OECD Countries", *Journal of Public Economics*, 74: 171-190.

Lucas, R. E., Jr (1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22: 3-42.

Mai Đình Lâm (2012), "Tác động phân cấp tài khóa đến tăng trưởng kinh tế tại Việt Nam", unpublished PhD dissertation, University of Economics HCMC.

Mankiw, N. G., D. Romer & D. N. Weil . (1992), "A Contribution to the Empirics of Economic Growth", *The Quarterly Journal of Economics,* 107(2): 407-437.

Martínez-López, D. (2005), "Fiscal Policy and Growth: The Case of Spanish Regions", *Economic Issues*, 10(1): 9-24.

Nickell, S. (1981), "Biases in Dynamic Models with Fixed Effects", *Econometrica*, 49(6):1417-1426.

Niskanen, W.A., Jr. (1971), *Bureaucracy and Representative Government*, New York: Aldine-Atherton.

Pedroni, P. (1999), "Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors", *Oxford Bulletin of Economics and Statistics*, (61): 653–670.

Pedroni, P. (2004), "Panel Cointegration; Asymptotic and Finite Sample Properties of Pooled Time Series Tests, with an Application to the PPP Hypothesis: New Results", *Econometric Theory*, 20(3): 597-625.

Pesaran, M. H., Y. Shin & R. P. Smith . (1999), "Pooled Mean Group Estimation and Dynamic Heterogeneous Panels", *Journal of the American Statistical Association*, 94(446): 621-634.

Rebelo, S. (1991), "Long Run Policy Analysis and Long-Run Growth", *Journal of Political Economy*, 99: 500-521.

Romer, P. M. (1986), "Increasing Returns and Long-Run Growth", *Journal of Political Economy*, 94: 1002-1037.

Roodman, D. (2009), "How to do xtabond2: An introduction to Difference and System GMM in Stata", *The Stata Journal*, 9(1): 86-136.

Sahoo, P., R. K. Dash & G. Natarai (2010), "Infrastructure Development and Economic Growth in China", Institute of Developing Economies, Discussion Paper No. 261.

Schaltegger, C. A. & B. Torgler (2004), "Growth Effects of Public Expenditure on the State and Local Level: Evidence from a Sample of Rich Governments", Center for Research in Economics, Management and the Arts, Working Paper No. 2004-16.

Stansel, D. (2005), "Local Decentralization and Local Economic Growth: A Cross-Sectional Examination of US Metropolitan Areas", *Journal of Urban Economics*, 57(1): 55-72.

Vasavakul, T., Lê Viết Thái & Lê Thị Phi Vân (2009), "Public Administration and Economic Development in Viet Nam: Remaking the Public Administration for the 21st Century", in J. Acuña-Alfaro (ed), *Reforming Public Administration in Vietnam: Current Situation and Recommendations*, UNDP, Vietnam Fatherland Front and Centre for Community Support and Development Studies. The National Political Publishing House. Hà Nội.

Vedder, R. K. & L. E. Gallaway (1998), "Government Size and Economic Growth", Joint Economic Committee, DC 20510. http://www.house.gov/jec/.

Wu, S.Y. J. H. Tang & E. S. Lin (2010), "The Impact of Government Expenditure on Economic Growth: How Sensitive to the Level of Development?" *Journal of Policy Modeling*, 32(6): 804-817.