INFLUENCE OF GOVERNMENT DEBT LEVEL ON FISCAL SPENDING AND GOVERNMENT REVENUES

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that dueacknowledgement has been given in the references to ALL sources of informationbe they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of anyapplication for any other degree or qualification of this or any other university, or

other institutes of learning.

(2) Equal contribution has been made by each group member in completing theresearch project.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION

1.0 Introduction

Back in early 2010, a working paper title "Growth in a Time of Debt" by the Carmen Reinhart and Kenneth Rogoff has stimulated big debate on whether the expansionary policies that promote on taking high levels of debt to finance additional government spending and cut in taxation should be continued or slowdown in order to balance the budget. These stimulus programmes which pursuing the Keynesian concept had been introduced by the European and American governments after the 2008 global financial crisis.

Reinhart & Rogoff (2010) sorted the data into four categories of indebtedness which are below 30%, 30% - 60%, 60% - 90% and above 90%. The high debt countries are mainly from Belgium, Greece, Italy and Japan. One of their main findings is the impact of government debt and on GDP growth is weak until the debt level reaches 90% of GDP. Once the debt rises above the critical level which is 90%, the growth rates then drop sharply. For instance, from 1970 to 2009, the average growth was 3.7% when the debt is below 30% of GDP whereas when the debt is above 90%, the average growth sinks to 1.7% and compared with the debt between 30% and 90% of GDP where the average growth rates of more than 3%. The result for sample after the WWII shows the declined is even more staged. The average growth sinks from about 3% to -0.1% after the debt attained 90% of GDP threshold. Moreover, both advanced and emerging economies have the similar threshold for public debt.

The sharp turning-point of this research has grabbed considerable attention from the media and among the policy makers. The findings of the research can prompt the market perception on risk to increase once the public debt over the 90% of threshold which can be lead to increase in interest rate and the risk of default. However, the work has been critiqued by some economists namely Bivens & Irons (2001), Herndon, Ash & Pollin (2013), and Pescatori, Sandri & Simon (2014). Recent IMF paper refutes the result by Reinhart & Rogoff (2010) reveals that economies with debt over 90% of GDP actually grew at 2.2%. Besides, Herndon, Ash & Pollin (2013) identified a spreadsheet coding error that affect the calculations of growth rates for advanced economies after the WWII.

Whether the governments' decision to call for reduction in government budgets and services and increase tax with response to the threshold, policy makers have to consider the cost and benefits of austerity. With this background, our study focus on the impact of asymmetry debt level on the tax revenue and government spending to assist policy makers to make decision on the fiscal adjustment.

1.1 Public Debt

Public debt is one of the financing methods to government operation where the funding is raised through the issuing of securities, government bonds and treasury bills. It denotes governments' liabilities incurred from financing fiscal deficit by rising funds through borrowing. The debt can be characterized by three tenors: short term, medium term and long term. Short term debt is one year or less; long term is ten years or more whereas medium term is between the interval of short and long term tenors.

Public debt can be classified into internal debt and external debt. Internal debt is funds borrowed from the lenders in the country whereas external debt is a form of financial obligation that is borrowed from lenders outside the domestic country such as sovereign debt. Internal debt is immuned to the fluctuation in the foreign rates (Johnson, 2014). Borrowing externally can be very expensive and subjects to the risks of exchange rate and interest rate fluctuation. However, this allows a country access to resources outside its home country.

Sovereign debt comes from bonds the national government issues in a foreign currency and sells these bonds to the foreign investors to raise funds to finance fiscal spending for development. For example, the government may use the funds to stimulate the job growth with spending on infrastructure projects. On the other hand, the country could get funds by increasing the taxes, redirect funds from internal spending or cut down the pensions.

Debt helps to improve welfare and growth of the economy if it is wisely managed. However, if it is unwisely used, it may harm the economy and bring negative effects to the whole economy. For countries with high debt, immediate action should be taken to address their fiscal problems. If the debt of the countries continues to rise, the investor may lose confidence in the ability of the government to pay off their debts or they have to take reduced rates on their investments. In this case, the debt sustainability of the country may be affected. In other words, the government is no longer has the ability to sustain its tax, current spending as well as other policies in the long term because of the solvency or defaulting on some of liabilities or promised expenditures by the government. Therefore, government may take an action which is to increase their liabilities by paying more interest to the investor to restore their confidence. Besides, if the country default rate in paying back the debt is high, the investors prefer not to hold the bond, so the government cannot raise funds. Consequently, these actions may cause the debt burden of the country become even worse (Cecchetti, Mohanty & Zampolli, 2011).

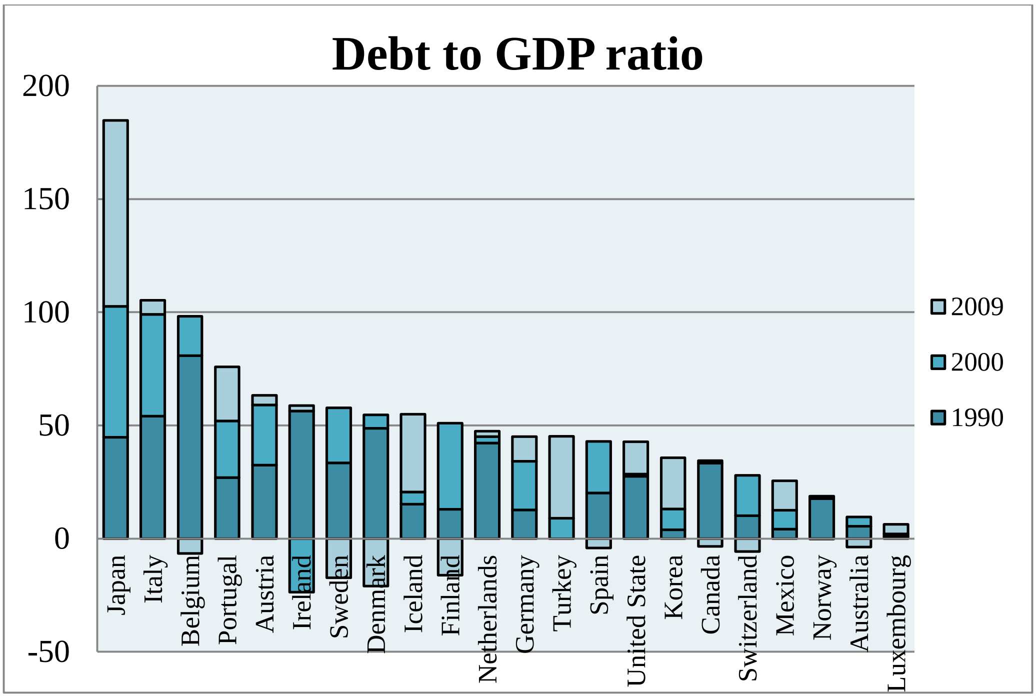
From year 2000 to 2007, the debt to GDP ratios lowered in many countries due to the economic growth during that period. For instance, Sweden successfully reduced its public debt from 57% to 34% debt to GDP during that period (OECDiLibrary, 2011). However, following the global financial crisis in 2008 and the euro zone sovereign debt crisis in 2009, developed economies have been seriously indebtedness. Therefore, the debt to GDP ratios for OECD countries has been increased consistently and it is estimated to grow to 112.5% in 2014 (Pasquali, 2013).

Based on the figure 1.1, the debt to GDP ratio in OECD ranged from the lowest 6.28% (Luxembourg) to the highest 184.78% (Japan). Many countries are encountered with high and raising debt level. For example, Spain's public debt to GDP ratio is anticipated to rise to 105% in the coming year from 42% in six years ago and Portugal's debt to GDP ratio is rising from 75% in 2007 to a projected 134.6% in 2014 (Pasquali, 2013).

Besides, Japan has long history of indebtedness. Its debt to GDP ratio had exceeded 100% since 1997 and is growing. This is because most of the debts issued by the Japan's government are financed by the local investors. Japan's government bonds are considered to have lower default risk and tend to have lower risk premium. Hence, the interest payment of the Japan's government to its creditors is considered low (OECDiLibrary, 2013).

Based on the OECD statistic, we can see that the debt to GDP ratio is increasing apparently after the crisis in 2008. Hence, governments of OECD countries are taking different fiscal actions in respond to this situation.

Figure 1.1: Debt, in Percent of GDP

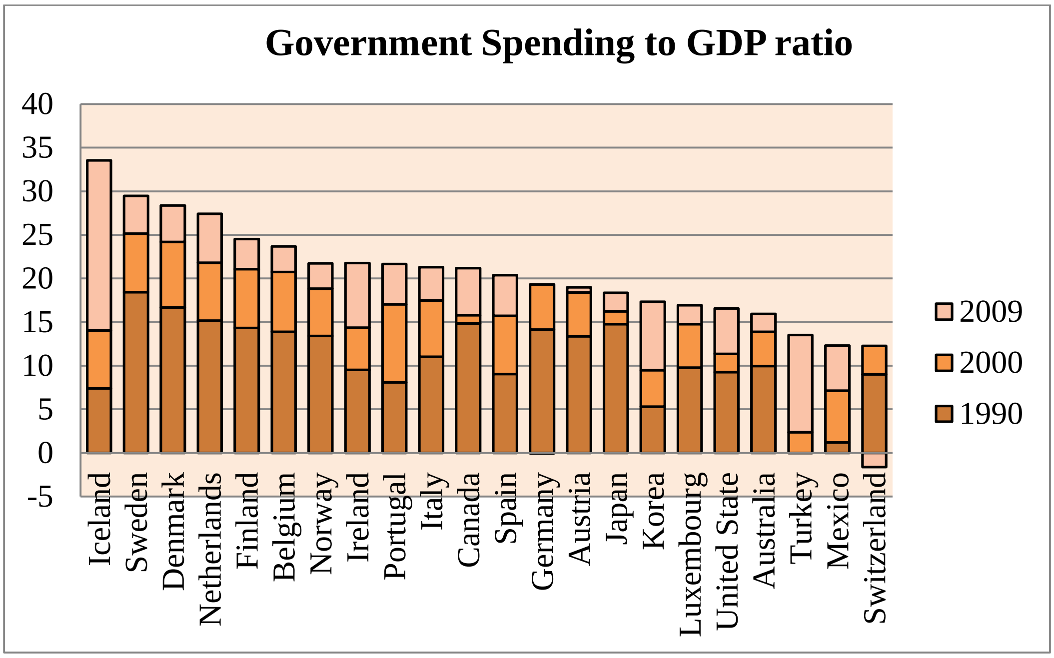


Source: *Author's plot, data: WDI, OECD.*

1.2 Government Spending

Government consumption is a kind of government spending which makes purchase on products or services in the economy. The absolute spending was credited by government sector. Gross investment comprised government spending for the fixed asset which straightly advantageous to society. For instance, building highway or give a hand to government bureaus in the activity of production like armed hardware procurement. Furthermore, on the aspect of defense and security, United States has higher expense on this sector than other country. The cost sheet of the base defense rises rapidly from $287 billion to $530 billion in 2007 (Plumer, 2013). Health care spending can be categorized to public health and administrative costs, pharmaceuticals and medical goods, ambulatory (physicians, specialists, dentists, etc.) and hospital, and nursing homes. According to OECD Health Data 2013, health spending is continues to decline. After a drastically declining in 2010, health spending remained unchanged among OECD countries in 2011 because there is an economic crisis continues to exist or the countries are hardest hit by the crisis (OECD, 2013). After the start of financial and economic crisis, the social spending of OECD countries went up in order to support for the social benefits such as the social assistance benefits and unemployment benefits as a result of declining and stagnating of GDP in many countries. The social average spending-to-GDP ratios across the OECD countries increased from about 19% in 2007 and reached the peak of 22.1% in 2009 (OECD, 2013).

Figure 1.2: GovernmentSpending, in Percent of GDP



Source: *Author's plot, data: WDI, OECD.*

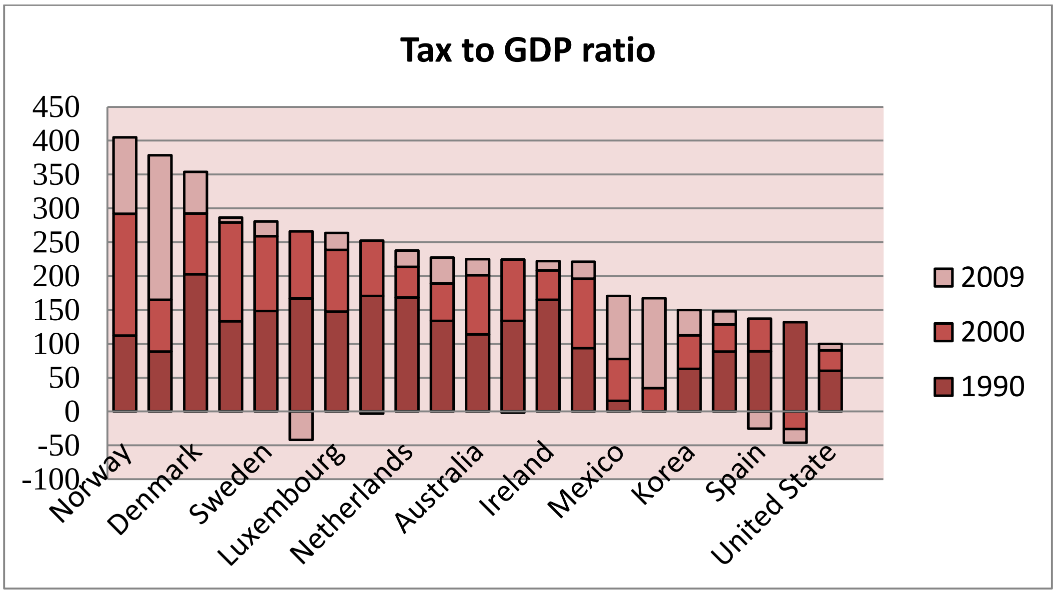
1.2 Tax Revenue

One of the reasons that lead to the raises of public debt is the revenues of the country is less than the government spending. In fact, tax is the main revenue that government collects from the public and the citizens. According to the OECD data, the tax revenue to GDP ratio of OECD countries increases gradually. Personal taxes are the revenues that obtained from the individuals in their countries. Most of the OECD members have the reduction trend of statutory personal income tax (OECD, 2012).

The taxpayers in most of the OECD countries are required to pay the employee social security contributions on the first unit of earnings. Employee social security contribution is one of the taxes that applied to the employees based on their incomes. The tax burden on wage income can be measured by the tax wedges. During year 2000 to year 2012, the OECD countries have the declining average tax wedges. For the household which consist of one earner couples and two children in the OECD countries, the average tax wedge declined from 27.7% to 26.1% (OECD, 2014).

Government also collects the taxes from the corporate and company to obtain the revenue. OECD countries reduced the corporate income tax rates started from year 1980s especially United Kingdom and United States. According to the OECD report (2011), the average of the corporate income tax rate decreased by 7.2 percentage point from year 2000 to year 2011 since its average corporate income tax rates falls from 32.6% to 25.4% between these 11 years. Among the OECD countries, there are almost 31 % of the government revenue are occupied by the consumption taxes and 33 OECD countries implement the value added tax (VAT) (OECD, 2012). Selected excise taxes are the tax that implemented on a limited range of products or specific types of goods such as tobacco and alcohol. Different countries have the different excise tax on the specific goods such as United States and Turkey which have the wide range of tax rates on the wine.

Figure 1.3: Government Tax Revenue, in Percent of GDP



Source: *Author's plot, data: WDI, OECD.*

1.3 Problem Statement

Public debt has grown significantly in most of the advanced countries (Figure 1.1). Public debt in OECD countries has been passed the annual GDP since 2011 (Elmeskov & Sutherland, 2012). It was due to the recession that caused the declined in the public revenue as well as the large public effort in dealing with the banking crisis. It is a major challenge for many countries to stabilize the debt level and bring it down to a sustainable level. However, the effort to bring the debt down to a sustainable level affects the growth. Growth can be affected by ways such as increase the cost of capital and the burden of distortionary taxation. Many countries are experiencing a various cycle of high debt, low growth and unsustainable public debt problem.

More generally, markets in the OECD economies have underestimated risk and preferred enormous risk taking which fuelled credit and housing booms and eventually triggered the financial crisis that erupted in the United States and the financial system in Europe also ran into serious trouble. Inevitably, the fiscal action is directed towards consolidation in dealing with such situation. Fiscal adjustment can have long term benefit such as reducing debt that will support for economic growth. However, it may have negative impact of which market confidence may adversely affected by the decline in demand that it depresses growth and hence debt sustainability. The size of the fiscal multiplier is the factor that decides the effect of the fiscal adjustment. Besides, the trade-off between macroeconomic stabilization and consolidation creates challenge for policy makers especially when interest rates close to the zero lower bound which gives little scope for monetary policy to accommodate fiscal consolidation.

Our paper is however looks at different aspect by taken into account the influence of the public debt asymmetries rather than the causes. We are in doubt that whether high debt can lead to increase or reduce in government spending and tax level in selected OECD countries. Put this differently, may different levels of public debt across the OECD members has impact on the size of the public spending and the overall tax level?

Consequently, instead of examine on the determination of public debt levels, our paper examines the influence of debt to government spending and taxation in selected OECD countries given that debt is pre-determined.

1.4 Objective

The objective of this research paper is to examine the impacts of public debt asymmetries on the size of public spending and the overall tax level in selected OECD countries. Specifically, this study aims:

(1) To examine the response of overall tax level to the asymmetries government debt level.

(2) To examine the response of government spending to the asymmetries government debt level.

1.5 Significant of study

Since high debt may bring harmful effect on the economic growth, therefore, we carried out this research would be beneficial to the public and policy makers. This study can provide useful information for further economics studies on OECD countries. For example, we analyze the response of overall tax level to the changes in the general government debt level, the relationship between public debt and government spending to see whether asymmetry public debt level will lead to high or low public spending and to examine whether the selected OECD countries favor revenue based consolidation or expenditure restraint in response to budgetary decision on fiscal consolidation.

The findings from this research can provide more details of information about the effect of high debt especially for policy makers as they can obtain the knowledge about the relationship between debt, tax and government spending, and thus, serve as a guideline to policy makers in the fiscal policy planning.

The government may take the action on either to reduce government spending or to increase tax revenue and eventually lower the public debt to GDP ratio. This is essential to our future prosperity. In addition, high debt may increase the vulnerability to shifts in the confidence of investors.

CHAPTER 2: LITERATURE REVIEW

2.0 Overview

Before we continue with empirical analysis on the impact of public debt on government spending and taxes, it is necessary to carry out review literature on public debt, government spending and also taxes. This chapter will review literatures focus on the relationship between public debt, government spending and taxes. Literature review covering the recent academic studies will help us to understand better on how public debt level affects the fiscal policy decision.

2.1 Review of the Literature

Public debt has very important influence on the economy. A reasonable level of borrowing can enhance economic growth through productivity growth and capital accumulation provided that the relationship between external debts and economic growth is concerned (Chowdhury, 2001). Both Zodrow & Mierzkowski (1989) and Heylen, Hoebeeck & Buyse (2013) models have analyzed on the asymmetric levels of the public debts and the obligations as well as to prove that the asymmetric public debts have the significant impact on the taxes and spending. There are many studies on OECD countries about the impact of public debt on government spending with inconclusive results. OECD countries including Japan, Greece, Italy, U.S., Portugal, United Kingdom, France, Spain and Germany are facing high debt and have either increase tax or reduce government spending, especially spending in welfare, public employees' wages and salaries in order to maintain debt sustainability. For instances, the different levels of the public debt throughout the EU countries has been investigated by researcher to analyze the effect that exists on the tax policy and adjustments (Krogstrup, 2002). Indeed, the issues that have been found out through the investigation are how these levels of asymmetric public debts influences the policies and bring the asymmetries to the fiscal policies such as the tax policy in EU countries. Doi, Hoshi & Okimoto (2011) in their paper with title of “Japanese Government Debt and Sustainability of Fiscal Policy” has examined the relationship between public debt and sustainability of the fiscal policy with the three complementary approaches. Broda & Weinstein (2005) and Doi (2009) developed the first approach with the issue of how much the tax revenues need to be raised by the government in order to balance the debt-to-income ratio and the future government spending and transfers are given. Moreover, the second approach has considered the dynamic feedback on the future government surpluses from government debt levels (Bohn, 1998). Lastly, David & Leeper (2007) developed the third approach which concern on the feedback of tax revenues towards the debt levels and the fluctuations in government expenditures. Krogstrup (2002) investigate the influence of asymmetric debt service obligations on government spending, taxes and also the tax mix across the EU countries by using panel of 13 EU member countries from 1970 to 1999. The results supported the hypotheses that, in the short run, taxes are higher in high debt countries as compared to low debt countries; primary spending is lower in high debt countries as compared to low-debt countries, ceteris paribus. Hence, the differences in the debt levels across the countries have been found to be an important source of asymmetry in public finances and the size of the public spending in the EU countries.

According to Gale & Orszag (2003) and Baldacci & Kumar (2010), capital accumulation and growth can be adversely affected by high public debt via higher long-term interest rates. Moreover, it also leads to inflation (Sargent & Wallace, 1981; Barro, 1995; Cochrane, 2010), higher future distortionary taxation (Barro, 1979; Dotsey, 1994), and higher uncertainty on policies and prospects.

Hence, the stabilization of the high public debt is needed by using adjustment of taxes and expenditures. Deficit reduction by increasing taxes is attempted more often than by reducing expenditure even though it is more likely to be long term in the latter case (Giannitsarou & Scott, 2006). From the review of tax research (Hanlon & Heitzman, 2010), they have concluded that the tax policy is important and it has been mainly focused on the federal stimulus effort that concern on the budget deficit and debts. Furthermore, Hisali & Ddumba-Ssentamu (2013) stated that the tax policy is important to solve the government debt through the tax rates or tax base. Thus, it is fundamental for the government to increase the tax revenues to overcome the high debt burden and increase the capabilities in repay the loans. Furthermore, the literature on the decision making in budgetary recommends that governments may favor revenue-based fiscal consolidation as compare to expenditure restraint because tapping the `common pool' of public funds is considered less costly than cutting specific spending programmes based on political perspective (von Hagen & Harden, 1995; Weingast et al., 1981). Study also found that independent governments who spend and tax with own discretion might lead to a deficit-bias and suffer from maintaining the concerted fiscal policy (De Mello, 1999). For instances, an analysis has showed that the deficit problem in United Stated is began when the government hugely increased the spending and expenditures without considered to increase the tax revenues (Thornton, 2012). In fact, the increases in tax effects which as the additional revenues to the government is able to reduce the deficits as well as sustain the debt level.

However, there is an issue on the reduction of the size of public debts with the distribution of tax increments when the public debt is high. Wood-ward (1992) investigated that increases of the taxes revenues might lead to a policy with the distortion effects as well as caused the conflict in reducing the role of government.

A few studies conclude that expenditure-based fiscal adjustment is likely to be less contractionary than tax-based fiscal consolidation (IMF, 2010).Several authors suggest that reductions in spending are even accompanied by economic expansion (Alesina & Perotti, 1995; Alesina & Ardagna, 2010). Moreover, as stated in Heylen, Hoebeeck & Buyse (2013) in the long run, both permanent tax increases and permanent expenditure cuts contribute substantially to reduction in debt, yet the effects of the permanent expenditure cuts are stronger. Expenditure cuts exact composition is very important. The researchers stated that the results were preferred cut in the wage bill in public sector and subsidies. However, only when public sector inefficiency in administration, public wage bill cuts help to reduce the debt ratio. Furthermore, if the aim is to lower down the public debt ratio, the method of cuts in public investment to reduce expenditures is highly counterproductive.

On the other hand, Blanchard (1990) argued that the fiscal policies and budgetary policies are able to maintain the sustainability of the deficit as the policies do not generate the rapid rising indebtedness and increase the tax burden in the economy.

There are several researches showing that the relationship between government debt and tax rates tends to be positive in both theoretical and empirical analyses. According to Barro (1979), he suggested that governments would alter the tax rates in response to the adjustment in permanent government expenditure in the hope to minimize the inter-temporal excess burden through uniform taxation. Barro & Sahasakul (1986) and Kenny & Toma (1997) found the relationship between the marginal tax rates from the government revenue and social security tax and the debt ratio in the US is positively related. The empirical results on the relationship between public debt and taxes are limited and mostly concentrated on EU countries. Among more recent studies, Holm-Hadulla, Leiner-Killinger & Slav ḱ (2011) use a panel dataset of 18 EU countries from 1979 to 2008 and found a positive relationship between the labor taxation to government debt in general and interest expenditure-to-GDP ratios respectively. According to Krogstrup (2004), he has indicated that the high level of public debt might reduce the flexibility of fiscal policy and thus it must be associated with higher taxes or lower spending. In this study, he concludes that the public debt has impacted on the taxes adjustment as the result showed that the debt has evidently increase the tax revenues in the percentage of Gross Domestic Products (GDP).

Furthermore, some analysts suggest that the indications for growth and the prospects of attaining continuous improvements in fiscal positions are based on the types of specific tax rate is adjusted and the category of government spending is reduced (Hauptmeier et al., 2007; Uhlig & Trabandt, 2009).

According to Adam (2011), debt-to-GDP ratio are increased over the period of 2007 to 2009 in OECD economies and the OECD anticipates for the years 2010 and 2011 report that the debt levels are forecasted to increase even higher. According to Allen (2013), Japan has the highest debt as a percentage of GDP which is 212% followed by Greece at 157%. Doi, Hoshi & Okimoto (2011) found that Japan faces a critical problem of the government debt. Moderate debt may help to boost the growth of economy. However, high debt may bring negative impact on economy growth and reduce welfare. The growing problem of government debt is unsustainable and some actions are needed to prevent serious economic problems in the future (Allen, 2013; Greiner, 2012). The increases in the debt ratios and increasing concern on the public finance's sustainability have carried out the need for a notable fiscal adjustment and the strategies of trustworthy debt reduction. The response of government spending on debt is inconclusive. Mahdavi (2004) found that the public debt burden has positive relationship with government spending whereas Adam (2011) concluded that the public debt and government spending has negative relationship.

According to Furceri & Mourougane (n.d.), it demonstrated that fiscal policy is considered an effective tool to stimulate demand in the short-term, but different with the GDP impacts instruments. Short-term multiplier effects are discovered to be the highest for increased government investment and consumption and also for a wage tax cut. In the long term effects, these also are the tools that create the lowest increases in public debt. In addition, Lin (2000) stated that if real GDP growth rate go beyond the real interest rate on debt, higher government expenditure which funded by government debt-issuance has positive growth effects in output. Essentially, when the government outstanding debt and the real interest rates are low, government expenditure which funded by debt-issuance is considered to be more effective in motivating the economy. However, Kandil (2006) indicates that the fiscal policy's usefulness in stabilize aggregate demand was relies on whether private spending is crowded out by government spending. Moreover, an increasing in government spending but not match by an increase in earnings will lead to a budget deficit. As a result, the domestic interest rate will be negatively affected and it crowds out private spending if the deficit is funded by the issuance of domestic debt.

While fiscal adjustment may be focus on honoring debt obligations, but debt and debt interest payments might have an impact on the social expenditures level. For instance, Mahdavi (2004) has evaluated how the burden on external debt can affect the government spending composition. He found that debt burden has negative impact on capital expenditure, and also on recurrent expenditures. Due to a major part of social expenditure arise in the circumstances of wages and salaries paid to public sector in the education and health sectors, this indicates that social expenditures are covered from the negative effects of the debt burden. Besides, Augustin (2008) found that the share of public spending in the social sector is adversely affected by the implicit debt service burden, with same impacts on education and health. Even though results show that public investment might also be affected by such burden, the harmful influences of debt servicing seem to be mainly a social-sector phenomenon.

On the other hand, the findings of Lora & Olivera (2007) give credits to many of the commonly held opinion about the harmful impacts of high indebtedness. Displacement between debt and social expenditures are mainly caused by further reduction in indebtedness. Cecchetti, Mohanty & Zampolli (2011) claimed that debt can improve and enhance growth at moderate levels. But beyond a certain level, debt is bad for growth. Nevertheless, there is some empirical analysis of the effect of the public debt on tax and government expenditures.

According to Mahdavi (2004), when debt increased, interest payment share also increased. However, Adam (2011) claimed that higher government debt levels reduced the public spending. Besides, Mahdavi (2004) also claimed that the debt and other spending components are negatively related. There is a negative "indirect crowding-out" effect of the debt. In other words, when debt level increased, the government spending reduced.

Mahdavi (2004) has carried out a study on the relationship between the external public debt burden and the composition of public spending for 47 developing countries in the period of 1972 to 2001 by using pooled data set. The random-effects model (REM) and fixed-effects model (FEM) have been used to carry out the research. In full sample, the debt burden and interest payment is significantly and positively related. The results indicate that an increase in the public debt burden has negative impact on both capital accumulation and capital maintenance. The relationship between public debt and subsidies and other current transfer is also negatively related. Adam (2011) found a negative impact of government debt on government spending in United States over the period 1983 to 2002.

Chapter 3: Methodology

3.0 Introduction

In this chapter, we will discuss the framework and methodology to conduct analysis in this study. Balanced panel data approach is used to determine the responses of taxation and government spending on change of debt level. We apply pooled OLS, random effect model and fixed effect model. We use Breusch-Pagan test to examine whether the model is pooled OLS or random effect. If the Breusch-Pagan test shows enough evidence to conclude that the model is random effect, then we should proceed to use Hausman test to determine whether the model is fixed or random effect in order to get the correct model to avoid the model misspecification problem. Lastly, we conduct the robust test to detect the influential observation.

3.1 Framework

3.1.1 Empirical model for taxation

Many research reports have shown that there is a significant positive relationship between government debt and tax rates in both theoretical and empirical analyses, such as Holm-Hadulla,Leiner-Killinger & Slavik (2011), Barro & Sahasakul (1986), Kenny & Toma (1997), and Krogstrup (2002 & 2004).[1]

[1] According to Holm-Hadulla, Leiner-Killinger&Slavík (2011), they found a statistically and economically relevant positive response of labor taxation to changes in the general government debt and interest expenditure-to-GDP ratios. According to Krogstrup (2004), he has indicated that the high level of public debt might reduce the flexibility of fiscal policy and thus it must be associated with higher taxes or lower spending. In this study, they conclude that the public debt has impacted on the taxes adjustment as the result showed that the debt has evidently increase the tax revenues in the percentage of Gross Domestic Products (GDP). Barro (1979) suggests that governments, while

To this aim, we modified Bohn (1998) time-series model to a panel regression approach to estimate the debt-taxation nexus. The estimation equation can be written as below:

$$T_{it}=\beta_1 D_{it} + \beta_2 W_{it} + \varepsilon_{it} \qquad (1)$$

Where, T_{it} is tax revenue to GDP ratio in nation i during period t.β is the vector of coefficients on the vector of parameters value which affect the tax. D_{it} is the government debt to GDP ratio while W_{it} is a set of the other macroeconomics determinants of government taxation and ε_{it} is the error term.

The other macroeconomics determinants of government taxation (W_{it}) that are included to the study are population growth rate, income per capita and openness which measured by the trade volume. First, as Weber & Buchanan (1980) stated demand for public expenditure increased due to increase in population growth corresponding to increase the non-property tax revenue. Besides, Dowell (1978) stated increase in population growth will lead to increase taxes and create problems in public service provision. Hence, we have to determine whether the population growth will have positive direction with tax. According to the Weber & Buchanan (1980), they found that increase in population will lead to increase in property taxes of the average homeowner in long run. Besides, the relationship between population growth and tax bills of any group is negatively related. However, Dioda (2012) found that population growth are insignificant to affect tax revenue.

Second, income per capita is a proxy for the overall development of the economy. Based on the Wagner's law, the tax rate of goods and services that charged by government is expected to increase with income due to the demand for government services are income-elastic. Therefore, income per capita is considered positive related to tax revenue to GDP ratio (Gupta, 2007).There are many researches show

aiming to minimize the inter-temporal excess burden via uniform taxation, would adjust tax rates in response to changes in permanent government expenditure. Sahasakul (1986) and Kenny &Toma (1997) both of which established a positive relationship between the marginal tax rates from the federal income and social security tax and the debt ratio in the US.

that income per capita and tax to GDP ratio is positively related such as Lotz & Morss (1967), Bird, Martimez-Velasques & Torgler (2004), Dioda (2012), Mahdavi (2008), Khattry & Rao (2002), and Tanzi (1992)[2].

Third, as we are now in an open economy, there are imports and exports of goods and services among the countries. Hence, trade-related taxes are easier to impose. The imports and exports of the foreign sector reflect the extent of exposure of an economy to external economic factors. In term of capital inflows, outward borrowing can artificially improve the overall level of economy activity in short run and also the total tax base. As a result, tax revenues become artificially buoyant and volatile. Taxation make more amenable by some characteristics of foreign trade compared to domestic. Generally, the most monetized sector of the economy in developing nations is the foreign trade sector. Trade taxes can be implemented easily with administrative ease which becomes an attractive source of government revenue (Teera, n.d.). Hence, it reflects a positive relationship between trade openness and tax revenue to GDP ratio. The positive relationship between openness and the trade-tax GDP ratio can be clearly seen as trade tax revenue is gained from taxes on the exports and imports. There are many researchers found a positive relationship between the openness and tax to GDP ratio such as Khattry & Rao's (2002), Lotz & Morss (1967), Ghura (1998), Gupta (2007), Mahdavi (2008) and Dioda (2012)[3]. However, Bird, Martinez-Velasquez & Torgler (2004) found that trade openness does not have a statistically significant influence to tax revenue. On the other hand, Profeta & Scabrosetti (2010) found that trade openness has a

[2]Lotz&Morss (1967) found that income per capita have significantly positive relationship with tax to GDP ratio. According to Bird, Martimez-Velasques&Torgler (2004), they found that income per capita is positively associated with tax revenue. Dioda (2012) found that income per capita is positively related to tax revenue in a statically significant way. According to Mahdavi (2008), he found that there is a positive correlation between tax revenue and income per capita. Khattry&Rao (2002) found that income per capita have been significant in explaining the decline of income tax and trade tax revenues in low-income countries. Besides, according to and Tanzi (1992) showed that a review of tax systems in developing countries reveals a positive relationship between per capita income and total tax revenue as well as income taxes.

[3]AccordingtoKhattry and Rao"s (2002), they found that openness is positively related to both domestic indirect taxes and domestic direct taxes, but the effects are not significant and consistent.According to Lotz and Morss (1967), the study found that openness has significantly positive relationship with tax to GDP ratio. Ghura (1998) concludes that the tax ratio rises with degree of openness. According to a study of Gupta (2007), trade openness has a positive and statistically significant association with tax revenue per capita. Mahdavi (2008) also finds a positive correlation between tax revenue and openness of the economy. Dioda (2012) found that openness of the economy are positively related to tax revenue in a statically significant way.

positive effect on government tax revenue in Asia and Europe countries but has negative impact in Latin America.

Based on the explanation above, the equation (1) can be written as:

$$T_{it}=\beta_0 + \beta_1 D_{it} + \beta_2 POP_{it} + \beta_3 INC_{it} + \beta_4 OPEN_{it} + \varepsilon_{it} \qquad (2)$$

Where, i and t is time period and country respectively. T_{it}represents tax revenue to GDP ratio. D_{it} represents the total central government debts to GDP ratio.POP_{it} represents population growth in annual percentage. INC_{it} represents income per capita in current US$. $OPEN_{it}$ represents openness measured by the trade volume in percentage of GDP. ε_{it} is error term.

3.1.2 Empirical model for government spending

Mahdavi (2004) found that there is a positive relationship between public debt and government spending. However, there are also researchers found a negative impact of public debt on government spending such as Adam (2011), and Krogstrup (2002).[4]

Hence, we extend the time-series model of Bohn (1998) into a panel regression approach to determine the debt-government spending relationship. We can express the estimation model as following:

$$GS_{it}=\beta_1 D_{it} + \beta_2 W_{it} + \varepsilon_{it} \qquad (3)$$

Where, i and t is time period and country respectively. GS_{it} represents government spending to GDP ratio. D_{it}represents the total central government debts to GDP ratio while W_{it} represents the set of macroeconomics variables and ε_{it} is error term.

[4]According to Adam (2011)concluded that the public debt and government spending has negative relationship. According to Krogstrup (2004), he has indicated that the high level of public debt might reduce the flexibility of fiscal policy and thus it must be associated with higher taxes or lower spending.

The other macroeconomics determinants of government spending (W_{it}) that are included to the study are population growth, income per capita and openness. First, based on the Bank of International Settlement (1998), there are several factors that can cause government spending sharply over next several decades under current policies. The report shows that there is higher per capita expenditure for the elderly in the segments of public retirement benefits and welfare support on some countries. According to National Research Council review (1986), lowering fertility helps families reserve the time and money for more suitable health care and education for their children and this making it more convenience for governments to expand the spending on both health and education for each child. Besides, according to Sikua (n.d.), he states that increased in school-age population will lead to government increased in spending. According to Tayeh & Mustafa (2011), they stated that population growth which indicates larger demand for health care and education commodities which will lead to an increase in government spending.

Next, Wagner's law argued that income-elastic is the demand that willingly paid by people for their service. Hence, the expansion of the public economy is affected by a greater economic affluence of a nation (Cameron, 1978). According to Flaster & Henrekson (2001), government tends to improve with greater level of income and it often implies that income elasticity of demand for government is larger than unity. Shonchoy (2010) stated that there are several researches found some evidence against the laws, namely Gupta (1968), Musgrave (1969) and Bird (1971).Besides that, Sideris (2007) studied that government expenditure and national income have a positive relationship for the existence of a long-run. However, Henrekson (1993) found evidence to conclude that national income and government expenditure has no long-run positive relationship as implied by Wagner. Hence, the Wagner's law has been forged. Ram (1987) found empirical evidence for Wagner's Law in some time-series analysis but not in the cross-section. Nevertheless, some authors found evidence in the cross-section analysis. Stein, Talvi & Grisanti (1998) found that the government spending in the lowest income quartile of Latin America averages 20% of GDP as compared to the highest 30% of GDP and for OECD countries is 48% of GDP. It means that richer countries are more likely to have higher government spending. Besides, Easterly & Rebelo (1994) found significant evidence for Wagner's Law in cross-sectional data. The conjunction between per capita income and government spending is always found in both longitudinal and cross-sectional data in both past and current periods.

In addition, Cameron (1978) was the first to examine a relationship between trade openness and government finance. According to Cameron (1978), countries with greater trade openness have significant increases in public spending. He argued that the greater open economies will have higher rates of industrial concentration, leading to a more unionized labor market, which through the collective bargaining will influences public expenditure on social protection and social infrastructure. Rodrik (1998) examined a significant positive relationship between openness and government spending to strengthen on Cameron's work. The households' income that earned from firms that involve more on foreign business are subjected to larger external risk such as currency risk or fluctuations in supply or demand abroad in more open countries and this might create demand for public insurance against external risk assumed that some portion of the risk is not diversifiable. Rodrik (1998) speculate that advanced countries with administrative capacity reduce this undiversified external risk by spending on social protection. However, developing countries have lack ability to monitor large-scale social transfer programs but depend on simpler solutions such as public employment. In conclusion, Liberati (2007) shows that trade openness has significant negative impact on government spending which consistent with the conventional wisdom that capital mobility may erode the ability of governments to control larger public sectors.

Based on the explanation above, the equation (3) can be written as:

$$\mathrm{GS}_{\mathrm{it}}=\beta_0 + \beta_1 D_{it} + \beta_2 POP_{it} + \beta_3 INC_{it} + \beta_4 OPEN_{it} + \varepsilon_{it} \qquad (4)$$

Where, i and t is time period and country respectively. GS_{it} stands forgovernment spending to GDP ratio. D_{it} stands for the total central government debts to GDP ratio.POP_{it} stands for population growth in annual percentage. INC_{it} stands for income per capita in current US\$. $OPEN_{it}$ stands for openness which measured by the trade volume in percentage of GDP.ε_{it} is error term.

3.2 Analysis of Data

In our research paper, we use annual balanced panel data. The consideration of using balanced panel is we can avoid the problem of unobserved heterogeneity that may occur in a cross section data set (Paul, n.d.). According to Baltagi (2005), the error term in the balanced panel data is u = mu + v. However, there is an additional disturbance found in the error term from unbalanced panel data set which denoted as "e". Hence, the error term in the unbalanced data set is u = mu + v + e. When the value of "e" has significant effect on the model, it will create problem to the unbalanced panel data. Therefore, we need to exclude all the countries' data that have missing value in order to get balanced panel data. Besides, in doing non-dynamic model, we should collect the data which period more than country (T>N). Hence, we have taken the data for 22 OECD countries from 1990 to 2009. From the 22 countries, we separate them into 2 categories by using debt levels. A country is categorized as low debt countries if the debt level is lower than 30% of GDP and it is categorized as medium-high debt countries if the debt level is 30% of GDP and above. All data are collected from the OECD statistics and World Development Indicators (WDI).

In our model, government spending as ratio to GDP and taxation as ratio to GDP are dependent variables while government debt as ratio to GDP and other macroeconomic variables are independent variables. For both models, the macroeconomic variables that we use are population growth rate, income per capita, and trade openness. In order to remove the cyclical influence on government debt, government spending, and taxation, we will use the Hodrick Prescott (HP) filter for cyclical adjustment. In our research paper, some of the variables such as tax revenue as ratio to GDP, government spending as ratio to GDP, government debt as ratio to GDP, income per capita and openness are transformed into natural logarithmic forms and the regressions for the government spending and tax revenue are estimated using STATA.

3.3 Methodology

In panel data, pooled means, fixed and random effect models are considered to account for country heterogeneity and variations over time. For pooled means model, it's assumed that the independent variables are non stochastic. If there are stochastic, they are no related to error term. Sometimes, it is assumed that the independent variables are strictly exogenous which means that the variables does not depend on current, past, and future value of the error term, μ_{it}. (Gujarati & Porter, 2009)

For fixed effect (FE) model, it is assumed that fixed effects will derive from group mean. According to Gujarati & Porter's fifth edition's text book (2009), they stated that even if the intercept may different across countries, every entity's intercept does not change over time (time-invariant). If the sample size is small, we can simply fit a dummy for the observation. However, it cannot be done directly if there is large sample size, but there are mathematically equivalent models which achieve the same effect.

For the random effect (RE) model, it is assumed that the unobservable country specific effect μ_i is random and μ_i is uncorrelated with the v_{it}. The independent variables are uncorrelated with μ_i and v_{it}. If in data consists large N (country), random effects will be more efficient than fixed effects. If data consists large T (time period), the difference between fixed effects and random effects goes away. We must assume that α is uncorrelated with independent variables in order for OLS to be consistent for the random effect model. The composite error term (v) of observation within the same group are correlated, if α and μ are uncorrelated with each other, then $(v_{it}, v_{is}) = \frac{\sigma_\alpha^2}{\sigma_\alpha^2+\sigma_\mu^2}$. Hence, the random effects model is a feasible GLS estimator that estimates this covariance based on correlation between same unit residuals, then it is considered as a model that is BLUE conditional on this calculated covariance matrix.

3.3.1 Pooled mean? Fixed Effect Model (FEM)? Or Random Effect Model(REM)?

3.3.1.1 Breusch-Pagan Test

This test is developed by Breusch and Pagan (1980) for the purpose to examine whether the pooled OLS is a suitable model. This is based on the statistical hypothesis as below:

$H_0: \sigma_\alpha^2 = 0$

$H_1: \sigma_\alpha^2 \neq 0$

Hence, the null hypothesis, H_0 , is same as $Cor(\varepsilon_{it}, \varepsilon_{is}) = 0$ for $t \neq s$.

It is informative to explore the following equation:

$$\sum_{i=1}^{n}\left[\sum_{t=1}^{T}\varepsilon_{it}\right]^2 = \sum_{i=1}^{n}\sum_{t=1}^{T}\varepsilon_{it}^2 + \sum_{i=1}^{n}\sum_{s\neq t}\varepsilon_{is}\,\varepsilon_{it}$$

Based on the equation above, the second term on the right hand side equals to zero if the pooled OLS model is the suitable model. The summation of the left hand side and the first term on the right hand side can easily be diagnosed. Assume that both terms are approximately equal, undetectable individual heterogeneity is not relevant.

The estimation of a pooled OLS regression is enough to determine the test statistic. Let the estimated residuals e_{it} be an estimator for ε_{it}, the Breusch-Pagan test statistic then is

$$LM_{BP} = \frac{nT}{2(T-1)}\left[\frac{\sum_{i=1}^{n}[\sum_{t=1}^{T}e_{it}]^2}{\sum_{i=1}^{n}\sum_{t=1}^{T}e_{it}^2} - 1\right]^2$$

$$= \frac{nT}{2(T-1)}\left[\frac{\sum_{i=1}^{n}(T\bar{e}_i)^2}{\sum_{i=1}^{n}\sum_{t=1}^{T}e_{it}^2}-1\right]^2 \sim X_1^2$$

Under the null hypothesis, LM_{BP} is distributed as chi-squared with one degree of freedom.

3.3.1.2 Hausman Test

Hausman test is to examine whether the model is fixed effect or random effect. The Hausman test is based on the hypotheses as below:

H_0: α_i has no relationship with X

H_1: α_i has relationship with X

Under the null hypothesis, if the α_i has no relationship with the covariates X_{it}, the random effect model is considered consistent and efficient whereas the fixed effect model is consistent but inefficient. Under the alternative hypothesis, if the α_i has relationship with the independent variables, X_{it}, the fixed effect model is considered consistent and efficient while the random effect model is inconsistent. Hence, there should be no systematic differences between $\hat{\beta}_{FE}$ and $\hat{\beta}_{RE}$ under the null hypothesis. The hypothesis can be adjusted as following:

H_0: ($\hat{\beta}_{FE}$ - $\hat{\beta}_{RE}$) =0

H_1: ($\hat{\beta}_{FE}$ - $\hat{\beta}_{RE}$) ≠0

The variance of both estimators is required to quantify the test statistic. Generally, the variance of the differences is:

$$Var(\hat{\beta}_{FE}-\hat{\beta}_{RE}) = Var(\hat{\beta}_{FE}) + Var(\hat{\beta}_{RE}) - Cov(\hat{\beta}_{FE},\hat{\beta}_{RE}) - Cov(\hat{\beta}_{FE},\hat{\beta}_{RE})'$$

The first two elements on the right hand side are known from the estimations. However, the covariances are unknown. Hausman (1978) exhibited that the covariance of an efficient estimator with its differ from an inefficient estimator is zero, which reveals that

$$Cov\left[\left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right), \hat{\beta}_{RE}\right] = Cov\left(\hat{\beta}_{FE}, \hat{\beta}_{RE}\right) - Var\left(\hat{\beta}_{RE}\right) = 0$$

Therefore,

$$Cov\left(\hat{\beta}_{FE}, \hat{\beta}_{RE}\right) = Var\left(\hat{\beta}_{RE}\right)$$

Using this result turnouts the needed covariance matrix for the test:

$$Var\left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right) = Var\left(\hat{\beta}_{FE}\right) - Var\left(\hat{\beta}_{RE}\right) = s$$

S can be examined using estimated covariance matrices from the within-and GLS-model. The Hausman test- statistic then is:

$$HT = \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right)' \hat{S}^{-1} \left(\hat{\beta}_{FE} - \hat{\beta}_{RE}\right) \sim X_K^2$$

Under null hypothesis, Hausman Test is a distributed as chi-squared with K degree of freedom.

CHAPTER 4 : RESULT AND INTERPRETATION

4.0 Introduction

Firstly, we used Breusch and Pagan test and Hausman test to test the models whether they are random or fixed effect.

Secondly, the fixed effect regression results show the relationship between the debt level and government tax revenue as well as government spending for low and medium-high debt OECD countries.

Lastly, robust tests are conducted to test the sensitivity of the main variables.

4.1 Empirical Results

We used Breusch-Pagan test to determine whether the models are pooled OLS or Random, then examined whether the models are random effect or fixed effect by using the Hausman test. The results are presented in table 4.1.1 to table 4.1.4.Breusch-Pagan test rejects pooled OLS and the Hausman tests conclude that our models are fixed effect models.

Table 4.1.1: Results for the regression of tax revenue for low debt countries, basic specification

	Pooled Ordinary Least Squares	Random Effect (RE)	Fixed Effect (FE)
lndebt	0.5874072*** (0.0292265)	0.6878001*** (0.0213897)	0.7049984*** (0.0214781)
pop	0.4140119*** (0.814746)	0.0326605 (0.0734336)	0.003374 (0.0734307)
lninc	0.5969996*** (0.0580823)	0.4110898*** (0.0789165)	0.4092648*** (0.0813314)
lnopen	0.4000878*** (0.0938708)	-0.2099056 (0.1605193)	-0.4231471** (0.1720619)
Intercept	-4.71395*** (0.4612095)	-0.1227195 (0.7419307)	0.7875831 (0.7649591)
R-squared	0.8508	0.7117	0.6504
Adjusted R-squared	0.8474	-	-
	F-test: 249.41 Prob: 0.0000***	chi2: 1695.81 Prob: 0.0000***	F-test: 444.72 Prob: 0.0000***
Breusch and Pagan	450.92***		NIL
Hausman Test	NIL	12.8**	

Note: * $p < 0.1$; ** $p < 0.05$, *** $p < 0.01$

Table 4.1.2: Results for the regression of tax revenue for medium-high debt countries, basic specification

	Pooled Ordinary Least Squares	Random Effect (RE)	Fixed Effect (FE)
lndebt	0.0771082** (0.0346277)	0.1456214*** (0.0364703)	0.1620321*** (0.0408334)
pop	-0.2154275*** (0.0329846)	-0.0026791 (0.0285733)	0.0137373 (0.0286924)
lninc	0.2371932*** (0.0347378)	0.1639945*** (0.0352844)	0.17472*** (0.0398545)
lnopen	0.4741*** (0.0222758)	0.3941983*** 0.0531058	0.327755*** (0.0766898)
Intercept	0.5309626 (0.364433)	1.225354 0.3504886***	1.321678 (0.3526813)
R-squared	0.6827	0.6301	0.6139
Adjusted R-squared	0.6778	-	-
	F-test: 137.19 Prob: 0.0000***	chi2: 183.82 Prob: 0.0000***	F-test: 37.73 Prob: 0.0000***
Breusch and Pagan	533.33***		NIL
Hausman Test	NIL	28.72***	

Note: * $p <0.1$; ** $p < 0.05$, *** $p < 0.01$

Table 4.1.3: Results for the regression of government spending for low debt countries, basic specification

	Pooled Ordinary Least Squares	Random Effect (RE)	Fixed Effect (FE)
lndebt	0.6108669*** (0.0280323)	0.7096993*** (0.0191335)	0.7210131*** (0.0192861)
pop	0.1404357* (0.0781456)	0.0093572 (0.0656283)	0.0018188 (0.0659367)
lninc	0.482662*** (0.0557092)	0.2621124*** (0.0712785)	0.2500672*** (0.073031)
lnopen	0.347754*** (0.0900354)	-0.247964 (0.1468488)	-0.3715294 (0.154502)
Intercept	-5.65645 (0.4423651)	-1.035167 (0.6842797)	-0.4111832 (0.6868904)
R-squared	0.8602	0.7271	0.6875
Adjusted R-squared	0.857	-	-
	F-test: 269.25 Prob: 0.0000***	chi2: 2142.62 Prob: 0.0000***	F-test: 547.38 Prob: 0.0000***
Breusch and Pagan	644.26***		NIL
Hausman Test	NIL	9.62**	

Note: * p < 0.1 ; ** p < 0.05, *** p < 0.01

Table 4.1.4: Results for the regression of government spending for medium-high debt countries, basic specification

	Pooled Ordinary Least Squares	Random Effect (RE)	Fixed Effect (FE)
lndebt	0.1482747*** (0.0313105)	0.362371*** (0.0289285)	0.3780765*** (0.0317942)
pop	-0.0801557*** (0.0298248)	0.1056289*** (0.0226667)	0.1157486*** (0.0223408)
lninc	0.3393788*** (0.0314101)	0.3041999*** (0.0279877)	0.3014234*** (0.0310319)
lnopen	0.168256*** (0.0201418)	0.186609*** (0.0421117)	0.1905678*** (0.059713)
Intercept	-1.891273*** (0.3295213)	-2.542183 (0.278029)	-2.596849*** (0.2746086)
R-squared	0.489	0.4169	0.4107
Adjusted R-squared	0.481	-	-
	F-test: 61 Prob: 0.0000***	chi2: 511.62 Prob: 0.0000***	F-test: 136.64 Prob: 0.0000***
Breusch and Pagan	666.43***		NIL
Hausman Test	NIL	-6.47***	

Note: * p < 0.1 ; ** p < 0.05, *** p < 0.01

Table 4.1.5: Summary results for fixed effect models

	Low Debt - Tax Revenue	Medium-High Debt - Tax Revenue	Low Debt - Government Spending	Medium-High Debt - Government Spending
lndebt	0.7049984*** (0.0214781)	0.1620321*** (0.0408334)	0.7210131*** (0.0192861)	0.3780765*** (0.0317942)
pop	0.003374 (0.0734307)	0.0137373 (0.0286924)	0.0018188 (0.0659367)	0.1157486*** (0.0223408)
lninc	0.4092648*** (0.0813314)	0.17472*** (0.0398545)	0.2500672*** (0.073031)	0.3014234*** (0.0310319)
lnopen	-0.4231471** (0.1720619)	0.327755*** (0.0766898)	-0.3715294 (0.154502)	0.1905678*** (0.059713)
Intercept	0.7875831 (0.7649591)	1.321678 (0.3526813)	-0.4111832 (0.6868904)	-2.596849*** (0.2746086)
R-squared	0.6504	0.6139	0.6875	0.4107
F-Test	444.72	37.73	547.38	136.64
Probability	0.0000***	0.0000***	0.0000***	0.0000***
Correlation	0.7615	0.2023	0.821	0.3204

Note: * p <0.1 ; ** p < 0.05, *** p < 0.01

Table 4.1.5 presents the summary results for FEM. We examined that there is significant positive nexus between government debt and tax revenue in both low and medium-high debt OECD countries. In other words, when government debt increased, the tax revenue is also increased during the period of 1990 to 2009. Our findings are similar to Barro & Sahasakul (1986) and Kenny & Toma (1997) Holm-Hadulla et.al (2011). According to Krogstrup (2004), he concludes that the public debt has impacted on the taxes adjustment as the result showed that the debt has evidently increase the tax revenues in the percentage of Gross Domestic Products

(GDP). This may due to high level of public debt reduces the flexibility of fiscal policy and thus it must be associated with higher taxes.

Income per capita has significant positive impact on the tax revenue in both low and medium-high debt OECD countries. This means when income per capita increased, tax revenue of the governments increased during the period. This may be attributed to the tax rate of goods and services that charged by government is expected to increase with income due to the demand for government services are income-elastic (Gupta, 2007). Besides, trade openness has significant effect on tax revenue in both low and medium-high debt OECD countries. However, there is contradicting effects between low and medium-high debt countries where the trade openness has positive relationship with tax revenue in medium-high debt OECD countries but negative relationship in low debt OECD countries. This asymmetry results between low debt and medium-high debt countries could be due to high debt countries usually are more advanced countries and have higher trade activities as compared with low debt countries. Baunsgaard & Keen (2004) state that high income countries gained back more from other sources the revenues they have lost from past episodes of trade liberalization as compared to medium income countries. The positive relationship between the openness and tax to GDP ratio is shown in studies by Khattry & Rao's (2002), Lotz & Morss (1967), Ghura (1998), Gupta (2007), Mahdavi (2008) and Dioda (2012).

Next, on public spending, our findings show that there is significant positive relationship between public debt and government spending in both low and medium-high debt OECD countries. The results are consistent with Mahdavi (2004). He argued that high debt levels are normally accommodated with high interest payments as interest payments on the public debt is a comparatively significant and inflexible component of total public spending. According to the recently released annual Economic and Budget Outlook, a high debt create a higher risk of triggering a fiscal crisis during which the investors would lose their confidence in the government as they concern the government's ability to sustain its budget. Thus, government would have to offer higher interest rate in borrowing. However, our findings are contradicted with other researchers who found a negative impact of government debt on government spending such as Adam (2011), and Krogstrup (2002). According to Krogstrup (2004), he indicated that the high level of public debt might reduce the flexibility of fiscal policy and thus it must be associated with higher taxes or lower spending.

Population growth has significant positive effect on the government spending in medium-high debt countries whereas it has insignificant effect on the government spending in low debt countries. It may be due to population growth which indicates that there is more demand for health care and education commodities which will cause an increase in government spending (Tayeh & Mustafa, 2011). Besides, income per capita has significant impact on government spending in both low and medium-high debt OECD countries. The results support Wagner's law which argued that income-elastic is the demand that willingly paid by people for their service. Therefore, the public economy expansion is influenced by greater affluence of a nation (Cameron, 1978). Furthermore, trade openness has significant positive impact on the government spending in medium-high debt countries. This finding is consistent with Rodrik (1998) and Cameron (1978) who found a significant positive relationship between openness and public spending. The reason could be attributed to greater open economies will have higher rates of industrial concentration which will lead to more unionized labor markets through collective bargaining. As a result, it will influence public expenditure on social protection and social infrastructure (Cameron, 1978).

4.2 Robustness Test and Specification

We had done four types of robust testing to test the sensitivity of the main variables to the additional variables that added into the model (table 4.2.1). Specifically, unemployment rate is added to robust model (2), inflation rate is added to the robust model (3) whereas both inflation rate and unemployment rate are added together in the robust model (4). Lastly, white specification test is done on each of the robust models and also on the original models.

We notice that the model is considered stable across the model (2), (3), (4) and white specification tests on each model respectively. This shows that the impact same as we found in the original model (1). This inclusion of the variable does not have a substantial effect on the parameter estimate for debt level and the basic specification is kept.

Refer to table 4.2.2, debt level has significant effect on the tax revenue in medium-high debt countries in the robust model (6) and (8). However, the impact of debt level on tax revenue has changed in white specification test for models (5), (6), (7), and (8) in the way that the relationship between debt level and tax revenue has become insignificant and negatively related. This may due to our model will be at least some mis-specified or error terms are not perfectly independent and identically distributed. Besides, in practice it is usually the standard errors of robust models tend to larger than the standard errors of OLS model in economic applications (Auld, 2014). Moreover, this approach does not address problems of endogeneity, measurement error, missing data, and others. Hence, any inference must always rely on some theoretical understanding (King & Robert, 2014).

Results in table 4.2.3 show the consistency across the model (10), (11), (12) as well as the white specification tests on each model respectively. This is because it gives us the same impact as we found in the original model (9) in the way that it has significant positive relationship between debt level and government spending as the government spending is going up when debt is going up in the low debt countries.

Based on the table 4.2.4, the model is considered steady across the model (14), (15), (16) and white specification tests on each model respectively as the results are consistent with the original model (13) in the way that it has significant positive relationship between debt level and government spending. The government spending is going up when debt is going up in the medium-high debt countries.

From the results, variable added into the models are significant to explain the tax revenue and government spending in both low and medium-high debt countries. However, we excluded them from the original model for some reasons. According to Shin (1969), he found that inflation rate only being significant for the less developed countries. However, according to Cameron (1984) and Lybeck (1986), they showed that unemployment rate only influences the government spending in short run and it is vary to observe what it has to do in the long run study as it does not raise trend wise. As our model is using non-dynamic model which means that it has to determine the long run effect on tax revenue and government spending. Hence, unemployment rate is excluded from our study.

Table 4.2.1: Robustness of tax revenue estimates to the inclusion of other explanatory variables for low debt countries

	Fixed Effect (FE) (1)	Robust test						
		White test Diagonal	Add in unemployment rate (2)	White test Diagonal	Add in inflation (3)	White test Diagonal	Add in unemployment and inflation (4)	White test Diagonal
lndebt	0.7049984*** (0.0214781)	0.707213*** (0.047754)	0.7294957*** (0.0209999)	0.723723*** (0.057257)	0.6505461*** (0.0250248)	0.658041*** (0.050704)	0.6622268*** (0.0226919)	0.661197*** (0.055129)
pop	0.003374 (0.0734307)	0.027081 (0.074562)	-0.0620725 (0.0708788)	-0.011765 (0.072730)	0.0888491 (0.0739824)	0.116515 (0.074302)	0.0358991 (0.0673983)	0.097059 (0.075194)
lninc	0.4092648*** (0.0813314)	0.131306 (0.239371)	0.3816372*** (0.0771224)	0.084008 (0.245398)	0.2319792** (0.0907268)	-0.083736 (0.219962)	0.1323002 (0.0835512)	-0.255805 (0.204512)
lnopen	-0.4231471** (0.1720619)	-1.187615*** (0.376979)	-0.4054193** (0.1627015)	-1.021103*** (0.365996)	-0.0910111 (0.1865238)	-0.919** (0.387429)	0.0520921 (0.1701281)	-0.536968 (0.379872)
Unemployment	NIL	NIL	-0.0728978*** (0.0159554)	-0.056936** (0.023299)	NIL	NIL	-0.0934823*** (0.0151066)	-0.088559*** (0.021118)
Inflation	NIL	NIL	NIL	NIL	-0.010468*** (0.0027199)	-0.009898*** (0.002891)	-0.0142617*** (0.0025331)	-0.014431*** (0.003329)
Intercept	0.7875831 (0.7649591)	6.759060* (3.553916)	1.370654* (0.734313)	6.814300** (3.442645)	1.279807* (0.7462024)	7.873612*** (3.369817)	2.205909*** (0.6907015)	8.470054*** (3.046884)
R-squared	0.6504	0.964576	0.6933	0.966752	0.7453	0.96739	0.7942	0.972063
Adjusted R-squared	-	0.957054	-	0.959414	-	0.960193	-	0.965661
	F-test: 444.72 Prob: 0.0000***	F-test: 128.241 Prob: 0.0000***	F-test: 402.29 Prob: 0.0000***	F-test:131.7533 Prob: 0.0000***	F-test: 388.16 Prob: 0.0000***	F-test:134.422 Prob: 0.0000***	F-test:402.52 Prob: 0.0000***	F-test:151.8346 Prob: 0.0000***

Note: * p < 0.1 ; ** p < 0.05, *** p < 0.01

Table 4.2.2: Robustness of tax revenue estimates to the inclusion of other explanatory variables for medium-high debt countries

	Fixed Effect (FE) (5)	Robust test White test Diagonal	Add in unemployment rate (6)	White test Diagonal	Add in inflation (7)	White test Diagonal	Add in unemployment and inflation (8)	White test Diagonal
lndebt	0.1620321***	-0.028951	0.16274063***	-0.101792	0.066231	-0.089907	0.0875139*	-0.129547*
	(0.0408334)	(0.068332)	(0.0459308)	(0.069536)	(0.0449416)	(0.070156)	(0.0468864)	(0.071555)
pop	0.0137373	0.007086	0.0131832	0.055704*	0.0315396	0.014185	0.0081234	0.050823
	(0.0286924)	(0.027568)	(0.0330604)	(0.031310)	(0.0279504)	(0.029440)	(0.0317311)	(0.03155)
lninc	0.17472***	-0.064085	0.1747171***	-0.011617	0.1040642**	-0.111358	0.095557**	-0.05517
	(0.0398545)	(0.111625)	(0.0399367)	(0.108353)	(0.0416151)	(0.110426)	(0.041861)	(0.109258)
lnopen	0.327755***	-0.096320	0.3265507***	-0.004947	0.3643162***	-0.073941	0.3131764***	-0.007823
	(0.0766898)	(0.113795)	(0.0846371)	(0.108060)	(0.0743877)	(0.106646)	(0.0812372)	(0.105256)
Unemployment	NIL	NIL	-0.0001697	0.018989***	NIL	NIL	-0.0078175	0.01515***
			(0.0049981)	(0.005241)			(0.005064)	(0.004943)
Inflation	NIL	NIL	NIL	NIL	-0.0266708***	-0.022163**	-0.0298316***	-0.015446*
					(0.0060381)	(0.008621)	(0.0063595)	(0.008452)
Intercept	1.321678	6.276402***	1.325618***	5.468307***	2.314501***	6.950805	2.613626***	6.101688***
	(0.3526813)	(1.370847)	(0.3719644)	(1.327114)	(0.4075546)	1.405658	(0.4502238)	(1.378401)
R-squared	0.6139	0.922151	0.6141	0.927242	0.5837	0.926039	0.5987	0.928922
Adjusted R-squared	-	0.909988	NIL	0.915496	NIL	0.914099	-	0.917075
	F-test: 37.73 Prob: 0.0000***	F-test:75.81095 Prob: 0.0000***	F-test: 30.06 Prob: 0.0000***	F-test: 78.94298 Prob: 0.0000***	F-test: 36.39 Prob: 0.0000***	F-test:77.55805 Prob: 0.0000***	F-test:30.89 Prob: 0.0000***	F-test:78.41406 Prob: 0.0000***

Note: * p < 0.1 ; ** p < 0.05, *** p < 0.01

Table 4.2.3: Robustness of government spending estimates to the inclusion of other explanatory variables for low debt countries

	Fixed Effect (FE) (9)	White test Diagonal	Robust test Add in unemployment rate (10)	White test Diagonal	Add in inflation (11)	White test Diagonal	Add in unemployment and inflation (12)	White test Diagonal
lndebt	0.7210131***	0.717523***	0.7327151***	0.722766***	0.6485942***	0.64887***	0.655883***	0.651877***
	(0.0192861)	(0.05519)	(0.0196885)	(0.062293)	(0.0212405)	(0.054878)	(0.0202614)	(0.058050)
pop	0.0018188	-0.001406	-0.0294439	-0.013049	0.1154963*	0.124756*	0.0824556	0.112262
	(0.0659367)	(0.076639)	(0.0664525)	(0.075637)	(0.0627945)	(0.073663)	(0.0601792)	(0.076069)
lninc	0.2500672***	0.288867	0.23687***	0.2798	0.0142861	-0.010155	-0.0479136	-0.107739
	(0.073031)	(0.255796)	(0.0723062)	(0.261535)	(0.0770068)	(0.223873)	(0.074602)	(0.21583)
lnopen	-0.3715294	-0.656204**	-0.3630611**	-0.616241*	0.0701951	-0.274741	0.1594914	-0.051735
	(0.154502)	(0.331050)	(0.152541)	(0.329924)	(0.158317)	(0.336095)	(0.1519056)	(0.32804)
Unemployment	NIL	NIL	-0.034822**	-0.015269	NIL	NIL	-0.0583329***	-0.052972***
			(0.014959)	(0.024163)			(0.0134885)	(0.019444)
Inflation	NIL	NIL	NIL	NIL	-0.0139219***	-0.013313***	-0.0162892***	-0.016257***
					(0.0023086)	(0.003072)	(0.0022618)	(0.003347)
Intercept	-0.4111832	0.416848	-0.1326602	0.41607	0.2434502	1.927808	0.8213374	2.259263
	(0.6868904)	(3.547448)	(0.6884561)	(3.534141)	(0.6333589)	(3.266663)	0.6167199	(3.102104)
R-squared	0.6875	0.968159	0.704	0.968329	0.8053	0.973543	0.8188	0.975322
Adjusted R-squared	-	0.961489	-	0.961434	-	0.967783	-	0.969744
	F-test: 547.38 Prob: 0.0000***	F-test: 145.1639 Prob: 0.0000***	F-test: 450.57 Prob: 0.0000***	F-test: 140.4505 Prob: 0.0000***	F-test: 537.91 Prob: 0.0000***	F-test:169.0352 Prob: 0.0000***	F-test:499.18 Prob: 0.0000***	F-test:174.856 Prob: 0.0000***

Note: * p < 0.1 ; ** p < 0.05, *** p < 0.01

Table 4.2.4: Robustness of government spending estimates to the inclusion of other explanatory variables for medium-high debt countries

	Fixed Effect (FE) (13)	White test Diagonal	Robust test: Add in unemployment rate (14)	White test Diagonal	Add in inflation (15)	White test Diagonal	Add in unemployment and inflation (16)	White test Diagonal
lndebt	0.3780765*** (0.0317942)	0.191437*** (0.039917)	0.4188955*** (0.0352937)	0.172595*** (0.042815)	0.3288987*** (0.0357815)	0.149577*** (0.041362)	0.3692565*** (0.0364574)	0.146256*** (0.04414)
pop	0.1157486*** (0.0223408)	0.112361*** (0.021164)	0.0838227*** (0.025404)	0.124937*** (0.024275)	0.1248871*** (0.0222535)	0.117236*** (0.01877)	0.080484*** (0.0246731)	0.120305*** (0.022729)
lninc	0.3014234*** (0.0310319)	0.013515 (0.092075)	0.3012561*** (0.0306878)	0.027087 (0.091761)	0.2651536*** (0.0331331)	-0.018949 (0.083629)	0.2490217*** (0.0325498)	-0.014242 (0.083084)
lnopen	0.1905678*** (0.059713)	-0.154041* (0.084876)	0.1211872** (0.0650361)	-0.130404 (0.087594)	0.2093359*** (0.0592259)	-0.138672 (0.078150)	0.112362* (0.0631674)	-0.133134* (0.080313)
Unemployment	NIL	NIL	-0.0097775** (0.0038406)	0.004912 (0.004024)	NIL	NIL	-0.0148239*** (0.0039376)	0.001269 (0.003633)
Inflation	NIL	NIL	NIL	NIL	-0.013691*** (0.0048074)	-0.01522** (0.005924)	-0.0196846*** (0.004945)	-0.014657** (0.005728)
Intercept	-2.596849*** (0.2746086)	2.507184** (1.214005)	-2.369889*** (0.2858215)	2.298148* (1.217034)	-2.087201*** (0.3244862)	2.970317*** (1.104875)	-1.519986*** (0.3500794)	2.899192*** (1.101149)
R-squared	0.4107	0.930711	0.3871	0.931382	0.4246	0.934322	0.4037	0.934362
Adjusted R-squared	-	0.919884	-	0.920304	-	0.923719	-	0.923422
	F-test: 136.64 Prob: 0.0000***	F-test: 85.96628 Prob: 0.0000***	F-test: 113.08 Prob: 0.0000***	F-test: 84.07945 Prob: 0.0000***	F-test:114.13 Prob: 0.0000***	F-test: 88.12106 Prob: 0.0000***	F-test:102.65 Prob: 0.0000***	F-test: 85.41039 Prob: 0.0000***

Note: * $p < 0.1$; ** $p < 0.05$, *** $p < 0.01$

CHAPTER 5: CONCLUSION

5.0 Summary

This research paper is to examine the impacts of public debt asymmetries on the tax revenue and government spending in selected OECD countries in order to provide guideline in fiscal planning. We applied panel data approach on 22 OECD countries from year 1990 to 2009. We separated them into 2 categories by using debt levels. A country is categorized as low debt countries if the debt level is lower than 30% of GDP and it is categorized as medium-high debt countries if the debt level is 30% of GDP and above.

5.1 Conclusion

We first applied Breusch-Pagan test and Hausman test to determine whether the models are pooled OLS, random effect or fixed effect models to avoid the model misspecification problem. Then, we conducted the robust tests on the sensitivity of main variables to the additional variables in the model.

Based on our results, we conclude that our models for government spending and tax revenue in both low and medium-high countries are fixed effect models. Our findings show that there are significant positive relationships between government debt and tax revenue; government debt and public spending in both low and medium-high debt OECD countries. The robust test results show that the most of the models are considered consistent after inclusion of other variables into the models. In other words, it means our main variables are not sensitivity to the additional variables that added into the model. There are significant positive relationships between debt level on tax revenue; and debt level on government spending in the low debt countries. There is also a significant positive relationship between debt level and government spending in medium-high debt countries. However, the results are different from the original results in the white specification test for tax revenue in medium-high debt countries in the way that the relationship between debt level and tax revenue has become insignificant and negatively related.

5.2 Policy Implication

The high debt level will cause the rises in the government spending and taxes. When the government spending increased and the taxes rates are raised, it will harm the economic growth in a certain dimension. When the government spending increased, this indicated that government has to borrow more to increase the funds for spending and thus inflation will be happened. In addition, the raises of government spending tend to decrease the savings rates in the economy due to the high consumption and thus lead to higher interest rate which reduces the private investments such as investment of infrastructures that contributed significantly to the economic growth (Stratmann & Okolski, 2010). Besides, high government spending will eventually increases the tax burden of the people either in current state or in the future (Stratmann & Okolski, 2010). As the tax increased, the people are disposed to do the investment as well as reduce their jobs due to the higher income tax (Klein, 2001). This is the reaction and responses of people attempts to exempt from the higher tax and thus cause an underground economy to be existed in the country. As a result, the unemployment rate in the economy will be increased and the investment will be declined which lead to a lower economic growth.

Indeed, high debt level will cause the high government spending and tax burden in the economy and resulted in low economic growth. Thus, the government should have some interventions to reduce the high debt issue in the economy. The government should design a policy and plan to cut the federal spending wisely and effectively. Government should reduce the discretionary spending such as education programs and mandatory spending in order to reduce the unnecessary spending that caused the increased in the debt (Labonte, 2012). On the other hand, government should implement the tax reform or redesign the tax system in the economy such as increase the new revenue sources. The new revenue sources are able to reduce the debt and thus enhance the economic growth and efficiency rather than only increased the tax revenues (Labonte, 2012). Moreover, the public revenues will be increased when the taxes are paid necessary, to avoid the corruption and law breaking happened in the collection of tax as well as ensure the tax are paid equally among the people (Louis, 1894).

5.3 Limitation and Recommendation

There are some limitations in this research paper that needed for further study to encounter the inadequacy.

One of the limitations in this research paper is lack of the country base in our study. This is due to the reason that we using the annual balanced panel data to avoid the problem of unobserved heterogeneity that may occur in a cross section data set. In order to collect the complete balanced panel data, we need to exclude all the countries' data that have missing value. As a result, we can only use 22 countries out of all OECD countries from year 1990 to 2009 only.

Moreover, there is a minor problem occurred in our result. Debt level has significant effect on the tax revenue in medium-high debt countries in the robust model (6) and (8). However, there are different results across the models (5), (6), (7), and (8) with white specification test in the way that the relationship between debt level and tax revenue has become insignificant and negatively related. This is because our model may have at least some mis-specified or error terms are not perfectly independent and identically distributed.

There are certain recommendations that are associated with this research paper.

We are highly recommended the future researchers choose to expand the country base. In our research paper, we only used 22 countries from 1990 to 2009 due to the reason we need to collect the complete annual balanced panel data. Therefore, we excluded all the OECD countries that have missing value. We should expand the country base because it allows the researchers to increase the significance level of findings, this able to increase the confidence level of the result and make our result to be more accurately.

In addition, we also recommended the future researchers to apply this study in causality analysis. Instead of using fiscal spending and tax revenue as dependent variables, we suggest that carry out the research regarding the influence of fiscal spending and government revenue on government debt. This is due to the reason that government usually implemented fiscal policy or monetary policy in order to solve the high government debt issue in the country. Therefore, it is important for government to control the fiscal spending and government revenue to reduce the debt burden of the country.

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Appendix 1: STATA results of tax revenue for low debt countries

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   11.2   Copyright 1985-2009 StataCorp LP
  Statistics/Data Analysis            StataCorp
                                      4905 Lakeway Drive
     Special Edition                  College Station, Texas 77845 USA
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                                      979-696-4601 (fax)

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Notes:
      1.  (/m# option or -set memory-) 50.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

running C:\Users\User\Desktop\Stata11\profile.do ...

. *(8 variables, 180 observations pasted into data editor)

. tsset code year
       panel variable:  code (strongly balanced)
        time variable:  year, 1990 to 2009
                delta:  1 unit

. generate lntax=ln(tax)

. generate lndebt=ln(debt)

. generate lninc=ln(inc)

. generate lnopen=ln(open)


. xtsum lntax lndebt pop lninc lnopen
```

Variable		Mean	Std. Dev.	Min	Max	Observations	
lntax	overall	4.664175	1.303801	-2.337179	6.003342	N =	180
	between		.9626622	2.393423	5.464033	n =	9
	within		.9335666	-.0664271	7.390737	T =	20
lndebt	overall	2.257428	1.540408	-7.757994	4.005061	N =	180
	between		.9879373	.5444164	3.256242	n =	9
	within		1.224923	-6.044982	5.522442	T =	20
pop	overall	1.02919	.5406944	-.2533834	2.530086	N =	180
	between		.4641955	.1961629	1.612634	n =	9
	within		.315824	.2163565	2.4052	T =	20
lninc	overall	9.942763	.9386209	7.726829	11.62651	N =	180
	between		.9269904	8.363678	10.93131	n =	9
	within		.3360206	9.293926	10.82667	T =	20
lnopen	overall	4.224504	.5364129	3.244492	5.80974	N =	180
	between		.5388093	3.648747	5.487742	n =	9
	within		.1680446	3.636555	4.668691	T =	20

Results of Pooled OLS

```
. reg lntax lndebt pop lninc lnopen

      Source |       SS       df       MS              Number of obs =     180
-------------+------------------------------           F(  4,   175) =  249.41
       Model |  258.871686     4  64.7179215           Prob > F      =  0.0000
    Residual |   45.410112   175  .259486354           R-squared     =  0.8508
-------------+------------------------------           Adj R-squared =  0.8474
       Total |  304.281798   179  1.69989831           Root MSE      =   .5094

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .5874072   .0292265    20.10   0.000     .5297255     .645089
         pop |   .4140119   .0814746     5.08   0.000     .2532126    .5748111
       lninc |   .5969996   .0580823    10.28   0.000     .4823676    .7116317
      lnopen |   .4000878   .0938708     4.26   0.000     .2148232    .5853524
       _cons |   -4.71395   .4612095   -10.22   0.000    -5.624198   -3.803701
------------------------------------------------------------------------------
```

Results of Random Effect (RE)

```
. xtreg lntax lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9131                         Obs per group: min =        20
       between = 0.5198                                        avg =      20.0
       overall = 0.7117                                        max =        20

                                                Wald chi2(4)       =   1695.81
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .6878001   .0213897    32.16   0.000     .6458771    .7297232
         pop |   .0326605   .0734336     0.44   0.656    -.1112666    .1765877
       lninc |   .4110898   .0789165     5.21   0.000     .2564164    .5657632
      lnopen |  -.2099056   .1605193    -1.31   0.191    -.5245176    .1047064
       _cons |  -.1227195   .7419307    -0.17   0.869    -1.576877    1.331438
-------------+----------------------------------------------------------------
     sigma_u |  .4887567
     sigma_e |  .2831492
         rho |  .74871707   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results for Breush-Pagan Test

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        lntax[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                   lntax |   1.699898       1.303801
                       e |   .0801735       .2831492
                       u |   .2388831       .4887567

        Test:   Var(u) = 0
                             chibar2(01) =   450.92
                          Prob > chibar2 =   0.0000
```

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9142                         Obs per group: min =        20
       between = 0.4196                                        avg =      20.0
       overall = 0.6504                                        max =        20

                                                F(4,167)           =    444.72
corr(u_i, Xb)  = -0.2550                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .7049984   .0214781    32.82   0.000     .6625948     .747402
         pop |    .003374   .0734307     0.05   0.963    -.1415981    .1483462
       lninc |   .4092648   .0813314     5.03   0.000     .2486947     .569835
      lnopen |  -.4231471   .1720619    -2.46   0.015     -.762844   -.0834502
       _cons |   .7875831   .7649591     1.03   0.305    -.7226534     2.29782
-------------+----------------------------------------------------------------
     sigma_u |  .78835785
     sigma_e |   .2831492
         rho |  .88574095   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 167) =    49.92              Prob > F = 0.0000

. est store fixed

. xtreg lntax lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9131                         Obs per group: min =        20
       between = 0.5198                                        avg =      20.0
       overall = 0.7117                                        max =        20

                                                Wald chi2(4)       =   1695.81
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .6878001   .0213897    32.16   0.000     .6458771    .7297232
         pop |   .0326605   .0734336     0.44   0.656    -.1112666    .1765877
       lninc |   .4110898   .0789165     5.21   0.000     .2564164    .5657632
      lnopen |  -.2099056   .1605193    -1.31   0.191    -.5245176    .1047064
       _cons |  -.1227195   .7419307    -0.17   0.869    -1.576877    1.331438
-------------+----------------------------------------------------------------
     sigma_u |   .4887567
     sigma_e |   .2831492
         rho |  .74871707   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results of Hausman Test

```
. hausman fixed

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
      lndebt |    .7049984     .6878001        .0171983        .0019465
         pop |     .003374     .0326605       -.0292865               .
       lninc |    .4092648     .4110898        -.001825        .0196719
      lnopen |   -.4231471    -.2099056       -.2132415        .0619586
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       12.80
                Prob>chi2 =      0.0123
                (V_b-V_B is not positive definite)


. est store fixed

. xtreg lntax lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9142                         Obs per group: min =        20
       between = 0.4196                                        avg =      20.0
       overall = 0.6504                                        max =        20

                                                F(4,167)           =    444.72
corr(u_i, Xb)  = -0.2550                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .7049984   .0214781    32.82   0.000     .6625948     .747402
         pop |    .003374   .0734307     0.05   0.963    -.1415981    .1483462
       lninc |   .4092648   .0813314     5.03   0.000     .2486947     .569835
      lnopen |  -.4231471   .1720619    -2.46   0.015     -.762844   -.0834502
       _cons |   .7875831   .7649591     1.03   0.305    -.7226534     2.29782
-------------+----------------------------------------------------------------
     sigma_u |  .78835785
     sigma_e |   .2831492
         rho |  .88574095   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 167) =    49.92              Prob > F = 0.0000
```

Results of Pesaran CD Test

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =     1.080, Pr = 0.2801

Average absolute value of the off-diagonal elements =     0.535
```

Results of heteroscedasticity test

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (9)  =      283.59
Prob>chi2 =      0.0000
```

Results of correlation

```
. correlate lntax lndebt pop lninc lnopen
(obs=180)

             |    lntax   lndebt      pop    lninc   lnopen
-------------+---------------------------------------------
       lntax |   1.0000
      lndebt |   0.7615   1.0000
         pop |  -0.3041  -0.4617   1.0000
       lninc |   0.7077   0.3359  -0.3318   1.0000
      lnopen |   0.4272   0.0145  -0.0775   0.6186   1.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:28
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (unbalanced) observations: 178
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.759060	3.553916	1.901863	0.0592
LNDEBT	0.707213	0.047754	14.80962	0.0000
POP	0.027081	0.074562	0.363200	0.7170
LNINC	0.131306	0.239371	0.548548	0.5842
LNOPEN	-1.187615	0.376979	-3.150348	0.0020

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.964576	Mean dependent var	4.661208
Adjusted R-squared	0.957054	S.D. dependent var	1.310685
S.E. of regression	0.271618	Akaike info criterion	0.392534
Sum squared resid	10.77135	Schwarz criterion	0.964540
Log likelihood	-2.935545	Hannan-Quinn criter.	0.624498
F-statistic	128.2410	Durbin-Watson stat	0.415007
Prob(F-statistic)	0.000000		

Appendix 2: STATA results of tax revenue for medium-high debt countries

```
                                                        (R)
                                                 11.2   Copyright 1985-2009 StataCorp LP
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     Special Edition                                    College Station, Texas 77845 USA
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                                                        979-696-4601 (fax)

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Notes:
      1.  (/m# option or -set memory-) 50.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

running C:\Users\User\Desktop\Stata11\profile.do ...

. *(8 variables, 260 observations pasted into data editor)

. tsset code year
       panel variable:  code (strongly balanced)
        time variable:  year, 1990 to 2009
                delta:  1 unit

. generate lntax=ln(tax)

. generate lndebt=ln(debt)

. generate lninc=ln(inc)

. generate lnopen=ln(open)


. xtsum lntax lndebt pop lninc lnopen
```

Variable		Mean	Std. Dev.	Min	Max	Observations
lntax	overall	5.111157	.3726402	4.09428	5.869209	N = 260
	between		.3452153	4.448516	5.547096	n = 13
	within		.1686108	4.566616	5.434513	T = 20
lndebt	overall	3.853841	.446858	2.555354	5.243176	N = 260
	between		.3848482	3.44354	4.592673	n = 13
	within		.2498779	2.821039	4.504343	T = 20
pop	overall	.5806317	.4832565	-.2304818	2.878185	N = 260
	between		.3638841	.1772192	1.280022	n = 13
	within		.3329246	-.6149769	2.178795	T = 20
lninc	overall	10.20489	.3952421	8.959239	11.04446	N = 260
	between		.2791713	9.49631	10.50356	n = 13
	within		.2898225	9.515234	10.96975	T = 20
lnopen	overall	4.192333	.5934981	2.767827	5.213902	N = 260
	between		.595447	3.068536	4.979539	n = 13
	within		.1539248	3.759256	4.685647	T = 20

Results of Pooled OLS

```
. reg lntax lndebt pop lninc lnopen
```

Source	SS	df	MS
Model	24.554503	4	6.13862574
Residual	11.4104167	255	.044746732
Total	35.9649196	259	.138860694

```
Number of obs =     260
F(  4,   255) =  137.19
Prob > F      =  0.0000
R-squared     =  0.6827
Adj R-squared =  0.6778
Root MSE      =  .21153
```

lntax	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lndebt	.0771082	.0346277	2.23	0.027	.0089154	.1453009
pop	-.2154275	.0329846	-6.53	0.000	-.2803845	-.1504705
lninc	.2371932	.0347378	6.83	0.000	.1687836	.3056028
lnopen	.4741	.0222758	21.28	0.000	.4302321	.5179679
_cons	.5309626	.364433	1.46	0.146	-.1867191	1.248644

Results of Random Effect (RE)

```
. xtreg lntax lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.3809                         Obs per group: min =        20
       between = 0.7002                                        avg =      20.0
       overall = 0.6301                                        max =        20

                                                Wald chi2(4)       =    183.82
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .1456214   .0364703     3.99   0.000     .0741409    .2171019
         pop |  -.0026791   .0285733    -0.09   0.925    -.0586818    .0533235
       lninc |   .1639945   .0352844     4.65   0.000     .0948384    .2331506
      lnopen |   .3941983   .0531058     7.42   0.000     .2901127    .4982838
       _cons |   1.225354   .3504886     3.50   0.000     .5384094    1.912299
-------------+----------------------------------------------------------------
     sigma_u |  .15272902
     sigma_e |  .13671982
         rho |  .55514056   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results of Breush-Pagan Test

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        lntax[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                   lntax |   .1388607       .3726402
                       e |   .0186923       .1367198
                       u |   .0233262        .152729

        Test:   Var(u) = 0
                             chibar2(01) =   533.33
                          Prob > chibar2 =   0.0000
```

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.3831                         Obs per group: min =        20
       between = 0.6874                                        avg =      20.0
       overall = 0.6139                                        max =        20

                                                F(4,243)           =     37.73
corr(u_i, Xb)  = 0.3576                         Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .1620321   .0408334     3.97   0.000     .0815995    .2424647
         pop |   .0137373   .0286924     0.48   0.633    -.0427802    .0702549
       lninc |     .17472   .0398545     4.38   0.000     .0962157    .2532243
      lnopen |    .327755   .0766898     4.27   0.000     .1766934    .4788166
       _cons |   1.321678   .3526813     3.75   0.000     .6269755    2.016381
-------------+----------------------------------------------------------------
     sigma_u |  .21128324
     sigma_e |  .13671982
         rho |  .70485631   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 243) =    30.62             Prob > F = 0.0000
```

```
. est store fixed

. xtreg lntax lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.3809                         Obs per group: min =        20
       between = 0.7002                                        avg =      20.0
       overall = 0.6301                                        max =        20

                                                Wald chi2(4)       =    183.82
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .1456214   .0364703     3.99   0.000     .0741409    .2171019
         pop |  -.0026791   .0285733    -0.09   0.925    -.0586818    .0533235
       lninc |   .1639945   .0352844     4.65   0.000     .0948384    .2331506
      lnopen |   .3941983   .0531058     7.42   0.000     .2901127    .4982838
       _cons |   1.225354   .3504886     3.50   0.000     .5384094    1.912299
-------------+----------------------------------------------------------------
     sigma_u |  .15272902
     sigma_e |  .13671982
         rho |  .55514056   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results of Hausman Test

```
. hausman fixed

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
      lndebt |    .1620321     .1456214        .0164107        .0183653
         pop |    .0137373    -.0026791        .0164165        .0026112
       lninc |      .17472     .1639945        .0107255        .0185308
      lnopen |     .327755     .3941983       -.0664433        .0553271
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       28.72
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

```
. est store fixed

. xtreg lntax lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.3831                         Obs per group: min =        20
       between = 0.6874                                        avg =      20.0
       overall = 0.6139                                        max =        20

                                                F(4,243)           =     37.73
corr(u_i, Xb)  = 0.3576                         Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .1620321   .0408334     3.97   0.000     .0815995    .2424647
         pop |   .0137373   .0286924     0.48   0.633    -.0427802    .0702549
       lninc |     .17472   .0398545     4.38   0.000     .0962157    .2532243
      lnopen |    .327755   .0766898     4.27   0.000     .1766934    .4788166
       _cons |   1.321678   .3526813     3.75   0.000     .6269755    2.016381
-------------+----------------------------------------------------------------
     sigma_u |  .21128324
     sigma_e |  .13671982
         rho |  .70485631   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 243) =    30.62             Prob > F = 0.0000
```

Results of Pesaran CD Test

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =    11.644, Pr = 0.0000

Average absolute value of the off-diagonal elements =     0.495
```

Results of heteroscedasticity test

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (13)  =      247.54
Prob>chi2 =      0.0000
```

Results of correlation

```
. correlate lntax lndebt pop lninc lnopen
(obs=260)

             |    lntax   lndebt      pop    lninc   lnopen
-------------+---------------------------------------------
       lntax |   1.0000
      lndebt |   0.2023   1.0000
         pop |  -0.1895  -0.5048   1.0000
       lninc |   0.2275   0.0336   0.2299   1.0000
      lnopen |   0.7335  -0.0525   0.1042   0.0491   1.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14   Time: 01:46
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.276402	1.370847	4.578484	0.0000
LNDEBT	-0.028951	0.068332	-0.423679	0.6722
POP	0.007086	0.027568	0.257022	0.7974
LNINC	-0.064085	0.111625	-0.574111	0.5665
LNOPEN	-0.096320	0.113795	-0.846435	0.3982

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.922151	Mean dependent var	5.111157
Adjusted R-squared	0.909988	S.D. dependent var	0.372640
S.E. of regression	0.111800	Akaike info criterion	-1.416328
Sum squared resid	2.799816	Schwarz criterion	-0.923310
Log likelihood	220.1226	Hannan-Quinn criter.	-1.218128
F-statistic	75.81095	Durbin-Watson stat	0.309703
Prob(F-statistic)	0.000000		

Appendix 3: STATA results of government spending for low debt countries

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   11.2   Copyright 1985-2009 StataCorp LP
  Statistics/Data Analysis            StataCorp
                                      4905 Lakeway Drive
     Special Edition                  College Station, Texas 77845 USA
                                      800-STATA-PC        http://www.stata.com
                                      979-696-4600        stata@stata.com
                                      979-696-4601 (fax)

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       Serial number:  71606281563
         Licensed to:  STATAForAll
                       STATA

Notes:
      1.  (/m# option or -set memory-) 50.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

running C:\Users\User\Desktop\Stata11\profile.do ...

. *(8 variables, 180 observations pasted into data editor)

. tsset code year
       panel variable:  code (strongly balanced)
        time variable:  year, 1990 to 2009
                delta:  1 unit

. generate lngs=ln(gs)

. generate lndebt=ln(debt)

. generate lninc=ln(inc)

. generate lnopen=ln(open)
```

. xtsum lngs lndebt pop lninc lnopen

Variable		Mean	Std. Dev.	Min	Max	Observations	
lngs	overall	2.135156	1.292152	-4.847848	3.51231	N =	180
	between		.9569947	-.2316864	2.830522	n =	9
	within		.922513	-2.481006	4.971253	T =	20
lndebt	overall	2.257428	1.540408	-7.757994	4.005061	N =	180
	between		.9879373	.5444164	3.256242	n =	9
	within		1.224923	-6.044982	5.522442	T =	20
pop	overall	1.02919	.5406944	-.2533834	2.530086	N =	180
	between		.4641955	.1961629	1.612634	n =	9
	within		.315824	.2163565	2.4052	T =	20
lninc	overall	9.942763	.9386209	7.726829	11.62651	N =	180
	between		.9269904	8.363678	10.93131	n =	9
	within		.3360206	9.293926	10.82667	T =	20
lnopen	overall	4.224504	.5364129	3.244492	5.80974	N =	180
	between		.5388093	3.648747	5.487742	n =	9
	within		.1680446	3.636555	4.668691	T =	20

Results of Pooled OLS

. reg lngs lndebt pop lninc lnopen

Source	SS	df	MS
Model	257.093505	4	64.2733762
Residual	41.7751362	175	.238715064
Total	298.868641	179	1.66965721

Number of obs	=	180
F(4, 175)	=	269.25
Prob > F	=	0.0000
R-squared	=	0.8602
Adj R-squared	=	0.8570
Root MSE	=	.48858

lngs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lndebt	.6108669	.0280323	21.79	0.000	.555542	.6661919
pop	.1404357	.0781456	1.80	0.074	-.0137936	.2946649
lninc	.482662	.0557092	8.66	0.000	.3727137	.5926103
lnopen	.347754	.0900354	3.86	0.000	.170059	.5254489
_cons	-5.65645	.4423651	-12.79	0.000	-6.529507	-4.783392

Results of Random Effect (RE)

. xtreg lngs lndebt pop lninc lnopen,re

Random-effects GLS regression		Number of obs =	180
Group variable: code		Number of groups =	9
R-sq: within = 0.9287		Obs per group: min =	20
between = 0.5287		avg =	20.0
overall = 0.7271		max =	20
		Wald chi2(4) =	2142.62
corr(u_i, X) = 0 (assumed)		Prob > chi2 =	0.0000

lngs	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lndebt	.7096993	.0191335	37.09	0.000	.6721984	.7472002
pop	.0093572	.0656283	0.14	0.887	-.1192719	.1379862
lninc	.2621124	.0712785	3.68	0.000	.1224092	.4018157
lnopen	-.247964	.1468488	-1.69	0.091	-.5357824	.0398544
_cons	-1.035167	.6842797	-1.51	0.130	-2.37633	.305997
sigma_u	.55136547					
sigma_e	.25425215					
rho	.82464533	(fraction of variance due to u_i)				

Results of Breush-Pagan Test

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        lngs[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                    lngs |   1.669657       1.292152
                       e |   .0646442       .2542521
                       u |   .3040039       .5513655

        Test:   Var(u) = 0
                             chibar2(01) =   644.26
                          Prob > chibar2 =   0.0000
```

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9291                         Obs per group: min =        20
       between = 0.4606                                        avg =      20.0
       overall = 0.6875                                        max =        20

                                                F(4,167)           =    547.38
corr(u_i, Xb)  = -0.1849                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .7210131   .0192861    37.39   0.000      .682937    .7590891
         pop |   .0018188   .0659367     0.03   0.978    -.1283581    .1319956
       lninc |   .2500672    .073031     3.42   0.001     .1058842    .3942502
      lnopen |  -.3715294    .154502    -2.40   0.017    -.6765582   -.0665005
       _cons |  -.4111832   .6868904    -0.60   0.550    -1.767291    .9449247
-------------+----------------------------------------------------------------
     sigma_u |  .73114709
     sigma_e |  .25425215
         rho |  .89211954   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 167) =    59.90             Prob > F = 0.0000

. est store fixed

. xtreg lngs lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9287                         Obs per group: min =        20
       between = 0.5287                                        avg =      20.0
       overall = 0.7271                                        max =        20

                                                Wald chi2(4)       =   2142.62
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .7096993   .0191335    37.09   0.000     .6721984    .7472002
         pop |   .0093572   .0656283     0.14   0.887    -.1192719    .1379862
       lninc |   .2621124   .0712785     3.68   0.000     .1224092    .4018157
      lnopen |   -.247964   .1468488    -1.69   0.091    -.5357824    .0398544
       _cons |  -1.035167   .6842797    -1.51   0.130     -2.37633     .305997
-------------+----------------------------------------------------------------
     sigma_u |  .55136547
     sigma_e |  .25425215
         rho |  .82464533   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results of Hausman Test

```
. hausman fixed

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
      lndebt |    .7210131     .7096993        .0113138        .0024218
         pop |    .0018188     .0093572       -.0075384        .0063699
       lninc |    .2500672     .2621124       -.0120452        .0159031
      lnopen |   -.3715294     -.247964       -.1235654        .0480239
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        9.62
                Prob>chi2 =      0.0474
                (V_b-V_B is not positive definite)


. est store fixed

. xtreg lngs lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9291                         Obs per group: min =        20
       between = 0.4606                                        avg =      20.0
       overall = 0.6875                                        max =        20

                                                F(4,167)           =    547.38
corr(u_i, Xb)  = -0.1849                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .7210131   .0192861    37.39   0.000      .682937    .7590891
         pop |   .0018188   .0659367     0.03   0.978    -.1283581    .1319956
       lninc |   .2500672    .073031     3.42   0.001     .1058842    .3942502
      lnopen |  -.3715294    .154502    -2.40   0.017    -.6765582   -.0665005
       _cons |  -.4111832   .6868904    -0.60   0.550    -1.767291    .9449247
-------------+----------------------------------------------------------------
     sigma_u |  .73114709
     sigma_e |  .25425215
         rho |  .89211954   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 167) =    59.90              Prob > F = 0.0000
```

Results of Pesaran CD Test

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =     0.050, Pr = 0.9602

Average absolute value of the off-diagonal elements =     0.539
```

Results of heteroscedasticity test

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (9)  =      971.90
Prob>chi2 =      0.0000
```

Results of correlation

```
. correlate lngs lndebt pop lninc lnopen
(obs=180)
```

	lngs	lndebt	pop	lninc	lnopen
lngs	1.0000				
lndebt	0.8210	1.0000			
pop	-0.4050	-0.4617	1.0000		
lninc	0.6650	0.3359	-0.3318	1.0000	
lnopen	0.3673	0.0145	-0.0775	0.6186	1.0000

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 01:56
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (balanced) observations: 180
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.416848	3.547448	0.117507	0.9066
LNDEBT	0.717523	0.055190	13.00089	0.0000
POP	-0.001406	0.076639	-0.018339	0.9854
LNINC	0.288867	0.255796	1.129285	0.2606
LNOPEN	-0.656204	0.331050	-1.982189	0.0493

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.968159	Mean dependent var	2.135156
Adjusted R-squared	0.961489	S.D. dependent var	1.292152
S.E. of regression	0.253573	Akaike info criterion	0.253482
Sum squared resid	9.516305	Schwarz criterion	0.821119
Log likelihood	9.186585	Hannan-Quinn criter.	0.483635
F-statistic	145.1639	Durbin-Watson stat	0.427077
Prob(F-statistic)	0.000000		

Appendix 4: STATA results of government spending for medium-high countries

```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   11.2   Copyright 1985-2009 StataCorp LP
  Statistics/Data Analysis            StataCorp
                                      4905 Lakeway Drive
     Special Edition                  College Station, Texas 77845 USA
                                      800-STATA-PC        http://www.stata.com
                                      979-696-4600        stata@stata.com
                                      979-696-4601 (fax)

Single-user Stata license expires 31 Dec 9999:
       Serial number:  71606281563
         Licensed to:  STATAForAll
                       STATA

Notes:
      1.  (/m# option or -set memory-) 50.00 MB allocated to data
      2.  (/v# option or -set maxvar-) 5000 maximum variables

running C:\Users\User\Desktop\Stata11\profile.do ...

. *(8 variables, 260 observations pasted into data editor)

. tsset code year
       panel variable:  code (strongly balanced)
        time variable:  year, 1990 to 2009
                delta:  1 unit

. generate lngs=ln(gs)

. generate lndebt=ln(debt)

. generate lninc=ln(inc)

. generate lnopen=ln(open)


. xtsum lngs lndebt pop lninc lnopen
```

Variable		Mean	Std. Dev.	Min	Max	Observations	
lngs	overall	2.802323	.2654934	2.092654	3.382848	N =	260
	between		.1969379	2.467699	3.153142	n =	13
	within		.1858694	2.235264	3.287166	T =	20
lndebt	overall	3.853841	.446858	2.555354	5.243176	N =	260
	between		.3848482	3.44354	4.592673	n =	13
	within		.2498779	2.821039	4.504343	T =	20
pop	overall	.5806317	.4832565	-.2304818	2.878185	N =	260
	between		.3638841	.1772192	1.280022	n =	13
	within		.3329246	-.6149769	2.178795	T =	20
lninc	overall	10.20489	.3952421	8.959239	11.04446	N =	260
	between		.2791713	9.49631	10.50356	n =	13
	within		.2898225	9.515234	10.96975	T =	20
lnopen	overall	4.192333	.5934981	2.767827	5.213902	N =	260
	between		.595447	3.068536	4.979539	n =	13
	within		.1539248	3.759256	4.685647	T =	20

Results of Pooled OLS

```
. reg lngs lndebt pop lninc lnopen

      Source |       SS       df       MS              Number of obs =     260
-------------+------------------------------           F(  4,   255) =   61.00
       Model |  8.92711073     4  2.23177768           Prob > F      =  0.0000
    Residual |  9.32896081   255  .03658416            R-squared     =  0.4890
-------------+------------------------------           Adj R-squared =  0.4810
       Total |  18.2560715   259  .070486763           Root MSE      =  .19127

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .1482747   .0313105     4.74   0.000     .0866146    .2099347
         pop |  -.0801557   .0298248    -2.69   0.008     -.13889    -.0214214
       lninc |   .3393788   .0314101    10.80   0.000     .2775226     .401235
      lnopen |    .168256   .0201418     8.35   0.000     .1285906    .2079215
       _cons |  -1.891273   .3295213    -5.74   0.000    -2.540203   -1.242343
------------------------------------------------------------------------------
```

Results of Random Effect (RE)

```
. xtreg lngs lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.6919                         Obs per group: min =        20
       between = 0.2356                                        avg =      20.0
       overall = 0.4169                                        max =        20

                                                Wald chi2(4)       =    511.62
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |    .362371   .0289285    12.53   0.000     .3056722    .4190698
         pop |   .1056289   .0226667     4.66   0.000      .061203    .1500547
       lninc |   .3041999   .0279877    10.87   0.000     .2493449    .3590548
      lnopen |    .186609   .0421117     4.43   0.000     .1040717    .2691463
       _cons |  -2.542183    .278029    -9.14   0.000     -3.08711   -1.997256
-------------+----------------------------------------------------------------
     sigma_u |   .1188229
     sigma_e |  .10645429
         rho |  .55473892   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results of Breush-Pagan Test

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        lngs[code,t] = Xb + u[code] + e[code,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                    lngs |   .0704868       .2654934
                       e |   .0113325       .1064543
                       u |   .0141189       .1188229

        Test:   Var(u) = 0
                             chibar2(01) =   666.43
                          Prob > chibar2 =   0.0000
```

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.6922                         Obs per group: min =        20
       between = 0.2262                                        avg =      20.0
       overall = 0.4107                                        max =        20

                                                F(4,243)           =    136.64
corr(u_i, Xb)  = -0.3354                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .3780765   .0317942    11.89   0.000     .3154492    .4407039
         pop |   .1157486   .0223408     5.18   0.000     .0717423    .1597549
       lninc |   .3014234   .0310319     9.71   0.000     .2402976    .3625493
      lnopen |   .1905678    .059713     3.19   0.002     .0729466    .3081891
       _cons |  -2.596849   .2746086    -9.46   0.000    -3.137766   -2.055932
-------------+----------------------------------------------------------------
     sigma_u |  .19385498
     sigma_e |  .10645429
         rho |  .76830932   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 243) =    48.35             Prob > F = 0.0000
```

```
. est store fixed

. xtreg lngs lndebt pop lninc lnopen,re

Random-effects GLS regression                   Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.6919                         Obs per group: min =        20
       between = 0.2356                                        avg =      20.0
       overall = 0.4169                                        max =        20

                                                Wald chi2(4)       =    511.62
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |    .362371   .0289285    12.53   0.000     .3056722    .4190698
         pop |   .1056289   .0226667     4.66   0.000      .061203    .1500547
       lninc |   .3041999   .0279877    10.87   0.000     .2493449    .3590548
      lnopen |    .186609   .0421117     4.43   0.000     .1040717    .2691463
       _cons |  -2.542183    .278029    -9.14   0.000     -3.08711   -1.997256
-------------+----------------------------------------------------------------
     sigma_u |   .1188229
     sigma_e |  .10645429
         rho |  .55473892   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Results of Hausman Test

```
. hausman fixed

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
      lndebt |    .3780765     .362371        .0157055        .0131913
         pop |    .1157486     .1056289       .0101198            .
       lninc |    .3014234     .3041999      -.0027764         .013404
      lnopen |    .1905678     .186609        .0039588         .042335
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       -6.47    chi2<0 ==> model fitted on these
                                           data fails to meet the asymptotic
                                           assumptions of the Hausman test;
                                           see suest for a generalized test
```

```
. est store fixed

. xtreg lngs lndebt pop lninc lnopen,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.6922                         Obs per group: min =        20
       between = 0.2262                                        avg =      20.0
       overall = 0.4107                                        max =        20

                                                F(4,243)           =    136.64
corr(u_i, Xb)  = -0.3354                        Prob > F           =    0.0000
```

lngs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lndebt	.3780765	.0317942	11.89	0.000	.3154492	.4407039
pop	.1157486	.0223408	5.18	0.000	.0717423	.1597549
lninc	.3014234	.0310319	9.71	0.000	.2402976	.3625493
lnopen	.1905678	.059713	3.19	0.002	.0729466	.3081891
_cons	-2.596849	.2746086	-9.46	0.000	-3.137766	-2.055932
sigma_u	.19385498					
sigma_e	.10645429					
rho	.76830932	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(12, 243) =    48.35            Prob > F = 0.0000
```

Results of Pesaran CD Test

```
. xtcsd, pesaran abs

Pesaran's test of cross sectional independence =    16.459, Pr = 0.0000

Average absolute value of the off-diagonal elements =     0.507
```

Results of heteroscedasticity test

```
. xttest3

Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (13)  =       97.49
Prob>chi2 =      0.0000
```

Results of correlation

```
. correlate lngs lndebt pop lninc lnopen
(obs=260)
```

	lngs	lndebt	pop	lninc	lnopen
lngs	1.0000				
lndebt	0.3204	1.0000			
pop	-0.1165	-0.5048	1.0000		
lninc	0.4985	0.0336	0.2299	1.0000	
lnopen	0.3726	-0.0525	0.1042	0.0491	1.0000

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14   Time: 02:02
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13

Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.507184	1.214005	2.065216	0.0401
LNDEBT	0.191437	0.039917	4.795909	0.0000
POP	0.112361	0.021164	5.309119	0.0000
LNINC	0.013515	0.092075	0.146784	0.8834
LNOPEN	-0.154041	0.084876	-1.814893	0.0709

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.930711	Mean dependent var	2.802323
Adjusted R-squared	0.919884	S.D. dependent var	0.265493
S.E. of regression	0.075147	Akaike info criterion	-2.210848
Sum squared resid	1.264951	Schwarz criterion	-1.717830
Log likelihood	323.4102	Hannan-Quinn criter.	-2.012648
F-statistic	85.96628	Durbin-Watson stat	0.467183
Prob(F-statistic)	0.000000		

Appendix 5: Results of tax revenue for lower debt countries with add in unemployment rate

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen un,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9238                         Obs per group: min =        20
       between = 0.5007                                        avg =      20.0
       overall = 0.6933                                        max =        20

                                                F(5,166)           =    402.29
corr(u_i, Xb)  = -0.3009                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .7294957   .0209999    34.74   0.000     .6880344    .7709571
         pop |  -.0620725   .0708788    -0.88   0.382    -.2020126    .0778676
       lninc |   .3816372   .0771224     4.95   0.000     .2293701    .5339044
      lnopen |  -.4054193   .1627015    -2.49   0.014    -.7266503   -.0841883
          un |  -.0728978   .0159554    -4.57   0.000    -.1043994   -.0413962
       _cons |   1.370654    .734313     1.87   0.064    -.0791427     2.82045
-------------+----------------------------------------------------------------
     sigma_u |  .74814478
     sigma_e |   .2676693
         rho |  .88652115   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 166) =    55.23              Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:28
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (unbalanced) observations: 178
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.814300	3.442645	1.979379	0.0497
LNDEBT	0.723723	0.057257	12.63993	0.0000
POP	-0.011765	0.072730	-0.161767	0.8717
LNINC	0.084008	0.245398	0.342332	0.7326
LNOPEN	-1.021103	0.365996	-2.789927	0.0060
UN	-0.056936	0.023299	-2.443678	0.0157

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.966752	Mean dependent var	4.661208
Adjusted R-squared	0.959414	S.D. dependent var	1.310685
S.E. of regression	0.264050	Akaike info criterion	0.340382
Sum squared resid	10.10976	Schwarz criterion	0.930263
Log likelihood	2.706018	Hannan-Quinn criter.	0.579594
F-statistic	131.7533	Durbin-Watson stat	0.462278
Prob(F-statistic)	0.000000		

Appendix 6: Results of tax revenue for medium-high debt countries with add in unemployment rate

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen un,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.3831                         Obs per group: min =        20
       between = 0.6879                                        avg =      20.0
       overall = 0.6141                                        max =        20

                                                F(5,242)           =     30.06
corr(u_i, Xb)  = 0.3599                         Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .1627406   .0459308     3.54   0.000     .0722655    .2532158
         pop |   .0131832   .0330604     0.40   0.690    -.0519397     .078306
       lninc |   .1747171   .0399367     4.37   0.000     .0960491     .253385
      lnopen |   .3265507   .0846371     3.86   0.000     .1598312    .4932702
          un |  -.0001697   .0049981    -0.03   0.973     -.010015    .0096755
       _cons |   1.325618   .3719644     3.56   0.000     .5929166    2.058319
-------------+----------------------------------------------------------------
     sigma_u |  .21138748
     sigma_e |  .13700169
         rho |  .70420425   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 242) =    30.02             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:47
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.468307	1.327114	4.120449	0.0001
LNDEBT	-0.101792	0.069536	-1.463866	0.1446
POP	0.055704	0.031310	1.779155	0.0766
LNINC	-0.011617	0.108353	-0.107212	0.9147
LNOPEN	-0.004947	0.108060	-0.045777	0.9635
UN	0.018989	0.005241	3.623273	0.0004

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.927242	Mean dependent var	5.111157
Adjusted R-squared	0.915496	S.D. dependent var	0.372640
S.E. of regression	0.108325	Akaike info criterion	-1.476259
Sum squared resid	2.616742	Schwarz criterion	-0.969547
Log likelihood	228.9137	Hannan-Quinn criter.	-1.272554
F-statistic	78.94298	Durbin-Watson stat	0.348407
Prob(F-statistic)	0.000000		

Appendix 7: Results of government spending for lower debt countries with add in unemployment rate

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen un,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9314                         Obs per group: min =        20
       between = 0.4937                                        avg =      20.0
       overall = 0.7040                                        max =        20

                                                F(5,166)           =    450.57
corr(u_i, Xb)  = -0.2039                        Prob > F           =    0.0000
```

lngs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lndebt	.7327151	.0196885	37.22	0.000	.6938429	.7715872
pop	-.0294439	.0664525	-0.44	0.658	-.1606449	.1017571
lninc	.23687	.0723062	3.28	0.001	.0941117	.3796283
lnopen	-.3630611	.152541	-2.38	0.018	-.6642316	-.0618906
un	-.034822	.014959	-2.33	0.021	-.0643564	-.0052877
_cons	-.1326602	.6884561	-0.19	0.847	-1.491919	1.226598
sigma_u	.71331838					
sigma_e	.2509537					
rho	.88986068	(fraction of variance due to u_i)				

F test that all u_i=0: F(8, 166) = 62.14 Prob > F = 0.0000

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 01:57
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (balanced) observations: 180
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.416070	3.534141	0.117729	0.9064
LNDEBT	0.722766	0.062293	11.60273	0.0000
POP	-0.013049	0.075637	-0.172524	0.8633
LNINC	0.279800	0.261535	1.069840	0.2864
LNOPEN	-0.616241	0.329924	-1.867827	0.0638
UN	-0.015269	0.024163	-0.631899	0.5284

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.968329	Mean dependent var	2.135156
Adjusted R-squared	0.961434	S.D. dependent var	1.292152
S.E. of regression	0.253755	Akaike info criterion	0.259249
Sum squared resid	9.465581	Schwarz criterion	0.844624
Log likelihood	9.667586	Hannan-Quinn criter.	0.496594
F-statistic	140.4505	Durbin-Watson stat	0.440944
Prob(F-statistic)	0.000000		

Appendix 8: Results of government spending for medium-high countries with add in unemployment rate

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen un,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.7003                         Obs per group: min =        20
       between = 0.2025                                        avg =      20.0
       overall = 0.3871                                        max =        20

                                                F(5,242)           =    113.08
corr(u_i, Xb)  = -0.3929                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .4188955   .0352937    11.87   0.000     .3493735    .4884176
         pop |   .0838227    .025404     3.30   0.001     .0337816    .1338639
       lninc |   .3012561   .0306878     9.82   0.000     .2408068    .3617055
      lnopen |   .1211872   .0650361     1.86   0.064    -.0069219    .2492962
          un |  -.0097775   .0038406    -2.55   0.012    -.0173427   -.0022123
       _cons |  -2.369889   .2858215    -8.29   0.000    -2.932905   -1.806874
-------------+----------------------------------------------------------------
     sigma_u |  .20473435
     sigma_e |  .10527359
         rho |  .79089048   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 242) =    49.90             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 02:03
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.298148	1.217034	1.888319	0.0603
LNDEBT	0.172595	0.042815	4.031182	0.0001
POP	0.124937	0.024275	5.146734	0.0000
LNINC	0.027087	0.091761	0.295194	0.7681
LNOPEN	-0.130404	0.087594	-1.488744	0.1380
UN	0.004912	0.004024	1.220692	0.2235

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.931382	Mean dependent var	2.802323
Adjusted R-squared	0.920304	S.D. dependent var	0.265493
S.E. of regression	0.074950	Akaike info criterion	-2.212887
Sum squared resid	1.252701	Schwarz criterion	-1.706175
Log likelihood	324.6753	Hannan-Quinn criter.	-2.009182
F-statistic	84.07945	Durbin-Watson stat	0.476834
Prob(F-statistic)	0.000000		

Appendix 9: Results of tax revenue for lower debt countries with add in inflation rate

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen inf,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9212                         Obs per group: min =        20
       between = 0.5697                                        avg =      20.0
       overall = 0.7453                                        max =        20

                                                F(5,166)           =    388.16
corr(u_i, Xb)  = -0.1305                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .6505461   .0250248    26.00   0.000     .6011381     .699954
         pop |   .0888491   .0739824     1.20   0.231    -.0572187    .2349168
       lninc |   .2319792   .0907268     2.56   0.011      .052852    .4111064
      lnopen |  -.0910111   .1865238    -0.49   0.626    -.4592758    .2772537
         inf |   -.010468   .0027199    -3.85   0.000     -.015838   -.005098
       _cons |   1.279807   .7462024     1.72   0.088    -.1934635    2.753077
-------------+----------------------------------------------------------------
     sigma_u |  .64388192
     sigma_e |  .27211934
         rho |  .84845691   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 166) =    36.03              Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:29
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (unbalanced) observations: 178
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.873612	3.369817	2.336510	0.0208
LNDEBT	0.658041	0.050704	12.97816	0.0000
POP	0.116515	0.074302	1.568118	0.1190
LNINC	-0.083736	0.219962	-0.380682	0.7040
LNOPEN	-0.919000	0.387429	-2.372051	0.0190
INF	-0.009898	0.002891	-3.424096	0.0008

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.967390	Mean dependent var	4.661208
Adjusted R-squared	0.960193	S.D. dependent var	1.310685
S.E. of regression	0.261502	Akaike info criterion	0.320989
Sum squared resid	9.915597	Schwarz criterion	0.910870
Log likelihood	4.431981	Hannan-Quinn criter.	0.560202
F-statistic	134.4220	Durbin-Watson stat	0.445887
Prob(F-statistic)	0.000000		

Appendix 10: Results of tax revenue for medium-high debt countries with add in inflation rate

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen inf,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.4291                         Obs per group: min =        20
       between = 0.6295                                        avg =      20.0
       overall = 0.5837                                        max =        20

                                                F(5,242)           =     36.39
corr(u_i, Xb)  = 0.2311                         Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |    .066231   .0449416     1.47   0.142    -.0222956    .1547576
         pop |   .0315396   .0279504     1.13   0.260    -.0235175    .0865967
       lninc |   .1040642   .0416151     2.50   0.013     .0220901    .1860384
      lnopen |   .3643162   .0743877     4.90   0.000     .2177861    .5108463
         inf |  -.0266708   .0060381    -4.42   0.000    -.0385647   -.0147769
       _cons |   2.314501   .4075546     5.68   0.000     1.511694    3.117309
-------------+----------------------------------------------------------------
     sigma_u |  .21771134
     sigma_e |  .13179227
         rho |  .73182195   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 242) =    34.56             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:48
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.950805	1.405658	4.944875	0.0000
LNDEBT	-0.089907	0.070156	-1.281522	0.2013
POP	0.014185	0.029440	0.481833	0.6304
LNINC	-0.111358	0.110426	-1.008446	0.3143
LNOPEN	-0.073941	0.106646	-0.693336	0.4888
INF	-0.022163	0.008621	-2.570892	0.0108

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.926039	Mean dependent var	5.111157
Adjusted R-squared	0.914099	S.D. dependent var	0.372640
S.E. of regression	0.109217	Akaike info criterion	-1.459858
Sum squared resid	2.660013	Schwarz criterion	-0.953146
Log likelihood	226.7816	Hannan-Quinn criter.	-1.256153
F-statistic	77.55805	Durbin-Watson stat	0.400627
Prob(F-statistic)	0.000000		

Appendix 11: Results of government spending for lower debt countries with add in inflation rate

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen inf,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9419                         Obs per group: min =        20
       between = 0.6633                                        avg =      20.0
       overall = 0.8053                                        max =        20

                                                F(5,166)           =    537.91
corr(u_i, Xb)  = 0.0116                         Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .6485942   .0212405    30.54   0.000     .6066579    .6905305
         pop |   .1154963   .0627945     1.84   0.068    -.0084825    .2394752
       lninc |   .0142861   .0770068     0.19   0.853    -.1377528     .166325
      lnopen |   .0701951    .158317     0.44   0.658    -.2423793    .3827696
         inf |  -.0139219   .0023086    -6.03   0.000    -.0184799    -.009364
       _cons |   .2434502   .6333589     0.38   0.701    -1.007027    1.493927
-------------+----------------------------------------------------------------
     sigma_u |  .55535868
     sigma_e |  .23096845
         rho |  .85254037   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 166) =    40.32             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 01:58
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (balanced) observations: 180
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.927808	3.266663	0.590146	0.5560
LNDEBT	0.648870	0.054878	11.82389	0.0000
POP	0.124756	0.073663	1.693603	0.0925
LNINC	-0.010155	0.223873	-0.045360	0.9639
LNOPEN	-0.274741	0.336095	-0.817453	0.4150
INF	-0.013313	0.003072	-4.333127	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.973543	Mean dependent var	2.135156
Adjusted R-squared	0.967783	S.D. dependent var	1.292152
S.E. of regression	0.231928	Akaike info criterion	0.079367
Sum squared resid	7.907250	Schwarz criterion	0.664742
Log likelihood	25.85697	Hannan-Quinn criter.	0.316711
F-statistic	169.0352	Durbin-Watson stat	0.502328
Prob(F-statistic)	0.000000		

Appendix 12: Results of government spending for medium-high countries with add in inflation rate

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen inf,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.7022                         Obs per group: min =        20
       between = 0.2353                                        avg =      20.0
       overall = 0.4246                                        max =        20

                                                F(5,242)           =    114.13
corr(u_i, Xb)  = -0.3145                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .3288987   .0357815     9.19   0.000     .2584157    .3993817
         pop |   .1248871   .0222535     5.61   0.000     .0810519    .1687224
       lninc |   .2651536   .0331331     8.00   0.000     .1998875    .3304196
      lnopen |   .2093359   .0592259     3.53   0.000     .0926718        .326
         inf |   -.013691   .0048074    -2.85   0.005    -.0231607   -.0042213
       _cons |  -2.087201   .3244862    -6.43   0.000    -2.726379   -1.448023
-------------+----------------------------------------------------------------
     sigma_u |  .19038939
     sigma_e |  .10493016
         rho |  .76701865   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 242) =    47.54             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 02:03
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.970317	1.104875	2.688374	0.0077
LNDEBT	0.149577	0.041362	3.616250	0.0004
POP	0.117236	0.018770	6.246089	0.0000
LNINC	-0.018949	0.083629	-0.226582	0.8210
LNOPEN	-0.138672	0.078150	-1.774430	0.0774
INF	-0.015220	0.005924	-2.569278	0.0108

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.934322	Mean dependent var	2.802323
Adjusted R-squared	0.923719	S.D. dependent var	0.265493
S.E. of regression	0.073326	Akaike info criterion	-2.256684
Sum squared resid	1.199020	Schwarz criterion	-1.749972
Log likelihood	330.3690	Hannan-Quinn criter.	-2.052979
F-statistic	88.12106	Durbin-Watson stat	0.531171
Prob(F-statistic)	0.000000		

Appendix 13: Results of tax revenue for lower debt countries with add in unemployment rate and inflation rate

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen un inf,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9360                         Obs per group: min =        20
       between = 0.6660                                        avg =      20.0
       overall = 0.7942                                        max =        20

                                                F(6,165)           =    402.52
corr(u_i, Xb)  = -0.2435                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .6622268   .0226919    29.18   0.000     .6174228    .7070307
         pop |   .0358991   .0673983     0.53   0.595    -.0971752    .1689734
       lninc |   .1323002   .0835512     1.58   0.115    -.0326672    .2972675
      lnopen |   .0520921   .1701281     0.31   0.760    -.2838167    .3880009
          un |  -.0934823   .0151066    -6.19   0.000    -.1233094   -.0636552
         inf |  -.0142617   .0025331    -5.63   0.000    -.0192632   -.0092603
       _cons |   2.205909   .6907015     3.19   0.002     .8421567    3.569662
-------------+----------------------------------------------------------------
     sigma_u |  .59135255
     sigma_e |  .24589609
         rho |  .85258318   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(8, 165) =    48.27              Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:23
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (unbalanced) observations: 178
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.470054	3.046884	2.779906	0.0062
LNDEBT	0.661197	0.055129	11.99365	0.0000
POP	0.097059	0.075194	1.290787	0.1988
LNINC	-0.255805	0.204512	-1.250803	0.2130
LNOPEN	-0.536968	0.379872	-1.413549	0.1597
UN	-0.088559	0.021118	-4.193514	0.0000
INF	-0.014431	0.003329	-4.335603	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.972063	Mean dependent var	4.661208
Adjusted R-squared	0.965661	S.D. dependent var	1.310685
S.E. of regression	0.242879	Akaike info criterion	0.177545
Sum squared resid	8.494582	Schwarz criterion	0.785301
Log likelihood	18.19854	Hannan-Quinn criter.	0.424006
F-statistic	151.8346	Durbin-Watson stat	0.590631
Prob(F-statistic)	0.000000		

Appendix 14: Results of tax revenue for medium-high debt countries with add in unemployment rate and inflation rate

Results of Fixed Effect (FE)

```
. xtreg lntax lndebt pop lninc lnopen un inf,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.4347                         Obs per group: min =        20
       between = 0.6580                                        avg =      20.0
       overall = 0.5987                                        max =        20

                                                F(6,241)           =     30.89
corr(u_i, Xb)  = 0.3418                         Prob > F           =    0.0000

------------------------------------------------------------------------------
       lntax |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .0875139   .0468864     1.87   0.063    -.0048456    .1798734
         pop |   .0081234   .0317311     0.26   0.798    -.0543824    .0706291
       lninc |    .095557    .041861     2.28   0.023     .0130968    .1780172
      lnopen |   .3131764   .0812372     3.86   0.000     .1531509     .473202
          un |  -.0078175    .005064    -1.54   0.124    -.0177928    .0021578
         inf |  -.0298316   .0063595    -4.69   0.000    -.0423589   -.0173042
       _cons |   2.613626   .4502238     5.81   0.000     1.726749    3.500502
-------------+----------------------------------------------------------------
     sigma_u |  .22012797
     sigma_e |  .13141724
         rho |  .73723828   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 241) =    34.36             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNTAX
Method: Panel Least Squares
Date: 07/04/14 Time: 01:46
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.101688	1.378401	4.426640	0.0000
LNDEBT	-0.129547	0.071555	-1.810463	0.0716
POP	0.050823	0.031550	1.610886	0.1086
LNINC	-0.055170	0.109258	-0.504953	0.6141
LNOPEN	-0.007823	0.105256	-0.074325	0.9408
UN	0.015150	0.004943	3.065231	0.0024
INF	-0.015446	0.008452	-1.827529	0.0690

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.928922	Mean dependent var	5.111157
Adjusted R-squared	0.917075	S.D. dependent var	0.372640
S.E. of regression	0.107308	Akaike info criterion	-1.491927
Sum squared resid	2.556322	Schwarz criterion	-0.971520
Log likelihood	231.9506	Hannan-Quinn criter.	-1.282717
F-statistic	78.41406	Durbin-Watson stat	0.401223
Prob(F-statistic)	0.000000		

Appendix 15: Results of government spending for lower debt countries with add in unemployment rate and inflation rate

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen un inf,fe

Fixed-effects (within) regression               Number of obs      =       180
Group variable: code                            Number of groups   =         9

R-sq:  within  = 0.9478                         Obs per group: min =        20
       between = 0.6870                                        avg =      20.0
       overall = 0.8188                                        max =        20

                                                F(6,165)           =    499.18
corr(u_i, Xb)  = -0.0769                        Prob > F           =    0.0000
```

lngs	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lndebt	.655883	.0202614	32.37	0.000	.615878	.6958879
pop	.0824556	.0601792	1.37	0.172	-.036365	.2012762
lninc	-.0479136	.074602	-0.64	0.522	-.1952111	.099384
lnopen	.1594914	.1519056	1.05	0.295	-.1404379	.4594208
un	-.0583329	.0134885	-4.32	0.000	-.0849652	-.0317006
inf	-.0162892	.0022618	-7.20	0.000	-.0207549	-.0118235
_cons	.8213374	.6167199	1.33	0.185	-.3963425	2.039017
sigma_u	.53898167					
sigma_e	.21955796					
rho	.85767726	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(8, 165) =    45.02          Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 01:56
Sample: 1990 2009
Periods included: 20
Cross-sections included: 9
Total panel (balanced) observations: 180
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.259263	3.102104	0.728300	0.4676
LNDEBT	0.651877	0.058050	11.22957	0.0000
POP	0.112262	0.076069	1.475787	0.1422
LNINC	-0.107739	0.215830	-0.499186	0.6184
LNOPEN	-0.051735	0.328040	-0.157710	0.8749
UN	-0.052972	0.019444	-2.724363	0.0072
INF	-0.016257	0.003347	-4.857202	0.0000

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.975322	Mean dependent var	2.135156
Adjusted R-squared	0.969744	S.D. dependent var	1.292152
S.E. of regression	0.224759	Akaike info criterion	0.020851
Sum squared resid	7.375422	Schwarz criterion	0.623965
Log likelihood	32.12340	Hannan-Quinn criter.	0.265388
F-statistic	174.8560	Durbin-Watson stat	0.615660
Prob(F-statistic)	0.000000		

Appendix 16: Results of government spending for medium-high countries with add in unemployment rate and inflation rate

Results of Fixed Effect (FE)

```
. xtreg lngs lndebt pop lninc lnopen un inf,fe

Fixed-effects (within) regression               Number of obs      =       260
Group variable: code                            Number of groups   =        13

R-sq:  within  = 0.7188                         Obs per group: min =        20
       between = 0.2104                                        avg =      20.0
       overall = 0.4037                                        max =        20

                                                F(6,241)           =    102.65
corr(u_i, Xb)  = -0.3760                        Prob > F           =    0.0000

------------------------------------------------------------------------------
        lngs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lndebt |   .3692565   .0364574    10.13   0.000     .2974408    .4410723
         pop |    .080484   .0246731     3.26   0.001     .0318815    .1290865
       lninc |   .2490217   .0325498     7.65   0.000     .1849033      .31314
      lnopen |    .112362   .0631674     1.78   0.077    -.0120686    .2367927
          un |  -.0148239   .0039376    -3.76   0.000    -.0225804   -.0070675
         inf |  -.0196846    .004945    -3.98   0.000    -.0294255   -.0099438
       _cons |  -1.519986   .3500794    -4.34   0.000    -2.209592   -.8303803
-------------+----------------------------------------------------------------
     sigma_u |  .20153214
     sigma_e |  .10218577
         rho |  .79548535   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(12, 241) =    50.68             Prob > F = 0.0000
```

Results of White test

Dependent Variable: LNGS
Method: Panel Least Squares
Date: 07/04/14 Time: 02:02
Sample: 1990 2009
Periods included: 20
Cross-sections included: 13
Total panel (balanced) observations: 260
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.899192	1.101149	2.632879	0.0091
LNDEBT	0.146256	0.044140	3.313472	0.0011
POP	0.120305	0.022729	5.292985	0.0000
LNINC	-0.014242	0.083084	-0.171421	0.8640
LNOPEN	-0.133134	0.080313	-1.657694	0.0988
UN	0.001269	0.003633	0.349313	0.7272
INF	-0.014657	0.005728	-2.559000	0.0112

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.934362	Mean dependent var	2.802323
Adjusted R-squared	0.923422	S.D. dependent var	0.265493
S.E. of regression	0.073469	Akaike info criterion	-2.249599
Sum squared resid	1.198293	Schwarz criterion	-1.729192
Log likelihood	330.4479	Hannan-Quinn criter.	-2.040388
F-statistic	85.41039	Durbin-Watson stat	0.530427
Prob(F-statistic)	0.000000		