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Debt and Economic Growth in an Oil Rich Economy: Evidence from Saudi Arabia

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ABSTRACT

The objective of this paper is to examine the impact of debt on economic growth in Saudi Arabia based on autoregressive distributed lags approach for the period of 1969-2013. The result indicates that variables are cointegrated and null hypothesis was rejected at the 5% significance level. The coefficients of long-run result reveal that public debt affects economic growth in a positive and statistically significant manner. Furthermore, inflation was found to also enhance economic growth in the oil rich kingdom. Despite the overwhelming evidence in the literature suggesting debt stifles growth, our study recommend that policymakers maintain the current level of debt-to- gross domestic product in the country.

Keywords: Public Debt, Economic Growth, Inflation, Autoregressive Distributed Lags
JEL Classifications: H61, H62, H63

1. INTRODUCTION

To an average economist, fiscal policy is a significant determinant of investment and economic growth in a particular country; this has led to the articulation of public investment, revenue and other aspects of fiscal policy in the context of growth models. The literature contains two different views on the issue of government spending, investment and growth. The classical view, also known as the crowding out effect contends that increase in government expenditure drives down or even eliminates investment from the private sector. Proponents of this theory believe that demand for goods and services increase in the wake of an increase in public sector spending- whether this increase is financed with taxes or debt-making capital more expensive through raising interest rates and as a result, reducing private investment.

While on the other hand, the non-classical view or the crowding in effect argues that increased public sector spending stimulates investment and growth. The advocates of this school are of the opinion that an increase in government expenditure, either by tax or borrowing increases private investment by way of boosting demand for goods and services, which leads to an increase in private demand for new output sources such as factories. This may occur in developing economies where government spending on infrastructure can influence private investment.

In his study, Barro (1990) examined the effect of increase in government spending through tax on investment and growth. The analysis classified government spending into expenditure on productive service such as infrastructure and unproductive services which includes subsidies. He finds that expenditure on productive services affects growth positively while expenditure on unproductive services affects growth negatively. Barro's analysis focused on tax-financed government expenditure ignoring debt-financed expenditure. Although Habib and Miller (2000) studied the effect of disaggregated government expenditure on economic growth financed both with tax and debt, their study is based on a cross-sectional data of 34 countries. Given the diverse country sample employed in the analysis, the effects of expenditure on growth may differ across countries with varying levels of economic growth and moreover, increasing or decreasing panel members may affect the accuracy of the results. Furthermore, Narayan (2005) maintains that for any hypothesis to be popular, acceptable or criticized, it has to be examined for a range of countries with different economic and market structures. Hence, for this study, we examine the effect of government debt-financed expenditure on economic growth in the context of an oil producing economy.

Since the 1970s, oil producing states have experienced rising budget deficit largely due to the volatile global crude oil prices, and as a result, rising debt-to- gross domestic product (GDP) ratios. In the world's largest crude oil exporter, Saudi Arabia, public debt has been fluctuating since the years following the oil boom.

Our objective in this paper is to provide a comprehensive analysis of the long-run relationship between budget deficits and the rate of economic growth in Saudi Arabia. This issue would seem to be a timely one, especially for Saudi Arabia. The persistence and growing size of budget deficits[1] have become a cause for much concern to economists and Saudi Arabian policy-makers. The soaring budget deficits might have been expected because the government is accustomed to huge expenditure with a limited tax and revenue base[2]. Similarly, the economy has grown at an average rate of 8.8% over the past few decades, raising questions whether debt-financed government expenditure crowd in or crowd out investment and subsequently growth in the country.

The next section reviews some literature on the issue of expenditure and growth; section three outlines the model, methodology and data to be employed in the analysis. Section four presents and discusses the results while section five concludes the study.

2. LITERATURE REVIEW

Much of the empirical work examining the link between fiscal variables and economic growth focuses on the effect of total spending on economic growth. Although gaining importance, there is relative scarcity in the literature regarding the effects of government debt on economic growth. Even though the standard theoretical literature tends to support a negative relationship between government debt and economic growth (Aizenman et al., 2007; Saint-paul, 1992), a few endogenous growth models (Aizenman et al., 2007 and Aschauer, 2000) indicate that it is not unsurprising for debt to affect growth positively during the steady-state transition stage, subject to the type of project financed using the debt or to a particular threshold when the debt is used to finance productive capital projects.

High government debt may negatively affect medium- and long-term growth through a number of channels, among which are; increased future distortionary taxation (Dotsey, 1994; Barro, 1979); higher interest rates (Baldacci and Kumar, 2010; Gale and Orszag, 2002); higher long-run inflation (Cochrane, 2011; Barro, 1995); reduced long-term capital spending (Aizenman et al., 2007) and greater policy uncertainty (Kumar and Woo, 2013). High government debt, according to Woo (2009) and Aghion and Kharroubi (2007) may constrain the degree for countercyclical fiscal policies, which is likely to generate higher volatility and as a result further lowering growth.

In his study, Schclarek (2004) broadly examined the topic covering the advanced and emerging countries 1970 and 2002. The analysis failed to proof the existence of any strong relationship in 24 advanced economies. Conversely, recent examination of the impact of government debt and long-term real GDP growth rate in 20 industrialized economies by Reinhart and Rogoff (2010) found that over 2 centuries (17900-2009) where the government debt-to-GDP happens to be lower than 90%, debt weakly affects long-term growth. Furthermore, where the rate is above 90%, the average growth rate falls by about 4% but the median by 1%. Kumar and Woo (2013) finds that the relationship between government debt and growth to be linearly inverse in both advanced and emerging countries, however, the impact is somewhat smaller in advanced countries. Furthermore, they also show some evidence of nonlinearity, in other words, only high level of debt affects growth negatively for the whole sample.

Meanwhile, different studies have also been conducted on the impact of government spending on economic growth and development. Researchers such as Antonis et al. (2013), Koester and Priesmeier (2012), Lamartina and Zaghini (2011), Wu et al. (2010), Sideris (2007), Guerrero and Parker (2007), Dritsakis and Adamopoulos (2004), Chow et al. (2002), Islam (2001), Abizadeh and Yousefi (1996), Oxley (1994), Ram (1986), Lowery and Berry (1983) among others all found a significant and positive relationship between government expenditure and economic growth. In contrast, Afonso and Furceri (2010), Nakane and Resende (1999), Ansari et al. (1997), Afxentiou and Serletis (1996), Henrekson (1993), Gemmell (1990), Landau (1986) among others all report a negative relationship between government spending and growth and yet others such as Magazzino (2012), Durevall and Henrekson (2011), Narayan and Narayan (2007), Wahab (2004), Chang et al. (2004), Karagianni et al. (2002), Kolluri et al. (2000), failed to find any significant relationship between government spending and economic growth. The main reason for the conflicting results according to Bergh and Henrekson (2011) may be due to lack of consistency in variable definitions and country variations.

The following section of the study examines the effect of government debt on economic growth for Saudi Arabia with an empirical analysis.

3. EMPIRICAL MODEL, DATA AND RESULT

To examine the debt-growth correlation for Saudi Arabia, we modify the generic long-run model from the study of with the following form:

$$G_t = \alpha_0+\beta_1 x_t+\beta_2 y_t+\varepsilon_t \qquad (1)$$

Here, G_t is the economic growth measured in terms of gross domestic product (GDP) growth; x_t is government debt and y_t denotes inflation; α is the constant; and ε_t is the error term. The debt-growth correlation is determined by the size of β_1.

1 In 2015, the government post a record budget deficits of US$95 billion.

2 87% of budget revenue and 90% of export earnings are from crude oil. See CIA World fact book for details.

Examining the debt-economic growth correlation requires time-series data over a long time period. The earliest published data on Saudi Arabia budget and its components begins in 1969. Accordingly, we begin our sample in 1969 and end in 2013. Estimation of the models require data on government debt and measures of real output. We measure government debt by budget deficit because according to Essayyad and Madani (2003), history has shown that a severe fall in crude oil prices usually leads to budget deficit in Saudi Arabia which is always financed by debt; and real output by GDP. We control for inflation because it is documented in the extant literature to significantly affect long-run growth.

Our analysis begins with unit root tests for the variables employing two alternative methodologies: The augmented Dickey-Fuller and the Phillips-Perron unit root tests. The results of these tests are reported in Table 1. Both tests indicate that the variables are non-stationary at level but stationary at first difference. Following this result, it is common to proceed and test for cointegration using Engle and Granger (1987) two-step or the Johansen and Juselius (1990) procedures. However, due to the relative low power of unit root tests, we decided to proceed with autoregressive distributed lag (ARDL) model by Pesaran et al. (2001).

The ARDL approach establishes the long-run relationship regardless of the time-series properties of the variables used in the model. Hence, this makes the approach appealing. The procedure normally begins with the estimation of a conditional ARDL-ECM model in the following manner:

$$\Delta G_t = \alpha_0 + \sum_{i=1}^{p} \beta_1 \Delta G_{t-1} + \sum_{i=0}^{q} \delta_i \Delta X_{t-1} + \sum_{j=1}^{q} \varphi_j y_{t-1} + \pi_1 G_{t-1} + \pi_2 x_{t-1} + \pi_3 y_{t-1} + \varepsilon_t \quad (2)$$

Where G_t represents economic growth, x_t is the measure of government debt, y_t is inflation, α_0 denotes the drift component, and ε_t represents the random errors. The null hypothesis of absence of cointegration (H_0: $\pi_1=\pi_2=0$) is examined against the alternate hypothesis of presence of cointegration (H_0: $\pi_1 \neq \pi_2 \neq 0$) using a partial F-statistic. Although, as analyzed by Pesaran et al. (2001), irrespective of whether the variables are I(0) or I(1), the asymptotic distribution of the F-statistic is non-standard. In his study, Narayan (2005) provide lower and upper bound critical values where the upper bound critical values assume that all variables are I(1) and vice-versa for the lower bound critical values. Regardless of the order of integration of the respective variables, the null hypothesis of no cointegration can be rejected if the calculated F-statistic is above the upper bound critical value. Conversely, the null hypothesis of no cointegration cannot be rejected if the calculated F-statistic falls below the lower bound critical value. However, if the calculated F-statistic falls between the two critical values, then the result becomes inconclusive.

The long-run coefficients of the ARDL can be examined using the following model:

$$\mathrm{InG}_t = \alpha_0 + \sum_{i=1}^{p} \gamma_i X_{t-1} + \sum_{i=1}^{p} \varphi_i y_{t-1} + \sum_{j=0}^{q} \delta_j \mathrm{InG}_{t-j} + \varepsilon_t \quad (3)$$

The Schwarz Bayesian Criterion is used to select the lag length in the model and applied error correction model in order to determine the variables' short-run dynamics:

$$\mathrm{InG}_t = \alpha_0 + \sum_{i}^{p} \gamma_i X_{t-1} + \sum_{i}^{p} \varphi_i y_{t-1} + \sum_{j}^{q} \delta_j \mathrm{InG}_{t-j} + \vartheta \mathrm{ecm}_{t-1} + \varepsilon_t \quad (4)$$

The ARDL bounds test of long-run relationship between our variables is reported in Table 2. The calculated F-statistic (5.789) is higher than the upper bound critical value of 4.803 at the 5% significance level, hence, there is overwhelming evidence to support the existence of cointegration and consequently reject the null hypothesis of no cointegration.

Having established the long-run relationship among the variables, we proceed to examine both the short- and long-run dynamics within the error correction model[3]. Therefore, this study further examines the hypothesis concerning public and economic correlation in Saudi Arabia using equations 3 and 4. The long-run result as reported in Table 3 indicates that public debt has a positive and statistical significant impact on economic growth at the 1% significant level implying that public debt strongly determine economic growth in Saudi Arabia, this result re-establishes support for the theoretical arguments presented in the studies of Aschauer (2000) and Aizenman et al. (2007), although the latter group of researchers are of the opinion that the relationship is negative, they further argued that it is unsurprising to find a positive relationship. This also supports the theoretical argument that government spending (debt) crowd in private sector investment which promotes long-term growth. From the empirical literature, our result is similar to that obtained by Herndon et al. (2014) which disputed the contention by Reinhart and Rogoff (2010). Although this result contradict a lot of findings from the empirical literature (Checherita-Westphal and Rother, 2012; Panizza and Presbitero, 2014; Lin and Sosin, 2001), the finding is logical because most of the literature indicate that, debt is detrimental to economic growth only where it is high, with most suggesting 90% to GDP as the threshold. Furthermore, the analysis finds a positive and statistically significant relationship between inflation and economic growth at the 1% significance level.

In equation 4, the ECM captures the speed of adjustment at which any short-run deviations adjusts towards the long-run[4]. The F-statistics is used to determine the short-run causality in equation 4, while the statistical significance of error correction term is used to determine the long-run causality in the equation.

In the short-run which is reported in Table 4, the result indicates that both public debt and inflation exert a positive effect on economic growth. Furthermore, the partial F-statistics indicate a short-run causality among the variables between public debt, inflation and economic growth. As theoretically expected, the ECM is negative and statistically significant at 1% and less than one, the

3 In his argument, Granger (1988) submits that, where cointegration exists, at least one direction of causality must exist which should have a representation of error correction. This also needs the inclusion of an error correction term Engle and Granger (1987).

4 The standard inference in econometric analysis demands that the adjustment coefficient should be negatively significant.

Table 1: ADF and PP unit root test results

Variables	ADF		PP	
	Constant w/o trend	Constant with trend	Constant w/o trend	Constant with trend
Level				
lngdp	−2.596*	−3.112	−2.560	−2.740
lndebt	−3.749**	−4.447**	−3.749**	−4.508***
lninf	−6.337***	−6.550***	−6.342***	−6.550***
First difference				
lngdp	−4.883***	−5.072***	−4.969***	−5.163***
lndebt	−7.508***	−7.534***	−17.122***	−33.536***
lninf	−7.856***	−7.758***	−25.945***	−24.173***

The ADF and PP test equations include both constant and trend terms. The Schwarz information criterion (SIC) is used to select the optimal lag order in the ADF test equation. ***,**,*Denotes significance level at the 1%, 5% and 10% respectively, ADF: Augmented Dickey-Fuller, PP: Phillips-Perron

Table 2: ARDL bound test results for cointegration relationship

Critical values of the F-statistic for the bounds test results with intercept and no time						
K	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
3	5.018	6.610	3.548	4.803	2.933	4.020
Computed F-statistics F_G (y/debt/inf)				5.789		

Critical values are drawn from Narayan (2005), ARDL: Autoregressive distributed lag

Table 3: Estimated long-run coefficients based on SBC

Regressors	Coefficients	T-ratio
lndebt_t	0.0007***	4.357
lninf_t	0.159***	3.794
Constant	13.839***	50.133

SBC: Schwarz Bayesian Criterion, ***, ** and *denotes significance level at 1%, 5%, and 10%, respectively

Table 4: Estimated short-run coefficients from error correction model based on SBC

Regressors	Coefficients	T-ratio
lndebt_t	0.000***	4.089
lninf_t	0.008***	16.868
input	0.650***	4.643
ECM(−1)	−0.470***	−4.387

SBC: Schwarz Bayesian Criterion, Notes: ***, **, * denotes rejection of hypothesis at the 1% and 5% significance levels respectively

Table 5: ARDL diagnostic tests result

Tests	LM version	F-version
χ^2_{WT}	0.32110 (0.571)	0.30847 (0.582)
χ^2_{LM}	6.7460 (0.130)	7.0709 (0.015)
χ^2_{NORM}	2.7417 (0.254)	NA

ARDL: Autoregressive distributed lag, χ^2_{WT} and χ^2_{LM}, χ^2_{NORM} are the heteroskedasticity, serial correlation and Jarque-Bera normality tests respectively. The lags are chosen based on SIC. Figures in parenthesis are standard errors, SIC: Schwarze Information Criteria

values explain that any deviation from the long-run equilibrium among the variables will be corrected and converge to long-run equilibrium level at 47% annually.

In order to justify the consistency and efficiency of our model, we carried out diagnostic tests which are reported in Table 5. These tests show that our model is free from all the four time series problems of serial correlation, functional form, normality, and heteroscedasticity. All the four diagnostic tests fail to reject the null hypothesis, establishing the fact that our model has overcome all the modelling problems.

The stability of our model is shown by the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUM of squares) in Figures 1 and 2, respectively, as the blue lines lies within the critical bounds and is significant at 5% which confirmed that our model is highly stable over the sample period.

4. CONCLUSION

Our main focus in this paper has been on the effect of central government debt on economic growth in an oil rich and high expenditure country. A sharp drop in the international oil prices will likely lead to public debt to finance infrastructure in many oil dependent countries. We examine the experience of Saudi Arabia spanning up to 45 years of data on government debt and economic growth. The cointegration result indicate the existence of long-run relationship among the variables, leading to the rejection of the null hypothesis at the 5% significance level. Our main finding is that public debt is associated with enhanced economic performance for the sample period. Furthermore, the results show that inflation supports economic growth in the studied country, which does not dispute other studies from the extant literature. The direction of these relationships remains the same even in the short-run dynamics of the variables.

Policymakers in Saudi Arabia may continue to keep public debt at the current level because the overwhelming literature has found that high debt level impedes economic growth (especially if debt exceeds 90% to GDP). Government may also aim at diversifying revenue base to avoid soaring debt level because according to Dibra (2015), history has continually shown global oil prices to be unstable.

Although our study provides evidence for the crowding in effect, it is limited because we do not examine the threshold level where debt becomes undesirable for Saudi Arabia. Future

Figure 1: Plot of cumulative sum of recursive residuals

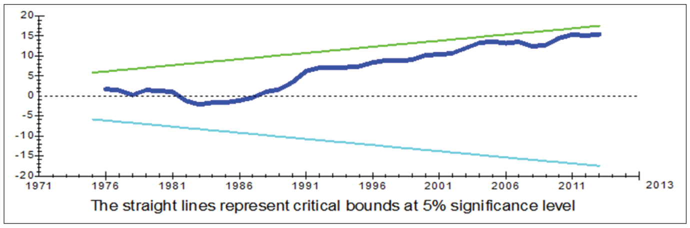
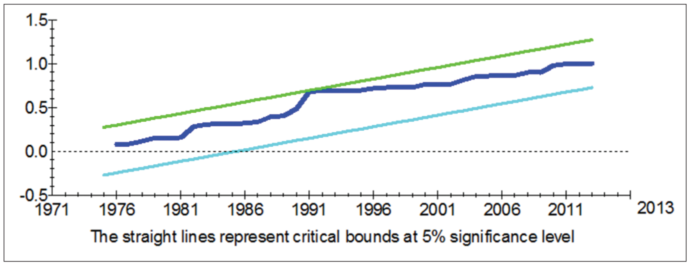


Figure 2: Plot of cumulative sum of squares of recursive residuals



researchers can look into this issue. Overall, our study offers an interesting addition to the literature on public debt and economic growth.

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