AN EMPIRICAL ANALYSIS OF GOVERNMENT DEBT IN SELECTED WESTERN EUROPE COUNTRIES: DOES PRODUCTIVITY MATTER?

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

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LIST OF ABBREVIATIONS

BGLM	Breusch Pagan Lagrange Multiplier Test
BLUE	Best Linear Unbiased Estimators
COR	Corruption
CPI	Corruption Perception Index
EU	European Union
FDI	Foreign Direct Investment
FEM	Fixed Effect Model
G-12	Group of Twelve
GDP	Gross Domestic Product
IMF	International Monetary Fund
IPS	Im-Pesaran-Shin Test

LLC	Levin Lin & Chu Test
LM	Simplified Version of BGLM (Lagrange Multiplier Test)
LSDV	Least Square Dummy Variable
OECD	Organization for Economic Cooperation and Development
Pooled OLS	Pooled Ordinary Least Square
PPP	Purchasing Power Parity
PRO	Productivity
REM	Random Effect Model
TAX	Tax Revenue Collected by Government

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PREFACE

Government debt, also known as national debt has gained the attention of the West Europe countries. A good level of government debt benefits its economic growth, improves standard living of citizens, lower default risk and etc, vice versa. It is important to outlining the macroeconomic and political factors, i.e., GDP growth rate, tax revenue, corruption and productivity, whether will affect the government debt in West Europe countries and how much their magnitude of significance on the government debt. By understanding these objectives, this can provide insight to all parties on the determinants of government debt in West Europe countries.

ABSTRACT

This research attempts to examine the relationship between macroeconomic factors like GDP growth, tax revenue and productivity as well as political factors like corruption on the government debt. This is a secondary-based research whereby all the data was collected from 2001-2016 from World Bank Database and OECD Database. The sample countries comprise of selected 16 West Europe countries. Due to the fact that this is a panel data, therefore this research is employing FEM model to examine the relationship. The empirical result showed that GDP growth rate and corruption has negative expected sign to the government debt whereas productivity has a positive impact on the government debt. In the process of further testing the interaction term of productivity on other variables, the result showed that productivity & GDP growth as well as productivity & corruption both has a positive relationship to the government debt. The tax revenue is neither significant in basic model nor model with interaction term. Hence, it is insignificant. Although this research has some limitations, yet the study still is a good reference for parties like government and researchers on the relationship of those variables on the government debt.

CHAPTER 1: INTRODUCTION

1.0 Introduction

Debt or borrowing is one of the critical instruments used by the government to get funding for development of a nation. It is used for the expenditure to generate productivity and stimulate economy growth (Muhammad, Roshayani, Ruhaini& Siti, 2017). In recent years, there was a large increase in the portion of government debt in relation to national income in various countries. Government debt influences the growth rate by influencing the government spending of the human capital production and real interest rate (Lin, 2000). Reinhart and Rogoff (2010), Panizza and Presbitero (2012) had concluded that the public debt results inverse impacts on economic growth after a certain threshold value.

According to Muhammad, et. al. (2017), budget deficit means that government spending exceeds its duty accumulated revenue which can be collected from domestic, as well as, foreign sectors. Government debt can be divided into domestic and foreign debts. Government debt can be foreseen as a situation when a government's securities holdings are not enough to cover past spending shortages. Besides that, from the macroeconomic theory's view, government debt which is to fund expenditures that should have an optimistic impact on growing in economic, while the expenditures are used on productive sectors.

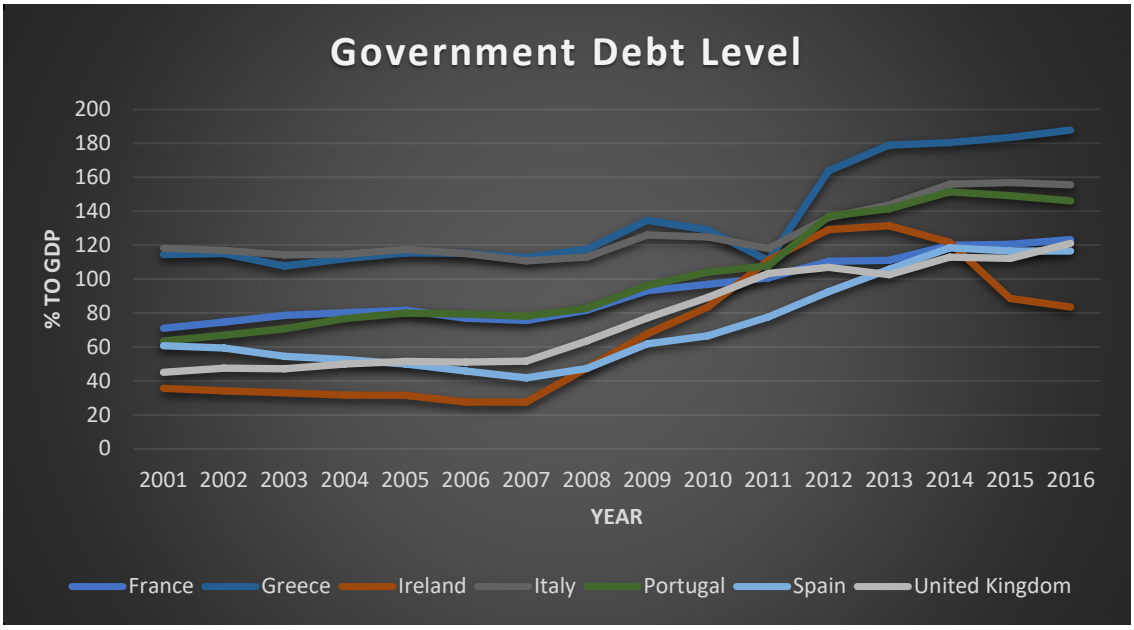
This study will focus on the selected West Europe countries as among the top 10 countries with huge debt, half of them come from West Europe region which generally considered as well-developed countries (OECD, 2018). For instance, Greece, Italy, Portugal, Ireland, France, Spain and etc. Indeed, huge debt supports

their development but on the other hand it triggers severe sovereign debt crisis in the region. Ireland was confronting banking crises, whereas Spain was facing a housing bubble. Moreover, Greece, Italy and Portugal were experiencing mismanagement of fiscal. Therefore, they fell into high sovereign debt trap and they still unable to escape from the crisis after four years recovery process since 2008.

1.1 Research Background

Greece, Italy, Spain and Portugal are the countries with highest government debt (refer to the figure 1). They generally breakthrough the threshold of 120% of government debt to GDP which is considered highly unhealthy for a nation. Greece, which ranks the champion in terms of the government debt level, has exceeded 190% as at 2016.Most of the nations in West Europe region rely heavily upon debt financing, which eventually cause them have incredibly high government debt level, which is an unhealthy situation. The circumstance is worsen when the government debt accelerated since 2008, after the financial crisis. The global markets are forced to loan with higher interest rates to the Greece's government, because of its downgraded credit rating due to spike in government debt level. (Mavridis, 2018).Other than that, the possibility of growing out in debt in Ireland and Spain may due to the macroeconomic circumstances. Both countries suffered from housing crisis, particularly in the construction and real estate industry. The excessively and risky expansion of the banking investment in the construction market renders the country to suffer when the growth engine in the housing industry bursts (Ptak&Szymanska, 2016).

Figure 1.1 Government Debt Level for France, Greence, Ireland, Italy, Portugal, Spain and United Kingdom for year 2001 to 2016

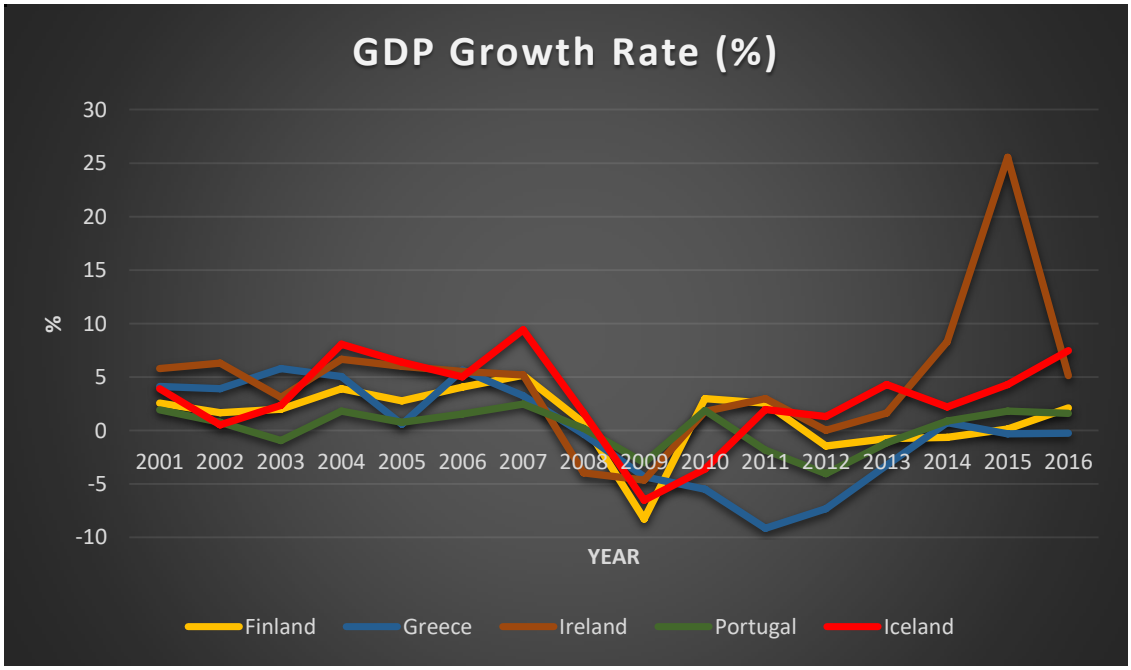


Source: OECD and World Bank database

During the 08 financial crisis, almost all West Europe countries experienced economic downturn which rendered them a low or even negative GDP growth rate. Iceland's GDP growth rate has slumped from positive 10% in 2007 to nearly negative 7% in 2009; while Finland also recorded a fall in GDP from +5% to -9%. Among West Europe countries, Greece was most severely impacted as its GDP up to date still unable to recover to the pre-crisis level. This may due to the weak internal demand, caused by high unemployment and low wages. The purchasing power among people is low, together with the cutback from government budget, which further deplete the internal demand (Sky, 2015). Other than that, Ireland has recorded an extraordinary GDP growth rate in 2015 as high as 25%, which surpass India's economic growth and being ranked as the strongest GDP growth rate in Europe zone. Nonetheless, the statistics is distorted as the hike was mainly resulted from large multinational sector. For instance, Tech giant like APPLE relocated a large portion of its intellectual property assets at Ireland for tax avoidance. Moreover, Aircraft companies such as

Aercap relocated its assets worth 39 billion euro in Ireland, for tax avoidance. The non-productive investment eventually resulted in high GDP growth, yet isn't helpful to the overall economy (Kennedy, 2016). There is an inverse relationship between government debt and gdp growth rate.

Figure 1.2 GDP Growth Rate for Finland, Greece, Ireland, Portugal and Iceland for year 2001 to 2016

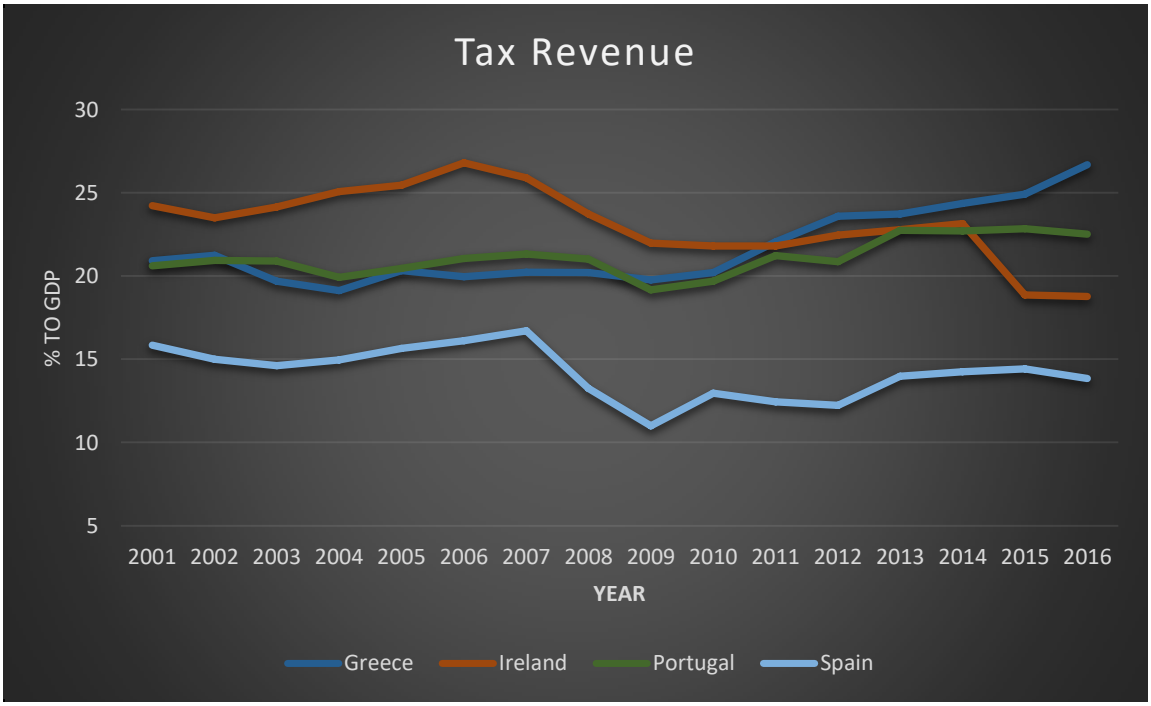


Source: Worldbank database

Tax revenue is defined as by the channel of taxation, income obtained or taxes on the economic activities such as transaction of goods and services, transfer of ownership and others. Certain nations with high government debt ratio are either recording decelerating tax revenue or wandering at low tax revenue level. For instance, Ireland' tax revenue keeps decreasing, from peak of 29% to GDP in 2006 to as low as 19% to GDP in 2016. Other than that, Spain also suffered from low tax revenue trap since 2008, and it is still unable to return to the level before crisis. In 2017, the General Council of Economists CGE) in Spain disclosed a report on the losing of tax revenue with the amount nearly €26 billion because of the tax fraud (Madrld, 2017). As in

Ireland, in the end of 2017, The Irish Times reported that there would be an unprecedented on the target of the government's tax revenue (Kennedy, 2017). According to that, Department of Finance under the government of Ireland published that the tax revenue was hit until €39 billion in the 10 months' time. Until 2018, the government came out the announcement to raise up €3 billion in order to fund a fair (Irish Examiner, 2018). When tax revenue decreased, the income of the government cannot cover the spending, hence government borrows money resulted in accumulated government debt.

Figure 1.3 Tax Revenue for Greece, Ireland, Portugal, and Spain for year 2001 to 2016



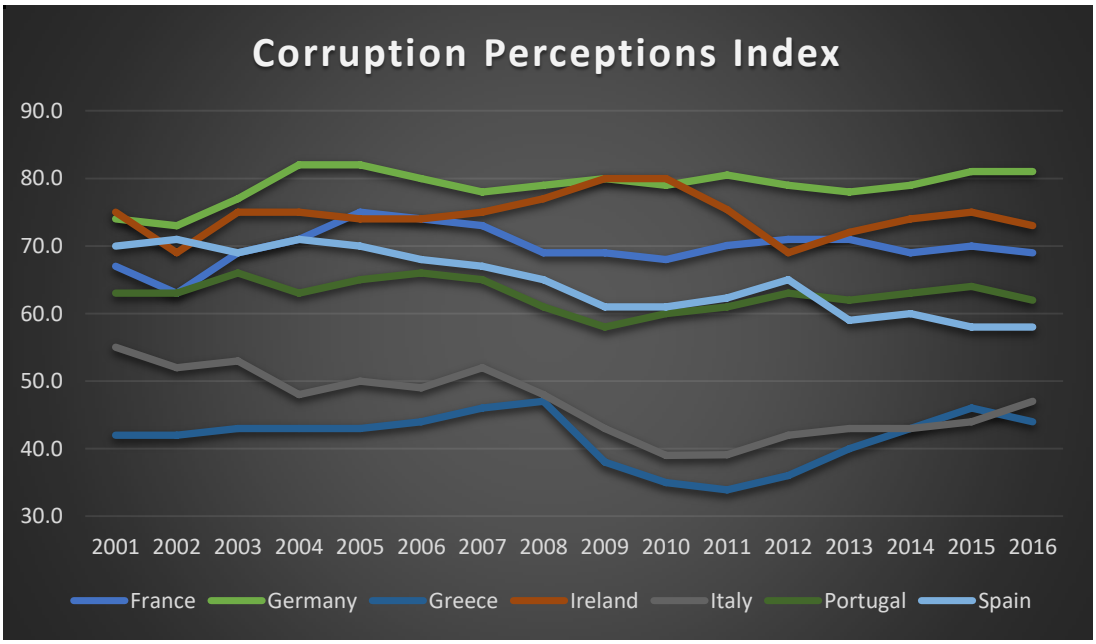
Source: World Bank database

According to Transparency International, the lower the Corruption Perception Index, the more serious the corruption in the country (Benfratello, Monte, Pennacchio, 2018).As shown in the figure 1.4, Greece and Italy recorded at around 45 while Spain and Portugal struggle at around 60, which are considered as highly corrupted.The Bárcenas affair is one of the huge corruption scandals in recent Spanish history (Ares & Hernández 2017). The former treasurer of Spain's ruling party has been jailed for a

33 year sentence for receiving bribery, tax crime and money laundering ("Gurtel Corruption Case: Spanish Ruling Party Officials Found Guilty", 2018).

Apart from Spain, Ireland also faced severe corruption problem, to the extent that corruption becomes the culture in the business. In May 2018, The Irish Times reported that Minister for Justice, Charlie Flanagan, proposed to consolidate anti-corruption law which the donation will be treated as corruption if it is not revealed (O'Halloran, 2018). Among the countries studied, Greece again being ranked as the most corrupted country. The atmosphere of corruption is widespread in the country, even the former Greek finance minister was being charged for money laundering, and receiving bribes in the major procurement projects. The level of corruption will largely determine the government debt level as highly corrupted country will have to borrow more to finance the extra costs caused by corruption activities ("Greece Jails Former Minister, Wife Ahead of Corruption Trial", 2018).

Figure 1.4 Corruption Perceptions Index for France, Germany, Greece, Ireland, Italy, Portugal and Spain for year 2001 to 2016



Source: Worldbank database

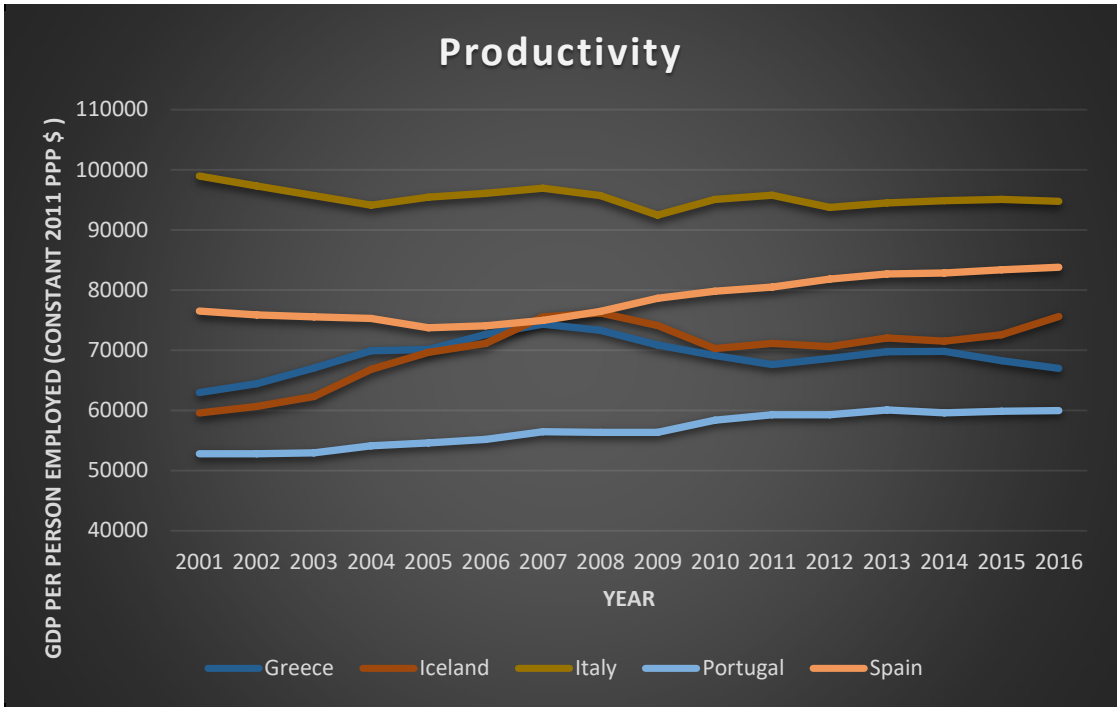
The term "productivity" that is discussed in this research measured in terms of labour productivity. It is to gauge the human capabilities as well as economic performances

(Yilmazer & Cinar, 2015). This research aims at unveiling new perspective as of how the human capital efficiency affects the government debt level, especially in well developed countries.

At the end of 2009, Greece faced a severe economic crisis, it is the second highest budget deficit and debt-to GDP ratio in the Europe (Ozturk &Sozdemir, 2015). At the same time, Greece's productivity was rather low as compared with other members in the region. Without a solid productivity growth in the nation, Greece was suffering high unemployment rates, inefficient bureaucracy and large informal economy.Even though Greek people worked more than any members in the EU region, yet there was still imbalances between the workload engaged in and the productivity due to the fact that Greece was having the lowest labour participation rate and most of the labours were engaged in less productive sector, resulted in low productivity in Greece (Caruso-Cabrera, 2011).

Apart from Greece, Portugal has the lowest productivity than other members in the region. It was trapped in the low productivity issue. Even though it is enjoying huge capital inflows to the nation, yet the misallocation of resources in the financial sector results the capital to the relatively low productive sector. Thus there was a fall in terms of the productivity. The circumstance also explained why Portugal has stagnated GDP while other member nations are enjoying high growth in the same period. In short, the low productivity issue is a doom for a nation as its GDP is stagnated, which in turns cause the government have to resort to more debt financing to stimulate the economy (Reis, 2013).

Figure 1.5 Productivity for Greece, Iceland, Italy, Portugal and Spain for year 2001 to 2016



Source: Worldbank database

1.2 Problem Statement

The resort to sovereign debt financing has been becoming a common practice for countries when they are facing budget deficit, in which the gap between revenue and expenditure is filled by debt borrowing (Murrja, Ndregjoni, &Cerpja, 2014). In other words, debt borrowing is inevitable in the path of developing economic and social welfare. Worldwide nations, either developed or developing countries enjoyed high economic performance from the expansionary fiscal policies implemented. Yet, most of the nations are then trapped into high debt level dilemma, especially when 2008 global financial crisis exploded. The economic downturn along with the high unemployment arose due to the global financial crisis have prompted the governments to further emphasize on expansionary fiscal policies to stimulate the economic growth. Hence, large debt issuance by the governments were exploited. Nonetheless, high debt level might trigger the health of a nation and even drive it towards bankruptcy if it is controlled inappropriately.

The outbreak of global financial crisis drove Greek government to accelerate borrowing in the international capital market which has led the nation's debt grew exponentially and highly fluctuating. Its high debt level also exceeded the permitted level by European Monetary Union (EMU) at 60% of GDP. As at latest circumstance, Greece debt level stands at nearly 190% of GDP, as compared to its average 120% before crisis in 2008 (Rady, 2012). Greece, in face of high unemployment, has been struggling with its high debt for years and it is eventually forced to seek for assistance from EU and IMF for the structural economic reformation to cure the aftermaths caused by the abuse of debt borrowings (Hope, 2017).

With high debt ratios, GDP growth rates will decrease (Reinhart & Rogoff, 2010). In other words, debt and GDP growth rate have inverse relationship. Among the selected West Europe Countries, Ireland's GDP is the strangest in terms of its volatility. During the subprime crisis, it dropped sharply to negative point as this may due to the depression of economic of growth (Sullivan & Kennedy, 2010). The negative

relationship is supported by graphical explanation. The decrease in GDP growth rate (from 5% to -5%) followed by an increase in government debt level (from 30% to 130%). To further prove, Ireland recorded an extraordinary high GDP in 2015. As a result, its government debt level keep reducing from 130% to 80%. Hence, there is a negative relationship between GDP and the government debt.

Tax revenue is one of the deciding factors affecting the level of government debt as any insufficiency in tax revenue will have to be filled by borrowing to meet the public spending (Siddiqi & Ilyas, 2011). When there is a more enhanced and sustainable sources of tax revenue, the economy could be more self-reliance and thus avoid large external debt (Siddiqi & Ilyas, 2011). Hence, the tax revenue and debt level have inverse relationship. To further prove, Ireland and Spain both recorded decelerating tax revenue from 2007 onwards. Ireland's tax revenue rate dropped from 27% to as low as 19% in 2016, while Spain's tax revenue reduce from 17% to nearly 14% in 2016. Meanwhile, the government debt level keep increasing to nearly 120% and 80% for Spain and Ireland respectively. Hence, tax revenue and government debt level are having negative relationship.

According to Cooray, Dzhumashev& Schneider (2017) an increase in corruption will increase public debt as well. Greece and Italy have a comparable lower corruption perceptions index which range between 30-55%, which indicated the nations have widespread corruption issue. When the Corruption Perception index (CPI) is low (serious corruption) for both countries during financial crisis, both nations' government debt level surge to higher level. On the other hand, while the CPI recovers (low corruption issue), the government debt starts to stabilize, increase in a rather stabilized way. This may because low corruption help reduce the government debt, but other variables surpass the effect, thus there will be a slow increment in government debt level. Hence, the level of corruption perception index will inversely impact the government debt level.

The study from Levine and Warusawitharana (2014) claimed that there was a positive relationship between debt and productivity. Among the selected West Europe

Countries, Greece has the lowest productivity. This situation was due to the global crisis of 2008 and its traditional rigidities of the Greece labor market have which caused low participation of young and women in the labor market (Sotiropoulos, 2014). Started from 2009, which was post-crisis period, Greece productivity has been rising at a very slow pace, yet considered as improving. On the other hand, Greece's government debt also rises rapidly. This indicates that the two variables are in positive relationship.

1.3 Research Objectives

1.3.1 General Objectives

The objective of this research is to investigate the macroeconomic and quality of governance determinants of debt level in selected West Europe countries which include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherland, Portugal, Spain and Switzerland from 2001-2016 in order to understand the correlation between the determinants and debt level.

1.3.2 Specific Objectives

(i) To investigate the relationship between GDP, tax revenue, corruption and productivity to government debt level among selected West Europe countries from 2001-2016.

(ii) To determine the interaction between productivity with GDP, tax revenue and corruption and overall impact on the government debt level from 2001-2016.

1.4 Research Questions

(i) What are the factors affecting the government debt level among selected West Europe countries from 2001-2016?

(ii) How does productivity interact with GDP, tax revenue and corruption and overall affect the government debt level among selected West Europe countries from 2001- 2016?

1.5 Significance of Study

The outbreak of Greek debt crisis has triggered the health of Europe Union and drives it into bankruptcy and structural economic reformation. This has become a precedent signal and indication to other well-developed countries regarding the potential negative consequences of resorting to high debt financing. This research will contribute to the ongoing investigations about the determinants of high debt level in different dimensions.

First of all, we are highlighting the relationship between macroeconomic factors like GDP, tax revenue and productivity as well as political factor like corruption to the government debt level. The combination of economic and political factors in variables provide a more holistic view on the topic. Although there were a number of studies investigated on debt-related topic, yet new variables like tax revenue and productivity are employed as contribution variables in this research to better explain the determinants that affect government debt. This is because productivity and tax revenue greatly indicates and signals the economic performance of a country will eventually decides the government debt level. If they are weak in economic downtrend, greater debt fiscal stimulus will be implemented. Hence, the study on new variables enables the government to better understand the reasons behind high debt level.

On top of that, productivity measures the capability of a country producing outputs, hence it can be understood as the root for economic growth. Any improvement or retracement in productivity level will greatly influence tax revenue, GDP and even the corruption activities, and eventually impact the debt level. Thus, productivity level is used as interaction contribution and combined with tax revenue, GDP, and corruption in explaining the relationship with government debt level.

Moreover, this research gathers data from 16 selected West Europe region including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy,

Luxembourg, Netherland, Portugal, Spain and Switzerland as sample countries as most of the highest debt countries come from this region. The time scope we studied range from 2001 to 2016, accounted for 15 years. During this timeframe, the selected countries experienced severe subprime crisis in 2008 as well as the European sovereign debt crisis after 2009. Therefore the inclusion of these events enrich the research results. The large set of observations would also provide a more accurate and convincing result to the readers.

This research offers relevant knowledge to the government as of how the overall debt level is affected. By understanding the relationship between GDP, tax revenue, corruption, productivity and the debt level, the government could implement policies to stimulate or improve the determinants in order to cure or increase the government debt level.

Next, consumers and businesses concerns with the debt level are going to benefit in terms of tax revenue. If the government is determined to decrease the debt level in foreseeable future, it might adjust the tax rate, either personal or corporate income tax. In view of this, the consumers or businesses could have better prepared in their spending in anticipation of tax rate hike.

In addition, businesses are going to benefit in terms of productivity. Any modification on government policies may turn the business sentiment favourable or dull, which eventually affect the national productivity. Hence, in anticipation of positive business sentiment, the businesses could actively expand the productivity.

Moreover, if the government is going to minimize corruption to cure the debt level, it could benefit through the improvements in the administration efficiency and minimize shadow economies, which is good to the economy performance

Lastly, this research could be a reference for future researchers as it explores new determinant of debt and explains the interaction between variables, which previous literatures have limited studies on them. Moreover, the limitations in this research offers more insights and ideas on debt, which encourage further research in the particular area.

1.6 Chapter Layout

There are five chapters in this research. Chapter 1 is the background of research topic followed by problem statement, research questions, research objectives, significance of study and chapter summary. Chapter 2 will cover detailed literature review and theoretical models and framework are used to explain the relationship between determinants. Chapter 3 will discuss data and methodology, as well as the econometric framework while chapter 4 will present and interpret the empirical results through graphs, tables and charts. Lastly, chapter 5 will summarize the findings of the research, along with limitations and recommendations for the research.

CHAPTER 2: LITERATURE REVIEW

2.0 Theoretical Review / Framework

According to his theoretical analysis of the case of tax, David Ricardo found that about half of the tax revenue has transferred to the debt. From his point of view, tax should be charged equally, hence, it will prevent the possibility with natural equilibrium which might have existed if the disturbance has been excluded (Barro, 1979).

Besides that, if government would like to finance their expenditure, they could impose taxes or issue bonds. Nevertheless, bonds are loans which must be paid eventually, and this action has raised the debt. Hence, it is assumed that tax will be raised in the future. When the tax has been raised, the tax revenue has been increased which eventually used to pay the government debt. Hence, it is assumed that the public debt will be reduced. In short, the tax and government debt are interrelated (Dome, 2003).

The proof of the Ricardian Equivalence is that it proposed the government has same outcome on consumer spending no matter how of the tax burdens and debt levels. When the government decide to stimulate the economy, it increases its spending, it will take out more debt, and people will save more money for the expectation of high taxes in the future. They decide to carry out this behavior in order to offset the debt. Hence, the logic of the Ricardian equivalence is true, so, high levels debt country should have relatively higher levels of household savings to cope expected higher tax in the future (Barro et al., 1979).

Endogenous growth theory also known as "New Growth Theory" which is concerned in the growth process. The endogenous growth theory, an economic growth theory which places unlimited wants and humans' desires promote a growing productivity and economic growth. The endogenous growth theory claims that real GDP per person will increase perpetually due to human's pursuit of profits. The economic growth is because of the indefinite investment in human capital which had a spillover effect. Besides that, lowers the profit in one area may due to the competition, people have to seek better ways constantly to invent new products or do things that is for gaining a higher profit. Endogenous Growth Theory is long-run economic growth that is rated which is determined by the forces that are to the internal economic system, specifically to those forces governing the chances and incentives to develop technological knowledge (Aghion, et al., 1998).

The simplest endogenous model, AK model, is assumed exogenous, constant saving rate. AK model is derived from the equation Y=AK which Y is the output/income per worker, A represents total factor productivity, and K represents Capital per worker. It calculates the technological progress with a single parameter. It also assumes that production function does not show diminishing returns to scale which lead to endogenous growth. Many of the rationales for the assumption that have given, for instances, positive spillovers from capital investment to the entire economy or leading further improvement (Aghion, et al., 1998). Nevertheless, the endogenous growth theory is assisted with model in which agents most favourable determined the consumption and saving, improving the allocation of resource to research and development which affects technological process (Fagan, Gaspar, & McAdam, 2016).

The implication of endogenous growth theory is that the policies that embrace openness, competition, change, competition and innovation is promoting growth. In contrast, policies that have the effect of avoiding or slowing change by favouring or protecting specific existing industries or firms has a disadvantage to the slow growth of the community. It is assumed that when there is a high productivity, there will be a high GDP growth which will result in lower debt (Izushi, 2008).

2.1 Empirical Review

2.1.1 Government Debt (Dependent variable)

Li and Lin (2011) had examined the government debt of China in terms of size and structure. When comparing the China government debt level to other emerging nation or in the same stage of development nation, it is considerably high. In order to have a clearer view, three kind of government contingent liabilities are investigated. There are domestic government debt, tertiary institution debt as well as state bank's nonperforming loans. They found out that the reason for the emerging of these kinds of debt is due to limited revenue from land sales, global financial crisis caused to the accumulation of debt, enrolment and number of institution rises and so on.

The relationship between the external debt and the macroeconomic indicators in Malaysia was examined and there is a long run connection between them by JJ cointegration test (Lau, Lee & Arip, 2015). The related data collected from International Monetary Fund and World Bank from 1970 and 2013. The paper was study on the variables such as gross domestic product (GDP) and so on. In the research, they suggested that an effective debt management is needed to control the debt level in the coming future in order to enhance the economy of Malaysia. Also, Siti and Podivinsky (2015) studied on the issue of government debt in Malaysia. They employed the real GDP per capita as the proxy to economic growth. The results showed that the economic growth will be better as the government debt level increase.

The government debt sustainability should be there but the question is how to keep it in the desirable level (Draksaite, 2014). The researcher pointed out that the government debt stabilization system should be modified based on the

particular characteristics or traits of separate economy. Hence, by using the government debt stabilization instruments which including the monetary policy arrangement, transparency and size of the economy, with the period of 2004 until 2012 in Lithuania, the researcher conduct an investigation on the characteristic of small as well as open economy within currency board system.

2.1.2 GDP Growth Rate and Government Debt

The study from Imimole et al (2014) found that GDP has a positive but insignificant relationship with government debt by using cointegration test. The same result was supported by Forslund et al (2011) stated that GDP growth is positively associated with increases in government debt by using a fixed effects model.

The result was supported by Imimole et al (2014) claimed that GDP had a negative and significantly with government debt by using cointegration test. 1% increase in GDP will lead to about 2.786% decrease in the government debt. According to Sinha, Arora and Bansal (2011), there is resulted total government debt is negatively related to GDP growth in the middle income group countries by applying the autoregressive model. On top of that, as the GDP growth rate increases will lead to government debt levels decrease. There is a negative impact on GDP growth on the reduction of government debt by adopting the panel data analysis (Globan&Matosec, 2016), which is from 12 European countries from 2000 to 2014. A negative and statistically significant between GDP growth rate and government debt is resulted by using the dynamic FE-IV specification also known as plausible effect (Bittencourt, 2014). In other words, each percentage point of GDP growth rate increase will lead to government debt decreases by 0.7% per year. The data is collected from South American from 1970 to 2007. On the other hand, GDP

growth are negative and highly significant with the external debt (Waheed, 2017).

2.1.3 Tax Revenue and Government Debt

Between the government debt level and the income level, there is a positive and statistically significant relationship (Ehalaiye, Redmayne &Laswad, 2017). They collected the data with the period of 2004 to 2015. Besides, Ashworth, Geys and Heyndels (2005), they also supports this positive relationship of government debt and income level. They used a panel data from 1977 to 2000 in 298 Flemish municipalities. The total personal income, is used to measure as the proxy of municipal GDP. The results showed that the increasing of income will lead to the rising of liabilities.

On the other hand, there can be a negative relationship between tax revenue and government debt. In the research of Coll, Prior and Ausina (2015), they stated the revenue dropped sharply especially due to the financial crisis lead to the likelihood of rising cost. Moreover, Xu, Kim and Moussawi (2016) mentioned that 1981 tax cut event gave a big impact on the government debt because government revenue decreases leading to the increasing of debt. In addition, Waheed (2017) collected the data from the period of 2004 until 2013 of oil and gas exporting and importing nations. Furthermore, Feld, Kirchgässner and Schaltegger (2011) mentioned the negative sign with significant effect of revenue on 2004 domestic government debt. The research was on the 137 biggest Swiss cities and rural areas in 2004. Apart from that, Benito and Bastida (2004) pointed out that the 130 cities from Autonomous Community of Valencia (Spain) with the period of 1994 until 1998 had a negative sign on capital revenue and indebtedness. Meanwhile, the increasing

in the capital revenue will lead to the debt level decrease. According to Bon (2015), government revenue was negative correlated to the public debt. The researcher used the data for 60 developing nations in Asia, Africa and Latin America by applying the method of difference panel GMM Arellano-Bond from 1990 until 2014.

2.1.4 Corruption and Government Debt

According to Cooray, Dzhumashev, and Schneider (2017), corruption has a positive and significant relationship to government debt. They collected data from 126 countries from 1996 until 2012. To measure the corruption, they adopted Kaufmann et al index and Transparency International Corruption Perceptions Index. This positive relationship also supported by Fernández and Velasco (2014) who stated that corruption has a positive relationship to the government debt. They were using Corruption Perception Index for the targeted regions in Spanish Autonomous Communities in the form of panel data from 2000 until 2012. Besides, Benfratello, Monte, Pennacchio (2015; 2018) also believe that government debt will lead to corruption. Hence, there is a positive and statistically significant relationship between them. They adopted a panel data from 1995 until 2013 for 166 countries. Apart from that, by using dynamic panel data, a panel data from 1995 until 2010 for 30 OECD economies is adopted to support the hypothesis and it corroborated that public corruption cause the government debt (Grechyna, 2012). Montes and Paschoal (2016) used data for 130 countries which include 30 developed countries and 100 developing countries. Furthermore, Liu, Moldogaziev and Mikesell (2017) used the data from 1977 to 2008 to conduct the research and the results was supporting the hypothesis whereby the level of corruption rises as the government debt level increase.

2.1.5 Productivity and Government Debt

The study from Levine & Warusawitharana (2014) stated that a positive relationship between productivity and government debt by employing the Alternate Hypothesis. The particular research is examining the productivity and debt level on company basis. The company debt level can be generalized to government debt level as the research studied on most of the publicly and privately traded companies in United Kingdom, Italy, France, Spain, while the proportion of company debt to the government debt stood at above 80%, therefore it is appropriate to conclude that the journal's company debt level can be generalized to government debt level.

It assumed that when the management expect future productivity to improve, they tend to borrow more to input to the production to further enjoy higher performance. Hence, when the future productivity is high, government debt will accelerate as well.

Due to lack of literature review studied on productivity, this research is going to examine and unveil the impact of productivity on government debt.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter, the research methodology will be discussed. Four independent variables including GDP growth rate, tax revenue, corruption, tax revenue, and productivity will be used to examine their relationship to the government debt level. A total of 16 selected West Europe countries are used as sample country, from year 2001 to 2016. After that, data collection method, definition of variables, theoretical and empirical framework will be discussed, as well as the explanation on methodology used.

3.1 Source of Data

The variables used to determine the relationship with government debt level are GDP growth rate, tax revenue, corruption and productivity. The data was collection from World Bank indicator, and Transparency International, from year 2001 to 2016 among 16 selected West Europe nations. Table 3.1 shows the data sources and collection method of variables.

Table 3.1 Source of Data for Variables

Type of variables	Variables	Unit of measurement	Sources of method
Dependent Variable	Government debt	% to GDP	World bank and OECD
Independent Variables	GDP growth rate	%	World bank
Independent Variables	Tax revenue	% to GDP	World bank
Independent Variables	Corruption	Corruption Perception Index (100 means least corrupted; 0 means highly corrupted)	Transparency International
Independent Variables	Productivity	Constant 2011 PPP, $	World bank

3.2 Data Description

Table 3.2 Data Description for Variables

Variables	**Definition**
1. Debt Level	Debt is defined as the liabilities of a country. Government debt can be obtained through different categories such as account payable, currency and deposits, and insurance technical reserves. Changes in government debt reflect the impact of government deficits.
2. GDP Growth	GDP growth rate is represented as the growing of the economy. It is the sum of gross value which included product taxes and excluded the subsidies by local producers in the economy. Depreciation of made-up assets and depletion of natural resources are not deducted in the calculation of GDP.
3. Tax Revenue	Tax revenue is defined as revenue collected from the tax on income, goods and services, profits instead of social security contributions which are needed to transfer to central government for public purpose.
4. Corruption	Corruption is the abuse of using power for personal gain which can be ranged from grand or petty depending on the amount of money lost.
5. Productivity	Productivity is defined as labour productivity which is measured in term of Purchasing power parity (PPP) GDP. PPP GDP is GDP converted to 2011 constant international dollars using PPP rates.

3.3 Econometric Framework

3.3.1 Empirical model 1

The basic model is formed with the functional form DEBT= f (GDP, TAX, COR, PRO). The functional form can be expressed in the econometric model as stated below:

$$\log(\text{DEBT})_{it} = \beta_{0_{it}} + \beta_1 \log(GDP)_{it} + \beta_2 \log(TAX)_{it} + \beta_3 \log(COR)_{it} + \beta_4 \log(PRO)_{it} + \varepsilon_t$$

where DEBT = Government debt, measured in % of GDP

TAX =Tax Revenue collected by the government, measured in % of GDP

COR = Corruption, measured in Corruption Perception Index (CPI)

PRO = Country productivity, measured in % of GDP

3.3.2 Empirical Model 2

The second model in the research consists of productivity variable acts as interaction term to determine the joint relationship with other determinants to the government debt. The functional form can be expressed as log(DEBT)= f (GDPPRO, TAXPRO, CORPRO). The econometric equation can be written as below:

$$DEBT_{it} = \beta_{0_{it}} + \beta_1 GDP_{it} + \beta_2((GDP)_{it} * (PRO)_{it}) + \beta_3 TAX_{it} + \beta_4((TAX)_{it} * (PRO)_{it}) + \beta_6 COR_{it} + \beta_6((COR)_{it} * (PRO)_{it}) + \varepsilon_t$$

where DEBT = Government debt, measured in % of GDP

TAX = Tax Revenue collected by the government, measured in % of GDP

COR = Corruption, measured in Corruption Perception Index (CPI)

PRO = Country productivity, measured in % of GDP

log(GDP)log(PRO), log(TAX)log(PRO), log(COR)log(PRO) = Interaction terms

3.4 Model Estimation

3.4.1 Panel Unit Root Test

The function of panel unit root test is used to check the stationarity status of the variables in the model. Stationarity assumption in the variables is important to ensure the validity of the model as the violation of this assumption (non-stationary or known as has unit root) would end up providing misleading result or better known as spurious regression. In other words, non-stationary status would render the model's standard deviation invalid, as the t ratios not follow t-distribution, hence lead the obtained results not reliable. Due to the fact that panel unit root test is important to ensure the accuracy of the results, it is often conducted before the model is developed (Mahadeva & Robinson, 2004). The hypothesis for unit root test is shown as follow:

Ho: Panels contain unit roots
H1: Panels are stationary

The decision rule for panel unit root test is that rejected H_o when the probability is smaller than the alpha (0.05) and otherwise do not reject.Among various available unit root tests, Levin, Lin and Chu test (LLC) and Im-Pesaran-Shin (IPS) tests are adopted in examining the variables' unit root test.

3.4.1.1 Levin, Lin and Chu Test

An auxiliary regression is formed based on Augmented Dickey Fuller regression:

$$\Delta Y_{it} = \alpha y_{it-1} + \sum_{k=1}^{pi} \beta_{ik} \Delta y_{it-k} + \gamma_{it} \delta + \varepsilon_{it}$$

where i = 1, 2, 3 ……, 16

t = 2001, 2002 ……, 2016

LLC proved that a null, modified t-statistics would have an asymptotically normally distributed $\hat{\propto}$:

$$t_{\propto} * = \frac{t_{\propto} - (N\,T) S_N \hat{\sigma}^{-2} (\widehat{\alpha}) \mu_{m\tilde{T}} *}{\sigma_{m\tilde{T}} *} \rightarrow \text{N (0,1)}$$

where $t_{\propto}$ = standard t-statistics for $\hat{\propto}$ = (0, $\hat{\propto}^2$)

Levin (2002) claimed that there is a limited power of individual unit root test on the alternative hypothesis. Limited power indicates that the ability to reject null hypothesis when the unit root test is false. Hence LLC suggests and supports a more persuasive panel unit root test, with the assumptions as stated below:

(i) It is in the form of Autoregression (AR) coefficients dynamics

(ii) It does not have the element of heterogeneity for panel data, in other words it accepts individual effect, time effect and linear trend.

(iii) Error term contains homogenous of first autoregressive model.

3.4.1.2 Im-Pesaran-Shin Test (IPS)

IPS is another test that is widely used to determine the presence of unit roots in panels. It combines information from cross sectional dimension as well as the time series dimension**.** Researchers have also proved that IPS test is superior in analyzing the panel data's long term relationship. It begins by establishing the Augmented Dickey Fuller for cross sectional with individual effects and without time effect:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t\ 1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t\ j} + \varepsilon_{it}$$

where $i = 1, \ldots, N$

$t = 1, \ldots, T$

After that, the average t-statistics for $\propto_I$ is computed from the individual Augmented Dickey Fuller regression, where $t_{iT_i}(p_i)$:

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{iT}(p_i \beta_i)$$

The t-bar statistics is made standardized and it is shown that there is convergence between standardized t-bar statistics and standard normal distribution because T and $N \to \infty$. IPS (1997) had proven that t-bar test has relatively better performance than other tests when the T and N are small.

3.4.2 Pooled Ordinary Least Square (Pooled OLS)

There are several assumptions underlying Pooled OLS model that has to be fulfilled when apply this model, which are:

(i) The intercepts and slopes are constant across observation

(ii) Time invariant across observations (without time effect).

(iii) No heteroscedasticity problem.

The example for Pooled OLS is as shown below:

$$Y_{it} = \beta_1 + \beta_2 X_{it} + \mu_{it}\ , i = 1, \dots, N, t = 1, \dots, T$$

Even though Pooled OLS is famous for its simplicity over other models, yet there are limitations that restrict the use of this model in panel data research. Firstly, the researchers cannot differentiate the effect and features of the observations across periods. Besides that, the research is likely to get biased result if heterogeneity problem exists in the data across periods (Gujarati & Porter, 2009). Heterogeneity would render the result become biased, inconsistent and inefficient, which does not follow the BLUE characteristics.

3.4.3 Fixed Effect Model (FEM)

Fixed Effects Model (FEM) is also known as Least-Square Dummy Variable (LSDV) model, which intercept in the regression model is allowed to differ among individuals characteristics. In order to consider the slope coefficient and time effects, FEM can be categorized into 3 different scenarios. The 3 scenarios are (intercepts are to be assumed different across individuals):

a) Slopes are constant across individuals and time invariant

"Fixed Effects" refers to the unique features which make each individual different in terms of background, risk preference, principle and etc. In the general form of LSDV, such "Fixed Effects" is assumed to be no time effect, which is constant across time. The regression for POLS can be written as:

$$Y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \dots + \alpha_{12} D_{12i} + \beta_2 X_{it} + \varepsilon_{it} \quad (6)$$

Where D_{2i} = 1 if company is General Motor (GM)

= 0 if otherwise

D_{3i} = 1 if the company is U.S. Steel (US)

= 0 if otherwise

...

D_{12i} = 1 if the company is Westinghouse (WEST)

= 0 if otherwise

t = 2001-2016

b) Slopes are constant across individuals and time variant

By applying the same method can address the time effect which often take place due to unexpected events such as changes in technology, government regulatory or tax policies. In order to examine whether there is different in term of slope across the time period, Fixed Effects Least Squares Dummy Variable(LSDV) Model should include time dummy variable. The regression model can be formulated as:

$$Y_{it} = \alpha_0 + \alpha_1 DUM_{06} + \dots + \alpha_{10} DUM_{15} + \beta_2 X_{it} + \varepsilon_{it} \quad (7)$$

Where DUM_{06} = 1 if the observations belongs to year 2001

= 0 if otherwise

DUM_{15} = 1 if the observations belong to year 2016

= 0 if otherwise

i = General Motor (GM), U.S. Steel(US)...

We may then integrate equation (6) into (7), and thus the mode can be expressed as:

$$Yit = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \dots + \alpha_{12} D_{12i} + \alpha_0 + \alpha_1 DUM_{06} + \dots + \alpha_{10} DUM_{15} + \beta_2 X_{it} + \varepsilon_{it}$$

c) Slope are different across individuals and time invariant

In this scenario, the model assumes that slope coefficients and intercept are varies over individuals as well as no time effect. The model for can be shown as:

$$Y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \dots + \alpha_{12} D_{12i} + \beta_2 X_{it} + \gamma_1 (D_{2i} X_{it}) + \gamma_2 (D_{3i} X_{it}) + \dots + \gamma_{10} (D_{12i} X_{it}) + \varepsilon_{it}$$

If one or more of the ɣ coefficients are statically significant, it can be said that the slope coefficients are different from the base group. However there are few limitations in FEM. A caution should be take note which is not to include too many dummy variables as it reduce degree of freedom and cause information loss in data is high as well. Next, there is high chance of getting multicollinearity problem. Lastly, FEM model unable to identify the effects of time invariant variables.

3.4.4 Random Effect Model (REM)

REM model is also known as error component model which could be defined as a regression with random constant terms (Gujarati & Porter, 2009). It is applied to eliminate the omitted variable bias by measuring changes within group and gather all the potential omitted variables and make them become an independent variable. REM model assumes that the independent variables have no relationship with the individual effect, thus allows individual effects to become an independent variable. REM is different from FEM in the sense that REM assumes the unobserved effects are uncorrelated with the independent variables, $(\boldsymbol{\mu i} \mid \boldsymbol{Xit}) = 0$ (Baltagi, 2013). The unobserved effects could act as inference for the population from which the samples are randomly

picked. Hsiao (2003) claimed that REM model has relatively greater efficiency as compared to FEM model as REM has smaller standard errors and higher power to detect effects. The sample equation for REM model is as show below:

$$Y_{it}=\beta_{i1}+\beta_2 X_{it}+u_{it} Y_{it}=(\beta_1+\beta_i \varepsilon_i)+\beta_2 X_{it}+u_{it} Y_{it}=\beta_1+\beta_2 X_{it}+\varepsilon_i+u_{it}$$

where β_0 = Intercept's mean

β_1 = Independent variables slope

X_{it} = Independent variable

ε_{it} = Random individual specific error component

u_{it} = Combination of cross sectional and time series error component

3.4.5 Breusch-Pagan Lagrange Multiplier Test

Breusch-Pagan Lagrange Multiplier (BGLM) test is an ordinary way used by the econometrician to select the better model between POLS and REM.

Recall the Random Effect Model, where

$$Y_{it} = \beta_1 + \beta_2 X_{itk} + \mu_i + \varepsilon_{it}$$

The null hypothesis (H_o) of BGLM test is that the variance of random effects equal to zero: Var [μ_i]= 0, then the intercepts of every cross-sectional unit are constant, which means that there is no any random effect in the model and POLS is preferable. In order to test the hypothesis we need to perform the auxiliary regression equation of the form

$$\hat{u}_t^2 = \gamma_0 + \gamma_1 x_{itk}$$

If the R^2 of the auxiliary model is high, the $\hat{u}_t^2$ is said to be well related to the independent variables (Breusch & Pagan, 1979). Therefore, the test statistic which the NR^2 will be greater than the critical value on chi-square distribution. Because of this, we can conclude that REM is more preferable is this situation as null hypothesis is rejected, Var [μ_i] ≠ 0.

Based on the P-value of test-statistic, we can reject the null hypothesis if it is lower than the significant level (0.1/0.05/0.01). Otherwise, do not reject null hypothesis. If null hypothesis is rejected, which means that REM is better as compared to the POLS.

3.4.6 Hausman Test

Hausman (1978) proposed a test based on the difference between the random effects and fixed effects estimates. Purpose of this test is used to examine whether REM or FEM is more appropriate to test in panel data (Hill, Griffiths & Lim, 2008). The hypothesis is:

H_0: Random effect model (REM) is preferable

H_1: Fixed effect model (FEM) is preferable

Test statistic formula for Hausman specification test:

$$H = (\beta^{FE} - \beta^{RE}) [(\beta^{FE}) - Var(\beta^{RE})] - 1(\beta^{FE} - \beta^{RE})$$

The decision rule for Hausman test is that if the probability value (P-value) of H-statistic is lower than the significant level (0.1/0.05/0.01), null hypothesis will be rejected. Otherwise, do not reject the null hypothesis. If null hypothesis is rejected, which means that the FEM is more preferable as compared to the REM. This shows that REM is interrelated with any of the independent variables.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

The results of the LM test and Hausman test to determine the best model between the POLS, FEM, and REM will be discussed in this chapter. The results were shown in Table below for better understanding. There will be further discussion on the relationship of government debt and four independent variables including GDP growth rate, productivity, corruption and tax revenue. Besides, the interpretation of the interaction term (productivity) with other independent variables also discussed based on the results.

4.1 Panel Unit Root Test

The unit root test is to test the stationary or non-stationary of the variables. The individual intercept and individual intercept and trend are conducted on Levin, Lin, Chu Test (LLC) and Im-Pesaran and Shin Test (IPS). When the p-value is less than 0.01, 0.05 or 0.1 which will reject the null hypothesis that is representing the data is stable and stationary.

In LLC test for model 1 and model 2, the results are shown in the Table 4.2.1. At individual intercept, LLC proves that most of the variables are stationary at 1% significance level except for the variable of LOG(TAX REVENUE) in model 1 and TAX_REVENUE in model 2 that is stationary at 10% significance level and

TAX_REVENUE * PRODUCTIVITY in model 2 that is stationary at 5% significance level. The dependent variables are stationary at significance level of 10%. At individual intercept and trend, all independent variables are stationary at significance level of 1%, however, the dependent variables are stationary at significance level of 5%.

In IPS test for model 1 and model 2, the results are shown in Table 4.2.2. At individual intercept, IPS proves that all independent variables are stationary. Nevertheless, the significance level that for each variable to stationary is different. In model 1, LOG(GDP_GROWTH_RATE), and LOG(CORRUPTION) is at significance level of 1%. Besides that, LOG(PRODUCTIVITY) is stationary at significance level of 5%. LOG(TAX_REVENUE) is stationary at significance level of 10%. In model 2, almost all of the variables are stationary at significance level of 1% except for TAX_REVENUE * PRODUCTIVITY is stationary at significance level of 10%. However, the dependent variable shows not stationary. At individual intercept and trend, it also proves that all variables are stationary but at different significance level. In model 1, the LOG(GDP_GROWTH RATE) and LOG(CORRUPTION) are stationary at significance level of 1%. LOG(PRODUCTIVITY) are stationary at significance level of 5%. LOG(TAX_REVENUE) is stationary at significance level of 10%. In model 2, all of the independent variables are stationary at the significance level of 1% except for the TAX_REVENUE which is stationary at the significance level of 10% and TAX_REVENUE * PRODUCTIVITY that is stationary at the significance level of 5%. The dependent variable is stationary at the significance level of 5%.

In a nutshell, we can conclude that the results are in a satisfactory state due to all independent variables are proved to be stationary.

Table 4.1.1 Levin, Lin & Chu Test for Model 1

Variables	Levin, Lin & Chu Test	
	Individual Intercept	Individual Intercept and Trend
LOG(Debt_Level)	-17.0688***	-1.67954**
LOG(GDP_Growth_Rate)	-10.8255***	-9.42654***
LOG(Tax_Revenue)	-1.51655*	-2.86830***
LOG(Corruption)	-4.08534***	-7.61157***
LOG(Productivity)	-3.08954***	-4.49782***

Table 4.1.2 Im-Pesaran-Shin Test for Model 1

Variables	Im-Pesaran-Shin Test	
	Individual Intercept	Individual Intercept and Trend
LOG(Debt_Level)	-2.68758***	-1.70830**
LOG(GDP_Growth_Rate)	-7.37894***	-5.00495***
LOG(Tax_Revenue)	-1.43996*	-1.47610*
LOG(Corruption)	-2.79582***	-5.36348***
LOG(Productivity)	-1.72664**	-1.66869**

Table 4.1.3 Levin, Lin & Chu Test for Model 2

Variables	Levin, Lin & Chu Test	
	Individual Intercept	Individual Intercept and Trend
Debt_Level	-5.35229 ***	-2.03926**
GDP_Growth_Rate	-4.76752***	-3.75619***
Tax_Revenue	-1.38205*	-2.82755***
Corruption	-3.85932***	-6.31885***
GDP_Growth_Rate * Productivity	-4.36978***	-3.33285***
Tax_Revenue * Productivity	-1.56164**	-1.75817***
Corruption * Productivity	-6.21622***	-4.82990***

Table 4.1.4 Im-Pesaran-Shin Test for Model 2

Variables	Im-Pesaran-Shin Test	
	Individual Intercept	Individual Intercept and Trend
Debt_Level	1.16592	-2.02022**
GDP_Growth_Rate	-3.35720***	-5.03985***
Tax_Revenue	-1.35965*	-1.57991*
Corruption	-2.34304***	-3.90420***
GDP_Growth_Rate * Productivity	-3.30036***	-4.87043***
Tax_Revenue * Productivity	-6.10778***	-1.31334**
Corruption * Productivity	-4.20154***	-3.24697***

Note: The asterisks, *, **, *** indicate rejection of the null hypothesis at 10%, 5% and 1% level of significance respectively.

4.2 Model Comparison

For model comparison, POLS, REM and FEM are used to compare to select the best model in the research. There are two model will further discuss in the following study.

4.2.1 POLS

In model 1, the variables GDP growth rate LOG(GDP_GROWTH_RATE), corruption LOG(CORRUPTION), and productivity LOG(PRODUCTIVITY) in the result of POLS are statistically significant at 1% significant of level with p-value 0.0000 except for the tax revenue LOG(TAX_REVENUE) which is insignificant. The reason for stated it as such is due to the p-value 0.8027 exceeds the 1% significant of level. To the sign, the significant variables show that they are inverse relationship between the independent variables and dependent variables.

In model 2, the variables GDP growth rate multiply by productivity (GDP_GROWTH_RATE * PRODUCTIVITY) and corruption multiply by productivity (CORRUPTION * PRODUCTIVITY) are statistically significant at 1% significant of level with the p-value 0.0039 and 5% significance of level with the p-value 0.0324 respectively. They also have positive relationship to the government debt. On the other hand, tax revenue (TAX_REVENUE * PRODUCTIVITY) is significant at the significance level of 1% with the p-value 0.0014. It has a negative relationship towards the government debt.

4.2.2 REM

In model 1, GDP Growth Rate LOG(GDP_GROWTH_RATE) and corruption LOG(CORRUPTION) show statistically significant at 1% significant of level with p-value 0.0001 and 0.0000 respectively. Both variables also carry the negative relationship to dependent variable which is government debt. In REM result, it shows the insignificant for the variables including productivity LOG(PRODUCTIVITY) and tax revenue LOG(TAX_REVENUE) which the p-value are 0.1462 and 0.1043 respectively.

In model 2, the result is sharing some similarities as the result of model 2 in POLS which GDP Growth Rate multiply by productivity (GDP GROWTH RATE * PRODUCTIVITY) and corruption multiply by productivity (CORRUPTION * PRODUCTIVITY) are statistically significant at 1% significant of level and they are in similar relationship to the dependent variables. The only difference is the p-value in the different figure which is 0.0012 and 0.0008. Tax revenue multiply by productivity (TAX REVENUE * PRODUCTIVITY) shows a significant result that has inverse relationship with the dependent variable with the p-value 0.0001.

4.2.3 FEM

In model 1, the result is like the POLS whereby GDP growth rate LOG(GDP_GROWTH_RATE), corruption LOG(CORRUPTION), and productivity LOG(PRODUCTIVITY) are statistically significant at 1% significant of level with p-value 0.0000. However, the productivity LOG(PRODUCTIVITY) carry a positive relationship while the rest are still negative relationship to the dependent variable. Tax revenue LOG(TAX_REVENUE) still insignificant with the p-value 0.2681.

In model 2, GDP growth rate multiply by productivity (GDP_GROWTH_RATE * PRODUCTIVITY) and corruption multiply by productivity (CORRUPTION * PRODUCTIVITY) are significant at significance level of 10% and 1% with p-value 0.0839 and 0.0011 respectively. However, tax revenue multiply by productivity (TAX REVENUE * PRODUCTIVITY) shows insignificant result with p-value 0.2072.

4.3 Comparison Test

We carried out Lagrange Multiplier (LM) test and Hausman test to determine the best model between, POLS, FEM, and REM. The LM test is to determine the comparison between POLS and REM while the Hausman test is to determine the comparison between FEM and REM.

4.3.1 Model 1

We carried out the LM test and the test statistic shown 308.4982 while the p-value shown 0.0000. Hence, we reject the null hypothesis at significance level of 1%, 5%, and 10% respectively and we conclude that REM is more preferable than POLS.

Besides, we carried out the Hausman test to compare the preferable of FEM and REM. The result of Hausman test shows that the test statistic value is 81.248735 and p-value is 0.0000. Hence, we reject the null hypothesis at the significance level of 1%, 5%, and 10% respectively. We have sufficient evidence to conclude that FEM is more preferable than REM.

Hence, we conclude that the FEM is a preferable model in Model 1. The R square in FEM of Model 1 is 0.799046. The result of FEM shows that corruption LOG(CORRUPTION), GDP growth rate LOG(GDP_GROWTH_RATE), and productivity LOG(PRODUCTIVITY) are significant and rejected the null hypothesis at significance level of 1%, 5%, and 10% respectively. Besides, government tax LOG(TAX_REVENUE) is insignificant and do not reject the null hypothesis at any significant level by using FEM.

4.3.2 Model 2

We carried out the LM test and the test statistic shown 278.5165 while the p-value shown 0.0000. Hence, we reject the null hypothesis at significance level of 1%, 5%, and 10% respectively and we conclude that REM is more preferable than POLS.

Besides, we carried out the Hausman test to compare the preferable of FEM and REM. The result of Hausman test shows that the test statistic value is 33.145234 and p-value is 0.0000. Hence, we reject the null hypothesis at the significance level of 1%, 5%, and 10% respectively. We have sufficient evidence to conclude that FEM is more preferable than REM.

Hence, we conclude that the FEM is a preferable model in Model 2 with the productivity as the interaction variable. The R square in FEM of Model 1 is 0.758379. The result of FEM shows that corruption (CORRUPTION), GDP growth rate (GDP_GROWTH_RATE), corruption multiply by productivity (CORRUPTION * PRODUCTIVITY), and GDP growth rate multiply by productivity (GDP_GROWTH_RATE * PRODUCTIVITY) are significant and rejected the null hypothesis at significance level of 1%, 5%, and 10% respectively. Besides, government tax (TAX_REVENUE), and government tax multiply by productivity (TAX_REVENUE * PRODUCTIVITY) is insignificant and do not reject the null hypothesis at any significant level by using FEM.

To be brief, Table 4.3.1 shows FEM is more preferable in Model 1, and FEM is preferable in Model 2 with the productivity as interactive variable in Table 4.3.2.

Table 4.3.1 Model Comparison for Model 1

Model 1		
	LM Test	Hausman Test
Test Statistic	308.4982*** (p-value 0.0000)	81.248735*** (p-value 0.0000)
Decision Making	Reject null hypothesis	Reject null hypothesis
Conclusion	REM is preferable than POLS	FEM is preferable than REM

Table 4.3.2 Model Comparison for Model 2

Model 2		
	LM Test	Hausman Test
Test Statistic	278.5165*** (p-value 0.0000)	33.145234 (p-value 0.0000)
Decision Making	Reject null hypothesis	Reject null hypothesis
Conclusion	REM is preferable than POLS	REM is preferable than FEM

Note: The asterisks, *, **, *** indicate rejection of the null hypothesis at 10%, 5% and 1% level of significance respectively.

4.3.3 FEM and REM (Final Model)

4.3.3.1 Model 1 (FEM)

We have compared the expected sign and real sign of independent variables in the fixed effect model (FEM) test. The result of FEM in Model 1 shows that GDP growth rate and corruption are in negative sign, while productivity is positive sign to the government debt. Tax revenue is insignificant in the result.

Based on the literature review in Chapter 2, there are some arguments for the GDP whether it is positive or negatively influencing the government debt, which point out that increase in GDP will lead to the increase in debt (Forslund et al., 2011). However, some researches proved that GDP and government debt has negative relationship by showing that one percent increase in GDP, government debt will decrease by 2.786 percent (Imimole et al., 2014). This is because if rise in domestic production of goods and services, national economic will grow and government will reduce the demand for external debt. Based on the result of researches, our expected sign for GDP is negative sign and this is consistent with the result shown in Model 1 with the use fixed effect model (FEM). According to Sinha et al. (2011) and Bittencourt (2018), GDP becomes the most important determinant of debt situation especially during debt crisis because government debt is under control if economic activities are performing well. Globan & Matosec (2016) also indicated that GDP growth rate has negative impact towards debt. Higher GDP growth rate will diminish the chances of internal and external borrowing. A country with high level of income will have lower demand on external funding (Waheed, 2017).

Another significant of this study is the impact of corruption on the government debt. Result shown in FEM model is positive, means when higher

corruption (low CPI), government debt will increases, which is consistent with the expected sign. According to Cooray, Dzhumashev&Schneider (2017), they suggested that increase in level of corruption will lead to increase in general government gross debt, which the result showed that the larger shadow economy reduces the tax revenues and at the same time magnifies the effect of corruption on debt. Parallel relationship between these two variables is also supported by Benfratello, Monte&Pennacchio (2018) who indicated that the effect is stronger for high income countries and weaker for less-developed countries.

Lastly, the productivity is an important contribution for our study. The expected sign for the coefficient of productivity is positive, which is mentioned by Levine & Warusawitharana (2014). They employed the Alternate Hypothesis which assume that on insider information basis, when the management realize that future productivity will improve, they tend to borrow more to input to the production to enjoy high performances. Therefore, the result in fixed effect model (FEM) is consistent with the expected sign.

4.3.3.2 Model 2 (FEM)

This research employs productivity as the interaction term to examine the impact of independent variables to productivity and eventually to the government debt. Based on FEM in Model 2, this research discovers that corruption and productivity, as well as GDP and productivity both have a positive relationship to the government debt; while tax and productivity is neutral in terms of the impact to the government debt.

Based on the empirical result, when (corruption & productivity) increases by 1 unit, on average, the government debt will increase by 0.0000245 unit, ceteris paribus. This result is interpreted in CPI, hence it has to be adjusted in the form of corruption. Lower CPI resulted in higher corruption. Therefore, it should be expressed as when the interaction between corruption and productivity decrease by 1 unit, on average the government debt will increase by 0.0000245 unit, forming a negative relationship. The empirical result is tally with the result from at firm level in the research from Yan and Oum (2014) where management or authority is likely to pursue personal advantages by exchanging the allocation of resources in the production under a highly corrupted atmosphere, resulted in a low productivity. The result holds true in the research from Rosa, Gooroochurn and Gorg (2013) where firms that engaged in paying bribes generally suffered from lower productivity than those who do not, approximately 5% less productive. In a highly corrupted atmosphere, the pay of bribes is a common practice in business, which means corruption practice will not render a competitive advantage to the players, but conversely deplete the resources that could have been inputted to the operations, eventually reduce the productivity (Olomola & Osinubi, 2018). As for the country level, the widespread of corruption in either short run or long run tends to reduce productivity due to capital outflow, practice of bribery, inefficiency in enforcing anti-corruption legislation (Olomola & Osinubi, 2018). When the productivity is even lower, it prompts the authority to further resort to corruption practice, form a vicious cycle, and this is where the interaction occurs: corruption and productivity will influence each other. The low productivity will eventually cause the government debt will be reduced as the authority will not consider to leverage higher and magnify the risks (Levine & Warusawitharana, 2014). In a nutshell, the high corruption environment interact with low productivity will lead low government debt, which is a negative relationship.

On the other hand, this research obtains a positive relationship as well, for the relationship between GDP growth rate and productivity to the government debt. Based on the results, when (LN gdp growth n productivity) increases by 1 unit, on average, the government debt will increase by 0.0000263 unit. This is tally with the empirical result from Suna Korkmaz and Oya Korkmaz (2017). They found that improved labour productivity has a positive impact on the economic growth through improved cost of input and efficient use of factor of production. For instance, labour productivity can be improved through technological innovation, knowledge and skill learning, which minimize the possibility of doing wrongly, and increase the productivity. Yalcinkaya, Huseyni and Celik (2017) further explained that the productivity will affect the economic growth in both developed and developing countries. Their research claimed that productivity is more sensitive affecting the G-7 and less influential to G-12. For instance, when the productivity increases by 1 unit, on average, the economic growth in G-7 improves by 0.8171% as compared to 0.5550% in G-12, ceteris paribus. According to Nakamura, Kaihatsu, and Yagi (2018) innovation in productivity includes a wide range of new invention, which is the employ of new technologies as well as the improvement in business. All these innovations transform into improved competitiveness, produce more at lower cost, and thus enhance economic growth. The interaction between GDP and productivity occurs when a constant improvement in productivity help boost the economic development and drive a sustainable economic growth in the country, the positive economic growth in return will stimulate more productivity, form a positive growth cycle. The positive relationship is proven when the high productivity is ended up in high government debt (Levine & Warusawitharana, 2014).

4.4 Diagnostic Checking

Diagnostic test is carried out to detect whether the model is having the problem of multicollinearity, normality of the error term. The objective of carrying out the test is to make sure the model are fall under the requirement of Best Linear Unbiased Estimators (BLUE).

4.4.1 Model 1

4.4.1.1 The Normality Test

The normality test is to identify the data set whether is normally distributed. If the error term is not normally distributed, the data set is said to be unreliable. Jarque-Bera test is used to identify whether the error term is normally distributed or it is not.

H_0: The error term is normally distributed

H_1: The error term is not normally distributed

If the p-value of the Jarque-Bera Test is lesser than the significance level of 1%, 5% or 10%, there is sufficient evidence to conclude that the null hypothesis is to be rejected which means the error term is not normally distributed.

Table 4.4.1 Jarque-Bera Test for Model 1

Jarque-Bera Test	P-value	Decision
2.846328	0.240950	Normally Distributed

According to Table 4.4.1, the p-value of Jarque-Bera Test for model 1 is 0.240950 which is greater than significance level of 5%. Hence, there is not enough evidence to reject the null hypothesis which the results will be the error term is normally distributed.

4.4.1.2 Multicollinearity Test

The multicolinearity test is to be carried out to identify whether the independent variables and dependent variables has a linear or non-linear relationship.

H_0: There is no multicolinearity problem existed among independent variables

H_1: There is multicolinearity problem existed among independent variables

Table 4.4.2 Result of Variance Inflation Factor of Model 1

Variables	Centered VIF	Low/High
LOG(CORRUPTION)	1.072960	Low
LOG(GROWTH)	1.010252	Low
LOG(PRODUCTIVITY)	1.081067	Low
LOG(TAX)	1.005353	Low

According to the table 4.4.2, all of the variables in model 1 have no serious multicollinearity problem. Therefore, the problem can be ignored as the degree of Variation Inflation Factor of the independent variables are fell between 1 and 10 which means that there is no serious multicollinearity problem. Hence, the estimated parameters are efficient, consistent and unbiased.

4.4.2 Model 2

4.4.2.1 Normality Test

Table 4.4.3 Jarque-Bera Test for Model 2

Jarque-Bera Test	P-value	Decision
0.725575	0.695734	Normally Distributed

According to Table 4.4.3, the p-value of Jarque-Bera Test for model 2 is 0.695734 which is greater than significance level of 5%. Hence, there is not enough evidence to reject the null hypothesis which the results will be the error term is normally distributed.

4.5 Summary

In short, panel unit root test that is conducted prior to the model estimation proved that all variables are stationary, which means that the data are reliable to use in regression. After that, the comparison of model (Pooled OLS, FEM, REM) is completed and we reach a conclusion that model 1 and model 2 are best suited to FEM. In model 1, the empirical result showed that GDP growth rate is negatively related to the government debt while corruption and productivity are positively affecting the government debt. On the other hand, in model 2, (corruption and productivity) negatively affect the government debt.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.0 Introduction

This research studies on the relationship between GDP growth rate, tax revenue, corruption and productivity on the government debt, as well as the interaction between productivity on the GDP growth rate, tax revenue and corruption to the government debt. In this chapter, there will be summary of empirical findings, followed by implication of study, limitation and recommendations for future researchers.

5.1 Summary of Findings

In order to examine the government debt and the determinants that drive to a high debt problem, this research as carried out a holistic panel data analysis, through the formulation of two models, studies on 16 West Europe countries, from 2001 to 2016. This research has employed Pooled OLS, FEM and REM to determine which model is best suited to the regression. By conducting LM and Hausman test, the result shows that both models should employ FEM. Based on the empirical result in chapter 4, the relationship of the determinants are as shown below:

Table 5.1: Summary of Findings

Model 1 (FEM)	Gdp growth rate	Negative	When GDP increase by 1%, government debt will decrease by 0.067%, ceteris paribus
	Corruption	Positive	When corruption increases 1 %, government debt will increase 1.8%, ceteris paribus.
	productivity	Positive	When productivity increase by 1%, government debt will rise 2.37%, ceteris paribus.
Model 2 (REM)	GDP & productivity	Positive	When GDP & productivity hikes 1 unit, government debt will increase by 0.0000263 unit, ceteris paribus.
	Corruption & productivity	Positive	When Corruption & productivity increase by 1 unit, government debt will hike 0.0000245 unit, ceteris paribus.

Lastly, both models have been retested in terms of its normality assumptions. The test conducted showed that both models abide the assumptions in which both models are normally distributed. Besides that, the panel unit root test that is conducted fulfill the stationarity assumption.

5.2 Implication of study

The effort to cut the government debt to a sustainable level has to be handled carefully as it would affect the welfare of citizens pervasively. Hence, a deep and comprehensive reformation has to be implemented across various sectors in the country over the long run, especially through the influence of GDP, corruption and productivity on the government debt level.

The effort to reduce government could be implemented through the improvement in GDP by stimulating on domestic demand or encouraging exports. The government could implement tax reformation to revise the tax structure and cut unnecessary tax to relief the burden of citizen. When people's purchasing power is strong, they are willing to increase spending on products and service. This would later prompt manufacturers to produce more differentiated products to cope with tastes from consumers, directly encouraging labour market, form a solid and strong domestic market, which is good for economic performance. In addition, when the tax rate is favourable for foreign companies, FDI will flow into the country, and directly increase the GDP and improve government debt. Moreover, the government should establish policies to encourage manufacturers to become exports-oriented to explore new market by granting incentives to them.

From the corruption perspective, the government plays a vital role in curbing the corruption activities in the country. The governments should at all cost, intensify the fight against corruption in various governmental projects, at all cost,to utilize the public expenditures, in a more efficient way. Therefore, the government public projects must be analyzed thoroughly in terms of its practicality, economic and social returns, to ensure it is worth to spend the public resources on these financial projects. Any tendering of the projects will go open to minimize the possibility of under table corruption and to encourage price competition which is good for the government. When the government spending is utilized, they could significantly reduce the amount of government debt. On the other hand, the practice of corruption could be minimized

through the effective enforcement of anticorruption legislation against public servant. When the public servants strictly abide the anticorruption laws, people will find no way to conduct corruption to the government, thus reduce the practice of corruption, and eventually help improve the government debt.

According to the empirical result productivity is positively correlated to the government debt, thus over pursue on the productivity growth may not end up in a welcoming output, where the government debt is controlled at a sustainable level. Nonetheless, labour productivity could be improved in another way, through its interaction with GDP, jointly affect the government debt. In empirical model 2, it shows that high productivity would result in better economic performance, hence lower down the government debt. Therefore, the government could input more effort in nurturing first class human capital, equipped with sophisticated skill. This could increase their competitiveness in workplace, and in return they are rewarded with higher paid. The improvement in salary is transformed into higher purchasing power, which is good for economic performance. Moreover, the government could grant incentives to exports-oriented companies, encourage them to transform, progress towards the wave of Industrial Revolution 4.0 to boost the productivity. There will be exponential growth among those companies which is good for economic performance.

5.3 Limitations of Study

This research is based on empirical instead of theory, this is due to the reason of theory is not always equivalent to the reality. Throughout this research, we have facing some difficulties that needed to be discussed and overcome in order to make our analysis more meaningful.

According to our study, the other problem we encountered is data insufficiency. We collected a series of data from selected West Europe countries from 2001 to 2016. There are missing data from West Europe region that force us to only use 16 countries which are relatively insufficient for panel data analysis. This research investigates only the government debt in developed countries, while ignoring the issue on developing countries. Moreover, one of the countries, which is Iceland has missing data in terms of its government debt, as its data started from 2003. This research filled up the gap from 2001 to 2002 from worldbank data. In order to avoid large distortion from the actual figure, hence we employ the timeframe from 2001 onwards, which is also insufficient for panel data analysis.

Besides that, we assumed that dependent variable, government debt will only be affected by four independent variables which are GDP growth rate, tax revenue, corruption and productivity. However, one of the variables is insignificant to the dependent variables after conducting the analysis. This indicate there are only three significant variables to explain the government debt, which is intuitively insufficient in the real world. Hence, some important variables may have been omitted in this research. Therefore, this research may not fully show the determinants of government debt, and the analysis can be further improved.

Additionally, West Europe region that we selected faced severe subprime crisis in 2008 and sovereign debt in 2009, which fall between the timeframe of the research. The sudden structural change will magnify the impact of determinants to the government debt in the more simplify methods we used in this research, REM and FEM, as compare to other method like GMM, which is undesirable when explaining the relationship between variables.

5.4 Recommendations

Firstly, we should insert more variables in this research to better explain the relationship of determinants to the government debt. An input to widen the research scope, whereby the inclusion of political, economic, and social variables will help enhance the accuracy and reliability of the empirical results.

Secondly, future researchers could increase the sample size of the research as the panel data that this research is using is relatively insufficient as there are only 16 countries, with 16 years period. To enrich the result, there should be more countries, consisting of developed and emerging countries that suffer from high debt trap, and longer timeframe, thus result in larger sample size. A large sample size can increase the accuracy of the studied model (Stockwell & Peterson, 2002).

Thirdly, we suggest future researchers to avoid timeframe that includes sudden shocks like the incidents of financial crisis and sovereign debt crisis, prolong the time frame without the inclusion of events that could have structural change as they could cause distortion from the actual impact.

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APPENDICES

Appendix 4.1: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for LOG(DEBT_LEVEL)

Null Hypothesis: Unit root (common unit root process)
Series: LNDEBT_LEVEL
Date: 01/19/19 Time: 23:05
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 6
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 179
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-17.0688	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on LNDEBT_LEVEL

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.03954	0.0029	0.0022	0	6	3.0	15
Belgium	-2.53612	1.E-05	0.0032	6	6	1.0	9
Denmark	-0.92998	0.0002	0.0177	6	6	2.0	9
Finland	0.00503	0.0073	0.0099	0	6	1.0	15
France	-0.00934	0.0021	0.0021	0	6	0.0	15
Germany	-0.22459	0.0023	0.0039	2	6	1.0	13
Greece	3.81291	0.0030	0.0030	5	6	14.0	10
Iceland	-0.22830	0.0252	0.0818	3	6	2.0	12
Ireland	-0.36484	0.0157	0.0799	5	6	2.0	10
Italy	1.37195	0.0005	0.0024	6	6	4.0	9
Luxembourg	-0.76678	0.0002	0.0165	6	6	0.0	9
Netherland	-0.77761	2.E-05	0.0062	6	6	1.0	9
Portugal	1.00400	0.0009	0.0044	6	6	0.0	9
Spain	0.03245	0.0117	0.0230	0	6	2.0	15
Switzerland	-2.16903	0.0003	0.0035	6	6	1.0	9
United Kingdom	0.01236	0.0042	0.0076	4	6	1.0	11

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.67489	-18.508	2.400	-0.554	0.919		179

Appendix 4.2: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for LOG(GDP_GROWTH_RATE)

Null Hypothesis: Unit root (common unit root process)
Series: LNGDP_GROWTH_RATE
Date: 01/19/19 Time: 23:22
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 236
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-10.8255	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on LNGDP_GROWTH_RATE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.69766	1.2782	0.2062	0	2	13.0	15
Belgium	-0.71248	0.6509	0.1259	0	2	13.0	15
Denmark	-1.79728	0.4140	0.0992	2	2	14.0	13
Finland	-0.76572	0.9305	0.4200	0	2	4.0	15
France	-1.09474	0.7016	0.0996	0	2	14.0	15
Germany	-0.79208	0.5892	0.1329	0	2	12.0	13
Greece	-0.55707	1.3102	0.2791	0	2	14.0	15
Iceland	-0.95590	0.5888	0.1090	0	2	14.0	15
Ireland	-0.75399	1.7585	1.0145	0	2	3.0	15
Italy	-0.95112	1.0577	0.2733	0	2	8.0	15
Luxembourg	-1.09494	0.5284	0.1195	0	2	9.0	15
Netherland	-0.70985	1.0287	0.2169	0	2	12.0	15
Portugal	-1.33126	0.4307	0.1298	0	2	8.0	15
Spain	-0.95187	1.8835	0.3338	0	2	13.0	15
Switzerland	-0.59659	1.2420	0.1966	0	2	14.0	15
United Kingdom	-1.22857	0.2276	0.0387	0	2	11.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.90649	-13.648	1.037	-0.554	0.919		236

Appendix 4.3: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for LOG(TAX_REVENUE)

Null Hypothesis: Unit root (common unit root process)
Series: LNTAX_REVENUE
Date: 01/20/19 Time: 00:22
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 236
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.51655	0.0647

** Probabilities are computed assuming asympotic normality

Intermediate results on LNTAX_REVENUE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.46477	0.0003	0.0005	0	2	0.0	15
Belgium	-0.72309	0.0007	0.0013	1	2	1.0	14
Denmark	-0.40468	0.0014	0.0010	0	2	2.0	15
Finland	-0.22113	0.0009	0.0012	0	2	1.0	15
France	-0.44860	0.0006	0.0006	0	2	1.0	15
Germany	-0.27355	0.0005	0.0006	0	2	0.0	15
Greece	0.09930	0.0017	0.0021	0	2	1.0	15
Iceland	-1.07542	0.0117	0.0188	2	2	1.0	13
Ireland	-0.08279	0.0039	0.0040	0	2	0.0	15
Italy	-0.14499	0.0006	0.0004	0	2	7.0	15
Luxembourg	-0.85877	0.0004	8.E-05	0	2	14.0	15
Netherland	-0.65684	0.0005	0.0012	1	2	1.0	14
Portugal	-0.31198	0.0015	0.0008	0	2	4.0	15
Spain	-0.41973	0.0074	0.0027	0	2	7.0	15
Switzerland	-0.44995	0.0004	0.0002	0	2	2.0	15
United Kingdom	-1.04721	0.0005	0.0001	0	2	13.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.33798	-6.641	1.074	-0.554	0.919		236

Appendix 4.4: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for LOG(CORRUPTION)

Null Hypothesis: Unit root (common unit root process)
Series: LNCORRUPTION
Date: 01/20/19 Time: 00:27
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 231
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-4.08534	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on LNCORRUPTION

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.19643	0.0017	0.0023	0	2	1.0	15
Belgium	-0.54399	0.0005	0.0011	0	2	1.0	15
Denmark	-0.15999	0.0002	3.E-05	0	2	9.0	15
Finland	-0.16444	0.0002	6.E-05	2	2	14.0	13
France	-0.97527	0.0001	0.0013	2	2	1.0	13
Germany	-0.85356	0.0001	0.0005	1	2	3.0	14
Greece	-0.49040	0.0030	0.0076	1	2	1.0	14
Iceland	0.01941	0.0005	0.0006	0	2	1.0	15
Ireland	-0.79148	0.0009	0.0006	1	2	7.0	14
Italy	-0.24920	0.0030	0.0042	0	2	1.0	15
Luxembourg	-0.41008	0.0003	0.0001	2	2	9.0	13
Netherland	-0.19149	0.0004	0.0003	0	2	3.0	15
Portugal	-0.45648	0.0009	0.0007	0	2	3.0	15
Spain	-0.09494	0.0012	0.0005	0	2	3.0	15
Switzerland	-0.27959	0.0003	0.0004	0	2	2.0	15
United Kingdom	-0.18111	0.0010	0.0012	0	2	1.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.33067	-8.116	1.175	-0.554	0.919		231

Appendix 4.5: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for LOG(PRODUCTIVITY)

Null Hypothesis: Unit root (common unit root process)
Series: LNPRODUCTIVITY
Date: 01/20/19 Time: 00:30
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 235
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.08954	0.0010

** Probabilities are computed assuming asympotic normality

Intermediate results on LNPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.39440	0.0003	0.0003	0	2	2.0	15
Belgium	-0.20502	7.E-05	3.E-05	0	2	11.0	15
Denmark	-0.14023	0.0002	6.E-05	0	2	6.0	15
Finland	-0.35257	0.0004	0.0002	0	2	11.0	15
France	-0.05428	0.0002	5.E-05	0	2	6.0	15
Germany	-0.57473	0.0003	4.E-05	0	2	13.0	15
Greece	-0.36141	0.0002	0.0011	1	2	2.0	14
Iceland	-0.21069	0.0007	0.0015	0	2	2.0	15
Ireland	0.18076	0.0022	0.0035	2	2	1.0	13
Italy	-1.01381	0.0001	6.E-05	1	2	14.0	14
Luxembourg	-0.42383	0.0012	0.0015	0	2	4.0	15
Netherland	-0.08636	0.0004	4.E-05	0	2	11.0	15
Portugal	-0.05769	0.0001	6.E-05	0	2	8.0	15
Spain	-0.05204	8.E-05	0.0003	1	2	2.0	14
Switzerland	-0.19989	0.0002	0.0002	0	2	3.0	15
United Kingdom	-0.27277	0.0001	0.0002	0	2	0.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.16985	-5.905	1.071	-0.554	0.919		235

Appendix 4.6: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for LOG(DEBT_LEVEL)

Null Hypothesis: Unit root (common unit root process)
Series: LNDEBT_LEVEL
Date: 01/19/19 Time: 23:06
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 233
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.67954	0.0465

** Probabilities are computed assuming asympotic normality

Intermediate results on LNDEBT_LEVEL

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.45101	0.0021	0.0016	0	2	5.0	15
Belgium	-0.24492	0.0020	0.0012	0	2	5.0	15
Denmark	-0.39449	0.0061	0.0144	1	2	1.0	14
Finland	-0.32204	0.0047	0.0064	1	2	0.0	14
France	-0.32885	0.0017	0.0024	0	2	1.0	15
Germany	-0.50401	0.0019	0.0031	1	2	1.0	14
Greece	-0.59987	0.0084	0.0016	0	2	9.0	15
Iceland	-0.40015	0.0199	0.0816	1	2	2.0	14
Ireland	-0.40210	0.0195	0.0797	1	2	2.0	14
Italy	-0.37046	0.0020	0.0003	0	2	14.0	15
Luxembourg	-0.71763	0.0109	0.0164	0	2	0.0	15
Netherland	-0.39436	0.0046	0.0062	0	2	1.0	15
Portugal	-0.40009	0.0035	0.0044	0	2	0.0	15
Spain	-0.28707	0.0047	0.0133	1	2	1.0	14
Switzerland	-0.21812	0.0024	0.0018	0	2	4.0	15
United Kingdom	-0.47938	0.0032	0.0075	1	2	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.36957	-9.145	1.014	-0.703	1.003		233

Appendix 4.7: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for LOG(GDP_GROWTH_RATE)

Null Hypothesis: Unit root (common unit root process)
Series: LNGDP_GROWTH_RATE
Date: 01/19/19 Time: 23:24
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 233
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-9.42654	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on LNGDP_GROWTH_RATE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.81452	1.1648	0.2068	0	2	13.0	15
Belgium	-1.00059	0.5969	0.1084	1	2	14.0	14
Denmark	-1.82493	0.3693	0.1000	2	2	14.0	13
Finland	-1.05781	0.7400	0.4608	0	2	4.0	15
France	-2.47884	0.4116	0.0928	2	2	14.0	13
Germany	-0.78827	0.5850	0.1029	0	1	12.0	13
Greece	-0.67310	1.1458	0.1625	0	2	14.0	15
Iceland	-0.95643	0.5757	0.0934	0	2	14.0	15
Ireland	-0.76640	1.7502	0.7796	0	2	4.0	15
Italy	-0.96014	1.0411	0.3178	0	2	9.0	15
Luxembourg	-1.10196	0.5232	0.1188	0	2	9.0	15
Netherland	-0.73758	0.9787	0.2290	0	2	9.0	15
Portugal	-1.38690	0.3805	0.1279	0	2	8.0	15
Spain	-0.99404	1.8410	0.2262	0	2	14.0	15
Switzerland	-0.67861	1.1724	0.1930	0	2	14.0	15
United Kingdom	-1.26954	0.2165	0.0351	0	2	12.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-1.00633	-14.295	1.053	-0.703	1.003		233

Appendix 4.8: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for LOG(TAX_REVENUE)

Null Hypothesis: Unit root (common unit root process)
Series: LNTAX_REVENUE
Date: 01/20/19 Time: 00:23
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 233
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.86830	0.0021

** Probabilities are computed assuming asympotic normality

Intermediate results on LNTAX_REVENUE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.43381	0.0003	0.0003	0	2	3.0	15
Belgium	-1.01496	0.0005	0.0013	2	2	1.0	13
Denmark	-0.84638	0.0011	0.0008	0	2	2.0	15
Finland	-0.23351	0.0009	0.0010	0	2	2.0	15
France	-0.49648	0.0005	0.0007	0	2	0.0	15
Germany	-0.58291	0.0004	0.0006	0	2	0.0	15
Greece	-0.23401	0.0011	0.0001	0	2	14.0	15
Iceland	-1.03249	0.0116	0.0163	2	2	1.0	13
Ireland	-0.78096	0.0022	0.0031	1	2	2.0	14
Italy	-1.01810	0.0003	0.0001	1	2	12.0	14
Luxembourg	-1.19909	0.0003	4.E-05	0	2	14.0	15
Netherland	-0.67760	0.0005	0.0011	1	2	1.0	14
Portugal	-0.51113	0.0013	0.0004	0	2	6.0	15
Spain	-0.48303	0.0073	0.0017	0	2	9.0	15
Switzerland	-0.84124	0.0003	0.0002	0	2	2.0	15
United Kingdom	-1.04222	0.0005	8.E-05	0	2	14.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.60495	-10.285	1.059	-0.703	1.003		233

Appendix 4.9: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for LOG(CORRUPTION)

Null Hypothesis: Unit root (common unit root process)
Series: LNCORRUPTION
Date: 01/20/19 Time: 00:27
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 231
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-7.61157	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on LNCORRUPTION

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.65464	0.0010	0.0023	1	2	1.0	14
Belgium	-0.63837	0.0005	0.0009	0	2	0.0	15
Denmark	-1.53109	6.E-05	1.E-05	1	2	9.0	14
Finland	-1.11493	0.0002	4.E-05	1	2	14.0	14
France	-1.03277	8.E-05	0.0012	2	2	1.0	13
Germany	-0.88744	0.0001	0.0003	1	2	5.0	14
Greece	-0.57047	0.0028	0.0074	1	2	1.0	14
Iceland	-0.43636	0.0003	0.0005	0	2	1.0	15
Ireland	-0.76747	0.0008	0.0005	1	2	7.0	14
Italy	-0.23665	0.0030	0.0032	0	2	0.0	15
Luxembourg	-1.67549	0.0002	0.0001	1	2	9.0	14
Netherland	-0.49673	0.0003	0.0002	0	2	3.0	15
Portugal	-0.51626	0.0008	0.0009	0	2	2.0	15
Spain	-0.89114	0.0007	0.0004	0	2	4.0	15
Switzerland	-0.35139	0.0002	0.0003	0	2	1.0	15
United Kingdom	-0.31743	0.0009	0.0011	0	2	1.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.72406	-15.097	1.130	-0.703	1.003		231

Appendix 4.10: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for LOG(PRODUCTIVITY)

Null Hypothesis: Unit root (common unit root process)
Series: LNPRODUCTIVITY
Date: 01/20/19 Time: 00:31
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 231
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-4.49782	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on LNPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.47945	0.0003	0.0002	0	2	5.0	15
Belgium	-0.87627	5.E-05	1.E-05	1	2	14.0	14
Denmark	-0.94135	0.0001	4.E-05	1	2	7.0	14
Finland	-0.46168	0.0003	7.E-05	0	2	11.0	15
France	-0.61498	0.0001	3.E-05	0	2	6.0	15
Germany	-0.74171	0.0002	4.E-05	0	2	14.0	15
Greece	-0.34354	0.0002	0.0005	1	2	1.0	14
Iceland	-0.35017	0.0005	0.0011	1	2	1.0	14
Ireland	-1.60700	0.0017	0.0019	1	2	3.0	14
Italy	-1.33368	9.E-05	2.E-05	1	2	13.0	14
Luxembourg	-0.44265	0.0012	0.0015	0	2	4.0	15
Netherland	-1.21061	0.0002	4.E-05	1	2	11.0	14
Portugal	-0.51093	0.0001	2.E-05	0	2	14.0	15
Spain	-0.32394	5.E-05	0.0002	1	2	2.0	14
Switzerland	-0.35836	0.0002	2.E-05	0	2	14.0	15
United Kingdom	-0.54939	9.E-05	0.0002	1	2	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.49692	-10.317	1.069	-0.703	1.003		231

Appendix 4.11: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for LOG(DEBT_LEVEL)

Null Hypothesis: Unit root (individual unit root process)
Series: LNDEBT LEVEL
Date: 01/19/19 Time: 23:12
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 6
Total number of observations: 179
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.68758	0.0036

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-0.3636	0.8926	-1.514	0.923	0	6	15
Belgium	-9.0815	0.0001	-1.248	2.194	6	6	9
Denmark	-2.3910	0.1687	-1.248	2.194	6	6	9
Finland	0.0420	0.9487	-1.514	0.923	0	6	15
France	-0.1311	0.9288	-1.514	0.923	0	6	15
Germany	-1.5208	0.4920	-1.360	1.215	2	6	13
Greece	1.4711	0.9971	-1.171	2.080	5	6	10
Iceland	-1.6751	0.4177	-1.330	1.528	3	6	12
Ireland	-1.2071	0.6257	-1.171	2.080	5	6	10
Italy	0.4558	0.9722	-1.248	2.194	6	6	9
Luxembourg	-7.3045	0.0003	-1.248	2.194	6	6	9
Netherland	-12.793	0.0000	-1.248	2.194	6	6	9
Portugal	1.0895	0.9926	-1.248	2.194	6	6	9
Spain	0.3608	0.9733	-1.514	0.923	0	6	15
Switzerland	-2.2542	0.2027	-1.248	2.194	6	6	9
United Kingdom	0.0988	0.9492	-1.189	1.920	4	6	11
Average	-2.2002		-1.313	1.742			

Warning: for some series the expected mean and variance for the given lag and observation are not covered in IPS paper

Appendix 4.12: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for LOG(GDP_GROWTH_RATE)

Null Hypothesis: Unit root (individual unit root process)
Series: LNGDP GROWTH RATE
Date: 01/20/19 Time: 00:18
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 236
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-7.37894	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.6387	0.1074	-1.514	0.923	0	2	15
Belgium	-2.7152	0.0944	-1.514	0.923	0	2	15
Denmark	-4.0418	0.0103	-1.360	1.215	2	2	13
Finland	-2.8498	0.0750	-1.514	0.923	0	2	15
France	-4.0165	0.0090	-1.514	0.923	0	2	15
Germany	-2.8096	0.0838	-1.510	0.981	0	2	13
Greece	-1.9411	0.3066	-1.514	0.923	0	2	15
Iceland	-3.3255	0.0322	-1.514	0.923	0	2	15
Ireland	-2.8104	0.0803	-1.514	0.923	0	2	15
Italy	-3.4713	0.0247	-1.514	0.923	0	2	15
Luxembourg	-3.9720	0.0098	-1.514	0.923	0	2	15
Netherland	-2.6708	0.1018	-1.514	0.923	0	2	15
Portugal	-5.1248	0.0012	-1.514	0.923	0	2	15
Spain	-3.4527	0.0255	-1.514	0.923	0	2	15
Switzerland	-2.3511	0.1702	-1.514	0.923	0	2	15
United Kingdom	-4.5658	0.0033	-1.514	0.923	0	2	15
Average	-3.2973		-1.504	0.945			

Appendix 4.13: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for LOG(TAX_REVENUE)

Null Hypothesis: Unit root (individual unit root process)
Series: LNTAX_REVENUE
Date: 01/20/19 Time: 00:24
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 236
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.43996	0.0749

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.9320	0.0650	-1.514	0.923	0	2	15
Belgium	-2.1351	0.2353	-1.500	1.060	1	2	14
Denmark	-2.0722	0.2568	-1.514	0.923	0	2	15
Finland	-1.3838	0.5616	-1.514	0.923	0	2	15
France	-2.0116	0.2791	-1.514	0.923	0	2	15
Germany	-1.4689	0.5210	-1.514	0.923	0	2	15
Greece	0.7292	0.9883	-1.514	0.923	0	2	15
Iceland	-2.2193	0.2090	-1.360	1.215	2	2	13
Ireland	-0.3997	0.8859	-1.514	0.923	0	2	15
Italy	-0.8233	0.7828	-1.514	0.923	0	2	15
Luxembourg	-2.9369	0.0645	-1.514	0.923	0	2	15
Netherland	-2.7952	0.0840	-1.500	1.060	1	2	14
Portugal	-1.4102	0.5491	-1.514	0.923	0	2	15
Spain	-1.9695	0.2954	-1.514	0.923	0	2	15
Switzerland	-2.0010	0.2832	-1.514	0.923	0	2	15
United Kingdom	-3.8511	0.0122	-1.514	0.923	0	2	15
Average	-1.8550		-1.503	0.958			

Appendix 4.14: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for LOG(CORRUPTION)

Null Hypothesis: Unit root (individual unit root process)
Series: LNCORRUPTION
Date: 01/20/19 Time: 00:28
Sample: 2001 2016
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 231
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.79582	0.0026

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-1.1493	0.6665	-1.514	0.923	0	2	15
Belgium	-3.3011	0.0337	-1.514	0.923	0	2	15
Denmark	-0.8375	0.7785	-1.514	0.923	0	2	15
Finland	-1.0293	0.7089	-1.360	1.215	2	2	13
France	-6.3431	0.0003	-1.360	1.215	2	2	13
Germany	-7.2340	0.0000	-1.500	1.060	1	2	14
Greece	-2.6983	0.0987	-1.500	1.060	1	2	14
Iceland	0.2411	0.9657	-1.514	0.923	0	2	15
Ireland	-2.9822	0.0612	-1.500	1.060	1	2	14
Italy	-1.7591	0.3843	-1.514	0.923	0	2	15
Luxembourg	-1.3352	0.5796	-1.360	1.215	2	2	13
Netherland	-0.9674	0.7361	-1.514	0.923	0	2	15
Portugal	-1.9491	0.3034	-1.514	0.923	0	2	15
Spain	-0.6815	0.8226	-1.514	0.923	0	2	15
Switzerland	-1.7325	0.3964	-1.514	0.923	0	2	15
United Kingdom	-1.1633	0.6606	-1.514	0.923	0	2	15
Average	-2.1826		-1.482	1.003			

Appendix 4.15: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for LOG(PRODUCTIVITY)

Null Hypothesis: Unit root (individual unit root process)
Series: LNPRODUCTIVITY
Date: 01/20/19 Time: 00:33
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 4
Total number of observations: 225
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.72664	0.0421

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-4.8425	0.0038	-1.189	1.920	4	4	11
Belgium	-1.7533	0.3869	-1.514	0.923	0	4	15
Denmark	-1.3201	0.5914	-1.514	0.923	0	4	15
Finland	-2.8323	0.0789	-1.500	1.060	1	4	14
France	-0.3923	0.8873	-1.514	0.923	0	4	15
Germany	-2.3656	0.1665	-1.514	0.923	0	4	15
Greece	-2.8644	0.0747	-1.500	1.060	1	4	14
Iceland	-2.3797	0.1639	-1.500	1.060	1	4	14
Ireland	0.4970	0.9789	-1.360	1.215	2	4	13
Italy	-3.7154	0.0168	-1.500	1.060	1	4	14
Luxembourg	-2.3611	0.1708	-1.330	1.528	3	4	12
Netherland	-0.6185	0.8386	-1.514	0.923	0	4	15
Portugal	-0.8974	0.7596	-1.514	0.923	0	4	15
Spain	-0.7555	0.8004	-1.500	1.060	1	4	14
Switzerland	-1.7205	0.4018	-1.514	0.923	0	4	15
United Kingdom	-2.3745	0.1652	-1.500	1.060	1	4	14
Average	-1.9185		-1.467	1.093			

Appendix 4.16: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for LOG(DEBT_LEVEL)

Null Hypothesis: Unit root (individual unit root process)
Series: LNDEBT LEVEL
Date: 01/19/19 Time: 23:20
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 5
Total number of observations: 182
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.70830	0.0438

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-3.5316	0.0920	-1.750	3.947	5	5	10
Belgium	-1.8012	0.6495	-2.170	1.071	1	5	14
Denmark	-4.5191	0.0263	-1.750	3.947	5	5	10
Finland	-2.4578	0.3382	-1.944	1.975	3	5	12
France	-3.3425	0.1175	-1.750	3.947	5	5	10
Germany	-2.2569	0.4162	-1.750	3.947	5	5	10
Greece	2.0106	1.0000	-1.765	3.424	4	5	11
Iceland	-3.4604	0.1003	-1.750	3.947	5	5	10
Ireland	-3.2341	0.1342	-1.750	3.947	5	5	10
Italy	0.0019	0.9866	-1.750	3.947	5	5	10
Luxembourg	-2.4713	0.3346	-2.167	0.869	0	5	15
Netherland	-1.7786	0.6637	-2.167	0.869	0	5	15
Portugal	-3.9779	0.0520	-1.750	3.947	5	5	10
Spain	-5.4036	0.0088	-1.750	3.947	5	5	10
Switzerland	-1.1828	0.8763	-2.167	0.869	0	5	15
United Kingdom	-4.3769	0.0315	-1.750	3.947	5	5	10
Average	-2.6114		-1.867	3.034			

Warning: for some series the expected mean and variance for the given lag and observation are not covered in IPS paper

Appendix 4.17: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for LOG(GDP_GROWTH_RATE)

Null Hypothesis: Unit root (individual unit root process)
Series: LNGDP GROWTH RATE
Date: 01/20/19 Time: 00:20
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 233
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.00495	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.8673	0.1985	-2.167	0.869	0	2	15
Belgium	-2.5541	0.3021	-2.170	1.071	1	2	14
Denmark	-4.0886	0.0337	-1.965	1.272	2	2	13
Finland	-3.5296	0.0726	-2.167	0.869	0	2	15
France	-3.9883	0.0393	-1.965	1.272	2	2	13
Germany	-2.6724	0.2607	-2.167	0.974	0	1	13
Greece	-2.2972	0.4104	-2.167	0.869	0	2	15
Iceland	-3.2331	0.1154	-2.167	0.869	0	2	15
Ireland	-2.7038	0.2484	-2.167	0.869	0	2	15
Italy	-3.3844	0.0913	-2.167	0.869	0	2	15
Luxembourg	-3.8496	0.0432	-2.167	0.869	0	2	15
Netherland	-2.7103	0.2463	-2.167	0.869	0	2	15
Portugal	-5.3769	0.0035	-2.167	0.869	0	2	15
Spain	-3.3721	0.0931	-2.167	0.869	0	2	15
Switzerland	-2.4732	0.3338	-2.167	0.869	0	2	15
United Kingdom	-4.5650	0.0132	-2.167	0.869	0	2	15
Average	-3.3541		-2.142	0.939			

Appendix 4.18: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for LOG(TAX_REVENUE)

Null Hypothesis: Unit root (individual unit root process)
Series: LNTAX_REVENUE
Date: 01/20/19 Time: 00:26
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 233
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.47610	0.0700

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.5748	0.2941	-2.167	0.869	0	2	15
Belgium	-2.5419	0.3067	-1.965	1.272	2	2	13
Denmark	-2.8307	0.2091	-2.167	0.869	0	2	15
Finland	-1.0851	0.8969	-2.167	0.869	0	2	15
France	-2.3686	0.3780	-2.167	0.869	0	2	15
Germany	-2.0927	0.5084	-2.167	0.869	0	2	15
Greece	-1.3578	0.8302	-2.167	0.869	0	2	15
Iceland	-1.5767	0.7451	-1.965	1.272	2	2	13
Ireland	-2.5295	0.3114	-2.170	1.071	1	2	14
Italy	-3.5088	0.0777	-2.170	1.071	1	2	14
Luxembourg	-4.5098	0.0144	-2.167	0.869	0	2	15
Netherland	-2.4640	0.3370	-2.170	1.071	1	2	14
Portugal	-2.0562	0.5264	-2.167	0.869	0	2	15
Spain	-1.9241	0.5930	-2.167	0.869	0	2	15
Switzerland	-2.9543	0.1751	-2.167	0.869	0	2	15
United Kingdom	-3.6783	0.0571	-2.167	0.869	0	2	15
Average	-2.5033		-2.142	0.957			

Appendix 4.19: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for LOG(CORRUPTION)

Null Hypothesis: Unit root (individual unit root process)
Series: LNCORRUPTION
Date: 01/20/19 Time: 00:29
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 231
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.36348	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-3.0498	0.1546	-2.170	1.071	1	2	14
Belgium	-3.1675	0.1276	-2.167	0.869	0	2	15
Denmark	-3.8214	0.0477	-2.170	1.071	1	2	14
Finland	-3.9101	0.0414	-2.170	1.071	1	2	14
France	-7.6363	0.0002	-1.965	1.272	2	2	13
Germany	-6.7426	0.0005	-2.170	1.071	1	2	14
Greece	-2.8548	0.2040	-2.170	1.071	1	2	14
Iceland	-2.9110	0.1864	-2.167	0.869	0	2	15
Ireland	-2.9182	0.1865	-2.170	1.071	1	2	14
Italy	-0.9323	0.9236	-2.167	0.869	0	2	15
Luxembourg	-6.5242	0.0007	-2.170	1.071	1	2	14
Netherland	-2.0734	0.5180	-2.167	0.869	0	2	15
Portugal	-2.0618	0.5237	-2.167	0.869	0	2	15
Spain	-3.2659	0.1096	-2.167	0.869	0	2	15
Switzerland	-2.5629	0.2986	-2.167	0.869	0	2	15
United Kingdom	-1.3218	0.8407	-2.167	0.869	0	2	15
Average	-3.4846		-2.156	0.982			

Appendix 4.20: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for LOG(PRODUCTIVITY)

Null Hypothesis: Unit root (individual unit root process)
Series: LNPRODUCTIVITY
Date: 01/20/19 Time: 00:36
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 231
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.66869	0.0476

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.1562	0.4772	-2.167	0.869	0	2	15
Belgium	-2.9971	0.1667	-2.170	1.071	1	2	14
Denmark	-3.1342	0.1366	-2.170	1.071	1	2	14
Finland	-2.2100	0.4512	-2.167	0.869	0	2	15
France	-2.2781	0.4192	-2.167	0.869	0	2	15
Germany	-2.7053	0.2479	-2.167	0.869	0	2	15
Greece	-2.8208	0.2138	-2.170	1.071	1	2	14
Iceland	-2.3822	0.3711	-2.170	1.071	1	2	14
Ireland	-2.4189	0.3556	-2.170	1.071	1	2	14
Italy	-4.2991	0.0223	-2.170	1.071	1	2	14
Luxembourg	-1.9171	0.5965	-2.167	0.869	0	2	15
Netherland	-3.3182	0.1038	-2.170	1.071	1	2	14
Portugal	-1.7070	0.6970	-2.167	0.869	0	2	15
Spain	-2.5494	0.3038	-2.170	1.071	1	2	14
Switzerland	-1.4880	0.7871	-2.167	0.869	0	2	15
United Kingdom	-2.9314	0.1830	-2.170	1.071	1	2	14
Average	-2.5821		-2.169	0.982			

Appendix 4.21: E-view Result - Pooled Ordinary Least Square for Model 1

Dependent Variable: LNDEBT_LEVEL
Method: Panel Least Squares
Date: 01/20/19 Time: 00:50
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (unbalanced) observations: 255

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	16.57212	0.953254	17.38479	0.0000
LNCORRUPTION	-1.124063	0.097896	-11.48217	0.0000
LNGDP_GROWTH_RATE	-0.096922	0.021195	-4.572902	0.0000
LNPRODUCTIVITY	-0.647467	0.083996	-7.708270	0.0000
LNTAX_REVENUE	-0.017440	0.069719	-0.250147	0.8027

R-squared	0.536794	Mean dependent var	4.256839
Adjusted R-squared	0.529383	S.D. dependent var	0.513933
S.E. of regression	0.352566	Akaike info criterion	0.772254
Sum squared resid	31.07565	Schwarz criterion	0.841690
Log likelihood	-93.46235	Hannan-Quinn criter.	0.800184
F-statistic	72.42918	Durbin-Watson stat	0.228212
Prob(F-statistic)	0.000000		

Appendix 4.22: E-view Result - Fixed Effect Model for Model 1

Dependent Variable: LNDEBT_LEVEL
Method: Panel Least Squares
Date: 01/20/19 Time: 00:54
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (unbalanced) observations: 255

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14.30458	4.161035	-3.437746	0.0007
LNCORRUPTION	-1.802947	0.272301	-6.621151	0.0000
LNGDP_GROWTH_RATE	-0.067231	0.015516	-4.333065	0.0000
LNPRODUCTIVITY	2.379764	0.320277	7.430319	0.0000
LNTAX_REVENUE	-0.256628	0.231200	-1.109980	0.2681

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.799046	Mean dependent var	4.256839
Adjusted R-squared	0.782799	S.D. dependent var	0.513933
S.E. of regression	0.239517	Akaike info criterion	0.054804
Sum squared resid	13.48162	Schwarz criterion	0.332550
Log likelihood	13.01252	Hannan-Quinn criter.	0.166525
F-statistic	49.18017	Durbin-Watson stat	0.518357
Prob(F-statistic)	0.000000		

Appendix 4.23: E-view Result - Random Effect Model for Model 1

Dependent Variable: LNDEBT LEVEL
Method: Panel EGLS (Cross-section random effects)
Date: 01/20/19 Time: 00:55
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (unbalanced) observations: 255
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.335425	2.012482	4.638762	0.0000
LNCORRUPTION	-1.666267	0.177610	-9.381603	0.0000
LNGDP GROWTH RATE	-0.062658	0.015353	-4.081152	0.0001
LNPRODUCTIVITY	0.244486	0.167716	1.457740	0.1462
LNTAX REVENUE	-0.221283	0.135728	-1.630335	0.1043

Effects Specification	S.D.	Rho
Cross-section random	0.202353	0.4165
Idiosyncratic random	0.239517	0.5835

Weighted Statistics

R-squared	0.254339	Mean dependent var	1.210046
Adjusted R-squared	0.242408	S.D. dependent var	0.315031
S.E. of regression	0.274024	Sum squared resid	18.77223
F-statistic	21.31821	Durbin-Watson stat	0.285177
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.294221	Mean dependent var	4.256839
Sum squared resid	47.34941	Durbin-Watson stat	0.113062

Appendix 4.24: E-view Result - Hausman Test for Model 1

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	81.248735	4	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LNCORRUPTION	-1.802947	-1.666267	0.042603	0.5078
LNGDP GROWTH RATE	-0.067231	-0.062658	0.000005	0.0414
LNPRODUCTIVITY	2.379764	0.244486	0.074449	0.0000
LNTAX REVENUE	-0.256628	-0.221283	0.035031	0.8502

Cross-section random effects test equation:
Dependent Variable: LNDEBT LEVEL
Method: Panel Least Squares
Date: 01/20/19 Time: 00:58
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (unbalanced) observations: 255

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-14.30458	4.161035	-3.437746	0.0007
LNCORRUPTION	-1.802947	0.272301	-6.621151	0.0000
LNGDP GROWTH RATE	-0.067231	0.015516	-4.333065	0.0000
LNPRODUCTIVITY	2.379764	0.320277	7.430319	0.0000
LNTAX REVENUE	-0.256628	0.231200	-1.109980	0.2681

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.799046	Mean dependent var	4.256839
Adjusted R-squared	0.782799	S.D. dependent var	0.513933
S.E. of regression	0.239517	Akaike info criterion	0.054804
Sum squared resid	13.48162	Schwarz criterion	0.332550
Log likelihood	13.01252	Hannan-Quinn criter.	0.166525
F-statistic	49.18017	Durbin-Watson stat	0.518357
Prob(F-statistic)	0.000000		

Appendix 4.25: E-view Result - LM Test for Model 1

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	174.7608 (0.0000)	133.7375 (0.0000)	308.4982 (0.0000)
Honda	13.21971 (0.0000)	11.56449 (0.0000)	17.52508 (0.0000)
King-Wu	13.21971 (0.0000)	11.56449 (0.0000)	17.52508 (0.0000)
Standardized Honda	15.83979 (0.0000)	12.13063 (0.0000)	15.55678 (0.0000)
Standardized King-Wu	15.83979 (0.0000)	12.13063 (0.0000)	15.55678 (0.0000)
Gourieroux, et al.*	--	--	308.4982 (0.0000)

Appendix 4.26: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for DEBT_LEVEL

Null Hypothesis: Unit root (common unit root process)
Series: DEBT LEVEL
Date: 03/28/19 Time: 15:34
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 6
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 170
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-5.35229	0.0000

** Probabilities are computed assuming asymptotic normality

Intermediate results on DEBT LEVEL

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.02658	19.218	16.601	0	6	2.0	15
Belgium	-2.70274	2.5083	36.931	6	6	1.0	9
Denmark	-0.82634	0.4113	39.547	6	6	2.0	9
Finland	0.04546	16.788	26.661	0	6	2.0	15
France	0.01860	17.097	18.658	0	6	1.0	15
Germany	-0.24051	13.078	21.519	2	6	1.0	13
Greece	10.1215	12.206	66.597	6	6	14.0	9
Iceland	0.86409	0.4005	426.43	6	6	2.0	9
Ireland	0.82307	4.2766	420.43	6	6	2.0	9
Italy	-0.59377	10.202	41.110	5	6	3.0	10
Luxembourg	-0.75684	0.1499	4.0177	6	6	1.0	9
Netherland	-0.85602	0.0875	19.981	6	6	0.0	9
Portugal	2.09221	11.170	60.957	6	6	1.0	9
Spain	-0.86827	12.961	110.10	5	6	2.0	10
Switzerland	-2.13396	1.0882	11.869	6	6	1.0	9
United Kingdom	0.20444	20.815	43.358	4	6	1.0	11

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.43728	-8.199	2.930	-0.554	0.919		170

Appendix 4.27: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for GDP_GROWTH_RATE

Null Hypothesis: Unit root (common unit root process)
Series: GDP_GROWTH_RATE
Date: 03/28/19 Time: 15:49
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-4.76752	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on GDP_GROWTH_RATE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.43633	1.0791	0.7361	1	1	1.0	14
Belgium	-0.79463	1.0720	0.2117	1	1	14.0	14
Denmark	-1.20859	1.5682	0.2478	1	1	14.0	14
Finland	-0.62257	3.9233	1.7133	1	1	4.0	14
France	-0.95577	0.7913	0.1103	1	1	11.0	14
Germany	-0.72897	2.1788	0.3406	1	1	14.0	14
Greece	-0.73086	6.0805	2.0401	1	1	7.0	14
Iceland	-0.93661	6.3402	1.4634	1	1	13.0	14
Ireland	-1.96620	26.604	4.4069	1	1	14.0	14
Italy	-1.20493	1.6288	0.4687	1	1	7.0	14
Luxembourg	-1.40848	3.4941	0.9049	1	1	8.0	14
Netherland	-0.61580	0.9930	1.0272	1	1	3.0	14
Portugal	-1.36354	0.8326	0.2305	1	1	7.0	14
Spain	-0.73643	1.4888	0.3107	1	1	14.0	14
Switzerland	-0.66850	0.7582	0.3758	1	1	10.0	14
United Kingdom	-1.34882	0.7332	0.1840	1	1	7.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.86710	-9.968	1.032	-0.554	0.919	224

Appendix 4.28: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for TAX_REVENUE

Null Hypothesis: Unit root (common unit root process)
Series: TAX_REVENUE
Date: 03/28/19 Time: 15:54
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 238
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.38205	0.0835

** Probabilities are computed assuming asympotic normality

Intermediate results on TAX_REVENUE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.46926	0.1919	0.3257	0	1	0.0	15
Belgium	-0.71921	0.4513	0.8107	1	1	1.0	14
Denmark	-0.42495	1.6371	1.0843	0	1	2.0	15
Finland	-0.21153	0.3550	0.4055	0	1	0.0	15
France	-0.43684	0.2787	0.2995	0	1	1.0	15
Germany	-0.27169	0.0607	0.0707	0	1	0.0	15
Greece	0.13606	0.7568	0.8190	0	1	0.0	15
Iceland	-0.31946	16.263	15.642	0	1	1.0	15
Ireland	-0.09254	1.9361	1.9676	0	1	0.0	15
Italy	-0.13831	0.3166	0.1839	0	1	7.0	15
Luxembourg	-0.85352	0.2754	0.0507	0	1	14.0	15
Netherland	-0.65527	0.2179	0.3930	1	1	0.0	14
Portugal	-0.29617	0.6660	0.3447	0	1	4.0	15
Spain	-0.40723	1.3716	0.5835	0	1	6.0	15
Switzerland	-0.45766	0.0353	0.0185	0	1	2.0	15
United Kingdom	-1.04417	0.3138	0.0645	0	1	13.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.31538	-6.270	1.073	-0.554	0.919		238

Appendix 4.29: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for CORRUPTION

Null Hypothesis: Unit root (common unit root process)
Series: CORRUPTION
Date: 03/28/19 Time: 15:58
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.85932	0.0001

** Probabilities are computed assuming asympotic normality

Intermediate results on CORRUPTION

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.27036	9.2192	13.611	1	1	1.0	14
Belgium	-0.55004	2.5670	5.7737	1	1	1.0	14
Denmark	-0.09766	1.2555	0.2117	1	1	9.0	14
Finland	-0.21025	3.0555	0.5017	1	1	14.0	14
France	-0.72620	2.5837	6.3195	1	1	1.0	14
Germany	-0.85886	0.7258	2.5367	1	1	4.0	14
Greece	-0.50592	5.5294	12.413	1	1	1.0	14
Iceland	-0.03197	3.1744	4.7901	1	1	1.0	14
Ireland	-0.77864	5.1034	3.3068	1	1	6.0	14
Italy	-0.26099	6.7284	8.4928	1	1	1.0	14
Luxembourg	-0.67749	3.3908	0.8748	1	1	9.0	14
Netherland	-0.26232	2.6764	1.9277	1	1	3.0	14
Portugal	-0.56017	3.4139	2.8519	1	1	3.0	14
Spain	-0.08372	4.3789	1.9997	1	1	3.0	14
Switzerland	-0.34491	1.8117	3.3568	1	1	2.0	14
United Kingdom	-0.23661	5.0629	7.4904	1	1	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.32813	-7.896	1.127	-0.554	0.919		224

Appendix 4.30: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for GDP_GROWTH_RATE * PRODUCTIVITY

Null Hypothesis: Unit root (common unit root process)
Series: GDPGROWTHRATEPRODUCTIVITY
Date: 03/27/19 Time: 23:23
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-4.36978	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on GDPGROWTHRATEPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.44259	9.E+09	6.E+09	1	1	1.0	14
Belgium	-0.81597	1.E+10	2.E+09	1	1	14.0	14
Denmark	-1.21079	1.E+10	2.E+09	1	1	14.0	14
Finland	-0.60663	3.E+10	2.E+10	1	1	3.0	14
France	-0.99081	6.E+09	9.E+08	1	1	11.0	14
Germany	-0.73173	2.E+10	2.E+09	1	1	14.0	14
Greece	-0.75459	3.E+10	9.E+09	1	1	9.0	14
Iceland	-0.90836	3.E+10	2.E+10	1	1	7.0	14
Ireland	-2.64850	5.E+11	9.E+10	1	1	14.0	14
Italy	-1.20047	1.E+10	4.E+09	1	1	7.0	14
Luxembourg	-1.28576	2.E+11	4.E+10	1	1	9.0	14
Netherland	-0.61986	7.E+09	8.E+09	1	1	2.0	14
Portugal	-1.23764	3.E+09	8.E+08	1	1	7.0	14
Spain	-0.85588	9.E+09	2.E+09	1	1	13.0	14
Switzerland	-0.66942	8.E+09	3.E+09	1	1	11.0	14
United Kingdom	-1.40364	4.E+09	1.E+09	1	1	6.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.86436	-9.878	1.031	-0.554	0.919	224

Appendix 4.31: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for TAX_REVENUE * PRODUCTIVITY

Null Hypothesis: Unit root (common unit root process)
Series: TAXPRODUCTIVITY
Date: 03/27/19 Time: 23:35
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.75817	0.0394

** Probabilities are computed assuming asympotic normality

Intermediate results on TAXPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-1.12278	3.E+09	5.E+08	1	1	12.0	14
Belgium	-0.80730	5.E+09	8.E+09	1	1	0.0	14
Denmark	-0.90732	1.E+10	8.E+09	1	1	4.0	14
Finland	-0.67058	4.E+09	4.E+09	1	1	5.0	14
France	-0.52990	3.E+09	4.E+09	1	1	1.0	14
Germany	-0.92860	3.E+08	8.E+07	1	1	11.0	14
Greece	-0.59525	2.E+09	2.E+09	1	1	3.0	14
Iceland	-0.32482	1.E+11	1.E+11	1	1	1.0	14
Ireland	-0.55027	1.E+10	2.E+10	1	1	0.0	14
Italy	-0.84609	1.E+09	3.E+09	1	1	3.0	14
Luxembourg	-0.64921	4.E+10	3.E+10	1	1	2.0	14
Netherland	-0.73396	4.E+09	5.E+09	1	1	3.0	14
Portugal	-0.78854	2.E+09	6.E+08	1	1	7.0	14
Spain	-0.66060	7.E+09	1.E+09	1	1	14.0	14
Switzerland	-0.33659	5.E+08	8.E+08	1	1	0.0	14
United Kingdom	-0.89145	4.E+09	6.E+08	1	1	14.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.70000	-10.781	1.019	-0.703	1.003		224

Appendix 4.32: E-views Results - Levin, Lin & Chu Test (Individual Intercept) for CORRUPTION * PRODUCTIVITY

Null Hypothesis: Unit root (common unit root process)
Series: CORRUPTIONPRODUCTIVITY
Date: 03/28/19 Time: 03:27
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-6.21622	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on CORRUPTIONPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.37236	1.E+11	1.E+11	1	1	0.0	14
Belgium	-0.34767	4.E+10	7.E+10	1	1	2.0	14
Denmark	-0.65165	2.E+10	7.E+09	1	1	14.0	14
Finland	-0.91927	5.E+10	1.E+10	1	1	12.0	14
France	-0.59619	2.E+10	6.E+10	1	1	0.0	14
Germany	-0.70893	2.E+10	4.E+10	1	1	3.0	14
Greece	-0.53234	3.E+10	9.E+10	1	1	1.0	14
Iceland	-0.23107	2.E+10	1.E+11	1	1	2.0	14
Ireland	-0.42159	4.E+11	5.E+11	1	1	1.0	14
Italy	-0.27949	7.E+10	1.E+11	1	1	1.0	14
Luxembourg	-0.52313	6.E+11	1.E+11	1	1	14.0	14
Netherland	-0.72349	3.E+10	8.E+09	1	1	9.0	14
Portugal	-0.46597	1.E+10	7.E+09	1	1	4.0	14
Spain	-0.45822	2.E+10	1.E+10	1	1	3.0	14
Switzerland	-0.39646	1.E+10	6.E+10	1	1	2.0	14
United Kingdom	-0.37124	4.E+10	8.E+10	1	1	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.42519	-11.091	1.046	-0.554	0.919		224

Appendix 4.33: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for DEBT_LEVEL

Null Hypothesis: Unit root (common unit root process)
Series: DEBT LEVEL
Date: 03/28/19 Time: 15:42
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.03926	0.0207

** Probabilities are computed assuming asympotic normality

Intermediate results on DEBT LEVEL

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.60599	12.836	12.789	1	1	3.0	14
Belgium	-0.31774	22.622	16.369	1	1	4.0	14
Denmark	-0.37883	12.290	36.684	1	1	2.0	14
Finland	-0.27293	11.026	13.861	1	1	0.0	14
France	-0.38041	13.184	16.735	1	1	1.0	14
Germany	-0.46874	11.668	17.567	1	1	1.0	14
Greece	-0.63482	152.66	23.163	1	1	11.0	14
Iceland	-0.45522	72.338	419.36	1	1	2.0	14
Ireland	-0.45858	70.373	413.04	1	1	2.0	14
Italy	-0.42098	33.422	4.5873	1	1	14.0	14
Luxembourg	-0.63170	4.8889	3.9992	1	1	1.0	14
Netherland	-0.50160	15.188	19.941	1	1	0.0	14
Portugal	-0.43400	47.675	59.329	1	1	1.0	14
Spain	-0.25258	20.159	55.527	1	1	1.0	14
Switzerland	-0.34764	7.3519	6.0797	1	1	4.0	14
United Kingdom	-0.45548	21.469	39.686	1	1	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.38447	-9.592	1.016	-0.703	1.003	224

Appendix 4.34: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for GDP_GROWTH_RATE

Null Hypothesis: Unit root (common unit root process)
Series: GDP_GROWTH_RATE
Date: 03/28/19 Time: 15:49
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.75619	0.0001

** Probabilities are computed assuming asympotic normality

Intermediate results on GDP_GROWTH_RATE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.60814	0.9217	0.7001	1	1	1.0	14
Belgium	-1.05667	0.8847	0.1450	1	1	14.0	14
Denmark	-1.21118	1.5322	0.2421	1	1	13.0	14
Finland	-0.83467	3.2761	1.6198	1	1	4.0	14
France	-1.22896	0.6570	0.1197	1	1	10.0	14
Germany	-0.71742	2.1757	0.3150	1	1	14.0	14
Greece	-0.75008	5.7177	1.1596	1	1	10.0	14
Iceland	-1.00647	6.0715	1.7144	1	1	10.0	14
Ireland	-2.09267	26.450	4.5029	1	1	14.0	14
Italy	-1.20371	1.6288	0.4317	1	1	7.0	14
Luxembourg	-1.40630	3.4899	0.7492	1	1	8.0	14
Netherland	-0.62117	0.9660	1.0327	1	1	2.0	14
Portugal	-1.59406	0.7476	0.2386	1	1	7.0	14
Spain	-1.01794	1.4076	0.1984	1	1	12.0	14
Switzerland	-0.63569	0.6848	0.1362	1	1	14.0	14
United Kingdom	-1.59653	0.6318	0.1887	1	1	7.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.94211	-10.678	1.035	-0.703	1.003		224

Appendix 4.35: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for TAX_REVENUE

Null Hypothesis: Unit root (common unit root process)
Series: TAX_REVENUE
Date: 03/28/19 Time: 15:54
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total number of observations: 237
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-2.82755	0.0023

** Probabilities are computed assuming asympotic normality

Intermediate results on TAX_REVENUE

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.43718	0.1846	0.2441	0	1	2.0	15
Belgium	-0.70662	0.4184	0.8078	1	1	1.0	14
Denmark	-0.88235	1.2527	0.7757	0	1	3.0	15
Finland	-0.22290	0.3548	0.4071	0	1	2.0	15
France	-0.48778	0.2198	0.3230	0	1	0.0	15
Germany	-0.57956	0.0518	0.0704	0	1	0.0	15
Greece	-0.18747	0.4959	0.0450	0	1	14.0	15
Iceland	-0.13828	14.305	13.338	0	1	1.0	15
Ireland	-0.74438	1.0718	1.7801	1	1	1.0	14
Italy	-0.70114	0.1658	0.0566	0	1	12.0	15
Luxembourg	-1.19358	0.1671	0.0257	0	1	14.0	15
Netherland	-0.67196	0.2175	0.4582	1	1	1.0	14
Portugal	-0.50276	0.5565	0.1988	0	1	5.0	15
Spain	-0.47516	1.3385	0.3208	0	1	8.0	15
Switzerland	-0.84903	0.0266	0.0183	0	1	2.0	15
United Kingdom	-1.03929	0.3126	0.0533	0	1	14.0	15

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.56256	-9.921	1.053	-0.703	1.003		237

Appendix 4.36: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for CORRUPTION

Null Hypothesis: Unit root (common unit root process)
Series: CORRUPTION
Date: 03/28/19 Time: 15:59
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-6.31885	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on CORRUPTION

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.64250	5.6282	13.257	1	1	1.0	14
Belgium	-0.73793	2.0983	4.7013	1	1	0.0	14
Denmark	-1.52912	0.5046	0.1214	1	1	9.0	14
Finland	-1.09070	1.4376	0.3105	1	1	14.0	14
France	-0.66966	1.9080	5.6729	1	1	1.0	14
Germany	-0.89149	0.6983	1.7749	1	1	5.0	14
Greece	-0.58325	5.1162	9.2406	1	1	0.0	14
Iceland	-0.53872	1.8921	4.1176	1	1	1.0	14
Ireland	-0.75450	4.5320	2.7512	1	1	7.0	14
Italy	-0.35854	6.6541	6.9466	1	1	0.0	14
Luxembourg	-1.64901	1.1094	0.9000	1	1	9.0	14
Netherland	-0.55200	2.2338	1.6328	1	1	3.0	14
Portugal	-0.70901	3.0471	3.6009	1	1	2.0	14
Spain	-0.97017	2.8544	1.9287	1	1	3.0	14
Switzerland	-0.56605	0.8307	1.9752	1	1	1.0	14
United Kingdom	-0.30522	5.0272	7.2535	1	1	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*		Obs
Pooled	-0.74471	-14.367	1.079	-0.703	1.003		224

Appendix 4.37: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for GDP_GROWTH_RATE * PRODUCTIVITY

Null Hypothesis: Unit root (common unit root process)
Series: GDPGROWTHRATEPRODUCTIVITY
Date: 03/27/19 Time: 23:27
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.33285	0.0004

** Probabilities are computed assuming asympotic normality

Intermediate results on GDPGROWTHRATEPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.60264	7.E+09	6.E+09	1	1	1.0	14
Belgium	-1.05244	9.E+09	1.E+09	1	1	14.0	14
Denmark	-1.20751	1.E+10	2.E+09	1	1	14.0	14
Finland	-0.79774	2.E+10	1.E+10	1	1	4.0	14
France	-1.22629	5.E+09	9.E+08	1	1	10.0	14
Germany	-0.72170	2.E+10	2.E+09	1	1	14.0	14
Greece	-0.76982	3.E+10	4.E+09	1	1	14.0	14
Iceland	-0.94375	3.E+10	2.E+10	1	1	5.0	14
Ireland	-2.61894	5.E+11	9.E+10	1	1	14.0	14
Italy	-1.19748	1.E+10	4.E+09	1	1	7.0	14
Luxembourg	-1.28509	2.E+11	4.E+10	1	1	8.0	14
Netherland	-0.61944	7.E+09	8.E+09	1	1	2.0	14
Portugal	-1.54685	3.E+09	8.E+08	1	1	7.0	14
Spain	-1.06493	9.E+09	1.E+09	1	1	10.0	14
Switzerland	-0.63174	7.E+09	1.E+09	1	1	14.0	14
United Kingdom	-1.57308	4.E+09	1.E+09	1	1	6.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.92539	-10.478	1.033	-0.703	1.003	224

Appendix 4.38: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for TAX_REVENUE * PRODUCTIVITY

Null Hypothesis: Unit root (common unit root process)
Series: TAXPRODUCTIVITY
Date: 03/28/19 Time: 03:28
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-1.75817	0.0394

** Probabilities are computed assuming asympotic normality

Intermediate results on TAXPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-1.12278	3.E+09	5.E+08	1	1	12.0	14
Belgium	-0.80730	5.E+09	8.E+09	1	1	0.0	14
Denmark	-0.90732	1.E+10	8.E+09	1	1	4.0	14
Finland	-0.67058	4.E+09	4.E+09	1	1	5.0	14
France	-0.52990	3.E+09	4.E+09	1	1	1.0	14
Germany	-0.92860	3.E+08	8.E+07	1	1	11.0	14
Greece	-0.59525	2.E+09	2.E+09	1	1	3.0	14
Iceland	-0.32482	1.E+11	1.E+11	1	1	1.0	14
Ireland	-0.55027	1.E+10	2.E+10	1	1	0.0	14
Italy	-0.84609	1.E+09	3.E+09	1	1	3.0	14
Luxembourg	-0.64921	4.E+10	3.E+10	1	1	2.0	14
Netherland	-0.73396	4.E+09	5.E+09	1	1	3.0	14
Portugal	-0.78854	2.E+09	6.E+08	1	1	7.0	14
Spain	-0.66060	7.E+09	1.E+09	1	1	14.0	14
Switzerland	-0.33659	5.E+08	8.E+08	1	1	0.0	14
United Kingdom	-0.89145	4.E+09	6.E+08	1	1	14.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.70000	-10.781	1.019	-0.703	1.003	224

Appendix 4.39: E-views Results - Levin, Lin & Chu Test (Individual Intercept and Trend) for CORRUPTION * PRODUCTIVITY

Null Hypothesis: Unit root (common unit root process)
Series: CORRUPTIONPRODUCTIVITY
Date: 03/28/19 Time: 03:28
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-4.82990	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate results on CORRUPTIONPRODUCTIVITY

Cross section	2nd Stage Coefficient	Variance of Reg	HAC of Dep.	Lag	Max Lag	Band-width	Obs
Austria	-0.55382	8.E+10	1.E+11	1	1	0.0	14
Belgium	-0.78064	3.E+10	7.E+10	1	1	1.0	14
Denmark	-1.13913	1.E+10	3.E+09	1	1	13.0	14
Finland	-1.08999	3.E+10	1.E+10	1	1	10.0	14
France	-0.65284	1.E+10	6.E+10	1	1	0.0	14
Germany	-0.78697	2.E+10	3.E+10	1	1	5.0	14
Greece	-0.57021	3.E+10	9.E+10	1	1	1.0	14
Iceland	-0.27847	1.E+10	1.E+11	1	1	2.0	14
Ireland	-1.44477	2.E+11	4.E+11	1	1	2.0	14
Italy	-0.39634	7.E+10	8.E+10	1	1	0.0	14
Luxembourg	-0.83871	5.E+11	1.E+11	1	1	14.0	14
Netherland	-1.02000	3.E+10	6.E+09	1	1	8.0	14
Portugal	-0.86682	9.E+09	7.E+09	1	1	4.0	14
Spain	-0.78155	2.E+10	1.E+10	1	1	3.0	14
Switzerland	-0.35481	1.E+10	3.E+10	1	1	1.0	14
United Kingdom	-0.43982	4.E+10	8.E+10	1	1	1.0	14

	Coefficient	t-Stat	SE Reg	mu*	sig*	Obs
Pooled	-0.53139	-12.001	1.096	-0.703	1.003	224

Appendix 4.40: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for DEBT_LEVEL

Null Hypothesis: Unit root (individual unit root process)
Series: DEBT LEVEL
Date: 03/28/19 Time: 15:44
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 6
Total number of observations: 170
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	1.16592	0.8782

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-0.2519	0.9114	-1.514	0.923	0	6	15
Belgium	-2.3236	0.1846	-1.248	2.194	6	6	9
Denmark	-1.8057	0.3549	-1.248	2.194	6	6	9
Finland	0.4339	0.9772	-1.514	0.923	0	6	15
France	0.2706	0.9677	-1.514	0.923	0	6	15
Germany	-1.6094	0.4501	-1.360	1.215	2	6	13
Greece	2.5647	0.9996	-1.248	2.194	6	6	9
Iceland	5.6113	1.0000	-1.248	2.194	6	6	9
Ireland	1.5770	0.9973	-1.248	2.194	6	6	9
Italy	-0.6726	0.8100	-1.171	2.080	5	6	10
Luxembourg	-5.0072	0.0047	-1.248	2.194	6	6	9
Netherland	-11.127	0.0000	-1.248	2.194	6	6	9
Portugal	1.2184	0.9944	-1.248	2.194	6	6	9
Spain	-2.2094	0.2142	-1.171	2.080	5	6	10
Switzerland	-2.2432	0.2057	-1.248	2.194	6	6	9
United Kingdom	1.2713	0.9959	-1.189	1.920	4	6	11
Average	-0.8939		-1.292	1.863			

Warning: for some series the expected mean and variance for the given lag and observation are not covered in IPS paper

Appendix 4.41: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for GDP_GROWTH_RATE

Null Hypothesis: Unit root (individual unit root process)
Series: GDP_GROWTH_RATE
Date: 03/28/19 Time: 15:50
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.35720	0.0004

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-1.2953	0.6006	-1.500	1.060	1	1	14
Belgium	-2.0117	0.2789	-1.500	1.060	1	1	14
Denmark	-3.0920	0.0506	-1.500	1.060	1	1	14
Finland	-1.5257	0.4918	-1.500	1.060	1	1	14
France	-2.1833	0.2195	-1.500	1.060	1	1	14
Germany	-2.1842	0.2193	-1.500	1.060	1	1	14
Greece	-2.0276	0.2730	-1.500	1.060	1	1	14
Iceland	-2.2772	0.1913	-1.500	1.060	1	1	14
Ireland	-2.7420	0.0918	-1.500	1.060	1	1	14
Italy	-2.8995	0.0704	-1.500	1.060	1	1	14
Luxembourg	-3.2936	0.0356	-1.500	1.060	1	1	14
Netherland	-1.9626	0.2976	-1.500	1.060	1	1	14
Portugal	-2.9800	0.0614	-1.500	1.060	1	1	14
Spain	-1.8834	0.3295	-1.500	1.060	1	1	14
Switzerland	-2.6729	0.1029	-1.500	1.060	1	1	14
United Kingdom	-2.7934	0.0842	-1.500	1.060	1	1	14
Average	-2.3640		-1.500	1.060			

Appendix 4.42: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for TAX_REVENUE

Null Hypothesis: Unit root (individual unit root process)
Series: TAX_REVENUE
Date: 03/28/19 Time: 15:56
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 236
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.35965	0.0870

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-3.0115	0.0566	-1.514	0.923	0	2	15
Belgium	-2.1723	0.2231	-1.500	1.060	1	2	14
Denmark	-2.1125	0.2427	-1.514	0.923	0	2	15
Finland	-1.3595	0.5730	-1.514	0.923	0	2	15
France	-1.9842	0.2896	-1.514	0.923	0	2	15
Germany	-1.4662	0.5223	-1.514	0.923	0	2	15
Greece	1.0333	0.9944	-1.514	0.923	0	2	15
Iceland	-2.1893	0.2181	-1.360	1.215	2	2	13
Ireland	-0.4603	0.8741	-1.514	0.923	0	2	15
Italy	-0.7929	0.7919	-1.514	0.923	0	2	15
Luxembourg	-2.9184	0.0666	-1.514	0.923	0	2	15
Netherland	-2.7716	0.0874	-1.500	1.060	1	2	14
Portugal	-1.3608	0.5724	-1.514	0.923	0	2	15
Spain	-1.9410	0.3066	-1.514	0.923	0	2	15
Switzerland	-2.0192	0.2763	-1.514	0.923	0	2	15
United Kingdom	-3.8396	0.0125	-1.514	0.923	0	2	15
Average	-1.8354		-1.503	0.958			

Appendix 4.43: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for CORRUPTION

Null Hypothesis: Unit root (individual unit root process)
Series: CORRUPTION
Date: 03/28/19 Time: 15:59
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.34304	0.0096

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-1.4962	0.5059	-1.500	1.060	1	1	14
Belgium	-2.2491	0.1995	-1.500	1.060	1	1	14
Denmark	-0.4365	0.8771	-1.500	1.060	1	1	14
Finland	-1.2617	0.6157	-1.500	1.060	1	1	14
France	-3.7772	0.0150	-1.500	1.060	1	1	14
Germany	-6.9843	0.0001	-1.500	1.060	1	1	14
Greece	-2.5960	0.1167	-1.500	1.060	1	1	14
Iceland	-0.3794	0.8881	-1.500	1.060	1	1	14
Ireland	-2.9800	0.0614	-1.500	1.060	1	1	14
Italy	-1.5282	0.4906	-1.500	1.060	1	1	14
Luxembourg	-2.8546	0.0760	-1.500	1.060	1	1	14
Netherland	-1.1782	0.6520	-1.500	1.060	1	1	14
Portugal	-1.9711	0.2944	-1.500	1.060	1	1	14
Spain	-0.5475	0.8534	-1.500	1.060	1	1	14
Switzerland	-1.8435	0.3464	-1.500	1.060	1	1	14
United Kingdom	-1.5647	0.4732	-1.500	1.060	1	1	14
Average	-2.1030		-1.500	1.060			

Appendix 4.44: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for GDP_GROWTH_RATE * PRODUCTIVITY

Null Hypothesis: Unit root (individual unit root process)
Series: GDPGROWTHRATEPRODUCTIVITY
Date: 03/27/19 Time: 23:26
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.30036	0.0005

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-1.3237	0.5875	-1.500	1.060	1	1	14
Belgium	-2.0645	0.2596	-1.500	1.060	1	1	14
Denmark	-3.1232	0.0479	-1.500	1.060	1	1	14
Finland	-1.5099	0.4994	-1.500	1.060	1	1	14
France	-2.2555	0.1976	-1.500	1.060	1	1	14
Germany	-2.2083	0.2117	-1.500	1.060	1	1	14
Greece	-2.0260	0.2736	-1.500	1.060	1	1	14
Iceland	-2.1960	0.2156	-1.500	1.060	1	1	14
Ireland	-2.6149	0.1132	-1.500	1.060	1	1	14
Italy	-2.8916	0.0714	-1.500	1.060	1	1	14
Luxembourg	-3.0182	0.0575	-1.500	1.060	1	1	14
Netherland	-1.9928	0.2861	-1.500	1.060	1	1	14
Portugal	-2.7712	0.0874	-1.500	1.060	1	1	14
Spain	-2.0237	0.2744	-1.500	1.060	1	1	14
Switzerland	-2.6828	0.1013	-1.500	1.060	1	1	14
United Kingdom	-2.8881	0.0718	-1.500	1.060	1	1	14
Average	-2.3494		-1.500	1.060			

Appendix 4.45: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for TAX_REVENUE * PRODUCTIVITY

Null Hypothesis: Unit root (individual unit root process)
Series: TAXPRODUCTIVITY
Date: 03/27/19 Time: 23:37
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 6
Total number of observations: 173
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-6.10778	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.8763	0.0717	-1.514	0.923	0	6	15
Belgium	-3.3553	0.0335	-1.360	1.215	2	6	13
Denmark	-11.812	0.0000	-1.248	2.194	6	6	9
Finland	-2.3746	0.1652	-1.500	1.060	1	6	14
France	-0.7863	0.7938	-1.514	0.923	0	6	15
Germany	-1.4843	0.4951	-1.248	2.194	6	6	9
Greece	1.3687	0.9964	-1.171	2.080	5	6	10
Iceland	-3.0595	0.0665	-1.248	2.194	6	6	9
Ireland	-2.6352	0.1212	-1.248	2.194	6	6	9
Italy	-0.6908	0.7999	-1.248	2.194	6	6	9
Luxembourg	-2.3601	0.1758	-1.248	2.194	6	6	9
Netherland	-0.6194	0.8383	-1.514	0.923	0	6	15
Portugal	1.6407	0.9977	-1.248	2.194	6	6	9
Spain	-1.6205	0.4372	-1.171	2.080	5	6	10
Switzerland	-7.3289	0.0003	-1.248	2.194	6	6	9
United Kingdom	-15.847	0.0000	-1.248	2.194	6	6	9
Average	-3.3650		-1.311	1.809			

Warning: for some series the expected mean and variance for the given lag and observation are not covered in IPS paper

Appendix 4.46: E-views Results - Im-Pesaran-Shin Test (Individual Intercept) for CORRUPTION * PRODUCTIVITY

Null Hypothesis: Unit root (individual unit root process)
Series: CORRUPTIONPRODUCTIVITY
Date: 03/27/19 Time: 23:40
Sample: 2001 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-4.20154	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-1.8871	0.3280	-1.500	1.060	1	1	14
Belgium	-1.6206	0.4467	-1.500	1.060	1	1	14
Denmark	-3.0455	0.0548	-1.500	1.060	1	1	14
Finland	-3.0589	0.0536	-1.500	1.060	1	1	14
France	-4.9024	0.0021	-1.500	1.060	1	1	14
Germany	-4.1113	0.0083	-1.500	1.060	1	1	14
Greece	-3.0265	0.0567	-1.500	1.060	1	1	14
Iceland	-2.8157	0.0811	-1.500	1.060	1	1	14
Ireland	-1.2487	0.6215	-1.500	1.060	1	1	14
Italy	-1.6391	0.4381	-1.500	1.060	1	1	14
Luxembourg	-1.9934	0.2858	-1.500	1.060	1	1	14
Netherland	-2.4061	0.1574	-1.500	1.060	1	1	14
Portugal	-2.0579	0.2619	-1.500	1.060	1	1	14
Spain	-1.7653	0.3803	-1.500	1.060	1	1	14
Switzerland	-3.8575	0.0130	-1.500	1.060	1	1	14
United Kingdom	-1.8654	0.3371	-1.500	1.060	1	1	14
Average	-2.5813		-1.500	1.060			

Appendix 4.47: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for DEBT_LEVEL

Null Hypothesis: Unit root (individual unit root process)
Series: DEBT LEVEL
Date: 03/28/19 Time: 15:45
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 5
Total number of observations: 186
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.02022	0.0217

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-3.6744	0.0769	-1.750	3.947	5	5	10
Belgium	-1.7510	0.6730	-2.170	1.071	1	5	14
Denmark	-4.9518	0.0153	-1.750	3.947	5	5	10
Finland	-1.7193	0.6877	-2.170	1.071	1	5	14
France	-3.4510	0.1015	-1.750	3.947	5	5	10
Germany	-3.8160	0.0639	-1.750	3.947	5	5	10
Greece	2.3228	1.0000	-1.765	3.424	4	5	11
Iceland	-4.7828	0.0187	-1.750	3.947	5	5	10
Ireland	-5.3050	0.0099	-1.750	3.947	5	5	10
Italy	0.7900	0.9982	-1.750	3.947	5	5	10
Luxembourg	-2.4949	0.3252	-2.167	0.869	0	5	15
Netherland	-1.7148	0.6934	-2.167	0.869	0	5	15
Portugal	-3.6836	0.0760	-1.750	3.947	5	5	10
Spain	-5.4720	0.0081	-1.750	3.947	5	5	10
Switzerland	-1.1892	0.8748	-2.167	0.869	0	5	15
United Kingdom	-3.0588	0.1587	-1.944	1.975	3	5	12
Average	-2.7470		-1.894	2.854			

Warning: for some series the expected mean and variance for the given lag and observation are not covered in IPS paper

Appendix 4.48: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for GDP_GROWTH_RATE

Null Hypothesis: Unit root (individual unit root process)
Series: GDP_GROWTH_RATE
Date: 03/28/19 Time: 15:51
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 238
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.03985	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.9614	0.1733	-2.167	0.869	0	2	15
Belgium	-3.6475	0.0601	-2.167	0.869	0	2	15
Denmark	-3.3651	0.0941	-2.167	0.869	0	2	15
Finland	-3.7191	0.0535	-2.167	0.869	0	2	15
France	-4.0392	0.0316	-2.167	0.869	0	2	15
Germany	-2.5736	0.2945	-2.167	0.869	0	2	15
Greece	-2.1378	0.4861	-2.167	0.869	0	2	15
Iceland	-3.1774	0.1257	-2.167	0.869	0	2	15
Ireland	-3.1611	0.1343	-1.965	1.272	2	2	13
Italy	-3.5212	0.0736	-2.167	0.869	0	2	15
Luxembourg	-3.8149	0.0457	-2.167	0.869	0	2	15
Netherland	-2.4595	0.3395	-2.167	0.869	0	2	15
Portugal	-4.8690	0.0079	-2.167	0.869	0	2	15
Spain	-3.2605	0.1106	-2.167	0.869	0	2	15
Switzerland	-1.8569	0.6263	-2.167	0.869	0	2	15
United Kingdom	-4.9692	0.0067	-2.167	0.869	0	2	15
Average	-3.3458		-2.154	0.894			

Appendix 4.49: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for TAX_REVENUE

Null Hypothesis: Unit root (individual unit root process)
Series: TAX_REVENUE
Date: 03/28/19 Time: 15:57
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 232
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.57991	0.0571

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.6363	0.2715	-2.167	0.869	0	2	15
Belgium	-2.5190	0.3153	-1.965	1.272	2	2	13
Denmark	-2.9354	0.1800	-2.167	0.869	0	2	15
Finland	-1.0446	0.9047	-2.167	0.869	0	2	15
France	-2.3743	0.3756	-2.167	0.869	0	2	15
Germany	-2.0725	0.5184	-2.167	0.869	0	2	15
Greece	-1.1029	0.8933	-2.167	0.869	0	2	15
Iceland	-1.4974	0.7760	-1.965	1.272	2	2	13
Ireland	-3.1428	0.1378	-1.965	1.272	2	2	13
Italy	-3.4745	0.0819	-2.170	1.071	1	2	14
Luxembourg	-4.4772	0.0152	-2.167	0.869	0	2	15
Netherland	-2.4301	0.3510	-2.170	1.071	1	2	14
Portugal	-2.0366	0.5363	-2.167	0.869	0	2	15
Spain	-1.9069	0.6016	-2.167	0.869	0	2	15
Switzerland	-2.9780	0.1692	-2.167	0.869	0	2	15
United Kingdom	-3.6669	0.0582	-2.167	0.869	0	2	15
Average	-2.5184		-2.129	0.970			

Appendix 4.50: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for CORRUPTION

Null Hypothesis: Unit root (individual unit root process)
Series: CORRUPTION
Date: 03/28/19 Time: 16:00
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.90420	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-3.0759	0.1488	-2.170	1.071	1	1	14
Belgium	-2.7975	0.2206	-2.170	1.071	1	1	14
Denmark	-3.8246	0.0474	-2.170	1.071	1	1	14
Finland	-3.7801	0.0509	-2.170	1.071	1	1	14
France	-3.8078	0.0487	-2.170	1.071	1	1	14
Germany	-6.5173	0.0007	-2.170	1.071	1	1	14
Greece	-2.7176	0.2451	-2.170	1.071	1	1	14
Iceland	-2.6117	0.2808	-2.170	1.071	1	1	14
Ireland	-2.9116	0.1882	-2.170	1.071	1	1	14
Italy	-1.0488	0.9011	-2.170	1.071	1	1	14
Luxembourg	-6.4103	0.0009	-2.170	1.071	1	1	14
Netherland	-1.8623	0.6202	-2.170	1.071	1	1	14
Portugal	-2.2683	0.4218	-2.170	1.071	1	1	14
Spain	-2.3963	0.3651	-2.170	1.071	1	1	14
Switzerland	-3.8342	0.0468	-2.170	1.071	1	1	14
United Kingdom	-1.0108	0.9081	-2.170	1.071	1	1	14
Average	-3.1797		-2.170	1.071			

Appendix 4.51: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for GDP_GROWTH_RATE * PRODUCTIVITY

Null Hypothesis: Unit root (individual unit root process)
Series: GDPGROWTHRATEPRODUCTIVITY
Date: 03/27/19 Time: 23:29
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 238
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-4.87043	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.9050	0.1880	-2.167	0.869	0	2	15
Belgium	-3.6090	0.0638	-2.167	0.869	0	2	15
Denmark	-3.3436	0.0972	-2.167	0.869	0	2	15
Finland	-3.6440	0.0604	-2.167	0.869	0	2	15
France	-4.0230	0.0324	-2.167	0.869	0	2	15
Germany	-2.5595	0.2999	-2.167	0.869	0	2	15
Greece	-2.2062	0.4530	-2.167	0.869	0	2	15
Iceland	-3.1279	0.1354	-2.167	0.869	0	2	15
Ireland	-3.0316	0.1614	-1.965	1.272	2	2	13
Italy	-3.5239	0.0732	-2.167	0.869	0	2	15
Luxembourg	-3.6800	0.0570	-2.167	0.869	0	2	15
Netherland	-2.3999	0.3646	-2.167	0.869	0	2	15
Portugal	-4.7250	0.0101	-2.167	0.869	0	2	15
Spain	-3.3200	0.1008	-2.167	0.869	0	2	15
Switzerland	-1.8491	0.6302	-2.167	0.869	0	2	15
United Kingdom	-4.9447	0.0070	-2.167	0.869	0	2	15
Average	-3.3058		-2.154	0.894			

Appendix 4.52: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for TAX_REVENUE * PRODUCTIVITY

Null Hypothesis: Unit root (individual unit root process)
Series: TAXPRODUCTIVITY
Date: 03/27/19 Time: 23:39
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified maximum lags
Automatic lag length selection based on SIC: 0 to 2
Total number of observations: 230
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.31334	0.0945

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-3.3449	0.0970	-2.167	0.869	0	2	15
Belgium	-2.9305	0.1857	-1.965	1.272	2	2	13
Denmark	-2.5158	0.3168	-2.167	0.869	0	2	15
Finland	-1.9808	0.5644	-2.167	0.869	0	2	15
France	-2.1604	0.4751	-2.167	0.869	0	2	15
Germany	-3.2293	0.1188	-2.170	1.071	1	2	14
Greece	-2.3857	0.3697	-2.170	1.071	1	2	14
Iceland	-1.9764	0.5597	-1.965	1.272	2	2	13
Ireland	-2.5101	0.3189	-2.170	1.071	1	2	14
Italy	-4.1457	0.0285	-2.170	1.071	1	2	14
Luxembourg	-2.0005	0.5546	-2.167	0.869	0	2	15
Netherland	-2.2277	0.4406	-2.170	1.071	1	2	14
Portugal	-2.4154	0.3581	-2.167	0.869	0	2	15
Spain	-2.0009	0.5544	-2.167	0.869	0	2	15
Switzerland	-1.1712	0.8759	-2.170	1.071	1	2	14
United Kingdom	-2.5299	0.3113	-2.167	0.869	0	2	15
Average	-2.4703		-2.143	0.995			

Appendix 4.53: E-views Results - Im-Pesaran-Shin Test (Individual Intercept and Trend) for CORRUPTION * PRODUCTIVITY

Null Hypothesis: Unit root (individual unit root process)
Series: CORRUPTIONPRODUCTIVITY
Date: 03/27/19 Time: 23:41
Sample: 2001 2016
Exogenous variables: Individual effects, individual linear trends
User-specified lags: 1
Total (balanced) observations: 224
Cross-sections included: 16

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-3.24697	0.0006

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Cross section	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
Austria	-2.7573	0.2326	-2.170	1.071	1	1	14
Belgium	-2.8961	0.1923	-2.170	1.071	1	1	14
Denmark	-3.7205	0.0560	-2.170	1.071	1	1	14
Finland	-3.8532	0.0454	-2.170	1.071	1	1	14
France	-4.3487	0.0206	-2.170	1.071	1	1	14
Germany	-3.9886	0.0366	-2.170	1.071	1	1	14
Greece	-3.1756	0.1286	-2.170	1.071	1	1	14
Iceland	-3.1103	0.1415	-2.170	1.071	1	1	14
Ireland	-3.8210	0.0477	-2.170	1.071	1	1	14
Italy	-1.1877	0.8720	-2.170	1.071	1	1	14
Luxembourg	-2.4897	0.3269	-2.170	1.071	1	1	14
Netherland	-2.9448	0.1795	-2.170	1.071	1	1	14
Portugal	-2.8011	0.2195	-2.170	1.071	1	1	14
Spain	-2.0729	0.5154	-2.170	1.071	1	1	14
Switzerland	-3.2538	0.1144	-2.170	1.071	1	1	14
United Kingdom	-1.7339	0.6809	-2.170	1.071	1	1	14
Average	-3.0097		-2.170	1.071			

Appendix 4.54: E-views Results - Pooled Ordinary Least Square for Model 2

Dependent Variable: DEBT LEVEL
Method: Panel Least Squares
Date: 03/27/19 Time: 23:06
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (balanced) observations: 256

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	189.7096	8.886795	21.34735	0.0000
GDP GROWTH RATE	-7.649294	1.896895	-4.032534	0.0001
CORRUPTION PERCEPTIONS INDEX	-2.532231	0.443571	-5.708737	0.0000
TAX REVENUE	5.622157	1.562099	3.599105	0.0004
GDPGROWTHRATEPRODUCTIVITY	4.74E-05	1.62E-05	2.917354	0.0039
CORRUPTIONPRODUCTIVITY	1.09E-05	5.07E-06	2.150932	0.0324
TAXPRODUCTIVITY	-5.47E-05	1.69E-05	-3.236199	0.0014

R-squared	0.631723	Mean dependent var	79.28730
Adjusted R-squared	0.622849	S.D. dependent var	35.91943
S.E. of regression	22.05906	Akaike info criterion	9.052287
Sum squared resid	121163.9	Schwarz criterion	9.149225
Log likelihood	-1151.693	Hannan-Quinn criter.	9.091275
F-statistic	71.18704	Durbin-Watson stat	0.273617
Prob(F-statistic)	0.000000		

Appendix 4.55: E-views Results – Fixed Effect Model for Model 2

Dependent Variable: DEBT LEVEL
Method: Panel Least Squares
Date: 03/27/19 Time: 23:08
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (balanced) observations: 256

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	236.1568	30.41379	7.764793	0.0000
GDP GROWTH RATE	-5.840766	1.777602	-3.285755	0.0012
CORRUPTION PERCEPTIONS INDEX	-4.376234	0.713160	-6.136400	0.0000
TAX REVENUE	3.787779	2.492185	1.519862	0.1299
GDPGROWTHRATEPRODUCTIVITY	2.63E-05	1.52E-05	1.735784	0.0839
CORRUPTIONPRODUCTIVITY	2.45E-05	7.39E-06	3.307632	0.0011
TAXPRODUCTIVITY	-3.68E-05	2.91E-05	-1.264763	0.2072

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.758379	Mean dependent var	79.28730
Adjusted R-squared	0.736695	S.D. dependent var	35.91943
S.E. of regression	18.43142	Akaike info criterion	8.748009
Sum squared resid	79493.84	Schwarz criterion	9.052673
Log likelihood	-1097.745	Hannan-Quinn criter.	8.870544
F-statistic	34.97427	Durbin-Watson stat	0.504896
Prob(F-statistic)	0.000000		

Appendix 4.56: E-views Results – Random Effect Model for Model 2

Dependent Variable: DEBT LEVEL
Method: Panel EGLS (Cross-section random effects)
Date: 03/27/19 Time: 23:08
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (balanced) observations: 256
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	214.8716	16.63659	12.91561	0.0000
GDP GROWTH RATE	-7.584188	1.717251	-4.416470	0.0000
CORRUPTION PERCEPTIONS INDEX	-3.789224	0.576316	-6.574907	0.0000
TAX REVENUE	8.006330	1.980097	4.043403	0.0001
GDPGROWTHRATEPRODUCTIVITY	4.71E-05	1.44E-05	3.272905	0.0012
CORRUPTIONPRODUCTIVITY	2.19E-05	6.44E-06	3.404604	0.0008
TAXPRODUCTIVITY	-8.44E-05	2.17E-05	-3.896708	0.0001

Effects Specification		
	S.D.	Rho
Cross-section random	11.90342	0.2943
Idiosyncratic random	18.43142	0.7057

Weighted Statistics			
R-squared	0.366601	Mean dependent var	28.62268
Adjusted R-squared	0.351339	S.D. dependent var	24.10011
S.E. of regression	19.41011	Sum squared resid	93811.30
F-statistic	24.01957	Durbin-Watson stat	0.381756
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.587724	Mean dependent var	79.28730
Sum squared resid	135639.7	Durbin-Watson stat	0.264031

Appendix 4.57: E-views Results – Hausman Test for Model 2

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	33.145234	6	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
GDP GROWTH RATE	-5.840766	-7.584188	0.210919	0.0001
CORRUPTION PERCEPTIONS INDEX	-4.376234	-3.789224	0.176457	0.1623
TAX REVENUE	3.787779	8.006330	2.290204	0.0053
GDPGROWTHRATEPRODUCTIVITY	0.000026	0.000047	0.000000	0.0000
CORRUPTIONPRODUCTIVITY	0.000024	0.000022	0.000000	0.4845
TAXPRODUCTIVITY	-0.000037	-0.000084	0.000000	0.0145

Cross-section random effects test equation:
Dependent Variable: DEBT LEVEL
Method: Panel Least Squares
Date: 03/27/19 Time: 23:08
Sample: 2001 2016
Periods included: 16
Cross-sections included: 16
Total panel (balanced) observations: 256

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	236.1568	30.41379	7.764793	0.0000
GDP GROWTH RATE	-5.840766	1.777602	-3.285755	0.0012
CORRUPTION PERCEPTIONS INDEX	-4.376234	0.713160	-6.136400	0.0000
TAX REVENUE	3.787779	2.492185	1.519862	0.1299
GDPGROWTHRATEPRODUCTIVITY	2.63E-05	1.52E-05	1.735784	0.0839
CORRUPTIONPRODUCTIVITY	2.45E-05	7.39E-06	3.307632	0.0011
TAXPRODUCTIVITY	-3.68E-05	2.91E-05	-1.264763	0.2072

Effects Specification

Cross-section fixed (dummy variables)

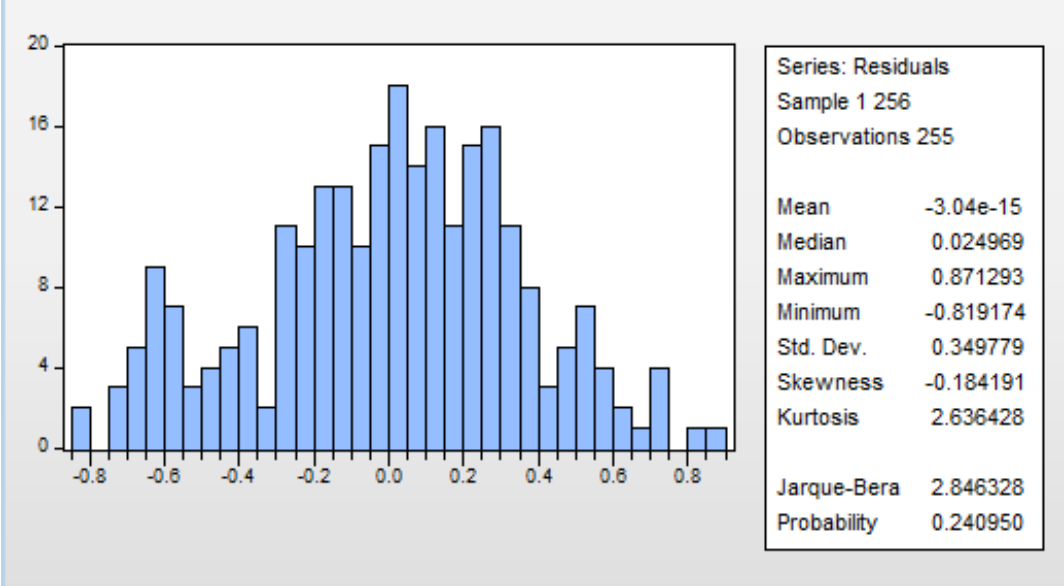
R-squared	0.758379	Mean dependent var	79.28730
Adjusted R-squared	0.736695	S.D. dependent var	35.91943
S.E. of regression	18.43142	Akaike info criterion	8.748009
Sum squared resid	79493.84	Schwarz criterion	9.052673
Log likelihood	-1097.745	Hannan-Quinn criter.	8.870544
F-statistic	34.97427	Durbin-Watson stat	0.504896
Prob(F-statistic)	0.000000		

Appendix 4.58: E-views Results – LM Test for Model 2

Lagrange Multiplier Tests for Random Effects
Null hypotheses: No effects
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided (all others) alternatives

	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	60.27991 (0.0000)	218.2366 (0.0000)	278.5165 (0.0000)
Honda	7.764014 (0.0000)	14.77283 (0.0000)	15.93596 (0.0000)
King-Wu	7.764014 (0.0000)	14.77283 (0.0000)	15.93596 (0.0000)
Standardized Honda	10.24826 (0.0000)	15.32778 (0.0000)	14.09443 (0.0000)
Standardized King-Wu	10.24826 (0.0000)	15.32778 (0.0000)	14.09443 (0.0000)
Gourieroux, et al.*	--	--	278.5165 (0.0000)

Appendix 4.59: E-views Results – Jarque Bera for Model 1



Appendix 4.60: E-views Results – Jarque Bera for Model 2