Abstract
This paper uses data from the Kingdom of Saudi Arabia (KSA) to empirically test Wagner’s Law in explaining public expenditure growth in association with economic growth; and if this growth enhanced the public welfare. The Kingdom of Saudi Arabia (KSA) has witnessed a marked increase in government expenditure. We use the Engle and Granger (E-G) two-step cointegration method to examine the relationship between government expenditure and economic growth. Out of the four model specifications that we have tested, two models indicate that a positive long run relationship exists between government expenditure and economic growth. However, the income elasticities are not large enough to suggest that the growth in government expenditure exceeds the growth in national income; only that upward pressure is exerted. Looking at available data it is clear that governmental expenditures from GDP expansions increased public welfare for Saudis over the test period.

JEL Classification: H11, O5

Key Words: Wagner’s Law, Saudi Arabia, Cointegration

1. Introduction

The relationship between the economic growth and the government spending remains an unsettled issue in public economics, despite a voluminous and growing empirical literature since the seminal work of Wagner (1883). Wagner’s Law states that the government expenditure grows at a faster rate than that of national income. It is in fact an observation on public expenditure in association with economic growth rather than a theory. Numerous scholars since then have tested this hypothesis for many different countries using different data sets and different econometric techniques. However, further studies on this relationship are warranted; mainly because of the inconclusive nature of existing results; and also with respect to changing perceptions favoring a more expanded role for government due to the ongoing global financial crisis since mid 2008.

This paper uses data from the Kingdom of Saudi Arabia (KSA) to empirically test Wagner's Law in explaining public expenditure growth in association with gross domestic output increases. It will not test what ideology for the role of government the political regime subscribes to. But it can test whether Wagner's Law acceptably models governmental growth in the presence of economic expansion. Using the KSA in a test of Wagner's Law would seem to draw criticisms that this Middle East regime is atypical of most Western economies for which Wagner's Law primarily models. But

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1 Department of Arts and Sciences. The Petroleum Institute. PO Box 2533. UAE email:awijeweera@pi.ac.ae, dgaris@pi.ac.ae
this is just the point: for Wagner's Law to be a robust model of public spending as a growing percentage of national output, different governmental models must be considered.

The study begins with a brief description and analysis of the Kingdom of Saudi Arabia (KSA) during the time period to be modeled. Then a literature review on results of similar studies is provided. This is followed by a methodology discussion. The data and results are then presented, with analysis of outcomes. Conclusions complete the study.

2. Institutional Background

The Kingdom of Saudi Arabia (KSA) has witnessed a marked increase in government expenditure during the last several decades. For instance, government expenditure has increased from 6 billion Saudi Riyals (SR) in 1969 to 466 billion SR in 2007 (Saudi Arabian Monetary Agency, 2006). Figure 1 illustrates the time trend of the government expenditure in Saudi Arabia.

As to real government expenditure, which is calculated by deflating nominal government expenditure by the implicit deflator, the increase is not that drastic, nevertheless considerable. To illustrate, real government expenditure has increased from 39 billion SR in 1969 to 266 billion SR in 2007.

![Government Expenditure 1969-2007](image)

However, the share of the public expenditure to real GDP does not tell the same story. To illustrate, the share of the real government expenditure to real GDP first increased from about 20 percent in 1972 to approximately 50 percent in 1983 before coming down to about 30 percent over recent years. The explanation for the shrinkage in government spending is simply the result of the world economic slowdown which lasted for most of the 1980's. If Wagner's Law posits that government expenditure increases as a percentage of some metric of economic growth, common observation confirms that it also shrinks during economic downturns, unless following a strict Keynesian prescription, in which case, the government sector would be expected to
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grow, even as the private sector shrinks, in an attempt to avoid a deflationary and asset liquidation spiral.

As seen in Figure 1 the increase in government expenditure is visible in both current, and capital, spending sectors. One reason for the increase in current expenditure is the salary increase. For instance, the salaries of government employees were raised by 15% in 2005. In addition, government employment increased from 137968 in 1970 to more than one million in 1995 (Albatel 2002).

Saudi Arabia has one of the highest population growth rates in the world (Krimly, 1999). In this, it is similar to its neighboring Gulf States, which have all experienced large natural increases in population growth, including, of course, the Northern Gulf States of Iran and Iraq. The timing of this increase is significant: one of the largest population growth rate increases coincided with the oil boom of 1979-1980, when the world price of oil—and Saudi export earnings from crude sales—more than quadrupled.

Other Saudi development activities are also responsible for this growth in public expenditures. For instance, the government signed contracts for executing 2900 government projects and schemes with a value of SR 40 billion in 2005 (Saudi Arabian Monetary Agency, 2006). Due to the country’s demographic structure and government’s development strategy it is expected that government expenditure will grow further in the future (Albatel 2002).

3. Literature Review

Wagner (1883), on the basis of empirical findings, suggested that the growth in public expenditure was inevitable for a progressive economy, because it is directly linked to the economic growth. According to Wagner’s Law, the growth in public expenditure over time should be greater than that of national output. That is, as a percentage of some metric of economic expansion, public sector expenditures should account for an ever larger share. His idea was tested using many different specifications over the years using an array of specification techniques.

For instance, Peacock and Wiseman (1967) have regressed government expenditure on gross national product (GNP). Goffman (1968) has regressed public expenditure on per capita income. Mann (1980) regressed the per capita government expenditure on gross national product. Some others such as Pryor (1969) instead looked at the relationship between government consumption expenditure and the gross national income. Some other well-known studies include: Musgrave (1969), Bird (1971), Ram (1986), and Murthy (1993).

These empirical tests have produced strikingly different results. Some studies have confirmed the Wagner’s Law of increasing public expenditure (see for example Ganti and Kolluri, 1979). However, other studies have shown that this is not true for every country. For instance, Ram (1986), using three decades of data for 63 countries, found only limited support for Wagner’s Law. Abizadeh and Gray (1985) on the other hand, found that Wagner’s Law holds for rich countries, but not for the poor nations. Among others, Henrekson (1993) and Pluta (1981) do not find robust evidence to support the
law. Earlier studies could have had methodological shortcomings because the series were not tested for stationarity (see Demirbas 1999).

A significant number of recent studies have utilized the new time series techniques and have tested the series for stationarity before estimating the model. Demirba’s (1999) study uses the data from Turkey over the period 1950-1990 and takes six versions of Wagner’s Law into account, but find no statistical support for the relationship of government expenditure to economic growth.

Results differing for rich or poor countries are problematic and suggest the presence of missing variables. For instance, many poor countries receive international aid in the form of direct and indirect investment. In some cases the governmental sector responsible for administrating international aid experiences significant growth while the rest of the economy remains largely untouched. Indeed, it is possible to model a "Dutch disease" phenomenon of immiserizing growth resulting from international aid.

Another difficulty with rich nation-poor nation comparisons is the coefficient of public sector corruption used. Unless corruption is captured and accounted for some of the results could be misleading for obvious reasons.

Apparently, few studies have attempted to test the Wagner’s Law for the case of Saudi Arabia. For instance, Al-Faris (2002) analyzed the relationship between public expenditure and economic growth in the Gulf Cooperation Council Countries. However, according to our best knowledge, only one published paper exists, that of Albatel (2002) that focuses entirely on Saudi Arabia. Using data for the 1964-1998-period, and using the Johansen-Jueslius cointegration test (1991) Albatel investigated the case of Saudi Arabia and found support for Wagner’s Law.

We attempt to improve upon this work in two ways: First, instead of the Johansen-Jueslius cointegration test we use the Engle and Granger (E-G) cointegration method to examine the long run and short run relationships between government expenditure and economic growth. Johansen-Jueslius’s approach is considered non-theoretical because all variables in the models are taken as endogenous in testing the cointegrating relationships. However, the E-G method is better suited because we are testing an already established hypothesis.

The major argument against Engle and Granger’s method is that it assumes a unique cointegration relationship while Johansen–Juselius’s approach allows for multiple relationships. For models of just two variables this advantage is of no consequence. In addition, the way the E-G method specifies the model allows for directly setting government expenditure as dependent on national income. Such dependence introduces a strong element of causality into the study.

The second improvement over Albatel's earlier study comes from our use of an updated data set for the analysis. As can be seen from Figure 1, a huge increase in government expenditure has occurred since Albatel’s study, which concluded in the year 1998. We use the data until 2007, which, it is hoped, captures the most recent developments in the public expenditure share of Saudi Arabia's economic growth.

Of significance is that during the period of our study world oil prices rose from a benchmark average of about $12.00/barrel (1998), to an average of $75/ barrel by the third quarter of 2007. This crude price increase coincided with the coming of age of
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the large population increase concurrent with the last oil boom of 1979-1981, precipitating vast increases in both private consumption and infrastructure expenditures. Our study attempts to capture the results in public sector expenditure growth during this economic boom period. It should be an illustrative test of Wagner's Law since the time series for the KSA captures unprecedented increases in national wealth, per capita private consumption, and infrastructure expansion. And this expansion came about from current account surpluses and national revenue increases from crude oil exports, rather than from the more problematic sources of international aid. Additionally, the coefficient of public corruption in the KSA is unremarkable, thus, giving greater assurance of experimental result robustness.

4. Data Description and Methodology

There is no unanimously accepted specification to model Wagner’s Law. Following the literature (See: Demirbas, 1999), we estimate four different specifications depending on which variables are used in the model. Model 1 uses income and real government expenditure, Model 2 uses per capita income and government expenditure, Model 3 uses per capita income and per capita government spending, and Model 4 uses national income and government final consumption expenditure. The 4 different versions of Wagner’s Law that we estimate in this paper are given below.

\[ LREXP_t = \beta_0 + \beta_1 LRGD_t + \varepsilon_t \]  
\[ LREXP_t = \beta_0 + \beta_1 LRPGD_t + \varepsilon_t \]  
\[ L(REXP_t / RGDP_t) = \beta_0 + \beta_1 LRPGD_t + \varepsilon_t \]  
\[ LRGC_t = \beta_0 + \beta_1 LRGD_t + \varepsilon_t \]  

The required data are obtained from the Saudi Arabian Monetary Agency Annual Report (2006) and its website. Per capita values are obtained dividing the relevant values by the population and the GDP deflator has been used to obtain real values. Real Gross National Product (GNP) is generally used to control for the national income. However, as pointed out in Albatel (2002), it is argued that GNP does not accurately reflect the level of economic activity within Saudi Arabia and hence we used Gross Domestic Product (GDP) to control for the national income. Government expenditure, final government consumption expenditure, and national income are expressed in millions of Saudi Riyals (SR).

It is standard practice in time series studies to test for stationarity to avoid the possibility of getting spurious results. Using time series data, we therefore identify whether the series are stationary before using them in the estimation process. This paper uses the popular Augmented Dickey Fuller (ADF) unit root test for nonstationary. The null hypothesis of the ADF test is that the series contains a unit root. Since the true data generating process of these variables is not known, ADF tests are conducted on the three model specifications; as a pure random walk, a random walk with drift and a random walk with drift and a trend. In each specification, we encounter the task of selecting the appropriate lag length. We rely on Schwartz Bayesian Criteria (SBC) to determine the optimal lag length. Since the ADF unit root
testing procedure is well established in the literature, its technical details are not considered further.

ADF test results suggest that all of the variables contain a unit root in levels (nonstationary), but are stationary in first differences.

<table>
<thead>
<tr>
<th>variable</th>
<th>levels</th>
<th>first differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRGDP</td>
<td>-1.68598</td>
<td>-6.050497</td>
</tr>
<tr>
<td>LREXP</td>
<td>-3.17776</td>
<td>-6.065522</td>
</tr>
<tr>
<td>L(REXP/RGDP)</td>
<td>-1.82592</td>
<td>-8.30798</td>
</tr>
<tr>
<td>LRGDPC</td>
<td>-3.47733</td>
<td>-9.711973</td>
</tr>
<tr>
<td>LRPGDP</td>
<td>-0.9615</td>
<td>-4.621195</td>
</tr>
</tbody>
</table>

Note: All variables are in logarithmic form. Optimum lag length was selected using Schwartz Information Criterion (SIC). All of the test used Constant, no trend. Critical value at 5% percent is 2.95.

Upon examining the stationarity properties, we will employ Engle and Granger (1987) co-integration test to see whether the Wagner’s Law holds in the long run. The EG method involves two steps: First, the best linear equation (as in the form of Model1-Model 4) is estimated and the residuals of the estimated model are tested for stationarity. ADF test results of residuals are provided in Table 2. Results suggest that co-integrating relationship exists for model 2 and model 3, but do not exist for other models. Hence, we can make valid statistical inferences and interpret the results for model 2 and 3.

<table>
<thead>
<tr>
<th>Model</th>
<th>No of Lags</th>
<th>ADF Test Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>-1.623314</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>-5.026815</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>-2.791957</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>-0.896318</td>
</tr>
</tbody>
</table>

Breusch-Godfrey Serial Correlation LM test suggests the presence of serial correction in the cointegrated equations. As the order and form of the autocorrelation is unknown, the model was re-estimated using the Newey-West Heteroskedasticity and Autocorrelation Consistent (HAC) estimator. The Newey-West HAC covariance estimator is consistent in the presence of both heteroskedasticity and autocorrelation of unknown form. The result of the model cointegrating equations using Newey-West HAC covariance estimator is shown in equation (5) and (6). T-values are provided in parentheses.

\[
LRGEXP = 5.662 + 0.630LRPGDP
\]

(5)

(6.568) (7.611)

R-squared 0.757
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\[ L(\text{REXP/RGDP}) = -2.336 + 0.134 \text{LRPGDP} \]  
\[ (-3.005) \quad (1.733) \]
\[ \text{R}-\text{squared} \quad 0.0923 \]

\( (6) \)

5. Findings

Results suggest that one percent increase in real GDP will increase real government expenditure by 0.63 percent. It is inelastic, but statistically significant. Model 2 results are weaker both in statistically and in magnitude, but the direction of the relationship is the same.

Cointegration is only related to the long run relationship of the variables. In order to examine the short run relationship we estimate an error correction model. The EG cointegration methodology provides an easier way to obtain the error correction model (ECM). Once the cointegration relationship of the variables is confirmed, the saved residuals are used to estimate the ECM as shown in equation (7).

\[ \Delta Y_t = \alpha_1 + \gamma EC_{t-1} + \sum \beta_i \Delta X_{t-i} + \epsilon_t \]  
(7)

All of the variables, except the error correction term, are differenced once to make them stationary. The results of the error correction model are given in equation (8) and (9) respectively.

\[ \text{D(LRGEXP)} = 0.0381 + 0.067 \text{D(LRPCI)} - 0.772 \text{ECM}_1 \]  
\[ (1.434) \quad (0.582) \quad (-6.049) \]
\[ \text{R}-\text{squared} \quad 0.549 \]

\[ \text{D(LRATIO)} = 0.0266 - 0.305 \text{D(LRPCI)} - 0.435 \text{ECM}_1 \]  
\[ (0.846) \quad (-2.243)(-3.376) \]
\[ \text{R}-\text{squared} \quad 0.342 \]

Long run relationships are further confirmed by the ECM results. As expected, the error correction terms are significant in both models. Adjustment parameters are quite large in magnitude. For instance, ECM results for Model 2 suggests that a large fraction of a shock to the long run equilibrium of real GDP and government spending is corrected within a year. To be specific, from any deviation about 77.2 percent is corrected within a year. Adjustment parameter related to the Model 3 is smaller, but still quite considerable correcting about 43 percent of deviation within a year.

6. Conclusion

Our results neither confirm nor deny Wagner’s Law. Out of the four model specifications that we have tested, two models indicate that a positive long run relationship exists between government expenditure and economic growth. However, the income elasticities are not large enough to suggest that the growth in government expenditure exceeds the growth in national income. It only suggests that the growth in national income exerts upward pressure on the government spending of KSA. The results imply that as a fast growing nation, Saudi Arabia should expect growing government expenditure in the coming years.
Further Analysis: Governmental growth and welfare growth?

While Wagner’s Law is instructive in analyzing the relationship of GDP growth to public sector growth, the more important question is the association between public sector growth, and changes in per capita welfare measures, such as health, education, and infrastructural expansion. Developed economies, such as the typical OECD economy, is assumed to be in long run state in terms of the desired size of the public sector; while less developed economies are still on the learning curve and growth path regarding the long run appropriate size of the government sector relative to its GDP. Clearly, each economy has different expectations as to the role of government, its relative size, its duties to its people, and the extent of its obligations. This relationship is more applicable to the Kingdom of Saudi Arabia because it maintains close cultural and institutional ties to Sunni Islam, with its vast scholarship on the role of government and state obligations to the individual. We might be justified, therefore, in expecting that a relatively wealthy economy such as that of the KSA would have used its larger public sector to enhance the welfare of its people by way of spending on healthcare, education and infrastructure.

Healthcare

Healthcare expenditure per capita during the test period increase by 24 percent, from $361.00 in 2002 to $448.00 in 2006. Additionally, physicians per 1,000 persons increased from one to two, a doubling in four years. As a more general measure of health improvements during this time is that life expectancy for Saudis rose from 71 years, to 73 years. According to the World Health Organization (WHOSIS 2008) 76.2 percent of healthcare costs was assumed by the government in 2005.

Education

Public spending on education as a percent of government expenditure has increased from 23 percent in 2001 to 28 percent in 2005. According to the “World Development Data Base,” current international comparisons of various indices of education for the Saudi population, the Kingdom of Saudi Arabia has shown modest gains at the primary school level over time. For instance, the education expenditure as a percent of gross national income for 2005 was 7.19 percent, which places the Kingdom 11th of 168 nations. However, the number of primary school-aged children not in school is high at 34.288/1,000, placing it 15th of 150 nations measured, with girls slightly more likely to receive primary education than boys of the same age.

Using UNESCO UIS data, per capita primary school aged children attending school was 0.108 per capita. This was 97th of 172 nations in 2002; which was a gain of one place—from 98th—in 2000. Secondary level per capita enrollment ranks 68 of 159 nations, at 92.428/1,000 in 2002. In the year 2000 the Kingdom ranked 53rd in this category. In 2002, tertiary schooling per 1,000 persons is 24.334, or 66th of 146 nations studied. In 2000 they were at the 63rd level. UNESCO tracked education categorical changes over time through 2005 for many countries, according to which education expenditures as a percent of GDP have increased from less than 10 percent in 1980 to more than 25 percent by 2004.
Infrastructural expansion

Another measure of the extent to which the population benefited from government expansion as GDP increased is found in infrastructural expansion of the physical assets of the nation. To illustrate, public allocations for the transport and communication sector has increased by 34 percent during the 2005-2006 period (SAMA 2007). The number of passengers using public transport increased from 6.5 million in 2005 to 6.6 million in 2006. Transport capacity was also increased over the test period. For all transportation, the total increase from 2004-2005 was from 42.3 million passengers and 122,951 thousand cargo tons, to 44.7 million passengers and 135,533 thousand cargo tons.

Other areas such as water and electricity also experienced growth due to the increase in government spending in infrastructure projects. According to SAMA data the Kingdom of Saudi Arabia has witnessed an increase in water and electricity generation and quantity of subscribers during the years of the test period. In power generation, capacity has grown from 22,060 MW in 2000 to 29,051 MW in 2005; while the number of power sector subscribers has increased from 3,623,391 to 4,727,371 customers (SAMA).

The question is the extent to which public welfare among Saudis increased over the test period, a period in which GDP and the size of government experienced significant expansion. The results from our econometric study sustain the association between GDP growth and governmental expansion. However, at least with respect to the Kingdom of Saudi Arabia, governmental expansion seemed to be responsible for increased social and personal welfare, according to the casual observation of the disaggregated components of government spending in KSA. They show that public welfare has experienced significant gains from the availability of funds generated from GDP increases. Government sectors involved saw an increase in capacity deliverance; which was followed, or was in tandem with, expenditures to increase public welfare in the KSA. In short, these data indicate a significant expenditure of GDP dedicated to those elements enhancing living standards for the Saudi people over the test period. That is, there was an increase in public expenditures enhancing public welfare during the period of GDP growth and government sector growth.

References


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