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Exploring the Long-run Output Effects of Fiscal Policy in Belize

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This paper examines the long-run GDP impact of fiscal policy for Belize from 1967 to 2021, considering the budget constraint and possible endogenous relationships. Using 55 years of data and autoregressive distributed lag (ARDL) techniques, the study found that capital spending had positive and significant effects on long-run GDP per capita. In contrast, current spending displayed negative, albeit insignificant, effects on output. When disaggregating total spending, reallocating spending from other expenditures to education and infrastructure was found to positively impact output, although the latter was insignificant.

JEL Classification: H30, 040

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Table of Contents

1.0 Introduction

Does fiscal policy have a long-term impact on GDP levels or growth rates? This question is relevant as governments, particularly those with limited fiscal space and significant public indebtedness, like Belize, need to know if their spending and tax decisions improve the prospect of economic growth. This question has occupied centre stage recently as government action has been key in supporting economic recovery during the COVID-19 pandemic. Now, fiscal policy is called on to build back sustained economic growth through a mix of tax and spending policies (OECD, 2021; Kim et al., 2021). Tax policies and the shift in the composition of government expenditure towards productive investments such as physical infrastructure have been purported in this COVID-19 recovery period to lead to durable growth impacts (Morgavi et al., 2022).

This link between government expenditure, revenue, and economic growth has underpinned developments in the endogenous growth theory, where Barro (1990) observed that both sides of the budget—expenditures and revenue—matter for growth. This observation contrasts with the traditional perspective, where fiscal changes can only affect income level as the growth rate would revert to its initial rate. However, endogenous growth studies suggest distortionary taxes and productive expenditures can affect the long-run growth rate (Barro, 1990; King & Rebolo, 1990; Mendoza et al., 1997). Fiscal policy affects growth by altering consumption and investment patterns via incentives and disincentives and, in turn, an individual's utility and productivity (Afonso & Alegre, 2011).

Where theoretical predictions have been clear, empirical evidence must be clearer. Conflicting results arise from several estimation difficulties, such as: "sensitivity" issues with conditioning variables (see Levine and Renelt 1992); biases when the implicit financing assumptions based on the government budget constraint (GBC) are ignored (see Kneller et al.,1999; Bleaney et al., 2001) and endogeneity issues (see Gemmel, 2001; Bleaney et al., 2001; Gemmel et al., 2014) associated with whether growth induces higher expenditure and taxes or vice versa, or both.

In addition to producing conflicting views, the existing literature[1] that seeks to address the government budget constraint bias is based either on the experiences of developed countries or large samples of developed and developing countries (Bose et al., 2007). Gemmel (2001) claimed that lower-income countries face a unique set of tax/expenditure distinctions, which lead to sensitivities to country-specific circumstances. Accordingly, understanding country-specific processes by which public expenditure and tax policies shape the prospect of income levels or economic growth for developing countries, particularly the Caribbean region, is lacking. However, considerable research on developing countries and the Caribbean do exist. See, for instance, Landau (1986), Belgrave and Craigwell (1995), Devarajan et al. (1996), Mathias and Birchwood (2004), Gupta et al. (2005), Gosh and Gregoriou (2008), Bose et al. (2003), Carter et al., (2013), and Joseph and Turner (2016). However, except for Gupta et al. (2005), Gosh and Gregoriou (2008), and Bose et al. (2003), these studies do not include the government budget constraint in full, thus affecting the interpretation of fiscal effects.

[1] Referred to as third generation studies by Gemmel, 2001

While this study does not claim to resolve these concerns, it attempts to address these potential biases carefully. Therefore, the primary objective of this paper is to examine the long-run effects of fiscal policy on GDP per capita levels for Belize by paying particular attention to (a) the "sensitivity" issues arising from conditioning variables, (b) the omission bias resulting from neglecting the implications of the government budget constraint, and (c) the endogeneity issues from potential simultaneity between growth and fiscal variables. For policy purposes, the paper further provides a disaggregated analysis of spending using investment and total outlays on health, education, and infrastructure. The long-run output effects of spending on these sectors of the economy provide useful information for a resource-constrained developing country like Belize, where the allocation of limited public resources between the sectors is an issue of significant importance, particularly in the COVID-19 recovery phase.

The results of the analysis suggest that capital spending has positive long-run output effects, while current spending has negative, albeit insignificant, long-run output effects. On evaluating the relationship between tax structure and GDP per capita, the analysis showed that a stronger reliance on goods and services tax, taxes on income and profit, and property taxes seems to be associated with higher levels of GDP per capita.

The remainder of the paper is organised as follows. Section 2 discusses critical predictions of theoretical endogenous growth models and the implications of the government budget constraint for empirical testing and summarises the main outcomes of empirical studies. Section 3 outlines the data and empirical methodology. Section 4 presents the results and further examines the implications of possible biases arising from conditioning variable sensitivities and endogeneity issues. Section 5 concludes.

2.0 Theoretical and Empirical Overview

2.1 The Growth Model

There is no conclusive theoretical answer regarding how government expenditure and taxes affect growth. Moreover, Levine and Renelt (1992, p. 943) noted that "there does not exist a consensus theoretical framework to guide empirical work on growth." The neoclassical growth model predicts that each additional capital for a given amount of labour will provide a lower return than the previous one. Thus, long-run growth will be driven by technological progress and population growth that is exogenously determined. Government activities and fiscal policy, which influence incentives to invest or save, alter the equilibrium capital-output ratio and, in turn, the level of output and its transition path to steady-state but not its slope. The effects on the growth rate are temporary as the economy transitions to its steady state. However, the length of this transition period is debatable and occurs over a long time. In contrast, endogenous growth models proposed that fiscal policy can have permanent or at least persistent effects on a country's long-run growth rate (see Barro,1990 and Devarajan et al.,1996).

The public-policy endogenous growth models of Barro (1990), Barro and Sala-i-Martin (1992, 1995) showed that fiscal policy could determine both the output level and the steady-state growth rate. Predictions from these endogenous growth models stem from categorising the government budget into four classifications: distortionary or non-distortionary taxation and productive or non-productive expenditures. Expectations were that distortionary taxes affect agents' investment decisions while non-distortionary taxes do not. Meanwhile, whether government spending is productive depends on whether it is included in the production function or affects only consumers' utility function.

Barro (1990), Kneller et al. (1999), Bleaney (2001), and Gemmel (2001) treated taxes on goods and services as 'non-distortionary', although studies claim that a more apt description might be 'less distortionary' since consumption taxes might distort labour-leisure choice (Mendoza et al., 1997; Kneller, 1999). These studies also treated taxes on income and profit and property taxes as 'distortionary' taxes, while 'other revenues' were seen as having ambiguous effects. However, Gemmel (2001) pointed out that for developing countries, indirect taxes have a higher share in total taxes and pinpointing definitively what taxes are distortionary or not distortionary is not as clear cut.

Furthermore, Devarajan et al. (1996) created an extension of the Barro model with multiple productive expenditures that showed that the long-run growth effects depend upon a combination of the relative productivities of expenditures and their relative budget shares.

Depending on the tax/expenditure combinations chosen, the effects on growth would be positive, negative, or zero (see Table 1). When these models are extended to allow for the growth effects of deficits/surpluses, results are again positive, negative, or ambiguous depending on what the deficit is financing; see Gemmell (2001) and Gemmell et al. (2011).

Table 1: Growth Effects of Taxes and Expenditure in a Growth Regression

Financed by:		**Public Spending:**		**Deficits:**
		Productive	**Unproductive**	
Taxes	Distortionary	Positive/negative (at low/high government size)	Negative	Ambiguous
	Non-distortionary	Positive	Zero	Negative
Deficits:		Ambiguous	Negative	-

Notes: Taken from 'Fiscal Policy in a Growth Framework', Norman Gemmell, 2001, p. 4. Copyright © UNU/WIDER

Agénor (2005) and Agénor and Neanidis (2006) using an extension of the Barro/Devarajan framework, modelled infrastructure, education, and health spending as inputs into the production function. Infrastructure affected the production of goods and the supply of health and education services, while health contributed to labour productivity. Semmler et al. (2007) developed an endogenous growth model to consider the output effects of education and health facilities, public infrastructure, and debt service on long-run per capita income and other macroeconomic variables. Their model suggested that about two-thirds of public investments should be directed towards public infrastructure, facilitating market production. The remaining third should be divided between the provision of health and education.

All the above endogenous growth models allow for "permanent" growth effects based on the so-called "knife-edge" properties, which depend on constant returns to scale (Dalgaard & Kreiner, 2003; Jakub, 2008; Gemmel et al., 2016). Arnold (2008) stated that a more credible empirical framework should be one that does not force a choice between either exogenous or endogenous growth. Therefore, Arnold (2008), in his exploration of tax structure and growth, adopted a more flexible growth model derived from Arnold et al. (2007), which used both an augmented Solow-Swan-type model and an endogenous growth model (Lucas, 1988) to account for the possibility of non-permanent but potentially persistent Solow-type transitional dynamics.

2.2 Implications for Empirical Testing – Acknowledging the Government Budget Constraint

In empirical studies, a specification issue that has been often overlooked, but has proved to be important, is the implicit financing based on the government budget constraint.

To illustrate this point, suppose that growth, Y, at time t can be shown as a function of conditioning non-fiscal variables X_t and fiscal variables represented by W_t:

$$Y_t = \alpha + \beta' X_t + \acute{\omega} W_t + \mu_t. \qquad (1)$$

Since the fiscal variables are tied together by a "closed system" of the government budget identity, the estimation of equation (1) requires that one fiscal variable is excluded to avoid perfect collinearity in the regression. This omitted variable is assumed to be the compensating or financing element within the government's budget constraint. Defining the budget identity, so that $\sum_{j=1}^{l} W_j = 0$ (where there are *l* distinct government expenditure and revenue elements) and substituting out one of the fiscal factors, denoted W_0, equation (1) is re-written as:

$$Y_t = \alpha + \beta' X_t + \Psi'_j W_{jt} + \mu_t. \qquad (2)$$

Where the coefficient $\Psi_j = (\acute{\omega}_i - \acute{\omega}_0)$ now measures the marginal impact of the fiscal element, W_j, on growth, net of the marginal impact of the excluded factor W_0. Therefore, the interpretation of the included element of the budget constraint (tax, expenditure, and deficit) will be the effect of a unit change in the relevant variable offset by a unit change in the omitted fiscal variable from the regression.

Kneller (1999) and Bleaney (2001) suggest that to avoid misspecification problems, only 'neutral' fiscal categories (those predicted to have a zero-growth impact in Table 1) should be omitted from regressions. Empirical tests based on this premise, albeit still not precise[2] and debatable, should first establish which categories are neutral to determine those that can be omitted. However, arbitrarily excluding a non-neutral category will not be non-robust. Instead, the interpretation will reflect the effect of a particular fiscal factor on growth, net of the impact of the excluded category (Gemmell, 2014; Acosta-Ormaechea and Morozumi, 2013; Adam and Bevan, 2003).

[2] Adam and Bevan (2003) criticise the assumption of testing for a growth-neutral category. They believe this is merely an assumption which cannot truly be subjected to empirical testing, as such a test for 'neutrality' is really testing whether they are equally distortionary.

2.3 Empirical Literature

Theory predicts that taxes, not including lump-sum taxes, lead to distortions that negatively affect growth. Easterly (1993), in a study of the United States (US), showed that taxes led to price distortions that negatively affect growth. However, further empirical studies that attempted to find evidence of a link between the overall level of taxes and growth performance have shown mixed results. In a cross-country study, Levine and Renelt (1992) failed to find a robust relationship between fiscal policy indicators and growth. Easterly and Rebelo (1993) found a weak correlation between tax rates and growth. A study by Mendoza et al. (1997) found that while the tax mix had no significant effect on the economic growth rate, it affected the rate of private investment. Yi and Kocherlakota (1996) found that tax measures significantly affected growth if capital expenditures were included in regressions. Arnold (2008) found that studies that used the tax structure instead of the overall average tax to GDP to investigate the link with growth drew more conclusive answers. Analysing the link between growth and tax structure, Kneller et al. (1999) separated tax into distortionary, defined as income and property taxes, and non-distortionary, defined as consumption taxes. They concluded that distortionary taxes lowered growth while non-distortionary taxes did not. Arnold et al. (2011) investigated the relationship between tax components—personal income, corporate income, consumption, and property taxes—and long-run GDP levels in the OECD. They found evidence of long-run GDP level effects from specific tax categories. However, the manner of the implicit financing assumptions based on government budget constraint captured in the regression specification affected the interpretation of the parameter estimates.

Looking at the economic composition of spending, Devarajan et al. (1996) and Gosh and Gregoriou (2008) showed that a rise in current expenditure raised the growth rate, while capital spending brought the opposite effect. On the other hand, Bose et al. (2003), Gupta et al. (2005) and Morozumi and Veiga (2016), along with several other studies, found that capital expenditure in GDP was positively and significantly correlated with economic growth but current spending was either insignificant or led to lower growth outcomes.

Analyses based on functional spending components typically agree that education, infrastructure, and health have some positive effects. Aschauer (1989), in studying private sector productivity in the US for the period 1949-1985, found that "core infrastructure," including streets, highways, bridges, and other public capital, had significant explanatory power. Blankenau et al. (2007), Dissou et al. (2016), and Bose et al. (2007) found that expenditure on education had a positive growth impact, while Levine and Renelt (1992) found that public education expenditures did not have a robust correlation with growth. However, Barro (1990) considered education spending as human capital. Agénor (2010) indicated that public health could affect labour productivity and thus influence growth. This finding was consistent with Alfonso and Jalles' (2014) results. However, Kneller, Bleaney, and Gemmell (1999) posited that the social protection component within social spending is not productive.

Regarding empirical estimation, in early time series studies, GDP was regressed on government expenditure without considering the dynamic properties of the series (e.g., Ram, 1987; Holmes & Hutton,1990). More recently, new empirical specifications have been implemented, considering non-stationary and co-integrating relationships. Studies on the Caribbean, namely Carter et al. (2013), used a Dynamic Ordinary Least Squares model, and Scott-Joseph and Turner (2016) used an Autoregressive Distributive Lag (ARDL) model. Gemmel et al. (2014, p. 7) claimed that the ARDL specification provides a flexible, functional form for analysis, which allows for a more structured modelling of expenditure dynamics, introducing the distinction between a long-term relationship and short-term adjustment.

3.0 Data and Empirical Methodology

3.1 The Dataset

For the analysis, the institutional coverage level is Central Government, and the period covered is 1967 - 2021. All fiscal variables are expressed as ratios to GDP. Data on tax and expenditure were obtained from the World Development Indicators (WDI) database of the World Bank, the Ministry of Finance, and the Central Bank of Belize's Statistical Digest.

Revenue data includes the categories: tax revenue, non-tax revenue, capital revenue, and grants. Tax revenue is broken out into its main categories: i) taxes on income and profit, which include pay-as-you-earn taxes and business taxes; ii) property tax; iii) taxes on goods and services, which include general sales tax, excise taxes, and stamp duties; and iv) taxes on trade and transactions, which include import duties as the largest component. Data on public expenditures include annual series for both recurrent and capital expenditures. Data are not available by functional classification for Belize. Instead, a dataset was constructed using the Ministry of Finance budget data to obtain current and capital expenditures for the health, education, and infrastructure sectors. (This approach is similar to the current and capital expenditures compiled by sectors used in Devarajan et al. (1996) and Bose et al. (2003)). The sectoral recurrent and capital expenditure data mainly reflect revised budget estimates and not necessarily actual data. Therefore, this data is used only in an extension of the baseline model, as results should be interpreted with caution.

The dataset also includes a few macroeconomic variables, including the dependent variable, real GDP per capita[3], obtained from the World Bank database and the Statistical Institute of Belize. Two macro variables are included as control variables in the regressions, namely, secondary school enrollment of the working-age population (see Levine and Renelt, 1992; Durlauf & Johnson, 1995) as a proxy for human capital accumulation and openness of a country (calculated as the value of imports and exports of goods and services relative to GDP). Rodrik (1998) argued that openness to international trade is an important variable in empirical models testing fiscal policy and growth for developing countries. As a robustness check, another trade indicator is added, export growth, alongside population growth. These variables have appeared as significant correlates of growth in previous studies (Levine & Renelt, 1992; Bose et al., 2003; Acosta-Ormaechea & Morozumi, 2013; and Afonso and Jalles, 2014).

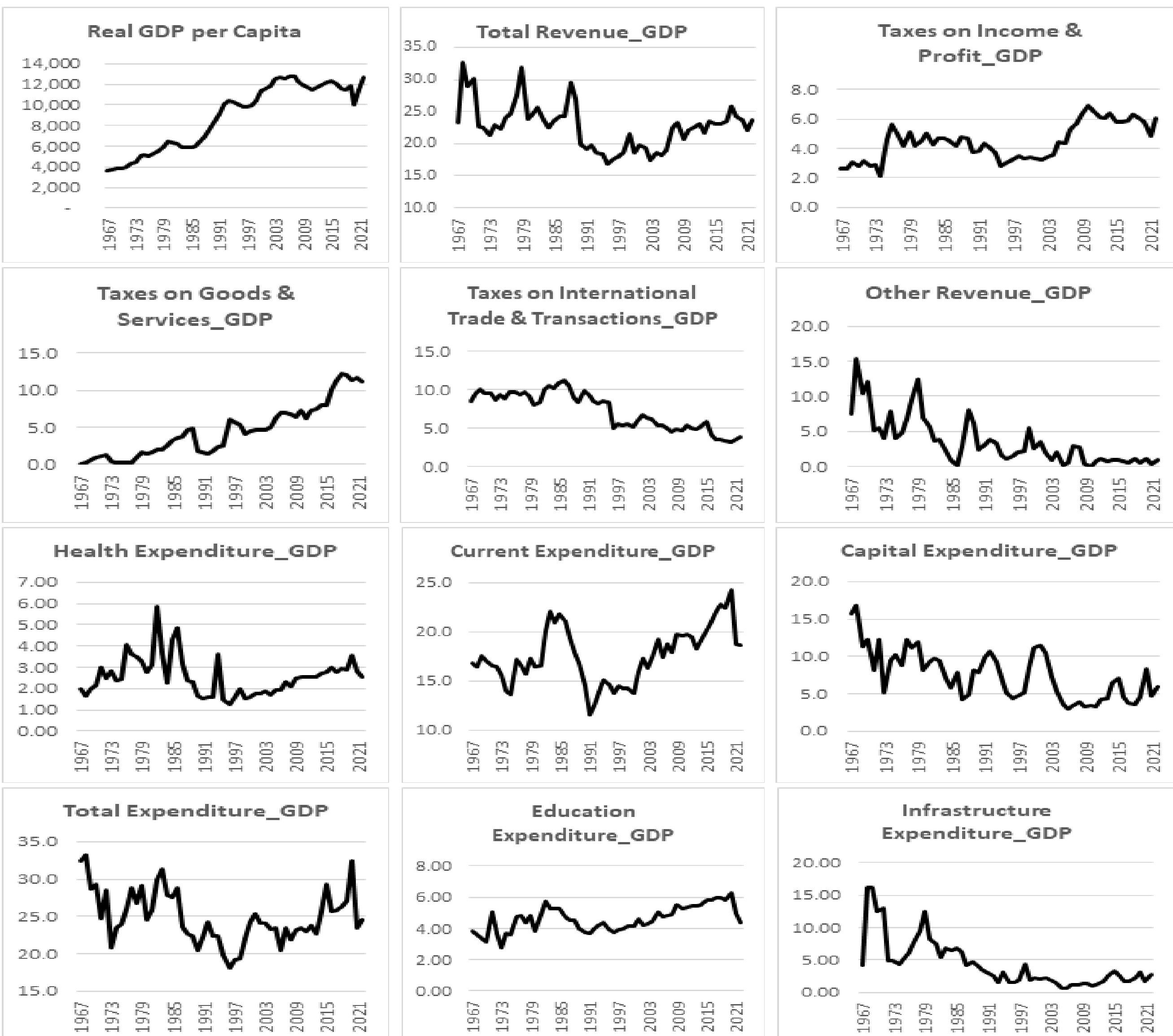
Table A1 in the appendix summarises the descriptive statistics for the fiscal variables relevant to the subsequent regression analysis. The Belizean economy grew on average around 3.2 per cent per capita per annum, with a population growth of around 2.4% per annum. Over the period, total revenue to GDP averaged 22.9% of

[3] Belize's GDP was rebased to a new base year of 2014 based on new 2014 supply use tables. The previous base year was 2000. Although real GDP could have been adjusted back, nominal was adjusted back to 1989, creating a break here. Therefore, a dummy variable reflecting this break was added to the regression.

GDP, peaking at 32.6% of GDP. Taxes on income and profit, including property tax, averaged 4.5% of GDP. This amount was similar to tax collections on goods and services of 4.5% of GDP from 1967 to 2021. Figure 1 further shows that taxes on goods and services have been trending upward, with a maximum tax ratio of 15.3%. This tax category has become a leading contributor to overall revenue, while taxes on trade and other revenue have progressively trended downward over the review period.

The graphical depiction shows that Belize increased its overall expenditure envelope (as a share of GDP) as GDP per capita climbed and reached a maximum of US $5,959. Importantly, the rise in total expenditure is essentially driven by recurrent expenditure, which has averaged 26.0% of GDP across the period. Capital outlays averaged 7.6% and fluctuated significantly over the period. However, capital expenditure has moderated over time.

Figure 1: Graphical Representation of Main Variables Used in Econometric Estimation



Notes: Annual real GDP per capita and current dollar values of fiscal ratios to GDP from 1967 to 2021. Sources: Central Bank of Belize, Ministry of Finance and World bank.

Turning to education, despite certain fluctuations across time, spending on this component relative to GDP increased over time. However, spending on health was relatively stable until 2000 and climbed after that. In contrast, infrastructure spending exhibits a clear downward pattern.

3.2 Empirical Specification and Methodology

3.2.1 ARDL estimation

This study follows the approach of Gemmell et al. (2014) and Arnold et al. (2008), employing an ARDL(p, q) model reparametrised in error correction form (ECM) to estimate long-run relationships and the speed of adjustment toward equilibrium. The general ARDL(p, q_1, ..., q_1) specification for the dependent variable Yt is given by:

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=0}^{q} \beta_j X_{t-j} + \epsilon_t \tag{3.0}$$

In this specification, the vector Xt includes both fiscal and control variables. The coefficients α and β and capture the autoregressive and distributed lag dynamics, respectively.

Equation (3.0) can be reparametrised into an error correction model (ECM) form as:

$$\Delta Y_t = \gamma_0 + \sum_{i=1}^{p-1} \gamma_i \Delta Y_{t-i} + \sum_{j=0}^{q-1} \delta j \Delta X_{t-j} + \phi(Y_{t-1} - \theta X_{t-1}) + \epsilon_t \tag{4.0}$$

In this ECM representation, ∅ is the error correction coefficient indicating the speed at which deviations from the long-run equilibrium are corrected, while θ represents the long-run relationship between Y_t and X_t. The differenced terms ΔY_t and ΔX_t account for the short run dynamics.

To test for the presence of a long-run relationship, the bounds testing procedure by Pesaran, Shin, and Smith (2001) is employed. This involves a t-statistic to assess the significance of the lagged error correction term ($\phi = 0$) and an F-statistic to test the joint significance of the level variables, with the null hypothesis of no cointegration tested against the alternative of a cointegrating relationship.

Gemmell et al. (2014, p. 7) argued that the ARDL framework offers a flexible functional form that does not impose the "permanent-growth" assumption of endogenous growth models, while still allowing for persistent, Solow-type transitional dynamics. Since Equation (4.0) is a reparameterisation of Equation (3.0), the model captures the long-run level effects of fiscal and other explanatory variables. Gemmell et al. (2014) and Jerupasin (2018) claim that using level specification allows the identification of the degree of persistence in GDP growth effects.

Another motivation for using the ARDL is that it can address the endogeneity concerns regarding the possible simultaneity between GDP per capita and the independent fiscal variables. Pesaran et al. (1999) and Pesaran and Shin (1999) proposed that a correction for endogeneity, in the form of contemporaneous correlation among the error terms, would be "equivalent to extending the ARDL (p, q) model to the more general ARDL (p, m) model," where $m \geq q$ (Pesaran & Shin, 1999, p. 15). Furthermore, simulation outcomes in Pesaran et al. (1999) showed that even in small samples, standard t- and F-tests on the long-run parameters from the ECM are valid, given sufficiently long lags of dependent and independent variables. Furthermore, in addition to long lags, endogeneity is overcome, provided that there exists a unique cointegrating relation between the I(1) variables (y_t and x_t) (Pesaran & Shin, 1999, p. 17).

4.0 Empirical Results

4.1 Pre-Testing the order of integration, cointegration, and ARDL lag structure

When applying an ARDL framework, the first step is to check the variables to ascertain whether they are I(0) or I(1). Unit root testing using the Augmented Dickey-Fuller (ADF) Test and the Phillips-Perron (PP) Test on the logarithm of the variables indicated that all variables were I(1) except for the fiscal deficit and capital expenditure to GDP, which were I(0), with the latter at a cautious 10.0% significance level (see Table A2 in appendix). The next step tested for the number of cointegrating relationships among the variables using Johansen's VAR approach. The Johansen analysis indicated the presence of at most one cointegrating long-run relationship among the variables, as shown in Table A3.

With unit root and cointegration pretesting completed, the results fulfil the first set of Pesaran and Shin (1999) conditions, allowing the ARDL model to overcome endogeneity concerns. Turning to the second condition, Pesaran et al. (1999) and Pesaran and Shin (1999) dealt with endogeneity problems in the ARDL context by ensuring a sufficiently long lag structure. In this study, the Schwarz Information Criterion (SIC) was used, and the ARDL model was allowed to select the appropriate lag length, which did not exceed 2 lags.

4.2 Regression Results

The discussion begins with the conditioning variables. The study finds that the two conditioning variables, school enrollment and openness, were positive and significant in regressions 2-4 (R2-R4). In R1, school enrollment was negative and insignificant, while openness was positive and significant. The error correction parameter, $\emptyset$, provides a measure of the speed of adjustment of growth following an exogenous shock. The results reveal that the adjustment process is relatively rapid. The country adjusts roughly 30.0% to 40.0% of the way towards a new equilibrium within a year.

4.2.1 Testing for Expenditure and Tax Effects

Table 2 presents the results of adding the main categories of tax, expenditure, and deficit into the growth regression. To save on degrees of freedom, the following regressions combined taxes on income and profits with property taxes. From now on, this is referred to as "income tax." The variable "other revenues" reflects non-tax revenue, capital revenue, and grants. The top line of Table 2 shows which fiscal variable has been omitted, acting as the compensating financing element. The omitted or financing variables comprise four fiscal variables: budget surplus/deficit, taxes on goods and services, income tax, and other revenues.

Table 2: Growth Regressions with Central Government Tax and Expenditures

Regression No.	**R1**	**R2**	**R3**	**R4**
Lags	(p,q ≥ 2)	(p,q ≥ 2)	(p,q ≥ 2)	(p,q ≥ 2)
Financed By:	*Budget Surplus/Deficit*	*Taxes on Goods & Services*	*Income Tax*	*Other Revenues*
Fiscal Variables				
BUDGET DEFICIT/SURPLUS	...	0.030 ** -0.01	0.038 *** (0.001)	0.017 (0.010)
T_GOODS_SERVICES_TAX	0.182 *** (0.030)	...	- 0.069 * (0.091)	0.097 *** (0.023)
T_INCOME_TAX	0.264 *** (0.090)	0.113 (0.174)	...	0.289*** (0.099)
T_OTHREVENUE	- 0.066 (0.06)	- 0.215 *** (0.090)	- 0.214 *** (0.103)	...
T_TRADE_TAX	- 0.099 (0.082)	- 0.238 *** (0.091)	- 0.329 *** (0.090)	0.050 (0.076)
X_CAP_GDP	0.120 (0.087)	0.274 *** (0.075)	0.353 *** (0.101)	0.250 *** (0.070)
X_CUR_GDP	- 0.684 *** (0.219)	- 0.367 (0.246)	- 0.007 (0.244)	- 0.194 (0.183)
Control Variables				
SCHOOL_ENROLL	-0.03 (0.464)	1.834 *** (0.331)	2.518 *** (0.382)	1.439 ** (0.414)
OPENNESS	1.39 *** (0.409)	0.593 *** (0.322)	0.441 *** (0.241)	0.505 *** (0.232)

RESULTS FROM BOUNDS TESTS ON REGRESSIONS 1-4

Models	F-statistic	Lower bound I(0) at 1% significance level	Upper bound I(1) at 1% significance level	ECM
R1	6.88	2.79	4.1	-0.358
R2	8.49	2.79	4.1	-0.283
R3	7.97	2.79	4.1	-0.287
R4	8.58	2.79	4.1	-0.425
Diagnostic Checks				
Observations	53	54	54	53
Jarque Bera (p-stat)	0.942	0.778	0.878	0.822
LM Test (p-stat)	0.063	0.724	0.425	0.075
Breusch-Pagan-Godfrey	0.381	0.324	0.334	0.592
Ramsey RESET (p-stat)	0.117	0.422	0.524	0.336

Notes: Standard errors are in parentheses. Newey West standard errors applied. The dependent variable is Real GDP per Capita. All fiscal variables are over GDP and logged except for the overall fiscal balance as a percent of GDP. Control variables are also logged. T-bound tests for each regression are all significant at 5%, showing that the cointegrating relationship is not nonsensical. Cusum tests showed that all models were stable. *p<0.1; **p<0.05; ***p<0.01.

4.2.2 A Look at Expenditure-output Effects

Table 2 reveals that capital expenditure has a long-run output effect that is positive and statistically significantly different from zero when financed by the omitted variables: taxes on goods and services, income tax, and other revenues. However, capital expenditure has insignificant long-run output effects when financed by a fiscal deficit. The largest positive association between capital expenditure and output is seen when income tax is the financing element, whereby a one percentage point increase in capital expenditure raises GDP per capita by 0.35 percentage points.

This outcome aligns with studies from Bose et al. (2003), Gupta et al. (2005), Acosta-Ormaechea and Morozumi (2013) and Morozumi and Veiga (2016). Regionally, the study by Joseph and Turner (2016) found that the impact of investment expenditure on sectoral growth was positive and significant for a panel of Caribbean countries.

Current expenditure displayed negative output effects for all financing assumptions. However, it was insignificant in R2-R4 when the compensating elements were taxes on goods and services, income tax, and other revenues. Adverse long-run effects on GDP per capita were steepest when current expenditure was financed from debt rather than from taxes.

Overall, the results suggest that an increase in capital expenditure produces significant positive impacts on output. In addition, financing current expenditures by any variable produces negative output effects.

4.2.3 A Look at Tax-output Effects

Turning to tax-output effects, R1 reveals that increases in taxes on goods and services and income taxes, matched by a corresponding redcution in the model's deficit, are siginificant and raises GDP per capita growth. Therefore, replacing a deficit with taxes on goods and services and income taxes would be growth-enhancing within limits. However, when trade taxes and other revenues are increased, and the deficit is reduced by a corresponding amount, the effects on GDP per capita are negative and insignificant.

R2–R4 evaluate the impact of the main tax categories, when omitting either taxes on goods and services, income tax, or other revenues, on long-run GDP per capita. R2 results indicate that shifts towards other revenues and trade taxes, financed by an offsetting reduction in taxes on goods and services, would lower GDP per capita. Meanwhile, a shift towards income taxes has positive, albeit insignificant effects on GDP per capita. R3 shows that increases in goods and services, other revenues, and trade taxes, matched by a corresponding redcution in income tax, lowers GDP per capita growth. Interestingly, a shift towards increasing taxes on goods and services yields the least negative impact on GDP. R4 shows that increases in goods and services and income taxes, when other revenues are omitted, are significant and raises GDP.

In summary, increases in goods and services and income taxes, when compensated by the omitted variables, produce the most growth-enhancing effects and the reverse would be true for trade taxes and other revenue.

4.3 Sectoral Breakout of Expenditure

Table 3 shows an alternative classification of the fiscal data in an extension of the baseline model. As an extension of the baseline analysis, total expenditure is disaggregated in to four functional categories: education, health, infrastructure, and other expenditure. Regressions 1 and 2 exclude the school enrollment variable as a control variable as this and the education spending variable measure the same phenomenon (Levine & Renelt, 1992, Benos & Zotou, 2013). Population growth replaced this variable. This breakout allows the study to focus on variables commonly used in previous investigations and offers another layer of analysis based on an alternative classification of expenditure.

The results in R1 (extension) show that an increase in spending on education and health, financed by an increase in budget deficit, produce a statistically significant negative effect on output. Meanwhile, an increase in infrastructure spending results in an insignificant but positive effect on GDP. However, an increase in all other combined expenditures leads to a significant and positive effect on GDP. R2 (extension) shows that an increase in education spending, with a compensating fall in other expenditure, leads to a significant and positive long-run effect on GDP. However, negative long-run associations with GDP are still observed for health. Additionally, the parameter for infrastructure remains positive but still insignificant.

These results align with several studies. For example, Devarajan et al. (1996) found that fiscal spending on health had a negative relation to growth for developing countries. However, it was statistically insignificant. In studies closer to home, Carter et al. (2013) found negative growth effects for Barbados' education and health expenditure in the long and short term. Mathias and Birchwood (2003), in their analysis of Latin America and the Caribbean, reported that spending on health care negatively influenced growth, while spending on education at low levels positively affected growth. However, this positive effect turned negative at higher levels of spending. For developing countries, Bose et al. (2003) found significant, positive output effects for spending on education and "other expenditure" when implicitly financed by non-tax revenue and suggested that it was due to the associated externalities in raising the productivity of both human and physical capital. Gemmel et al. (2014) also found evidence supporting long-run positive effects on GDP per capita levels for education for a sample of OECD countries. Alfonso and Jalles (2014) and Acosta-Ormaechea and Morozumi (2013) also discovered evidence of a positive impact of education, although, in contrast, they also found a positive impact on health on growth.

Overall, the results captured in both the baseline and extension analyses show that fiscal policy effects on long-run GDP per capita levels are generally small. This aligns with Gemmel et al. (2011), who claimed that these small output effects were due to fiscal policy volatility and because "growth-enhancing" and "growth-reducing" fiscal changes often occur simultaneously.

4.4 Robustness Checks

Furthermore, the paper seeks to reinforce the validity of its baseline findings by addressing three specific concerns. Levine and Renelt (1992) and Easterly and Rebelo (1993) cautioned that the effects of most of the variables used in growth regressions, particularly fiscal variables, tend to vary widely as the set of explanatory

Table 3: Sectoral Expenditures and GDP per Capita

Regression No.	**R1 (extension)**	**R2 (extension)**
lags	(p,q ≥ 2)	(p,q ≥ 2)
Financed By:	*Budget Surplus/Deficit*	*Other Expenditure*
Fiscal Variables		
BUDGET DEFICIT/SURPLUS	…..	- 0.050 *** (0.013)
T_GOODS_SERVICES_TAX	0.156 *** (0.019)	0.147 *** (0.058)
OTHER_REVENUE	0.050 (0.081)	0.392 *** (0.192)
EDUC_EXPEN	- 0.675 *** (0.109)	0.890 * (0.462)
HEALTH_EXPEN	- 0.544 *** (0.045)	- 1.354 *** (0.308)
INFR_EXPEN	0.005 (0.023)	0.106 (0.070)
OTHER_EXPEN	1.522 *** (0.152)	….
Control Variables		
OPENESS	0.898 *** (0.100)	1.065 *** (0.274)
POP_GROWTH	- 0.241 *** (0.022)	- 0.218 *** (0.051)

Models	F-statistic	Lower & Upper bound I(0) at 1% significance level	
R1	42.4	2.79	4.1
R2	17.08	2.79	4.1
Observations	51		51
Jarque Bera (p-stat)	0.628		0.893
LM Test (p-stat)	0.123		0.185
Breusch-Pagan-Godfrey	0.374		0.404
Ramsey RESET (p-stat)	0.657		0.459

Notes: Standard errors are in parentheses. Newey West standard errors applied. The dependent variable is as % of GDP. Control variables are also logged. T-bound tests for each regression are all significant at 2.5% or 1%, showing that the cointegrating relationship is not nonsensical. Cusum tests showed that all models were stable. *p<0.1; **p<0.05; ***p<0.01.

Sources: Own estimations with data from the Ministry of Finance, Statistical Institute of Belize, and World Bank Database.

variables changes. Thus, the first robustness check adds two control variables that drive the developments of GDP per capita in previous studies—population growth and export growth—to test R1 of the baseline analysis presented in Table 2. A second concern is the outlying observations of fiscal data and GDP per capita associated with COVID-19 years (2020 and 2021). Therefore, the second robustness check treats these outliers as missing data (see Carriero and Clark, 2021), shortening the sample period by two years. The third concern surrounds degrees of freedom and, thus, the number of variables in the model. The third check saves on degrees of freedom by combining trade taxes with non-tax revenue and grants to form the variable "other revenue" to see if that affects the results, particularly on capital and current spending.

Turning to the robustness checks, Table 4 replicates the results of R1 in Table 2 by doing the following: i) adding two more control variables in R1 (robustness), ii) shortening the sample period to eliminate the COVID-19 outlying variables in R2 (robustness), and iii) saving on degrees of freedom by combining tax variables in R3 (robustness). To save space, Table 4 shows only the parameters of interest and uses the preferred specification, which omits the budget surplus/deficit to perform the robustness checks. This omission facilitates our understanding of the results because deficit-funded tax or expenditure changes have an intuitive economic interpretation.

Results show that capital and current spending, alongside taxes, appear to have similar associations with growth, with similar signs in both the baseline analysis (Table 2) and the robustness check (Table 4). All the control variables likewise remain consistent after altering the conditioning set. Therefore, the findings were

Table 4: Robustness Checks

Regression No.	**R1 (robustness)**	**R2 (robustness)**	**R3 (robustness)**
lags	(p,q ≥ 2)	(p,q ≥ 2)	(p,q ≥ 2)
Financed By:	*Budget Deficit*	*Budget Deficit*	*Budget Deficit*
Fiscal Variables			
BUDGET DEFICIT	...	...	...
T_GOODS_SERVICES_TAX	0.243 ***	0.182 ***	0.278 ***
T_INCOME_TAX	0.213 ***	0.264 ***	0.316 ***
T_OTHREVENUE_TAX	-0.017	-0.065	-0.013
T_TRADE_TAX	0.214	0.099	
X_CAP_GDP	0.003	0.12	0.04
X_CUR_GDP	- 0.891 ***	- 0.683***	- 1.218 ***
Control Variables			
SCHOOL_ENROLL	-0.536	-0.031	0.06
OPENESS	1.201 ***	1.39 ***	0.994 ***
EXPORT GROWTH	0.005 ***		
POP_GROWTH	- 0.022 *		

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

robust to adding export and population growth variables. Similar results were also obtained in R2 (robustness) when the outlying years of 2020 and 2021 were omitted. In R3 (robustness), the relationship between GDP per capita, capital and recurrent expenditures, respectively, holds when income tax and "other revenue" are combined to further save on degrees of freedom.

4.4.1 Weak exogeneity tests

A major concern in running regressions in Table 2 is the potential for simultaneity between GDP per capita and the fiscal variables. As noted earlier, Pesaran and Shin (1999) argued that the ARDL framework deals with both regressor endogeneity and serial correlation in the error process. Therefore, a formal check can be executed to ascertain whether changes in the fiscal variables are statistically unrelated to the error correction terms from R1 and R2 in Table 2, baseline analysis, and R1 and R2 in Table 3, extension analysis. Are the fiscal variables really "weakly exogenous" or "long-run forcing" for GDP and, thus, reflect causal effects? The following procedure serves as an additional robustness check of the main variables of interest in Tables 2 and 3.

Johansen (1992) and Boswijk (1995), outlined in Calderon et al. (2015) and Gemmell et al. (2014), showed that weak exogeneity of the long-run parameters could be checked by estimating marginal models for each of the fiscal variables and using a variable addition test to assess the statistical significance of the error correction terms obtained from Table 2 for each of the marginal models.

Following Calderón et al. (2015) and Gemmell et al. (2014), the following marginal model was tested:

$$\Delta x_t = \sum_j \beta_j \Delta \boldsymbol{X}_{t-j} + \sum_j \alpha_j \Delta \boldsymbol{y}_{t-j} + \delta \xi_t(\hat{\beta}) + \varepsilon_t \qquad (5.0)$$

Where x_t represents each element of the vector X_t of RHS variables, $(\hat{\beta}) = (Yt\text{-}1 - \hat{\beta}\boldsymbol{X}t\text{-}1)$ are the estimated long-run equilibrium error correction (ECM) terms and ε_t is a random error term. The null hypothesis of weak exogeneity involves testing $\delta = 0$, as a t-test on the δ for each variable. Rejection of the null implies rejection of weak exogeneity (Gemmel et al., 2014).

Table 5: Weak Exogeneity Tests: t-ratios (absolute values)

Table 2	Taxes on Goods	Taxes on Income & Profit	Other Revenue	Trade Taxes	Capital Spending	Current Spending	Education	Health	Infrastructure	Other Expenses
R1	1.78	0.761	0.526	1.51	0.393	0.517				
R2	1.74	0.723	0.531	1.48	0.395	0.507				
R1							0.199	0.407	0.746	0.387
R2							0.421	0.362	0.54	0.014

The weak exogeneity tests showed that the hypothesis of weak exogeneity could be accepted for all variables except taxes on goods and services (Table 5). The endogeneity of taxes on goods in both regressions suggests more caution in interpreting its effects as causal. Based on this result, additional lags were added, which changed the result to a marginal acceptance of weak exogeneity.

5.0 Conclusion and Policy Implications

This paper examined the relationship between fiscal policy and GDP per capita for Belize. The paper's examination paid particular attention to the financing aspects of fiscal policy effects, endogeneity concerns, and sensitivity biases. The study confirms that the method of financing any spending or tax changes matters for growth outcomes.

Regarding tax, output effects depended on the compensating variable that was adjusted. Policy implications show that overall, tax shifts towards taxes on goods and services and income taxes and away from trade taxes and non-tax revenue are conducive to enhancing long-run GDP per capita.

When examining the effects of expenditure, capital spending had a positive long-run effect on output when financed by taxes on goods and services, income taxes or other revenues. The results also showed a negative and mostly insignificant long-run effect on output for current spending. As a result, Belize's fiscal policy decisions on current versus capital expenditure should lean towards capital spending, at least on the aggregate level, to enhance growth.

Turning to the sectoral breakout of expenditure, the study found long-run positive effects on GDP per capita for deficit-financed increases in infrastructure, albeit insignificant. This insignificance reveals some likely bureaucratic inefficiencies or quality hurdles affecting the full productivity potential that can be reaped from infrastructural projects. Therefore, a careful review of projects is needed to ensure efficiency in implementation. However, spending on health and education had significant, negative growth effects when financed by a deficit. Thus, deficit-financed expenditures in education and health cannot be growth-enhancing unless the specific forms of that spending are considered carefully. Furthermore, the assumed form of financing is very important. This analysis showed that switching spending towards education and infrastructure and away from "other expenditures" produced positive long-run output effects, although once again insignificant in the case of infrastructure.

When drawing policy conclusions from this study, it is essential to note that the government considers objectives besides growth when implementing tax and spending decisions, such as the distributional effect of different taxes, employment, and social protection. In addition, the quality of government services also affects the likely impact of fiscal policy. Since this study did not account for these factors, they can be viewed as avenues for future exploration.

6.0 References

Acosta-Ormaechea, S. and Morozumi, A. (2013). Can a government enhance long-run growth by changing the composition of public expenditure? IMF Working Paper, WP/13/162.

Afonso, A. and J. G. Alegre (2011). Economic growth and budgetary components: a panel assessment for the EU. Empirical Economics, 41: 703–723.

Agénor, P. (2005). Infrastructure, Public Education and Growth with Congestion Costs. Working Paper No. 47, Centre for Growth and Business Cycle Research, University of Manchester.

Agenor, P. and Neanidis, K. (2006). The Allocation of Public Expenditure and Economic Growth. The University of Manchester, Economics Discussion Paper.

Arnold, J.; A. Bassanini and S. Scarpetta (2007), "Solow or Lucas? Testing Growth Models Using Panel Data from OECD Countries". OECD Economics Department Working Papers No. 592.

Arnold, M., Brys, B., Heady, C., Johansson, A., Schwellnus, C. and Vartia, L. (2011). Tax policy for economic recovery and growth, Economic Journal, Vol. 121, pp. F59–F80.

Aschauer, D. (1989). "Is public expenditure productive?" Journal of Monetary Economics, Vol. 23, pp. 177–2
Barro, R. (1990). Government Spending in a Simple Model of Endogenous Growth. Journal of Political Economy, Vol. 98, S103-S107.

Barro, R. and X. Sala-i-Martin (1992). "Convergence". Journal of Political Economy, 100(21), pp. 223- 251.

Benos, N. and Zotou, S. (2013). Education and Economic Growth: A Meta-Regression Analysis. University of Ioannina, Ioannina, Greece.

Blankenau, W., Simpson, N. and Tomljanovich, M. (2007). Public Education Expenditures, Taxation, and Growth: Linking Data to Theory. The American Economic Review, Vol. 97, No. 2, pp. 393-397.

Bleaney, M., Gemmell, N. & R. Kneller (2001). Testing the endogenous growth model: public expenditure, taxation, and growth over the long-run. Canadian Journal of Economics, 34(1): 36–57.

Bose, N., Haque, M.E and Osborne, D. (2003). Public Expenditure and Economic Growth. A Disaggregated Analysis for Developing Countries. Centre for Growth and Business Cycle Research, Economic Studies, University of Manchester. Discussion Paper No. 30.

Boswijk, H. (1995). ‘Efficient inference on cointegration parameters in structural error correction models’, Journal of Econometrics, Vol.69, pp. 133–158.

Calderón, C., Moral-Benito, E. and Servén, L. (2014). ‘Is infrastructure capital productive? A dynamic heterogeneous approach, Journal of Applied Econometrics (forthcoming).

Carriero, A., and Clark, T. (2021). Addressing COVID-19 Outliers in BVARs with Stochastic Volatility. Presented at the seventh annual meeting on New Developments in Business Cycle Analysis, organized by Danmarks Nationalbank, Deutsche Bundesbank, and Norges Bank. https://www.ecb.europa.eu/pub/conferences/shared/pdf/20210615_11th_cft/Mertens_Paper3.pdf.

Carter, J., Craigwell, R. and Lowe, S. (2013). Government Expenditure and Economic Growth in a Small Open Economy: A Disaggregated Approach. Central Bank of Barbados Working Paper No. WP/13/15.

Devarajan, S., Swaroop, V. and Zou, H. (1996). “The composition of public expenditure and economic growth”, Journal of Monetary Economics, 37, 313- 344.

Durlauf, S. N., and Johnson, P. A. (1995). Multiple Regimes and Cross-Country Growth Behavior. Journal of Applied Econometrics, 10(4), 365-384.

Easterly, W. & Rebelo, S. (1993). Fiscal Policy and Economic Growth: An Empirical Investigation, Journal of Monetary Economics, 32 (December), p. 417- 458.

Fuente, de la A. (1997 “Fiscal Policy and Growth in OECD”, CEPR Discussion Paper, 1755.

Gemmell, N., R. Kneller and I. Sanz (2006), “Fiscal Policy Impacts on Growth in the OECD: Are They Long- or Short-Term?”, Mimeo, University of Nottingham 2006.

Gemmell, N., Kneller, R. and Sanz, I. (2011). The timing and persistence of fiscal policy impacts on growth: evidence from OECD countries, Economic Journal [online]. Vol. 121, pp. F33–F58. [Accessed 27 June 2019]

Gemmel N., Kneller, R and Sanz. I. (2014). Does the composition of government expenditure matter for long-run GDP levels? Working Paper. Business School, Victoria University of Wellington, New Zealand Victoria.

Ghosh, S. & Gregoriou, A. (2008). The Composition of Government Spending and Growth: Is Current or Capital Spending Better? Oxford Economic Papers [online]. 60(3), 484–516.

Holms, J. M. & P. A. Hutton (1990). On the Causal Relationship Between Government Expenditures and National Income. Review of Economics and Statistics, pp. 72, 87–95.

Jerupasin, K. (2018). Investigating the relationship between Government Spending and Economic Growth: Public Spending and long-run GDP level. Thammasat Review of Economic and Social Policy Vol 4, n0. 2.

Joseph, A. & Turner, T. (2016). Does the Composition of Government Expenditure Matter for Caribbean Economies' Long-run Sectoral Output Growth? An ARDL Bound Test Approach. University of the West Indies.

Kim, J., Wang, M. and Park, D. (2021). Fiscal policy and economic growth: some evidence from China. Review of World Economics (2021) 157:555–582 https://doi.org/10.1007/s10290-021-00414-5.

King, R. & Rebelo, S. (1990). "Public policy and economic growth: Developing neoclassical implications", Journal of Political Economy, 98, s126-151.

Kneller, R. Bleany, M.F. and Gemmell, N. (1999). Fiscal Policy and Growth: Evidence from OECD Countries", Journal of Public Economics, Vol. 74, pp. 171 – 190.

Levine, R., & Renelt, D. (1992). A Sensitivity Analysis of Cross-Country Growth Regressions. American Economic Review, 82 (4), 942-963.

Mathias R., and Birchwood, A., (2004). Government Spending and Economic Growth in Latin America and the Caribbean. Caribbean Centre for Monetary Studies p. 407.

Mendoza, E., Milesi-Ferretti, G. and Asea, P. (1997). On the effectiveness of tax policy in altering long-run growth: Harberger's superneutrality conjecture, Journal of Public Economics, 66, 99-126.

Morgavi, H., Pina, A., and Sunel, E. (2022). Increasing public investment to strengthen the recovery from the pandemic: A glass only half-full. OECD Economics Department.

OECD (2021) Tax and fiscal policies after the COVID-19 crisis. Report prepared for G20 Finance Ministers and Central Bank Governors (FMCBG). https://www.oecd.org/coronavirus/policy-responses/tax-and-fiscal-policies-after-the-covid-19-crisis-5a8f24c3/

Pesaran M.H. and Smith, R.P. (1995). Estimating long-run relationships from dynamic heterogeneous panels. Journal of Econometrics, Vol. 68, pp. 79-113.

Pesaran M.H. and Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis', in S. Strom (ed.), Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, Cambridge University Press, Cambridge, Ch.11, pp. 371-413.

Rodrik, D. (1998). Why do more open economies have bigger governments? Journal of Political Economy, pp. 106, 997–1034.

Sala-i-Martin, X. (1992). Public welfare and growth, Yale University, Economic Growth Centre Discussion Paper No. 666.

Semmler, W., Greiner, A., Diallo, B., Rezai, A., and Rajaram, A. (2007). Fiscal Policy, Public Expenditure Composition, and Growth Theory and Empirics. World Bank Policy Research Working Paper, n0. 4405.

Yi, K. and Kocherlakota, N. (1996). Is there endogenous long-run growth? Evidence from the U.S. and the U.K., Federal Reserve Bank of New York, 17, (December).

7.0 Appendix

Table A1: Summary Statistics

Variables		Mean	Std. Dev.	Minimum	Maximum
REAL GDP PER CAPITA	RGDP_CAPITA	8,424.90	2,935.70	3,489.00	12,009.00
TOTAL REVENUE	TOT_REV_GDP	22.9	3.4	17.4	32.6
TAX REVENUE	TAX_REV_GDP	16.6	2.9	11.6	25.6
TAXES ON INCOME AND PROFIT	T_INCOME_TAX	4.5	1.2	2.2	6.9
TAXES ON GOODS &SERVICES	T_GOODS_SERVICE_TAX	4.5	3.7	0.1	15.3
TAXES ON TRADE & TRANSACTIONS	T_TRADE_TAX	7.4	2.4	3.4	11.2
OTHER REVENUE	T_OTHREVENUE	6.5	4	2	19.8
TOTAL EXPENDITURE	X_TOTEXP_GDP	25.3	3.4	18.6	33.5
CAPITAL EXPENDITURE	X_CAP_GDP	7.6	3.4	3	16.8
RECURRENT EXPENDITURE	X_CUR_GDP	17.7	3.1	12	26
EDUCATION EXPENDITURE	EDUC_EXPEN	4.7	0.9	2.8	6.7
HEALTH EXPENDITURE	HEALTH_EXPEN	2.6	0.9	1.4	5.2
INFRASTRUCTURE EXPENDITURE	INFR_EXPEN	4.5	3.8	0.7	16.2
BUDGET DEFICIT/SURPLUS	DEFICIT_GDP	-2.3	3.2	-9.2	9.2

Notes: Fiscal ratios to GDP from 1967 to 2021.
Sources: Central Bank of Belize, Ministry of Finance and World bank.

Table A2: Augmented Dickey Fuller Test Results

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Conclusion
RGDP_CAPITA	-1.666	-3.56	-2.92	-2.60	Cannot reject the null
T_INCOME_TAX	-2.248	-3.56	-2.92	-2.60	Cannot reject the null
T_GOODS_SERVICE_TAX	-0.240	-3.56	-2.92	-2.60	Cannot reject the null
T_TRADE_TAX	-0.621	-3.56	-2.92	-2.60	Cannot reject the null
T_OTHREVENUE	-1.583	-3.56	-2.92	-2.60	Cannot reject the null
X_CAP_GDP	-3.340	-3.56	-2.92	-2.60	Reject the null
X_CUR_GDP	-1.981	-3.56	-2.92	-2.60	Cannot reject the null
EDUC_EXPEN	-2.687	-3.56	-2.92	-2.60	Cannot reject the null
HEALTH_EXPEN	-1.829	-3.56	-2.92	-2.60	Cannot reject the null
INFR_EXPEN	-2.265	-3.56	-2.92	-2.60	Cannot reject the null
DEFICIT_GDP	-4.844	-3.56	-2.92	-2.60	Reject the null
SCHOOL_ENROLL	-1.464	-3.56	-2.92	-2.60	Cannot reject the null
OPENESS	-2.379	-3.56	-2.92	-2.60	Cannot reject the null

Note: Reject the null when the p-value is less than or equal to 5%.

Table A3: Summary Results of Johansen Cointegration Method

Hypothesized No. of CE(s)	Trace Test			Maximum Eigenvalue Test		
	Statistic	0.05 Critical Value	Prob.	Statistic	0.05 Critical Value	Prob.
	RGDP_CAPITA = ƒ(T_INCOME_TAX, T_GOODS_SERVICE_TAX, T_TRADE_TAX,T_OTHREVENUE, X_CUR_GDP, SCHOOL_ENROLL, OPENESS)					
None*	177.2	159.2	0.004	54.5	52.4	0.029
At most 1	122.6	125.6	0.075	43.5	46.2	0.094

Note: Trace and Max-eigenvalue tests indicate one cointegrating equation at the 0.05 level. Schwarz information criterion chose a lag of 1 year.