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The Buoyancy of Major Direct Tax Categories: Evidence from Malaysia

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Abstract: This study is about the different direct tax form impacts on the growth path of a country's national income. Tax authorities are investing time to find the stability factors promoting buoyancy to ensure fiscal revenue remains stable and grows proportionally with economic growth to ensure public expenditure targets are achieved. This paper investigates the responsiveness of different tax forms to the buoyancy of tax revenue while studying the factors associated with GDP growth using data from a mid-income economy, Malaysia over period 1975-2015. This paper aims to determine the tax buoyancy contribution of major direct tax components in the short-run as well as the long run. The overall direct tax buoyancy is found to be lower than 1, which implies the increase in direct tax revenue is lower than the amount from the average growth in the nominal GDP. We apply the Fully-Modified and Dynamic OLS models to estimate the buoyancy coefficients of major direct tax categories. Findings from this study is useful as new knowledge especially for the tax administrator as well as the government to have information on the potential stream of revenues while the tax forms are held steady over the measurement period in order to meet the needs of the development goals of a the tested economy, Malaysia.

Keywords: Tax Buoyancy, Corporate taxes, Personal taxes, Petroleum taxes, Stamp Duty.

JEL Classification: D60, H23.

1. INTRODUCTION

The concepts of tax buoyancy and tax efficiency are applied measures of the responsiveness of tax revenue to economic growth. Tax buoyancy is a crude measure which does not distinguish between discretionary and automatic growth in tax revenue. In this study, the buoyancies of the major tax forms in a representative

developing economy, Malaysia, are estimated using alternative estimation techniques to provide comparison between tax categories. In general, tax receipts in Malaysia tend to be slightly buoyant while particular taxes such as the corporate and personal taxes are higher in buoyancy. The results of the study have important policy and research implications, and in our view, our findings are relevant for those middle-income economies around the world.

Malaysia is one of the emerging market economies in the ASEAN region, currently it has been exposed to the global financial risk such as drop in world oil prices. Malaysia is chosen as sample country for this research due to rapid changes in its economic structure and the modest achievements in economic growth.

Malaysian government in the 2017 budget announced its aim is to strengthen the economic growth through fiscal reform and governance. Based on the Economic Report 2016/2017, the Government will leverage existing resources and continue to undertake fiscal reforms to overcome the current economic challenges, one being the lower crude oil prices: crude oil is produced in this country. Fiscal deficit is targeted to reduce further from 3.2% of gross domestic product (GDP) in 2015 to 3.1% in 2016. The revenue in 2016 is expected to decline 3% (2015, it was -0.7%) to RM212.6 billion due mainly to the lower collection of petroleum-related revenue by 34.4% following lower crude oil prices. However, this is expected to be cushioned by better collection of GST and additional revenue from measures announced during the budget recalibration. Thus, total revenue as a percentage to GDP is estimated to be 17.2% in 2017 (2015: 18.9%).

1.1. Malaysia Tax System

Britain ruled this country from 1786 till 1957, so Britain played an important role in implementing the Western style tax regime to the country starting from 1921 to the last day of colonial rule in 1957. Prior to year 1976, the Inland Revenue Department administered the tax law. With effect from March 1996, the department was separated from government as a statutory authority, Inland Revenue Board of Malaysia (IRBM). The pre-existing Income tax laws were enacted into a new act of Parliament, renamed the Income Tax Act 1967. As at 2016, IRBM is responsible for the tax revenue collection.

Besides tax collection, IRBM is given the additional task of collecting other forms of tax under the Petroleum (Income Tax) Act 1967, Real Property Gains Tax Act 1976, Promotion of Investments Act 1986, Stamp Act 1949 and Labuan Business Activity Tax Act 1990. Apart from these forms of income taxes, there are other indirect taxes such as sales tax, service tax, excise duty, imports duty, export duty and since 2015 the GST. These have now come under the Goods and Services Act implemented from April 2015. The indirect taxes are under the authority of the Royal Malaysian Customs Department (RMCD). Table 1 is a summary of all forms of taxes forming the government revenue.

1.2. Tax Bouyancy Estimation for Period 1961-69

Choudhry (1975) estimates the tax buoyancy for West Malaysia for the period 1961-69. The result is that the overall buoyancy of income taxation as well as buoyancy of personal income and company income taxes are quite high. The result also shows that the buoyancy of total assessed income tax when regressed on GDP is about 1.63; while assessed personal income tax is 2.50 and is substantially higher than the

Table 1
Tax Forms of Government Revenues, Malaysia

Federal Government Revenue	
Tax Revenue	*Non Tax Revenue*
(i) Direct Taxes: (a) Income Taxes • Companies • Personals • Petroleum • Withholding and others	• PETRONAS Dividend • Petroleum Royalty and Gas • Motor Vehicle Licence and Road tax • *Bank Negara*/Central Bank Dividend • Others
(b) Others • Estate Duty • Stamp Duty • RPGT/Real Property Gain Tax • Others	*Non Revenue:* Revenue from Federal Territories
(ii) Indirect Taxes: • Export Duties • Import Duties • Excise Duties • Sales Tax • Service Tax • Goods and services tax • Others	

Data Source: Ministry of Finance, Malaysia, as at October 2016.

buoyancy of 1.27 of assessed company taxes. He also found that buoyancies are generally higher than elasticities, reflecting the fact that the 1967 tax changes has generated additional tax revenues and buoyancy of the personal income tax exceeded those of the company income tax.

A comparison between buoyancies of actual income tax collections with those income taxes assessed reveals the following results: See Table 2.

1. Buoyancies of actual total income tax and company income tax collections are higher than the corresponding buoyancies of assessments;
2. the buoyancy of actual personal income tax collection is lower than the corresponding estimates for personal income tax assessment; and the difference in buoyancy between personal and company income tax collections are lower than those between personal and company income tax assessments.

The result suggest that actual total income tax and company taxes grew at a higher rate, on average, than assessed total income and company taxes. On the other hand, actual personal income tax collection increased at a lower average rate than assessed personal income tax.

Table 2
Buoyancies of Assessed and Collected Income Taxes for West Malaysia (1960-69)

Independent Variables	*Estimates coefficient*	*Constant Statistic*	R^2	*D-W*
Buoyancy:				
Total assessed income tax	1.63	–6.98	0.88	1.90
Assessed personal income tax	2.50	–15.28	0.97	2.18[1]
Assessed company income tax	1.27	–4.67	0.77	1.80
Total collected income tax	1.74	–9.45	0.90	0.60[1]
Collected personal income tax	2.29	–15.51	0.94	0.84[1]
Collected company income tax	1.52	–7.92	0.85	0.60[1]

Based on data found in the Source: Choundhry, 1975.

[1] Serially correlated.

The rest part of the paper is organized as follows. Section 2 is a problem statement and research objectives. Section 3 contains a discussion of the previous study on tax buoyancy up to the current state. Section 4 explores the research methodology and data types as well as the model estimator. Section 5 contains a discussion of the findings. Finally Section 6 summarizes the result and concludes by noting some policy implications.

2. PROBLEMS STATEMENTS AND RESEARCH OBJECTIVES

Over the past four decades, tax receipts clearly accounts for almost 70 per cent of the total government revenue: non-tax revenues is just 30 per cent: see Table 3. Tax analysis and revenue forecasting seem to be very crucial to fund government expenditures. As for this matters, tax buoyancy estimates are considered more relevant measures than by just having tax to GDP ratios figures. Tax to GDP is more vital in the case of comparisons between countries as this will determine the tax index for each country for tax effort determination. Based on data in Table 3, tax revenue contributes 83 per cent in 1970-79, 76 per cent in 1980-89, 78 per cent in 1990-99, 73 per cent in 2000-09 and still contributes 74 per cent in 2010-15. The contribution of tax revenue components has changed over period from 1970s to 2000s. When direct tax contributes only 33 per cent compared to 50 per cent from indirect tax. This stemmed from significant contribution of the agriculture-based economy during the 1970s contributing heavily to the indirect tax. The economy has changed since to an industrialized one where electrical products manufacturing companies, oil and gas companies as well as services sectors have contribute more to direct taxes, which resulted in the higher contribution to total revenue after the 1990s from this new sector.

It is known from existing studies that different forms of tax have different–either favourable or unfavourable–impacts on the GDP growth. From a public policy point of view, a steady stream of revenue is growth-promoting and would also strengthen the government's ability to plan for development with greater confidence if a chosen tax mix does help to steady the revenue stream.

Firstly by maintaining fiscal deficit at 3.1 per cent of GDP in 2016 and secondly the 2016 Budget Recalibration initiated in order to adjust to the significant decline in government revenue. Adjusted estimates of income for 2016 is expected to be reduce by 3 per cent to RM212.60 billion (2015: RM219.09 billion).

Table 3
Statistics on Average Percentage of Revenue Components

Period of Years	*Direct Tax*	*Indirect Tax*	*Tax Revenue*	*Non-Tax Revenue*	*Total Revenue*
1970-1979	33	50	83	17	100
1980-1989	39	37	73	24	100
1990-1999	43	35	78	22	100
2000-2009	50	23	73	27	100
2010-2015	54	20	74	26	100

Data obtained from Source: Department of Statistics, Malaysia.

The expected income from petroleum will reduce in 2016. Nevertheless the loss of income as an overall has been supported by the collection of GST (Goods and Service Tax) that was put in place from April 2015. This is in line with the fiscal policy to increase the federal income during the budget recalibration announcement on 28 January 2016. The summary of income estimates for 2016 comparing with the income collection of 2015 is reported in Table 4.

Direct Tax is still a major contribution to the total revenue at 52 per cent, while indirect tax category comes second place at 26.6 per cent. The remaining contribution comprises of other revenues components such as Non-tax revenues at 20.1 per cent, Non-revenue at 0.9 per cent and the last is the Federal income at 0.4 per cent.

Table 4
The Summary of Federal Income's Component

	2015	*2016 Revised estimate*		*Growth*	
Classification	*(RM billion)*	*(RM billion)*	*(%)*	*(RM billion)*	(%)
Tax Revenue	165.44	167.10	78.6	1.66	1.0
Direct Tax	111.77	110.50	52.0	(1.27)	(1.1)
Indirect Tax	53.67	56.60	26.6	2.93	5.5
Non Tax Revenue	51.47	42.70	20.1	(8.77)	(17.0)
Non-Revenue	1.29	1.89	0.9	0.60	46.3
Federal Income	0.89	0.91	0.4	0.21	2.4
Total Revenue	219.09	212.60	100.0	(6.50)	(3.0)

Data Source: Estimates for Federal Government Revenue of Malaysia 2017 Report.

There are often questions and debates among scholars and economists when GDP does not always represent symmetrical growth in the revenue. To answer the question as to whether greater growth will raise revenue and vice versa, this study utilizes the Tax Buoyancy estimator because it will measures how tax revenues vary with changes in output.

Tax Buoyancy is a measure of the total effects of both GDP and discretionary changes such as changes in the tax regime in terms of policy and systems. It is also a measure of both the soundness of the

tax base and the effectiveness of tax changes in revenue collection. A buoyant tax system is desirable in order to sustain the fiscal government revenue as this implies that tax revenue responds positively to increase in economic growth.

A tax buoyancy greater than one means the revenue rises more than income growth. In general, a high degree of buoyancy is to be referred as 'revenue productivity' which is directly associated with a good tax system. This paper tries to answer three main research questions:

Research Objectives

1. How large are tax buoyancies for different types of direct tax revenues categories, both over the long run and in the short run?
2. To determine which direct tax components are most buoyant to GDP.
3. To assess the impact of tax buoyancy (TB) in the short run and also in the long run for economic growth from 1975-2016.

Research Questions are

1. What is the Tax Buoyancy estimators for the major direct tax categories over the period, 1975-2016?
2. Which Direct tax categories is most buoyant that can leads to lower tax collection during economic crisis and vice versa?
3. What is the impact of tax buoyancy (TB) in the short run and the long run for economic growth from 1975-2016?

Tax Buoyancy estimates give the tax policy administrator a valuable insight into revenue growth during economic growth as well as during crisis. Expected contributions to the literature will be:

(i) to estimate the Income Tax Revenue Productivity of major direct tax categories,

(ii) to estimate the impact of Tax Buoyancy based on MIER (Malaysia Institute of Economic Research) report on Overview of Tax Reform in Malaysia 1987 initiated the tax reforms policy in Malaysia.

(iii) as proposed by Dudine and Jalles (2017) that by analysing tax buoyancy we can allow the fiscal authorities

(a) to ascertain if more effort should be put into mobilizing revenues, and

(b) to better direct this effort at increasing the share of those taxes that better respond to a sustained increase in income.

3. LITERATURE REVIEW

Most recent study by Dudine and Jalles (2017) using the IMF platform revealed that the examination of tax buoyancy is crucial for tax policy formulation and design for three reasons. First, tax buoyancy illustrates the role that revenue policy plays in ensuring fiscal sustainability in the long run, and in stabilizing the economy over the business cycle in the short-run. Revenues which move in tandem with output in the long-run help support the sustainability of fiscal policy; revenues that are very responsive to changes in output in the short-run ensure that the tax system functions as a good output stabilizer.

Belinga *et al.* (2014) questioning on how much the economic growth boost government revenue? Their paper estimates short- and long-run tax buoyancy in OECD countries between 1965 and 2012. The study found that for aggregate tax revenues, short-run tax buoyancy does not significantly differ from one another in the majority of countries; yet, it has increased since the late 1980s so that tax systems have generally become better automatic stabilizers. Long-run buoyancy exceeds one in about half of the OECD countries, implying that GDP growth has helped improve structural fiscal deficit ratios. Corporate taxes are by far the most buoyant, while excises and property taxes are the least buoyant. For personal income taxes and social contributions, short- and long-run buoyancies have declined since the late 1980s and have, on average, become lower than one.

Twerefou *et al.* mention in public finance, two important measures that have been used to assess the efficiency of any tax system in terms of its mobilization capacity are tax buoyancy - total response of tax revenue to changes in national income and discretionary changes in tax policy over time; and tax elasticity as an automatic response of tax revenue to GDP changes less the discretionary tax changes. In this study, Dummy Variable is used to control for the effects of the Discretionary Tax Measures on Historical Time Series Data for the period 1970-2007 to estimate the elasticity of the Ghanaian tax system. Their findings reveal that the overall tax system in Ghana was buoyant and elastic in the long run and buoyancy exceeded the elasticity, but in the short run the reverse was the case. They also observe an improvement in both buoyancy and elasticity over the reform period (1985-2007) as evidenced in pre-reform buoyancy and elasticity coefficient which were generally less than unity but became greater than one after the reform. Overall tax elasticity was estimates to be about 1.03, suggesting that the responsiveness of the Ghana tax system to a unit change in GDP was more that unity thereby rejecting the hypothesis that the overall tax system is income inelastic in the long run.

Creedy and Gemmell (2008) focuses on corporate tax buoyancy and elasticity. Their study observed changes in corporation tax revenues from year to year, which include the effects of changes in tax rates, deductions and compliance that appear to be highly volatile relative to profits which is the tax base. This paper examines whether the 'built-in' fiscal drag properties of corporation tax can be expected to display similar properties. Simple, conceptual modelling demonstrates that the corporate tax revenue elasticity does indeed display this property in the presence of regular cyclical fluctuations in profit growth, suggesting that much of the observed volatility is inherent to the corporation tax system.

Empirical study by Upender (2008) discovers an empirical content to differential coefficient of tax [revenue] buoyancy during post tax reform period in India by fitting a double-log regression model with an interaction variable to the stationary time series data based on Augmented - Dicky Fuller [ADF] and Phillips-Parron [PP] tests. The period after 1992 is considered as post tax reform period to look at the prognostications of tax reforms that had been initiated by the government of India. The regression results illustrate that the estimate of constant gross tax buoyancy is positively significant and more than unity during pre tax reform period illuminating that gross tax is moderately elastic. From this upshot it can be comprehended that a one per cent increase in income leads to increase the gross tax revenue by more than one per cent, all else equal. Further it can be understood that the average propensity to tax [ratio of Gross Tax Revenue to Gross Domestic Product] was increasing with the increase in Gross Domestic Product during pre tax reform period. The regression coefficient of interaction variable is significantly negative and stumpy showing a downward shift in the degree of tax buoyancy during post tax reform period. The

estimate of the tax buoyancy, which was just above the unity during pre tax reform period, is less than unity during post tax reform period evincing the fact that the gross Tax is relatively inelastic. From this it can also be understood that the average propensity to tax is declining with the increase in Gross Domestic Product during post tax reform period. Thus the estimates of gross tax buoyancy during pre and post-tax reform periods are not stable.

4. RESEARCH METHODOLOGY AND DATA TYPES

Dudine and Jalles (2017) note that the buoyancy of a tax system measures the total response of tax revenue both to changes in national income and to discretionary changes in tax policies over time, and it is traditionally interpreted as the percentage change in revenue associated to a one per cent change in income.

Revenue buoyancy is traditionally estimated by means of a regression of the natural logarithm of tax revenue (or a subcomponent) on the natural logarithm of GDP. This double log approach that apply in this paper. Tax buoyancy can be calculated using the traditional model. In order to estimate tax buoyancy requires GDP, to be a determinant of tax revenue. The Tax Buoyancy model from this study follows Dudine and Jalles (2017) with some of modification on the variables. When estimating tax buoyancy, time span over which the response of revenues to GDP need to be considered. Over the long-run it is generally expected that buoyancy is equal to one. If not, at least on theoretical grounds, there would come a point when revenues exceed 100 per cent of their respective bases. However, over the short-run, buoyancies can be different from one and they can be different across revenue items. For example, in the short-run the PIT may increase more than proportionally to an increase in income if the revenue brackets or other deductions are not adjusted for inflation.

Another issue that need attention here if there exists a stable long-run relationship between them (GDP and tax components). In general, both the natural logarithm of tax revenue (or a component) and the natural logarithm of GDP are integrated and it is reasonable to expect that they are cointegrated. If data supports this prior, cointegration techniques very much relevance here. In other words, the tax buoyancy indicator measures income elasticity after controlling for discretionary effects.

In this section, the study provides estimations for long run buoyancies using ARDL Bounds Test. We compare the coefficients using several estimators namely, FMOLS (Fully Modified Ordinary Least Square) and DOLS (Dynamic Ordinary Least Square) to support the result. Unit root result also presented to confirm on the stationarity by using ADF and PP test.

4.1. Data Source

The main focus of this study is to examine the tax bouyancy of major items of direct tax categories. Annual data are collected for the period 1975 to 2016. Data for 2016 is based on estimation made by the Ministry of Finance. This study focus mainly on the major direct tax categories, namely, Corporate Income Tax (CT), Personal Income Tax (PT), Petroleum Tax (PET) and Stamp Duty (SD). The sources of data taken from the Statistics Department.

Most of previous studies used the GDP as the measurement of economic growth (Colombage, 2009, Koch *et al.*, 2005; Soli *et al.*, 2008; Karran, 1985; Hahn, 2008; Butkiewicz and Yanikkaya, 2005). In line with that, this study utilizes Nominal GDP as a proxy of economic growth (EG) and the value of GDP using

the current price or nominal price. Based on OECD definitions, Nominal gross domestic product (GDP) is GDP given in current prices, without adjustment for inflation. Current price estimates of GDP are obtained by expressing values of all goods and services produced in the current reporting period. Forecast is based on an assessment of the economic climate in individual countries and the world economy, using a combination of model-based analyses and expert judgement. This indicator is measured in level compared to previous year. Table 5 summarizes all variables used in the study.

Table 5
Dependent and Independent Variables used in Test Model

Variable Types	*Tax Components*	*Tax Categories*	*Abbreviation*
Independent	Direct Tax categories	Corporate Income Tax	CT
		Personal Income Tax	PT
		Petroleum Tax	PET
		Stamp Duty	SD
Dependent	Nominal Gross Domestic Product	NGDP	

To support the variables used in this study, Macek (2014) reported on the classification of individual types of taxes according to the tax quota by the Organisation for Economic Co-operation and Development (OECD) and World Tax Index (WTI) is shown in Table 6.

Table 6
Tax Classification According to OECD and WTI

Tax Classification According to OECD		*Tax classification according to WTI*	
1100	Personal Income Taxes	PIT	Personal Income Taxes
1200	Corporate Income Taxes	CIT	Corporate Income Taxes
2000	Social Security Contributions	VAT	Value Added Tax
4000	Property taxes	PRO	Property Taxes
5110	Value Added Tax	OTC	Other taxes on consumption
5120	Other taxes on consumption		

As found in OECD, Kotlán and Machová (2012b).

A preliminary look at the each tax variables and Nominal GDP is displayed in Figure 1. All variables are transformed to natural logarithm. When all variables transform into log form and display through graph, most of variables are in trend with some non-linearity looks.

4.2. Estimation Models

The tax buoyancy coefficient is calculated using base line model as follows:

$$Ln\,Y_t = \beta_0 + \beta_1 Ln CT_t + \beta_2 Ln\,PT_t + \beta_3 Ln\,PET_t + \beta_4 Ln\,SD_t + \varepsilon_t \quad (1)$$

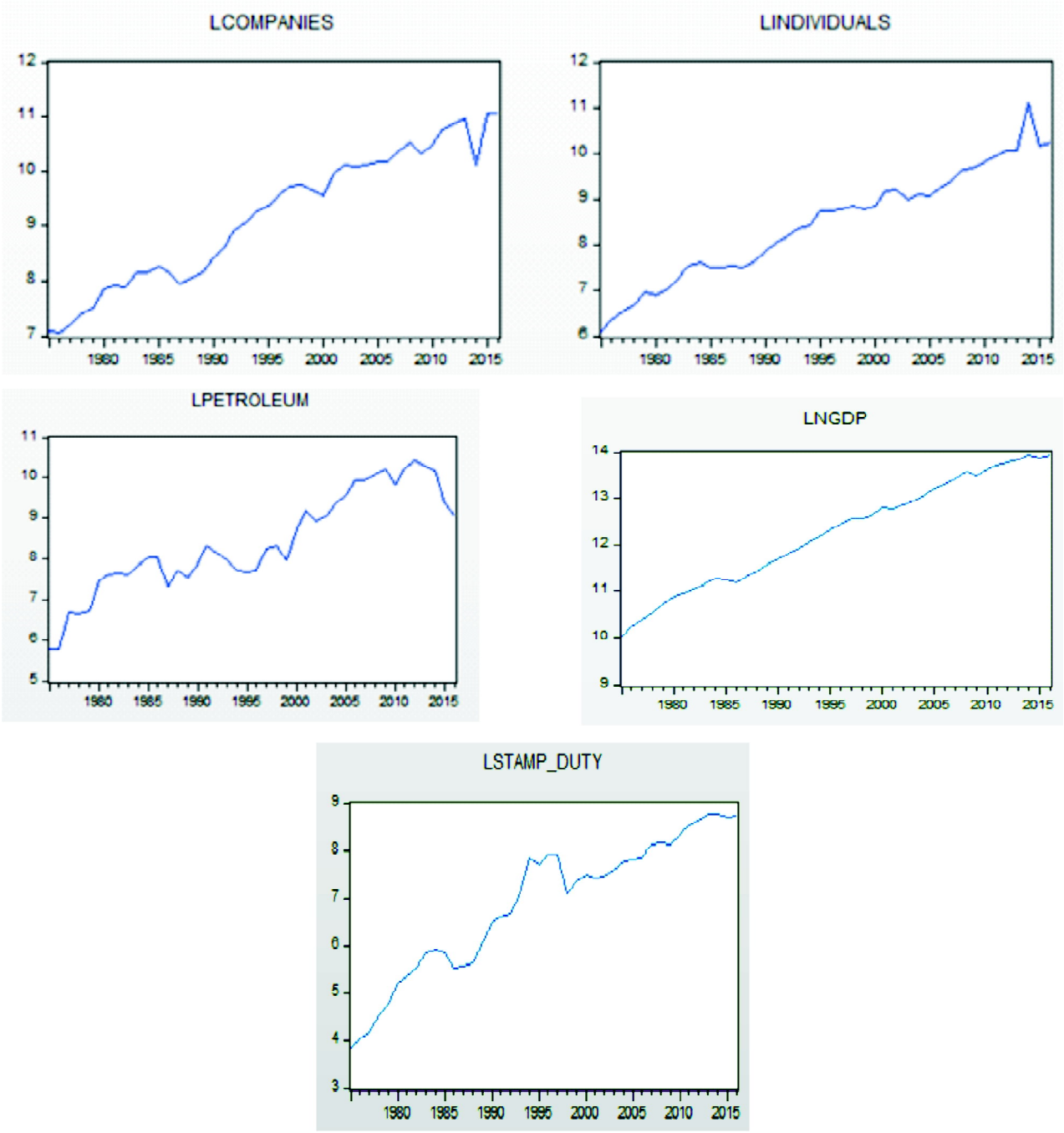


Figure 1: Range of Direct Tax Revenues Components from 1975-2016

Where Y is the nominal GDP, $Ln\ CT_t$ represent the corporate tax variable, $Ln\ PT_t$ represents the personal tax variable, $Ln\ PET_t$ is Petroleum Tax and $Ln\ SD_t$ is Stamp Duty. While ε is the error term. All variables are in natural logarithm forms.

In estimating the parameters using the regression models, where Wooldrige (2009) states that the method of Ordinary-Least Squares (OLS) is used. This method was also used in the case of Mankiw,

Romer and Weil (1992). Although statistical significance and the direction of impact between the dependent variable and independent variable are important in this study, the individual variables entering the analysis were first transformed into logarithms to prepare the data with less econometric issues.

Due to that, it is possible to interpret the resulting coefficients: If an independent variable changes by 1 per cent, this will lead to growth or decrease of GDP growth rate by the amount of estimated coefficient (Macek, 2014).

The main requirement in estimating time series model is that the variables must be stationary. One of the classical namely is the Augmented Dickey-Fuller or ADF test (Dickey and Fuller, 1981; Said and Dickey, 1984) which provides a convenient procedures to determine the univariate time series properties of time series data. This test is based on the null hypothesis that a unit root exists in the time series.

4.2.1. Bound Test for Cointegration Using ARDL Approach

With the existence of cointegration between direct tax categories and GDP, we base our analysis using the Autoregressive Distributed Lag (ARDL) bound testing approach proposed by Pesaran *et al.* (2001).

$$\begin{aligned}\Delta Ln\,GDP_t = C_1 + \sum_{i=1}^{p} \pi i\,\Delta Ln\,NGDP_{t-i} + \sum_{i=1}^{p} \gamma i\,\Delta Ln\,CT_{t-i} + \sum_{i=1}^{p} \delta i\,\Delta Ln\,PT_{t-i} \\ + \sum_{i=1}^{p} \alpha i\,\Delta Ln\,PET_{t-i} + \sum_{i=1}^{p} \in i\,\Delta Ln\,SD_{t-i} + \varphi_1 Ln\,NGDP_{t-1} + \varphi_2\,Ln\,CT_{t-1} + \varphi_3\,Ln\,PT_{t-1} \\ + \varphi_4\,Ln\,PET_{t-1} + \varphi_5\,Ln\,SD_{t-1} + \varepsilon_t\end{aligned} \tag{2}$$

To test on the existence of cointegration among variables, all coefficient at level form (φ_i) are being restricted whereby $H_0 = \varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = 0$. Null hypothesis indicate that there is no long-run or cointegration among variables under observation. The F-test shows a non-standard distribution that depends on; Firstly the order of the integration of the variables in ARDL whether it is I(0) or I(1). Secondly, the number of regressors and finally whether the ARDL model contain an intercept and/or trend.

By using two sets of critical values which are lower bound (when all regressor are I(0)) and upper bound (when all regressor are I(1)) to conclude on the result for cointegration. This analysis using yearly data from year 1975 until 2016 resulting in total 43 observations and Narayan (2005) critical value is use instead of Pesaran *et al.* (2001) due to small sample size. If calculated F-statistics is above than upper bound, then conclusive decision can be made that cointegration is exist among the variables. However, if the F-statistics lies between lower bound and upper bound, inconclusive decision about cointegration are triggered. On the other hand, no cointegration exist between variables if the calculated F-statistics fall below than lower bound critical value.

In the case where sufficient evidence to conclude the existence of long-run relationship, an ARDL (*p*, *q*, *r*, *s*, *t*) is being estimated using Akaike Information Criteria (AIC) and *R*-Bar Squared ($\overline{R}^2$). The ARDL specifications are based on level form which is as follows:

$$\begin{aligned}Ln\,NGDP_t = C_2 + \sum_{i=1}^{p} \lambda_{1i}\,Ln\,NGDP_{t-1} + \sum_{i=1}^{p} \lambda_{2i}\,Ln\,CT_{t-1} + \sum_{i=1}^{p} \lambda_{3i}\,Ln\,PT_{t-1} + \\ \sum_{i=1}^{p} \lambda_{4i}\,Ln\,PET_{t-1} + \sum_{i=1}^{p} \lambda_{5i}\,Ln\,SD_{t-1} + \in_t\end{aligned} \tag{3}$$

In addition, the long-run estimation of direct tax buoyancy model in (1) is based on the ARDL specification in (3) and the coefficient is being estimated as follows:

$$\beta_0 = \frac{C_2}{1-\sum_{i=1}^{p}\lambda_{1i}},\ \beta_1 = \frac{\sum_{i=0}^{q}\lambda_{2i}}{1-\sum_{i=1}^{p}\lambda_{1i}}, \beta_2 = \frac{\sum_{i=0}^{r}\lambda_{3i}}{1-\sum_{i=1}^{p}\lambda_{1i}},\ \beta_3 = \frac{\sum_{i=0}^{s}\lambda_{4i}}{1-\sum_{i=1}^{p}\lambda_{1i}},\ \beta_4 = \frac{\sum_{i=0}^{t}\lambda_{3i}}{1-\sum_{i=1}^{p}\lambda_{1i}}$$

4.2.2. ECM for Short-run and Long-run ECT (Error Correction Term)

Next step to estimate the short-run relationship, short-run dynamic is executed through Error Correction Model (ECM) which shows the following specification:

$$\begin{aligned}\Delta Ln\,NGDP_t = {} & C_3 + \sum_{i=0}^{p}\theta_{1i}\,\Delta Ln\,NGDP_{t-i} + \sum_{i=0}^{p}\theta_{2i}\,\Delta Ln\,CT_{t-i} + \sum_{i=0}^{p}\theta_{3i}\,\Delta Ln\,PT_{t-i} \\ & + \sum_{i=0}^{p}\theta_{4i}\,\Delta Ln\,PET_{t-i} + \sum_{i=0}^{p}\theta_{5i}\,\Delta Ln\,SD_{t-i} + \Psi \mathrm{ECT}_{t-1} + \varepsilon_t\end{aligned} \tag{4}$$

Short-run dynamic from independent variables towards dependent variables are analysed by restrict the coefficient of θ_{2i}, θ_{3i}, θ_{4i}, θ_{5i} and with 0. For an example, to investigate short-run causality running from LCT to LNGDP, one should restrict the coefficient θ_{2i} such that H_0: $\theta_{21} = \theta_{22} = ... = \gamma_{2q} = 0$ whereby null hypothesis indicate no short-run causality from LCT toward LNGDP.

Meanwhile, the long-run information is gathered from the error correction term (ECT). The significant of the ECT coefficient (ψ) indicates that long-run relationship exist between variables thus supporting the finding from cointegration. In the case when significantly negative of the coefficient measure speed of adjustment where the speed of which dependent variable responds to dis-equilibrium in the long-run following the deviation in the short-run. Short-run relationship is tested by using the null hypothesis where:

H_0: LCT, LPT, LPET, LSD (Corporate tax/Personal tax/Petroleum tax/Stamp Duty) does not Granger Cause LNGDP (Nominal GDP), or

H_1: LCT, LPT, LPET, LSD (Corporate tax/Personal tax/Petroleum tax/Stamp Duty) does Granger Cause LNGDP (Nominal GDP).

5. RESULTS AND FINDINGS

Table 7 shows unit root test results for LNGDP, LCT, LPT, LPET and LSD. By using two types of unit root test which namely Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) in order to determine the order of integration. This test is significant to ensure that there is no variable integrated with order 2 or I(2).

Result from table 7 shows that at level, ADF and PP statistics failed to reject null hypothesis of unit root even at 5% significant level indicating most of the variables are non-stationary at level excluded LCT and LPT seem to be significant at 5% and 1% respectively. However, all variables in log forms (CIT, PT, PET and SD) are stationary after first differencing and significance at even 1% their p-values. This can be concluded that all variables are integrated of order 1 or I(1).

Table 7
Unit Root Test performed using ADF and PP

	ADF Statistics		*PP Statistics*		
Series	*Level*	*1st differencing*	*Level*	*1st differencing*	*Test Equation*
LNGDP	–2.2262	–5.7446 ***	–2.3846	–5.7447 ***	I + T
LCT	–3.6312 **	–9.0647 ***	–3.6120 **	–12.7349 ***	I + T
LPT	–4.6509 ***	–9.4336 ***	–4.6186 ***	–11.0226 ***	I + T
LPET	–1.8988	–6.3402 ***	–1.9230	–6.3406 ***	I + T
LSD	–2.1454	–5.6015 ***	–2.2258	–5.5770 ***	I + T

** indicates significant at 5% , *** significant at 1% , where I = intercept and T = Trend. The ADF critical value at 1% and 5% significant level are –4.1985 and –3.5236.

5.1. Result for ARDL Bound Test to Cointegration

Result on Bound Test (Co-integration) shows that there is long-run equilibrium relationship between variables. A rejection of the null hypothesis implies that we have long-run relationship. Comparing to the Narayan table (case III) F-statistics value shows significance result of 5.36 which above the upper bound values I(1) = 4.54. See result in Table 8 as follows. Based on Narayan table (case III), F-critical is at 5% where I(0) or lower bound = 3.202 and I(1) or upper bound = 4.544. If the computed F-statistic falls below the lower bound we conclude that the variables are I(0), so no cointegration is possible, by definition. The outcome result shows positive values of f-statistics 5.357, so we need to estimate a long-run "levels model' as well as a separate "Restricted ECM".

Table 8
ARDL Bounds Test

Sample: 1977 2016
Included observations: 40
Null Hypothesis: No long-run relationships exist

Test Statistic	*Value*	*k*
F-statistic	5.357152	4

Based on bound test result that leads to the conclusion for the cointegration in existence. We now estimate the long-run equilibrium relationship between the variables. For each revenue type, we test the null hypothesis that the long-run coefficient is equal to one, and, in case of rejection, we test whether it is greater or smaller than one. The result shows as in Table 9 summarized of all the coefficients that represent each of the direct tax category's buoyancy.

Based on statistics in Table 9, corporate tax is negatively correlated to nominal GDP. The relationship between Corporate Tax and NGDP also seems to be not significance when *p*. value shows 0.3921. Similar to Stamp Duty tax that shows *p*-value 0.2475. While other variables namely, personal taxes and petroleum tax are positively correlated to NGDP and shows significance relationships to NGDP at 1 per cent and 5 per cent respectively.

The buoyancy coefficient by each direct tax components shows less buoyancy (less than one). In this case, null hypothesis is being rejected and conclusion can be drawn that these taxes are less volatile to GDP. This means that one per cent increase in corporate taxes could lead to decrease the NGDP by 0.34 per cent. On the other hand, Petroleum Taxes increase the NGDP by 0.36 per cent, Personal Tax by 0.81 per cent and Stamp Duty by 0.21 per cent. Above all, the buoyancy coefficients only significance for Personal tax as well as the Petroleum tax is concerned.

Table 9
ARDL Cointegrating And Long Run Form

Long Run Coefficients				
Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
LCT	–0.338228	0.388851	–0.869812	0.3921
LPET	0.363943	0.137384	2.649086	0.0133
LPT	0.808360	0.282338	2.863099	0.0080
LSD	0.206302	0.174537	1.182000	0.2475
C	3.599530	0.616006	5.843338	0.0000

Table 9A
Long-run equation

LNGDP = 3.5995 – 0.3382 LCT + 0.8084 LPT *** + 0.3639 LPET ** + 0.2063 LSD				
	(0.392)	(0.008)	(0.013)	(0.248)

Note: Number in parentheses is *p*-value. ** indicates significant at 5% and *** at 1%.

5.2. Error Correction Term (ECT)

The result towards short-run dynamic can be done through error correction model (ECM). The coefficient of the ECT can be interpreted as speed of adjustment–speed of which is correcting the system to converge to long-run equilibrium following the deviation in the short-run. Based on result from table 10, Stamp-Duty tax shows short-run Granger causality is running on NGDP significance at 1 per cent. However there is no short-run granger causality running from both Corporate tax and Petroleum tax towards NGDP. This implies that both Corporate tax and Petroleum tax does not have significant impact on NGDP in the short-run. However, Personal tax shows short-run Granger causality running on NGDP significance at 5 per cent.

Table 10 shows error correction model for direct tax categories in from 1975 until 2016. The significance of error correction term (ECT) at 1 per cent significance level is found. This test indicates the existence of long-run relationship between the variables. Result from Table 10 shows speed of adjustment by 22 per cent. This imply that about 22 per cent deviation in the short-run will be corrected by nominal GDP in next 4.5 years where this speed can be seen as a medium rate of speed. Above all, the empirical results from Table 10 show that Personal tax not only gives impacts on nominal GDP in the short-run but also in the long-run.

Table 10
Error Correction Model

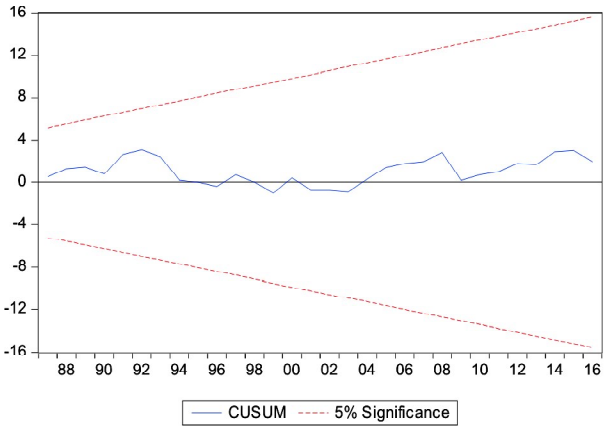
	ECT	Δ*LCT*	Δ*LPET*	Δ*LPT*	Δ*LSD*
			Wald F-test		
LNGDP-Coint Eq(–1)	0.218064	1.7651 (0.194)	1.6003 (0.2186)	4.3861** (0.0213)	5.4228*** (0.0098)
$\overline{R}^2$	0.5406				
LM	0.1102				
RESET	0.0068				
ARCH	0.7671				

Note: Number in parentheses is the *P*-value. LM stands for Breusch-Godfrey test for serial correlation. ARCH stands for Auto-regressive conditional Heterocedasticity test.

The adequacy of the error correction model in modelling the long-run relationship and short-run dynamic can be tested by several diagnostic checking. Results shows that, the error correction model is well specified since there is no problem in serial correlation and heteroscedasticity by looking at *p*-value that are greater than 0.05. In addition, value of $\overline{R}^2$ which is 0.5406 shows that for about 54% variation in Nominal GDP is explained by its independent variables. However in analysing for the specification test by using Ramsey RESET test shows result 0.0068 (*p*-values less than 0.05). This means that null hypothesis is being rejected and regression could leads to non-linearity based. See result from Table 10 where the specification of the equation model is significance at 5% to reject .

The stability of the error correction model is shown by figure 1. Both plot of CUSUM and CUSUM-SQ shows that the model is dynamically stable over the period of study since the blue line lies between the bound at 5% significant level.

Plot of Cumulative Sum of Recursive Residuals



Plot of Cumulative Sum of Squares of Recursive Residuals

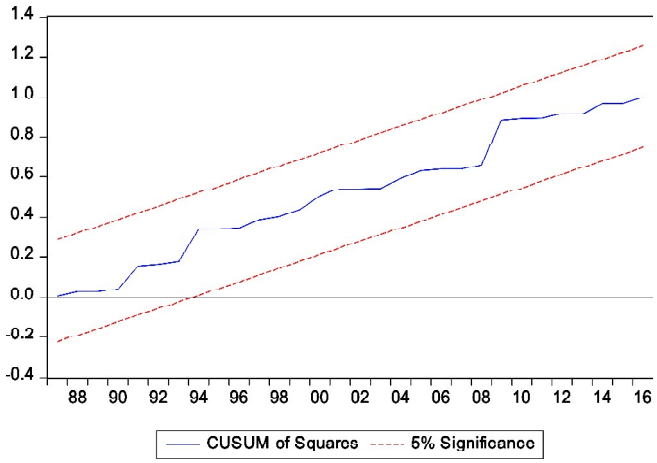


Figure 2: Plot of CUSUM and CUSUM-SQ

5.3. Fully-Modified OLS (FMOLS) and Dynamic (DOLS)

The study also estimates the long-run tax buoyancy in equation 2 for each of major direct tax categories by Fully-modified OLS (FMOLS) and Dynamic OLS (DOLS). Both FMOLS and DOLS cater for endogeniety and autocorrelation issues.

Based on regression result from Table 11, Corporates tax, Personal Tax and Petroleum Tax have significance relationship with GDP except for Stamp Duty tax. The result also shows that all main direct tax categories have tax buoyancy coefficient less than one. We can draw a conclusion that corporates taxes, personal taxes and petroleum taxes have less buoyancy than one. The highest buoyancy is the corporate taxes with 0.44, second is Personal tax 0.41 and Petroleum tax shows the least with 0.12. Whereby Stamp Duty tax shows 0.01 but still meaningless due to its insignificance relationship to the GDP. This means the possibility of other control variables such as discretionary tax changes policy which could have higher impact on buoyancy to GDP than the direct tax components.

Table 11
Result for Buoyancy Coefficients using Fully Modified Least Squares (FMOLS)

Dependent Variable: LNGDP
Sample (adjusted): 1976 2016
Included observations: 41 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
LCT	0.437685	0.078549	5.572151	0.0000
LPET	0.119556	0.041161	2.904608	0.0062
LPT	0.407157	0.078688	5.174346	0.0000
LSD	0.009039	0.068763	0.131451	0.8962
C	3.727237	0.267163	13.95115	0.0000
R-squared	0.992434	Mean dependent var	12.29687	
Adjusted R-squared	0.991593	S.D. dependent var	1.125089	
S.E. of regression	0.103157	Sum squared resid	0.383086	
Long-run variance	0.015803			

In order to support findings, we also present the result using DOLS. Referring to Table 12, the coefficient of all major direct tax components show buoyancy less than one. Personal taxes show the highest buoyancy, 0.45, followed by Corporates taxes, 0.32 and last is Petroleum taxes with 0.14. Stamp Duty shows 0.06 by coefficient but still insignificance in terms of it relationship to the GDP. The result by using DOLS seem to have similar patterns with result shows using FMOLS (as per Table 11).

6. SUMMARY AND RECOMMENDATIONS

The summary result based on all estimators (ARDL Cointegration, FMOLS and DOLS) determines the coefficient that represent as tax buoyancy presented in Table 19. Based on ARDL Cointegration (Long-

Table 12
Result for Buoyancy Coefficients using Dynamic OLS(DOLS)

Dependent Variable: LNGDP
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 1977 2015
Included observations: 39 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead = 1, lag = 1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
LCT	0.324338	0.175135	1.851929	0.0775
LPET	0.142396	0.050578	2.815347	0.0101
LPT	0.449547	0.165941	2.709081	0.0128
LSD	0.060933	0.109267	0.557653	0.5827
C	3.851394	0.371941	10.35484	0.0000
R-squared	0.997409	Mean dependent var	12.30797	
Adjusted R-squared	0.995525	S.D. dependent var	1.073385	
S.E. of regression	0.071807	Sum squared resid	0.113439	
Long-run variance	0.009994			

run Buoyancy), Corporate tax seem to have no relationship to GDP. On the other hand, by using FMOLS and DOLS estimators show that Corporates taxes does have significance relationships with the NGDP and buoyancy coefficient less than one. This is true because income tax system in Malaysia is based on prior year income taxable. It means that current corporates income is not buoyant to current GDP because the income will be tax in the following year. However, FMOLS result shows corporate tax buoyancy rate at 0.44 significance at 1 per cent. And DOLS shows corporate tax buoyancy at 0.32 significance at 10 per cent.

In addition to why the buoyancy coefficient of the Corporates taxes become less than one is due to the payment of the tax is based on previous year business income. All companies in Malaysia need to make their tax instalment payment for current year based on previous year income. Once the companies have computed the final taxable figures (in the next following year) then remaining tax balance need to be settled (after deduct from the instalment made earlier). Table 13 summarizes the example for simple illustration.

Table 13
Self-Assessment System for Corporates and Personal Business Taxes in Malaysia

Year and Explanation
2016: Tax instalments amount RM10,000.
30th July 2017: Companies need to submit the Tax Return Form before 30th July every year for previous taxable business profits. In this case, the final tax for instance amounting to RM20,000.
30th July 2017: Balance of tax RM10,000 (RM20,000 – 10,000) need to be paid before 30th July.

Previous scholars have some contradictions towards the relationship between Corporates taxes and Personal taxes on economic growth. Arnold. J. (2008) discovers that both Personal and Corporates taxes have negative relationship to GDP. Others study that show the same result are Kneller *et al.* (1999), Lee and Gordon (2005) and Macek (2014). However study done by Hakim and Bujang (2012) in Malaysia context showed positive relationship for both Corporate and Personal taxes on GDP. Study by Dudine and Jalles (2017) reveal that personal tax buoyancy exceed one in the long-run in emerging markets and Corporates tax buoyancy is larger during contractions than during times of economic expansion.

Based on the study result (Long-Run Buoyancy), Personal taxes deemed to be have strong relationships to the GDP. However the buoyancy coefficient still less than one. ARDL shows highest coefficient of Personal tax at 0.81 which is near to one. Petroleum taxes seem to have similar patter to Personal tax in terms of its relationship to the GDP and the buoyancy coefficient is at 0.37 (ARDL). Stamp Duty seem to have no relationships to the GDP at all in the long run. As for the conclusion, the highest buoyancy is the Corporates Taxes (0.44) based on Fully-Modified OLS which explain due to its highest contribution to the total revenue. Personal Taxes comes second with buoyancy coefficient by 0.41 while Petroleum tax is least buoyancy (0.14 form DOLS) among all major direct tax categories in Malaysia. The result imply Corporates taxes grew at a higher rate, on an average, than Personal tax and Petroleum taxes. On the other hand, Petroleum tax collection increased at a lower average rate than Corporates and Personal income tax from 1975-2016.

At earlier section 1.2, Choundry (1979) revealed that the buoyancy of Personal and Corporates tax in West Malaysia was 2.29 and 1.52 each for period 1960-69. As this study now shows the buoyancy of both Personal and Corporates tax is now reducing to 0.41 and 0.44 from period 1975-2016 (2016 figure is based on estimation). From this point of view, we can conclude that the major direct tax components namely, Corporate and Personal Tax are now less buoyant (Buoyancy rate less than 1). This also imply that 1 per cent increase in Corporates tax and Personal will increase the Nominal GDP by 0.44 and 0.41 only.

Considering short-run tax buoyancy result from Table 14, corporate taxes buoyancy is less than 1 (–0.0379) in short- run period at lag one year significance at 10 per cent. This imply that one lag year corporate tax increased by 1 per cent will decrease the nominal GDP by 0.04 per cent in the short run. On the other hand, personal taxes lag one year buoyancy by 0.13 per cent. This imply that increase 1 per cent in lag one year Personal Taxes will increased the nominal GDP by 0.13 per cent in the short-run. Petroleum tax buoyancy shows –0.038 significance at 10 per cent that impact reduce on nominal GDP by 0.04 per cent. Stamp Duty founds to have no significance relationships in the long-run but seem to have significance relationship in the short-run. Result from Table 17 shows tax buoyancy of Stamp Duty both at current as well as lag one year is significance at 5 per cent each, where current is 0.08 and lag one year shows 0.09.

To summarize based from the observed result, in the short run, Personal taxes and Stamp Duty could possibly turn to be good stabilizer due to its significance buoyancy by 0.13 (Personal taxes) and in range from 0.08 to 0.09 (Stamp Duty). In the long-run, Corporate taxes shows the highest buoyancy by 0.44 follow by Personal taxes by 0.41 and Petroleum taxes the least buoyant at 0.12. Stamp Duty does not have long-run significance relationship with nominal GDP which imply that the nature of this taxes is meant for short-run stabilizer.

Some other factors that could contribute to the less buoyancy result possibly due to the changes in the tax system from the formal (old) tax system to the new self-Assessment System, reducing in tax rates, more

new tax amnesty and tax incentives being introduced, increased growth in tax evasion and underground economies among local taxpayers and base erosion of profit shifting among multinational companies operating and making profits here in Malaysia.

Table 14
Summary of Long-Run Tax Buoyancy for Different Direct Tax Categories

DV (LNGDP) Regressor (IV)	*ARDL Cointegration*	*FMOLS*	*DOLS*	*Short-Run Tax Buoyancy*	
	Long-Run Tax Buoyancy			*@t*	*@t – 1*
LCT	–0.34 no (0.39)	0.44 *** (0.08)	0.32 * (0.18)	–0.029 (0.2613)	–0.0379 * (0.0926)
LPT	0.81 *** (0.81)	0.41 *** (0.08)	0.45 ** (0.17)	0.0627 (0.1887)	0.1336 *** (0.0052)
LPET	0.37 ** (0.14)	0.12 *** (0.04)	0.14 ** (0.05)	–0.02942 (0.2613)	–0.0379 * (0.0926)
LSD	0.21 no (0.17)	0.01 no (0.07)	0.06 no (0.11)	0.0809 ** (0.0179)	0.0900 ** (0.0344)
C	3.5995 *** (0.62)	3.7272 *** (0.27)	3.8514 *** (0.37)		

Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant.

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