

## **The Government Expenditure Function in an Oil Producing Country**

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**Abstract.** Conventional empirical work on the determinant of the government expenditure function usually overlooks the role of government revenue because it is mostly dependent on the growth of the economy (through taxation). This paper tries to shed light on the role of government revenue, as independent of income, in shaping the theory of government expenditure. It considers oil revenue, alongside income, as an explanatory variable determining the growth in government expenditure.

A simultaneous model is used to estimate the elasticity of government expenditure with respect to both income and oil revenue. Results show that oil revenue, as independent of income, plays an important role in explaining increase in total government expenditure and in government investment expenditure in an oil producing country. However, the same variable proved to be non-significant in explaining variation in the government consumption expenditure.

### **Introduction**

Most of the research on the determinants of government expenditures emphasizes the relationship between government expenditures and the growth of the economy [1, pp. 123-140; 2-5]. The core of the analysis of such works is the income elasticity of demand for public expenditures. Government expenditures are taken as the dependent variable and the growth of the economy, as measured by the GDP, as the independent variable. Other variables that might affect the growth of government expenditures are either ignored or stated implicitly.<sup>(1)</sup> Wagner and Webber, [5] for instance, include in their equation a time trend in order to capture such influences on government expenditures as might be caused by other forces. Henning and Tussing

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<sup>(1)</sup>In most cases, the intention was to test for the existence of Wagner's Law of the rise in the state activity.

[3] note that such increase in government expenditure could derive from supply rather than demand forces but proceed to estimate the income elasticity of demand for public expenditure. Recognizing the limitation of their procedure, they state:

"We admit to the charge that we present one-equation system and label the single equation demand. In doing so we follow precedential tradition and the intuitive judgement that income is more likely to explain demand than supply. In analysing the determinants of public expenditures, it becomes clear that there are two very different kinds of supply side: the traditional production function, and the *budgetary* supply side represented by the productivity of the public revenue system."

In countries where government revenue is not generated by taxation, the budgetary supply side is a relevant factor which can along with the increase in income explain the rise in government spending over-time. Such a case might well be typified by an oil producing country where the government is the owner of the natural resources, and its revenue is generated by the sale of the oil abroad.

The main purpose of this study is to assess the effect of the oil revenue variable on government expenditure for an oil producing country.

Accordingly, we consider the determinant of public expenditure for such a country with specific reference to the Kingdom of Saudi Arabia where oil revenue constitutes a major portion of the total government revenues. A model of two simultaneous equations system is developed and the two stage least square (2 SLS) method is used to estimate the elasticity of two types of government expenditure, viz. consumption and investment with respect to both the gross domestic product (GDP), and the government oil revenue. Results should show whether or not the increase in the oil revenues during the boom of 1970–1986, is a decisive factor in explaining the increase in the government expenditures during the same period.

The paper is divided into six sections. Section II presents the main theories which explain growth in public expenditures. In Section III, our model will be presented, Section IV is devoted to the definition of the government expenditure variables used in the investigation. Section V analyzes the results, and, finally Section VI concludes the study.

### **Causes of Public Expenditure Growth**

The demand theory of public expenditure emphasis the fact that, in an advanced society, a large and growing portion of government expenditure is devoted mainly to the provision of superior goods. This theory finds its roots in the writings of Adolph Wagner who anticipated about one hundred years ago that the development

of modern societies will increase the demand for public goods resulting in the absolute and relative growth of the public sector. This law, was the subject of academic research for over two decades from the mid 1950s till the early 1980s. Almost all participants concluded, in concert with Wagner, that in both developed and developing societies, as per capita income rises, government expenditures tend to increase as a proportion of total economic activity.

Alan Peacock and Jack Wiseman in an effort to explain the growth of the public sector in the United Kingdom by analysing time-series data for the period 1890-1955, draw attention to the effect of periods of national emergency and social upheavals, such as wars, on the level of public spending. During such periods, according to Peacock and Wiseman, the level of taxation rises to a plateau which would have been regarded as intolerable without a crises, but, after the emergency period has passed, a new level of taxation (higher than the pre-crisis level) becomes the acceptable norm, and a new level of civilian public expenditure takes place. This tendency for fiscal activity to rise “step by step” at the expense of the private sector is well known as the displacement effect.

This theory of public spending growth merely represents special cases in which a rise in government spending takes place during a specific period of time in order to fulfill certain government function, such as financing wars.

Other theories that are of general nature and can explain increases in government spending include: the supply side theory, the relative price effect, population growth and demographic change, and Wildavsky’s cultural theory of expenditure growth. However, they also seem to be not relevant in explaining variables presented in our model and can be overlooked at this stage.

### **The Models**

Government resource-using expenditure is part of the GDP, a single equation estimation of the elasticity of the government expenditures to the GDP may produce biased results. Therefore, a simultaneous model is developed and estimated to test for the hypothesis advanced in Section I. Three sets of equations are used. The first set tests the relationship between the total government resources-using expenditures and the suggested explanatory variables. The other sets test the same relationship for the components of total government resources-using expenditure, namely, government consumption expenditures and government investment expenditures.<sup>(2)</sup> These are as follows:

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<sup>(2)</sup> That government consumption and investment expenditures are sensitive to changes in oil revenues alongside GDP.

$$\begin{aligned}
 \text{A: } \ln \text{GNM}_t &= a_{11} + b_{12} \ln \text{OR}_t + b_{13} \ln \text{GM} + b_{14} \ln \text{GDPS}_t + b_{15} \ln \text{GNM}_{t-1} + u_t \\
 \ln \text{OR}_t &= a_{21} + b_{22} \ln \text{OP}_t + b_{23} \ln \text{CP}_t + b_{24} \ln \text{GDPW}_t + b_{25} \ln \text{OR}_{t-1} + u_t \\
 \text{B: } \ln \text{GC}_t &= a_{31} + b_{32} \ln \text{OR}_t + b_{33} \ln \text{GM}_t + b_{34} \ln \text{GDPS}_t + b_{35} \ln \text{GC}_{t-1} + u_t \\
 \ln \text{OR}_t &= a_{21} + b_{22} \ln \text{OP}_t + b_{23} \ln \text{CP}_t + b_{24} \ln \text{GDPW}_t + b_{25} \ln \text{OR}_{t-1} + u_t \\
 \text{C: } \ln \text{CI}_t &= a_{41} + b_{42} \ln \text{OR}_t + b_{43} \ln \text{GM}_t + b_{44} \ln \text{GDPS}_t + b_{45} \ln \text{GI}_{t-1} + u_t \\
 \ln \text{OR}_t &= a_{21} + b_{22} \ln \text{OP}_t + b_{23} \ln \text{OP} + b_{24} \ln \text{GDPR}_t + b_{25} \ln \text{OR}_{t+1} + u_t
 \end{aligned}$$

where:

GNM	=	non-military government resource using expenditure.
GC	=	government consumption expenditure.
GI	=	government investment expenditure.
OR	=	government oil revenue.
GM	=	government military expenditure.
OP	=	oil price.
CP	=	coal price.
GDPS	=	Saudi gross domestic product.
GDPW	=	aggregate world income.
Ut	=	the error terms.

All variables are in logarithmic form so that regression coefficient will measure the elasticity of government spending in relation to the accompanying explanatory variable.

The non-military resource-using government expenditure is made a function of government oil revenue, GDP, government military expenditure, and the dependent variable lagged one period.

As would be expected by the theory of demand for government expenditure, a positive relationship between expenditure in question and income must prevail. The relationship between government expenditure and government oil revenue is of prime interest in the present paper. Needless to say, this relationship has to be positive overtime.

The regression coefficient of the type of government expenditure in question with respect to government oil revenue has to be positive in order for such a relation to hold. Government military expenditure is an exogenous variable. It is chiefly determined by the need, both subjective and objective, for national security. Oil revenues play a role to be sure in the sense of making an expensive defense network feasible or affordable. But the amount allocated for defense is determined outside the model e.g. by political stability in the region. We would expect that negative relationship between the government expenditure in question and the government military expenditure to prevail. As military expenditure decrease civilian expenditure increase.

Finally, we have introduced a lagged dependent variable as an explanatory variable to account for a dynamic process in the determination of government expenditure. In particular, this is true in the case of government investment expenditures where the flows of investment expenditures in any given period result partly from investment decision made in previous periods.

Both equations in sets A,B, and C are overidentified according to the order conditions of identification. In these equations we have two endogenous variables ( $GNM_t$ , and  $OR_t$ ), and seven predetermined variables, namely  $GM_t$ ,  $GDPS_t$ ,  $GNM_{t-1}$ ,  $OP_t$ ,  $CP_t$ ,  $YW_t$ , and  $OP_{t-1}$ . This prompts us to use 2SLS in order to estimate the coefficients of the model.

### **Variables and Data**

The government expenditures used in the empirical analysis are of the resource-using kind. This consists mainly of two types. (1) government consumption expenditures defined as all current government expenditures on the purchase of goods and services such as salaries paid to government employees, and those expenditures which are paid for the purchase of utilities, stationary, furniture, etc. (2) and government investment expenditures which is of a capital formation type.

The period under investigation is from 1970 till 1986. This period is considered structurally different from the previous periods, because it was a period of unprecedentedly massive government revenues followed by equally massive government expenditure. We recognize the limitations of such short period of time for the purpose of the empirical work. However, we are restricted by the availability of consistent data for longer period of time. All variables are in constant 1970 prices.

### Results<sup>(3)</sup>

Results obtained by the model are displayed below. These results support the assumption that in an oil exporting country where government revenue receipts depend for the most part on the sale of oil abroad, government expenditure grows in relation to the growth of government revenue. Also, according to our model, the theory of demand for government expenditure proves to be relevant. The GDP still plays an important role in explaining variation in government expenditure.

Results obtained are:

$$\ln OR_t = 6.92 + 0.39 \ln OP_t + 0.76 \ln GDPW + 2.0 \ln CP_t$$

$$(t) \quad (2.06) \quad (2.05) \quad (1.87) \quad (5.44)$$

$$R^2 = 0.92$$

$$\ln GNM_t = -7.2 + 0.31 \ln OR_t + 1.40 \ln GDPS_t$$

$$(t) \quad (-6.13) \quad (1.92) \quad (6.12)$$

$$R^2 = 0.95$$

$$\ln GC_t = -8.82 - 0.77 \ln OR_t + 2.60 \ln GDPS_t$$

$$(t) \quad (-4.8) \quad (-2.63) \quad (6.43)$$

$$R^2 = 0.87$$

$$\ln GI_t = -1.31 + 0.52 \ln OR_t + 0.47 \ln GDPS_t$$

$$(t) \quad (-1.53) \quad (3.82) \quad (2.49)$$

$$R^2 = 0.94$$

The results obtained for the non-military government expenditure (GNM) show that this type of expenditure grows in relation to both the increase in oil revenue and the growth of the economy. However, in statistically significant terms the growth of the economy (GDP) seems to have more of a role in explaining the increase in the non-military public expenditure.

The results obtained for both government consumption expenditure (GC) and the government investment expenditure (GI) tell a slightly different story. The growth of the economy seems to be the only variable which explains the growth in the government consumption expenditure during the period of the study. This is a very plausible result since part of government spending must support a growing public service sector resulting from a growing demand on social goods and services such as education, health, and housing. Our results show that government consumption spending grown in relation to the growth of the economy as represented by the growth of

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(3) Results displayed below are for best fitted equations.

income. The income demand for government consumption expenditure seems to be highly elastic as explained by the beta elasticity of the government consumption spending with respect to income. This result is highly significant as indicated by the t-ratio (6.43) in the ln GC equation. The elasticity of government consumption expenditures with respect to oil revenue has maintained a negative sign. While this relation is statistically significant ( $t=-2.63$ ), the relation is rejected because it is contrary to our expectation of a positive relationship between the two variables.

The public investment expenditure, on the other hand, grows in relation to both variables. However, in term of both the beta elasticity and the t-statistic, oil revenue seem to be the better explanatory factor.

### Conclusion

The experience of the oil exporting countries adds new element to the formation of government expenditure function according to our study. The growth of the oil revenue generated from the sale of oil abroad proved to be significant factor in explaining the growth of the government expenditure. The growth of the economy received, over the years, most of the attention in explaining the growth of public spending for both developed and developing countries. Although our case study can not be generalized to include wide variety of countries, it represents a special case which may well fit the oil exporting nations.

### References

- [1] Chrystal, A. and Alt, J. "Endogenous Government Behavior: Wagner's Law of Gotterdammerung" In *Current Issues in Fiscal Policy*, by S. Cook and P.M. Jackson, published by Martin Robertson and Co. Ltd., 1979.
- [2] Ganti, Subrahmany and Kolluri, Bharati "Wagner Law of Public Expenditures: Some Efficient Results for the United States" *Public Finance* No. 2, Vol. xxxiv (1979), 225-233.
- [3] Henning, J. and Tussng, A., "Income Elasticity of the Demand for Public Expenditures in the U.S." *Public Finance*, No. 325-341 (1974).
- [4] Sahni, B.S. and Singh, B. "On the Causal Direction between National Income and Government Expenditure in Canada" *Public Finance*, 39, No. 3 (1984), 359-93.
- [5] Wagner, R. and Weber, W. "Wagner's Law, Fiscal Institutions and the Growth of the Government" *National Tax Journal*, Vol. xxx (1974), 59-68.

## دالة الإنفاق الحكومي في اقتصاد بترولي

زين العابدين بري

أستاذ مساعد، قسم الاقتصاد، كلية العلوم الإدارية  
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ملخص البحث . نتيجة لاعتماد معظم ميزانيات الدول في العصر الحاضر على الضرائب كمصدر رئيس من مصادر الإيرادات العامة، فإن الدراسات التطبيقية على محددات الإنفاق الحكومي تعتبر أن الدخل القومي هو الأساس للنمو في الإنفاق الحكومي (نظرية الطلب على الإنفاق الحكومي) . ولهذا فإننا نجد أن الإيرادات والتي تعتمد على نمو الاقتصاد قد حذفت من الجانب الأيمن من المعادلة في هذه الدراسات . وحيث إن إيرادات الدول البترولية تعتبر حالة خاصة تعتمد فيها الميزانية على مبيعات البترول في الخارج، فإن إيرادات هذه الدول يجب أن تكون مشمولة إلى جانب الدخل القومي كأحد محددات الإنفاق الحكومي .

ويحاول البحث أن يؤكد أن دالة الإنفاق الحكومي للدول البترولية تختلف عن مثيلاتها في بقية دول العالم من حيث إنها تعتبر أن الإيرادات الحكومية هي أحد محددات الإنفاق الحكومي وبصورة مستقلة عن الدخل القومي .

يستخدم البحث المعادلات الآتية : Simultaneous Equations System من أجل تقدير مرونة الإنفاق الحكومي بالعلاقة إلى كل من الإيرادات الحكومية والدخل القومي . نتائج البحث أظهرت أن الإيرادات الحكومية، وبصورة مستقلة عن الدخل القومي، يمكن أن تستخدم من أجل شرح التغيرات في كل من إجمالي الإنفاق الحكومي، وأيضاً الإنفاق الحكومي الاستثماري . من الناحية الأخرى، فإن هذا العامل لم يكن له أي أثر في شرح التغيرات في الإنفاق الحكومي الاستهلاكي خلال الفترة محل الدراسة .