DISSERTATION

RAPIDLY CHANGING ECONOMIC ENVIRONMENTS AND THE WAGNER'S LAW: THE CASE OF SAUDI ARABIA

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY HUSSAIN M. AMER AL-OBAID ENTITLED "RAPIDLY CHANGING ECONOMIC ENVIRONMENTS AND THE WAGNER'S LAW: THE CASE OF SAUDI ARABIA" BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

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ABSTRACT OF DISSERTATION

RAPIDLY CHANGING ECONOMIC ENVIRONMENTS AND THE WAGNER'S LAW: THE CASE OF SAUDI ARABIA

The size of government expenditure has been an issue of debate for decades. The consistent increase in size of government expenditure over the time is attributed to many reasons which lead to appear several models to explain government expenditure growth. More than one hundred years ago Adolph Wagner proposed a positive correlation (known as Wagner's Law) between level of development and growth of public sector. The objective of this study is to determine the nature of relationship between economic growth and government expenditure and its direction by testing the six existing versions of Wagner's Law in the case of Saudi Arabia. The first and the main task of this study is to present data mainly on government expenditure over the period 1970 to 2001. A second task of this study deals with explaining the observed growth of government expenditure. The major hypothesis tested in this respect is Wagner's Law of expanding state activities. The purpose here is to assess as much as possible, the contribution of this law in helping to understand the growth of Saudi Arabia economy.

For determining the long-run relationship between total government expenditure and real gross domestic product and its direction, we looked at the time series properties using aggregate time series data of Saudi Arabia for the period 1970-2001. Our results are indicative rather than definitive. We found that the public expenditure and GDP variables were non-stationary in levels, but stationary first differences, that is, they are integrated of order one I(1). According to the test results, there is one co-integration relationship between the variables. Co-integration is essential for the valid test of Wagner's Law. Finally, we used Granger Causality testing procedure to determine the direction of causality. Our conclusion from these tests is that there is Bidirectional causality which is suggested by Wagner's Law from LTEX to LGDP at log difference and log level. Overall the relationship between government expenditure and gross domestic product as hypothesized by Wagner finds statistical support in Saudi Arabia over the period 1970 to 2001. The general conclusion reached in this study is that the Saudi experience supports Wagner's Law.

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INTRODUCTION

The relationship between public expenditure and economic growth has attracted considerable interest on the part of economic researchers both on the theoretical as well as on the empirical level. Due to insufficient private sector incentives, the public sectors are usually attributed strong social and economic roles.

The growth in the size of the public sector has received considerable attention for several decades. In particular, the relationship between public expenditure and GDP has been tested empirically for various countries using both time-series and cross-sectional data sets within the context of `Wagner's Law'. Wagner's Law was proposed by the German political economist, Wagner (1883). Among several interpretations, the most accepted interpretation of this Law states that an increase in economic activities causes an increase in government activities, which in turn increases public expenditure.

In the case of Saudi Arabia, the public sector is the major employer and acts as a device to encourage the development process. This results in significant expansion of the sector, where the public expenditures are mainly spent on the development plan projects and on the salaries or pensions of public sector employees. The OPEC oil price explosions of the 1970s and early 1980s, together with continuously rising production, brought the Kingdom of Saudi Arabia vast amounts of oil money. The sharp price and production increases of oil in the 1970s and early 1980s enabled the government of Saudi Arabia to make a cautious decision to utilize these surpluses for the benefit of human and natural resources. But during 1970s and 1980s the economy suffered from the domination of the oil sector as a single source of income, an undiversified production base, insufficient institutional and administrative structures, a weak infrastructure and the lack of qualified Saudi human resources.

After three consecutive years of accelerating economic growth during 1994-1997, the decline in global oil prices by about 38% during 1998 affected both the government budget and the balance of payments. Thus, during 1999 the government put into practice measures which reduced expenditures, raised non-oil revenues and increased other structural improvements to alleviate the impact of these developments. The economic situation currently is quite different.

The economic base and different sources of income (Table 1.1) have witnessed a marked diversification. Many infrastructural projects, including those of public education and health services, have been improved. Human resources have been developed adequately for the majority of government jobs to be occupied by Saudis' and there are higher rates of Saudization in various private sectors. Saudi Arabia is now prepared to deal in a capable way with local, regional and international developments, particularly with the WTO, which the Saudi government is in the process of joining shortly. These measures, together with efforts aimed at improving oil prices on the international markets, significantly reduced the impact on the economy of the deteriorating oil markets

Table 1.1

Main Macroeconomic Indicators in the Seventh Plan (1999-2004)

(1995=100)

	Share in GDP (%)		Average Annual Growth Rate (%)
	(1999)	(2004)	
GDP	100.0	100.0	3.16%
- Crude Oil & Natural Gas	31.0	28.2	1.21%
- Non-Oil Private Sector	50.6	55.4	5.04%
- Government Services	17.8	16.2	1.21%
- Import duties less bank service charges	0.6	0.2	(16.0)%
Expenditure on GDP	100.0	100.0	0%
-Domestic Final Demand	87.7	84.4	3.42%
-Final Consumption	65.0	59.0	2.2%
- Private Final Consumption	38.8	36.0	2.94%
- Government Final Consumption	26.2	23.0	1.00%
-Gross Fixed Capital Formation	22.7	25.4	6.85%
-Private Investment	15.3	18.3	8.34%
-Government Investment	5.7	5.8	4.57%
-Oil Investment	1.7	1.3	(0.27)%
-Goods and Services Export Surplus:	10.0	13.8	1.0%
-Exports	41.4	44.3	2.74%
-Imports	31.4	30.5	3.30%
-Change in Stocks:	2.3	1.8	--

Source: Ministry of Planning 2002

After strong growth in 2000, the Saudi economy recorded modest growth of 1.2% in 2001, as world oil prices declined to around $25 per barrel in 2001 from $30 per barrel in 2000.

Although efforts have been made to expand Saudi Arabia's revenue base such as encouraging the investment in petrochemical industry and telecommunications sector, oil revenue remain fundamental to the Saudi economy and will continue to do so for the predictable future. While the private non-oil sector contribution to GDP (See Table 1.1) has increased over the past decade - and is now at around 60% - oil sales still make up some 80% of government revenues and over 90% of export revenues.

Since economic literature has already covered some case studies in this regard, this work includes some important related literature on the issue of government expenditure and economic growth in both economic history and Saudi Arabia studies. In general, this work focuses on the issue of government expenditure and economic growth in Saudi Arabia.

Government expenditure refers to the expenses which the government incurs for its own maintenance and for the society as a whole. On the other side, economic growth is the increase in the quality and quantity of goods and services as the result of hundreds of thousands of entrepreneurs hiring more workers, introducing technological innovations, and improving worker productivity.

Though historically, public expenditure is found to be continuously increasing over time in almost every country, the area of public expenditure remains relatively unexplored. In the 1950s economists started to study the effect of government expenditure on the other economics variables. As Lowell Harris (1958) says, "The theory of public expenditure has been more or less confined to that of generalizations in terms of the effects of public expenditure on employment and prices etc" (p. 261). In his study, Harris mentions that increased government expenditures have a diminishing effect on the growth of the economy.

At some level of spending, the impact of government expenditures on the production of goods and services is negative because government may focus its spending in certain sector and ignore others. However, in this study, we examined the causal relationship between public expenditure and GDP for Saudi Arabia economy.

In addition, we utilized recent advances in econometrics to overcome the problems which arise from the non-stationary time series data. Furthermore, we examined the growth and spending pattern of the Saudi Arabian economy from 1970-2001. Then the focus was on the "elasticities of total expenditure in relation to GDP" at current price (1999 = 100). In the next part of this work we tested the co-integration between five expenditure categories and the GDP. Then, we ran the causality test. Finally, according to this investigation, this work concluded with some recommendations for the decisions makers in the Saudi economy.

1.1. PROBLEM STATEMENT

The role of government expenditure in promoting economic growth remains a debatable subject in both developing and industrial countries (Chletsos and Kollias, 1997; Henrekson, 1992 and Hsieh and Lai, 1994). The size and role of the public sector in the Saudi Arabian economy has changed over last thirty years. Until the mid 1980s, the public sector dominated economic activities on both production and commercial sides.

In recent years, the Saudi government started reducing the massive government expenditures and put some efforts for maintaining the growth rate of GDP. The crucial questions here are: Is there causality between government size and the increase of government expenditure? Does Wagner's Law still apply in testing the relationship between government expenditure and the size of the economy? How should public expenditure be distributed among competing groups? These questions and others need to be answered through this study. This study is laid out as follows. Chapter 1 is an introduction and discussion of the classification of the public expenditure and its pattern in Saudi Arabia. Chapter 2 is the literature review of the relationship between government expenditure and economic growth. Chapter 3 briefly explains the theoretical analysis of public expenditure growth with special emphasis on Wagner's Law and empirical methodology. The empirical results of testing the existed six versions are covered in Chapter 4. Chapter 5 provides the empirical results of testing the five specific categories of government functional expenditure and Chapter 6 concludes some discussion and summary of the study.

1.2. STUDY OBJECTIVES

Mainly, this work is an attempt to investigate the existence and the nature of long-run relationship between Saudi Arabia GDP and five categories of government "functional" expenditure. Secondly, this work aims to shed some further empirical light on the subject of government expenditure's ability to promote growth by focusing on these five categories and the experience of Saudi Arabia as a "highly welfare-oriented country". In this work, we investigated whether the Saudi Arabia case supports Wagner's Law or not. By testing aggregate Saudi Arabia data for the period 1970-2001, we looked at the time series properties of the data, and then we tested for the existence of unit roots to see whether these variables (Government

Expenditure and GDP) are stationary or non-stationary. If they are non-stationary, then we need to see which level of differences we have. In other word, to avoid the potential problem of estimating spurious relationships, it is necessary to test the time series properties (of the variables under investigation) for unit roots. If a variable is stationary, i.e., it does not have unit roots, it is said to be I(0) (i.e., integrated of order zero). If a variable is not stationary in its level form but stationary in its first-differenced form, it is said to be integrated of order one, or I(1).

To have more accurate results, we need to find out the order of integration. And, since we have a single equation model, we did apply a co-integration test. There are at least three reasons for investigating the validity of Wagner's Law in the Saudi Arabia case. First, we need to update and analyze the relationship between government expenditures and economic growth since the last known Saudi case study was done twenty years ago by Al-Ghamdi (1983). Therefore, reevaluating this relationship with new methods of empirical testing is very important to measure the new phase of Saudi Arabia economic growth and find out the impact of government expenditure on the economic growth. The general purpose of this work is to test the relationship between government expenditure and economic growth while reviewing the main contribution of the Classical School and Wagner Doctrine, Keynesian School, Current Studies (starting from 1950s) and Saudi Arabia studies. By examining different methods and tests such as co-integration techniques, Causality Test, and Wagner's Law, we did come up with an accepted conclusion for the Saudi case. In this work, we tried to utilize Wagner's Law to empirically analyze public expenditure growth in Saudi Arabia. Relying on the scheme by Wagner, we did investigate whether there is a long-run tendency for public expenditure to grow. One of the motivations for this work is the fact that such analysis has not been attempted since 1983 while the Saudi economy has seen dramatic changes.

1.3. DATA DESCRIPTION:

The total government expenditure increased about 34 times from 3,797 million SR[1] in 1970 to 128,527 million SR in 1981 and jumped to 165,000 million SR in 1991 (see Figure 1.1).

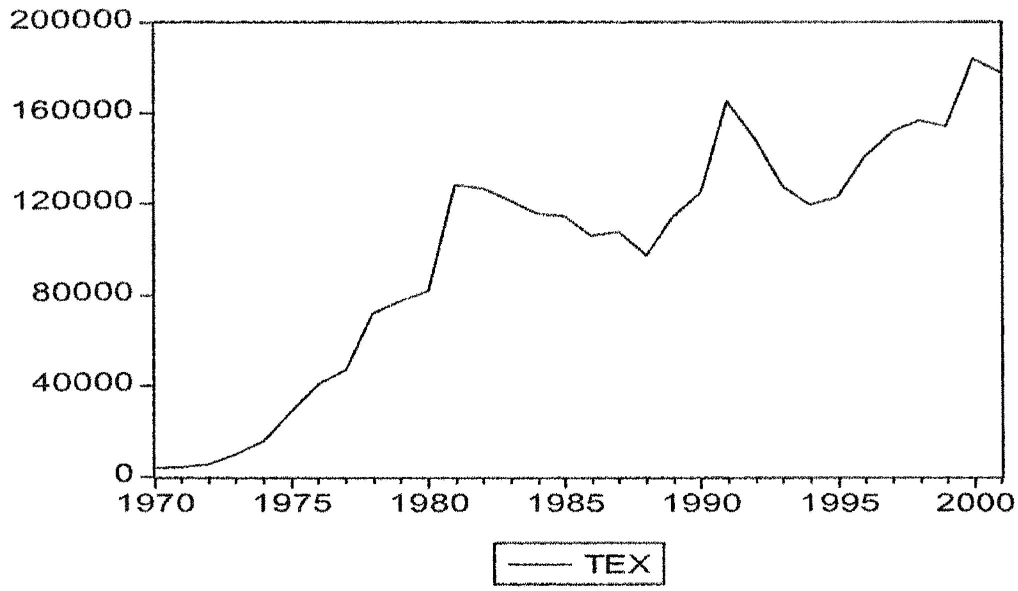

Figure 1.1 The increase of Saudi Arabia Total Expenditure from 1970 to 2001 (Millions of S.R)
Source: SAMA 2002.

Due to the second oil crisis (1979-1982/83), most Oil Producing Countries (OPC) experienced a rapid rise in their government spending. There was an increasing trend in the Saudi Arabian government expenditure between 1970 and 1981 from

[1] Saudi Riyal has been fixed to the $US since 1973 ($1=3.75)

12.87% in 1970 to 19.14 in 1981. However, the total government expenditure ratio to GDP (TEX/GDP) fell considerably to 1.3% in 1982 and 4.34% in 1983. One characteristic of an OPC economy is that it is highly exposed to external shocks.

In 1991, the Saudi Arabian government expenditure increased by 13.23% in real terms because of the severe effects of the Gulf War I. Its share in 1993 almost fell to the 1990 level, but has resumed its increase since 1995. In 2001, the total public expenditure was 177,837 million SR and GDP was 640,413 million SR, equivalent to 27.8% of GDP. The data under examination contain the Gross Domestic product (GDP), the Components of Government Expenditure and the Population growth as described in the following sections.

1.3.1. Gross Domestic Product

The Gross Domestic Product (GDP) experienced continuous growth for more than thirty years from 1968 to 2001 (See Figure 1.2 and Table 1.2). This increase in GDP is attributed to the increase in oil prices since the early 1970s. Table 1.3 shows the shape of Saudi Arabian GDP for the thirty three years from 1969 to 2001 and the corresponding GDP increase from oil and non-oil sectors.

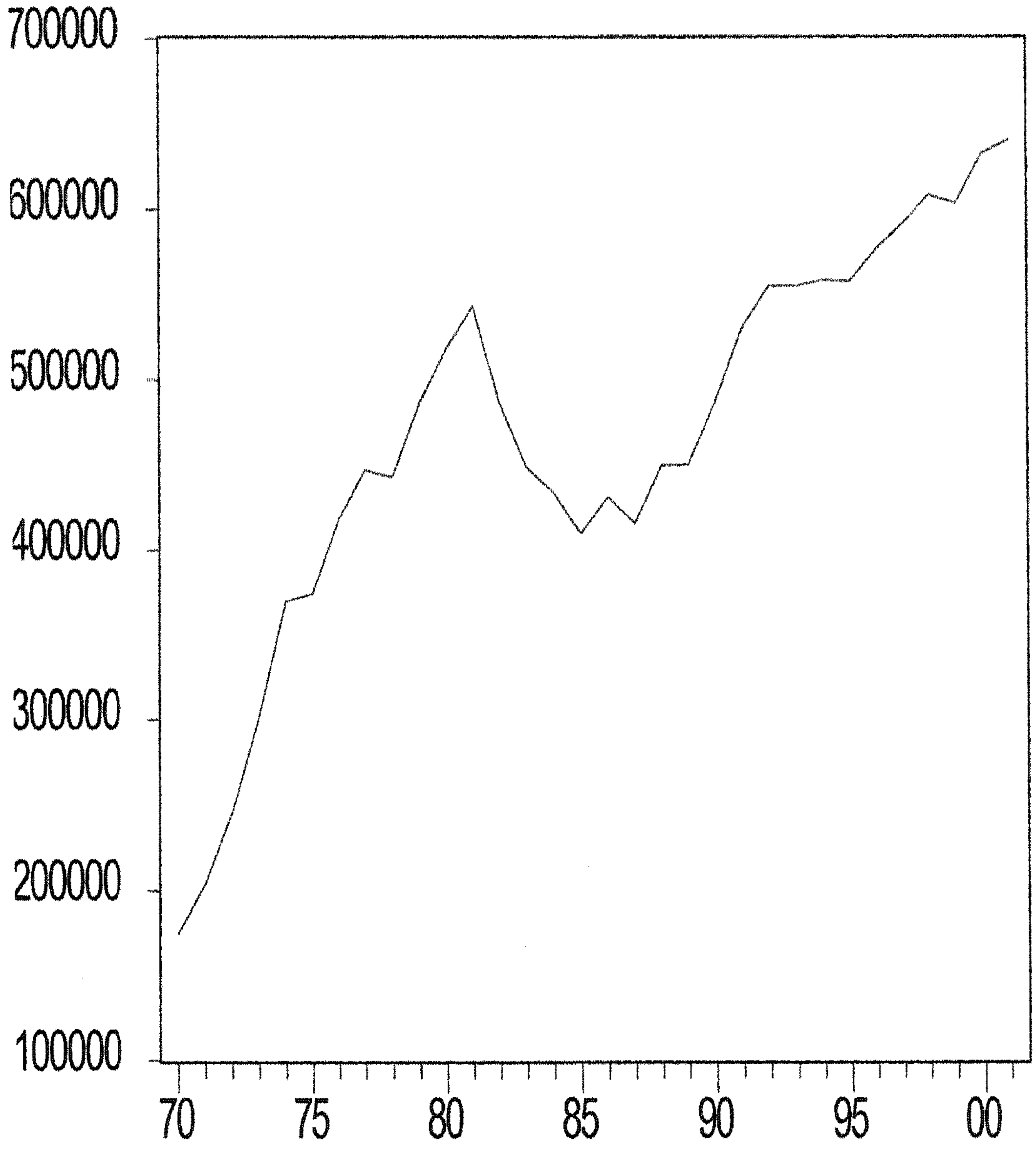

Figure 1.2 The Increase of Saudi Arabian GDP from 1970 to 2001.
(Millions S.R)
Source: Saudi Arabia Monetary Agency (SAMA) 2002.

Table 1.2
Gross Domestic Product by Institutional Sectors at 1999 Constant Prices
(Millions S.R)

Year	Oil Sector (1)	Private Sector (2)	Govern-ment Sector (3)	Non-Oil Sector (2) + (3) = (4)	GDP Excluding Import Duties (1) + (4) = (5)	Import Duties (6)	GDP (5) + (6)= (7)
1970	90,458	45,011	35,938	80,949	171,407	3,032	174,439
1971	112,618	48,835	38,636	87,471	200,089	3,827	203,916
1972	141,739	56,057	43,415	99,472	241,211	4,212	245,423
1973	177,997	67,719	51,175	118,894	296,891	4,156	301,047
1974	198,924	101,410	65,682	167,092	366,017	3,709	369,725
1975	163,661	125,198	81,247	206,445	370,107	3,746	373,853
1976	202,654	127,465	84,433	211,898	414,552	3,752	418,304
1977	216,623	135,219	90,497	225,717	442,339	4,735	447,075
1978	196,645	150,935	90,696	241,631	438,276	4,357	442,634
1979	225,557	165,268	91,149	256,417	481,974	3,991	485,965
1980	235,712	179,194	99,078	278,272	513,984	3,972	517,956
1981	233,109	200,055	106,317	306,372	539,481	3,545	543,026
1982	157,453	214,508	110,965	325,473	482,925	3,686	486,611
1983	113,175	217,478	113,652	331,131	444,306	4,096	448,402
1984	102,644	211,458	115,141	326,599	429,243	4,390	433,633
1985	82,291	206,119	116,913	323,032	405,322	4,331	409,654
1986	119,847	191,295	116,020	307,314	427,162	3,662	430,824
1987	104,743	191,893	115,064	306,957	411,700	3,956	415,656
1988	129,099	196,280	114,880	311,160	440,260	9,508	449,767
1989	125,987	200,040	116,337	316,377	442,364	7,723	450,087
1990	171,948	204,258	103,078	307,336	479,284	7,958	487,242
1991	209,845	207,846	105,781	313,627	523,472	7,235	530,707
1992	216,086	217,009	111,988	328,996	545,082	9,969	555,051
1993	209,492	221,813	113,968	335,781	545,274	9,909	555,183
1994	209,891	224,716	115,111	339,827	549,718	8,697	558,415
1995	208,980	223,747	117,617	341,365	550,345	7,612	557,956
1996	213,935	234,476	119,435	353,911	567,846	8,891	576,737
1997	210,894	245,243	126,708	371,951	582,845	8,950	591,794
1998	217,731	251,627	129,150	380,777	598,508	9,996	608,504
1999	201,474	262,227	130,255	392,481	593,955	9,634	603,589
2000	215,306	273,445	134,442	407,887	623,193	9,713	632,906
2001	212,661	282,907	136,775	419,682	632,342	8,070	640,413

Source: Saudi Arabia Monetary Agency (SAMA), 2002

Table 1.3

Gross Domestic Product (GDP) and oil and non-oil revenue from 1969 to 2001

(Millions S.R)

Year	Oil Sector	Non-Oil Sector	GDP
1969	76,451	77,282	156,683
1970	90,458	80,949	174,439
1971	112,618	87,471	203,916
1972	141,739	99,472	245,423
1973	177,997	118,894	301,047
1974	198,924	167,092	369,725
1975	163,661	206,445	373,853
1976	202,654	211,898	418,304
1977	216,623	225,717	447,075
1978	196,645	241,631	442,634
1979	225,557	256,417	485,965
1980	235,712	278,272	517,956
1981	233,109	306,372	543,026
1982	157,453	325,473	486,611
1983	113,175	331,131	448,402
1984	102,644	326,599	433,633
1985	82,291	323,032	409,654
1986	119,847	307,314	430,824
1987	104,743	306,957	415,656
1988	129,099	311,160	449,767
1989	125,987	316,377	450,087
1990	171,948	307,336	487,242
1991	209,845	313,627	530,707
1992	216,086	328,996	555,051
1993	209,492	335,781	555,183
1994	209,891	339,827	558,415
1995	208,980	341,365	557,956
1996	213,935	353,911	576,737
1997	210,894	371,951	591,794
1998	217,731	380,777	608,504
1999	201,474	392,481	603,589
2000	215,306	407,887	632,906
2001	212,661	419,682	640,413

Source: Saudi Arabia Monetary Agency (SAMA) annual report 2002.

1.3.2. Components of Public Expenditure

Paul Samuelson (1958) classified public expenditure on three categories of goods: (1) pure private goods, (2) pure public goods and (3) mixed goods. In general, government expenditure (Figure 1.2) data can be classified by functional or economic categories (Chu and Hemming, 1991). The functional classification reveals the government's priority in spending for the social and economic sectors during development plans. The economic classification reflects the impact of the government sector in the market for goods and services. Our focus in this work was on the functional government expenditure. But first, we did cover some elements of the notion of economic classification.

1.3.2.1. The Economic Classification

Economic service covers those areas of government associated with the regulation and more efficient operation of business (Chu and Hemming, 1991). This sector should reflects the objectives of government economic development and the creation of employment opportunities (see Figure 1.3). The maintenance of infrastructure such as roads, bridges, buildings and ports, necessary to facilitate economic development, are also classified in this section. The economic categories include salaries and wages, goods and services, interest duties (payments), transfers, and capital expenditure. They reflect the effect of the government sector in the market for goods and services, in the financial markets and in the distribution of income.

In this study, we used the major categories in government functional expenditure like, Defense (DEF), Education (EDU), Health (HTH), Social Security & Welfare System (SSWS) and Housing & Community Amenities (HCA).

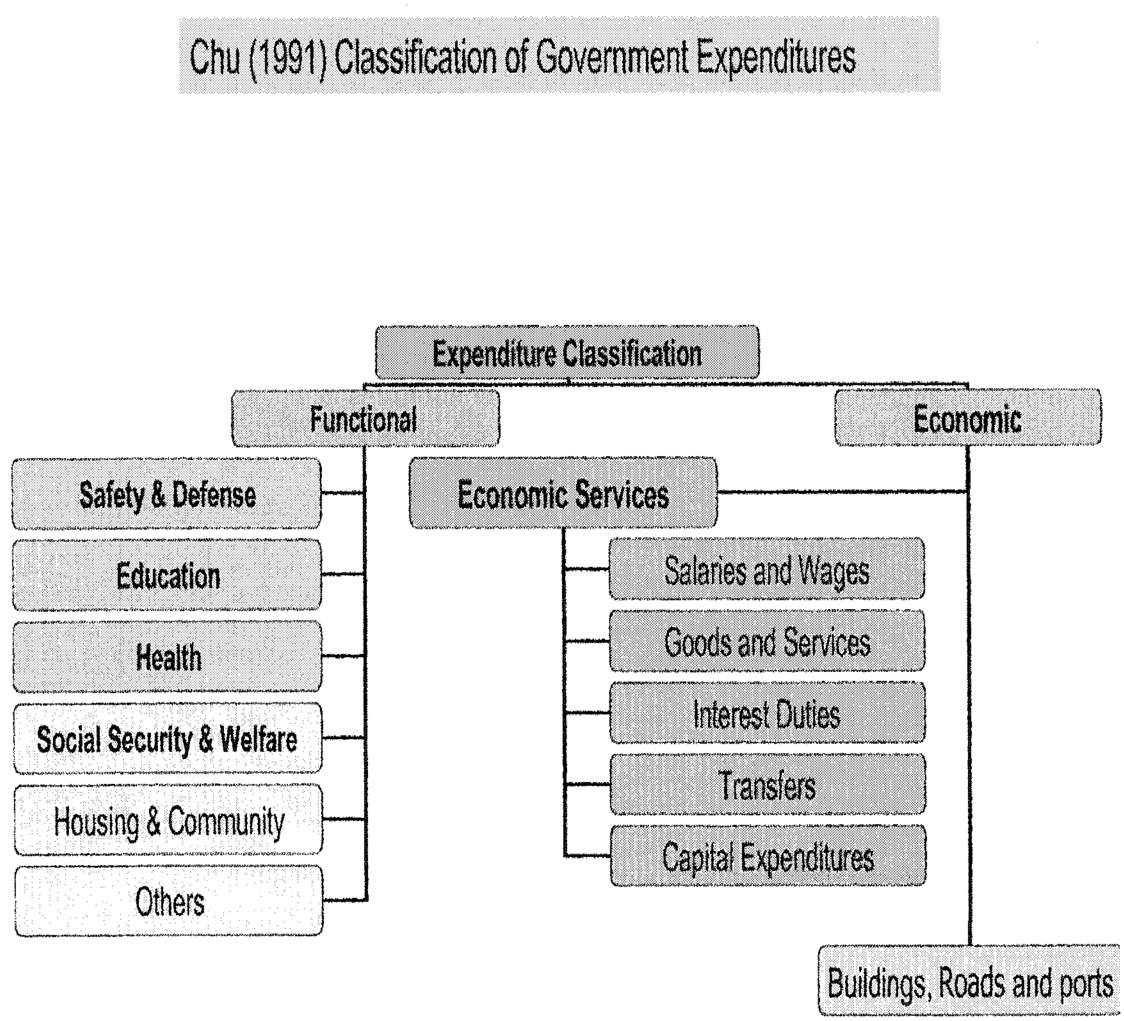

Figure 1.3 Chu and Hemming classification of Government Expenditure

1.3.2.2. The functional classification:

The functional classification relates to government spending in the social and economic sectors. In this way the trends in government expenditure can be observed over time. Government expenditure has been summarized into five broad groups as follows:

1. General Government
2. Public Order, Safety & Defense
   - (i) Defense Affairs & Services
   - (ii) Public Order & Safety
3. Community and Social
   - (i) Education
   - (ii) Health
   - (iii) Social Security & Welfare
   - (iv) Housing and Community
   - (v) Recreational, Cultural & Religious
4. Economic Services
   - (i)Fuel & Energy
   - (ii)Agriculture, Forestry and Fisheries
   - (iii)Transportation & Communication
   - (iv)Mining & Mineral Resources
5. Other Functions (primarily interest payments)

The most labor intensive functions were found in Public Order, Education and Health, which averaged over 80 percent of expenditure. Table 1.4 below illustrates the relative weight in the expenditure functions

Table 1.4
Government Final Consumption Expenditure in Purchaser's Values (in Millions SR) at Constant Price (1999)

Year	GPS	DEF	EDU	HTH	SSWS	HCA	OCSS	OP	Total
1970	646	1,804	469	153	24	57	146	498	3,797
1971	733	1,901	635	173	27	74	173	570	4,286
1972	942	2,526	753	265	32	87	169	562	5,336
1973	1,214	5,664	1,168	325	32	149	213	1098	9,863
1974	1,744	9,273	1,621	525	47	156	305	2239	15,910
1975	2,991	17,473	3,074	826	81	0	339	4098	28,882
1976	4,216	27,007	4,272	1,088	104	3	461	3884	41,035
1977	6,541	26,999	5,655	1,378	188	27	653	5593	47,034
1978	8,038	36,425	7,690	1,682	169	42	1,009	16850	71,905
1979	11,402	40,933	8,948	2,264	190	139	960	12728	77,564
1980	10,708	43,000	11,833	2,465	219	2,012	1,538	10139	81,914
1981	12,490	57,858	12,822	3,385	220	2,415	2,158	37179	128,527
1982	15,863	48,492	16,565	4,749	276	2,671	1,718	36570	126,904
1983	17,538	51,839	16,862	5,717	290	3,199	2,278	23902	121,625
1984	19,025	50,330	18,475	6,059	349	4,296	2,494	14619	115,647
1985	20,048	45,008	19,128	6,548	342	4,484	2,610	16220	114,388
1986	19,355	39,439	18,535	6,356	324	4,306	2,489	15563	106,367
1987	19,741	39,770	18,716	6,599	333	4,279	2,596	15673	107,707
1988	18,606	34,753	18,102	5,898	304	4,155	2,245	13354	97,417
1989	23,601	40,328	22,470	6,899	305	5,027	2,240	13429	114,299
1990	53,215	44,477	14,542	1,081	461	162	3,196	7570	124,704
1991	41,250	57,750	33,000	10,065	660	1,650	4,125	16500	165,000
1992	29,004	54,983	27,370	9,970	404	5,414	3,102	18718	148,965
1993	24,374	50,044	27,017	7,402	390	4,573	2,828	11151	127,779
1994	23,794	44,393	25,830	7,598	392	4,499	2,709	10347	119,562
1995	25,136	44,895	26,568	8,032	520	4,606	2,944	10148	122,849
1996	27,755	51,060	28,186	9,255	613	5,333	3,493	14560	140,255
1997	29,715	55,880	30,247	10,151	771	5,696	3,847	15344	151,651
1998	32,129	56,271	31,012	10,737	833	5,844	4,092	15732	156,650
1999	30,546	42,285	45,362	16,921	583	7,210	4,439	6748	154,094
2000	36,133	53,405	48,008	21,901	759	8,957	5,670	8970	183,803
2001	30,236	51,780	49,756	19,411	725	9,126	6,319	10483	177,837

GPS = General Public Services, DEF = Defense, EDU = Education, HTH = Health, SSWS = Social Security and welfare Services, HCA = Housing and Community Amenities, OCSS = Other Community and Social Services, OP = Other purposes and Total Expenditure.

Source: SAMA, Annual report 2002.

1.3.2.2.1. General Government Services

General Government Services include all government offices. In 2001 the general services function averaged 17% of recurrent expenditure and 4.7 % of GDP.

1.3.2.2.2. Defense

Defense affairs and services are expenses related to the administration, supervision and operation of defense facilities. This function amounts to about 33% of the total budget in 1995 (See Table 1.5) and 36% in the year 2001. This share increased in 1991 to 35% because of the effect of the Gulf War I. Not unexpectedly, the proportion of government expenditure in public order and safety ranked first in Saudi Arabia.

Table 1.5

Saudi Arabia: budget allocation 1995 & 2001

Description	SR million in (1995) prices	% (1995)	SR million In (2001) Prices	% (2001)
Military & security "Defense"	49,492	33.0	78,850	36.7%
Education	26,912	17.9	53,010	24.7%
Health & social services	13,366	8.9	18,089	8.4%
Municipalities & water	4,880	3.3	7,224	3.4%
Transport & communications	6,200	4.1	5,732	2.7%
Economic resources	9,989	6.7	5,629	2.6%
General items/subsidies/bond repayments	33,912	22.6	39,199	18.2%
Loans for housing, industry & farms	5,305	3.5	7,267	3.3%
Total	**150,056**	**100.0**	**215,000**	**100%**

Source: Saudi Arabian Monetary Agency (SAMA) 2002.

1.3.2.2.3. Community and Social Services

Community and social service functions include education, health, housing and cultural services, pensions and welfare services as shown in Table 1.4. In Saudi Arabia, these functions accounted for the largest share of recurrent expenditure.

Expenditure on human capital resources has been shown to contribute to the overall economic growth and development of countries, yielding high social rates of return for the given investment. The share of expenditure on educational services is the second highest government expenditure, accounting for 24.7% of the total government expenditure in 2001 (see Table 1.5). As can be expected, given the large numbers of teachers involved, this sector was the most labor intensive for Saudi Arabia employment However, outlays on education have exhibited an increasing trend in proportion to total expenditure because of the high rate of population growth since 1977.

1.3.2.2.4. Health

Expenditure on health services as shown in Table 1.5 is the fourth highest government expenditure, accounting for 8.4% of the total government expenditure in 2001. The major expense item in this function was that related to hospital and public health care. The labor costs in this function were not as high as that observed in education. Table 1.6 shows the number of employees of the health sector in the Kingdom during the period of 1994-1998.

Moreover, comparing the number of hospitals in 1994 to 1998, Table 1.6 shows that private sector share increased by 20.8% and the number of hospital beds have been increased in private sector from 1994 to 1998 by 28.7%, which indicates increased the expansion of health services in the private sector.

Table 1.6
Hospitals, Beds and Health Care Centers
(1994 - 1998)

Items	1994 (Number)	1998 (Number)	Increase Number	Increase Percent
Hospitals:				
Ministry of Health	173	182	9	5.2%
Other government agencies	34	39	5	14.7%
Private sector	72	87	15	20.8%
Total	279	308	29	10.4%
Hospital beds: Ministry of Health	26,878	27,428	550	2%
Other government agencies	8,357	9,119	762	9.1%
Private sector	6,592	8,485	1,893	28.7%
Total	41,827	45,032	3,205	7.7%
Primary Health Care Centers	1,719	1,751	32	1.9%

Source: Ministry of Planning (2002).

The new development plan's target is to ensure steady private sector growth in health care services, through greater participation in financing the establishment of health facilities and increased investment in the manufacturing of medicines, pharmaceuticals and medical equipment. An integrated set of policies for the development of the health sector will be needed to realize these aspirations and to address the key issues.

1.3.2.2.5. Social Security and Welfare

In the case of Saudi Arabia as no-tax country, the major emphasis was in the social security and welfare. Government expenditure for this function has increased year by year because of the high population growth.

1.3.2.2.6. Housing and Community Development

Middle- and low-income citizens face difficulties in securing their own housing units, from the land purchase stage to the stage of ensuring the necessary funds for building houses. What makes this situation even worse for such groups is the decline in the number of housing units constructed or financed by government agencies. The housing sector contributes to economic growth, prosperity and social stability. During the Sixth Development Plan period, housing rental accounted for about 26 percent of household expenditure, compared with 28 percent in Germany and 31 percent in the USA. Around 60 percent of the housing units in the Kingdom are owner-occupied, compared with 48 percent in Germany and 64 percent in the USA (see Table 1.7).

Table 1.7
Housing Units Completed during the Sixth Development Plan (1995-1999).

Executing Agency	Constructed during the Sixth Development Plan	Cumulative Stock up to End of Sixth Development Plan (Units)	Structure of Stock (Percent)
Government Housing:	-	-	-
Ministry of Public Works &Housing	-	24,540	0.8
Government Agencies (for employees)	-	221,000	7.1
Sub-Total	-	245,540	7.9
Private Sector:	-	-	
REDF Finance	33,300	573,000	18.3
Self Finance	250,000	2,308,000	73.8
Sub-Total	283,300	2,881,000	92.1
Total	283,300	3,126,540	100.0

* *REDF:* Real Estate Development Fund.
Source: Ministry of Planning 2002

1.3.3. Population:

Saudi population growth (Figure 1.4) was steady in the period from 1970 to 2001 and growing at a constant average as shown in Table 1.8. In addition, the rapid growth in the Saudi economy increased the demand for guest workers. See Table 1.9 for the percentage of guest workers in the Saudi population.

Human resources have received a large share of public spending during the last two development plans. The Seventh Development Plan places a very high priority on developing human resources through implementing effective measures and policies aimed at increasing the supply of Saudi labor and improving its quality. The plan pays even greater attention to increasing female participation in the labor force and promoting structural changes in the academic profiles of the Saudi labor force in order to increase the number of the academically qualified in general, and those with higher and technical qualifications in particular.

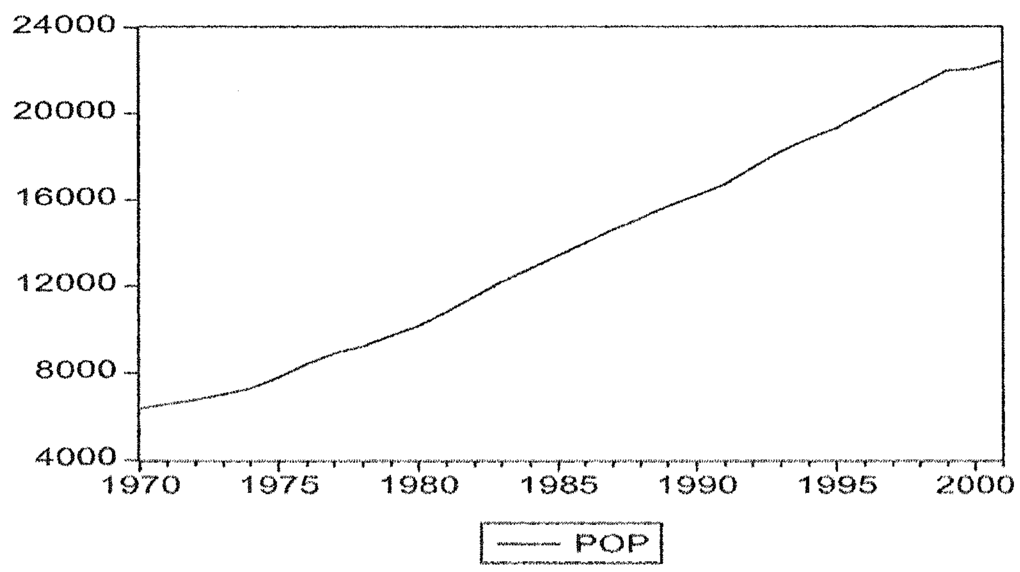

Figure 1.4 The Increased of Saudi Arabia population from 1970 to 2001. (Thousands)

Source: SAMA, 2000

Table 1.8
Gross National Product Per capita
GDP and population

Year	GDP (Millions S.R)	Population (Millions)	GDP Per Capita (S.R)
1971	20,589	6.38	3,227
1972	30,146	6.57	4,588
1973	82,349	6.76	12,182
1974	125,397	7.00	17,914
1975	165,394	7.30	22,657
1976	207,723	7.80	26,631
1977	223,620	8.40	26,621
1978	242,900	8.90	27,292
1979	381,061	9.23	41,285
1980	508,424	9.70	52,415
1981	522,903	10.20	51,265
1982	433,390	10.80	40,129
1983	392,464	11.50	34,127
1984	372,341	12.20	30,520
1985	327,529	12.80	25,588
1986	289,667	13.40	21,617
1987	292,835	14.00	20,917
1988	305,083	14.60	20,896
1989	329,520	15.12	21,794
1990	398,517	15.70	25,383
1991	437,155	16.20	26,985
1992	452,784	16.70	27,113
1993	436,609	17.50	24,949
1994	433,487	18.23	23,779
1995	469,744	18.80	24,986
1996	590,748	19.34	30,545
1997	617,902	20.00	30,895
1998	546,648	20.70	26,408
1999*	603,589	21.33	28,298
2000*	706,657	22.01	32,106

*Estimated data
Source: SAMA

Table 1.9

Civilian Employment during the Sixth Development Plan

(Thousand)

Sectors	(1994)	(1999)	Cumulative change	Average annual growth rate %
1. Producing Sectors:	2107.0	2273.3	166.3	1.5%
- - Agriculture	500.9	557.9	57.0	2.2%
- - Manufacturing	530.9	589.0	58.1	2.1%
- - Other producing sectors	1075.2	1126.4	51.2	0.9%
2. Services Sectors:	4289.8	4804.1	514.3	2.3%
- - Private	3429.5	3887.9	458.4	2.5%
- - Government	860.3	916.2	55.9	1.3%
Total Non-oil sectors	6396.8	7077.4	680.6	2.0%
3. Crude oil and gas	93.1	98.9	5.8	1.2%
Total	6489.9	7176.3	686.4	2.0%
Of which:				
- - Saudi	2544.8	3172.9	628.1	4.5%
- - Non-Saudi	3945.1	4003.4	58.3	0.3%

Source: Ministry of Planning 2002

The non-oil sector revenues expanded, increasing the sources of funding government expenditure, thereby helping to maintain the economic stability necessary for a positive investment climate. Thus, the positive impact of increasing non-oil revenues is not confined to the public sector only, but also extends to the private sector, through encouraging domestic and foreign private investment and reducing risks (see Table 1.10).

Table 1.10

Structure of Expenditure on Gross Domestic Product
at constant prices of (1994)

	Billions of SR		Share in GDP %		Average
	(1999)	(2004)	(1999)	(2004)	Growth Rat %
Final Domestic Demand	422.22	499.53	88.8	89.9	3.42
-Final Consumption	308.90	344.46	64.9	62.0	2.20
-Private Consumption	188.90	218.34	39.7	39.3	2.94
-Government Consumption	120.00	126.12	25.2	22.7	1.00
-Gross Capital Formation	106.32	148.07	22.4	26.7	6.85
-Non-Oil Private Sector	71.07	106.07	14.9	19.1	8.34
-Government Sector	27.40	34.26	5.8	6.2	4.57
-Oil Sector	7.85	7.74	1.7	1.4	-0.27
-Change in Stocks	7.00	7.00	1.5	1.3	--
Net Exports of Goods and Services	53.45	56.17	11.2	10.1	--
-Exports of Goods and Services	214.58	245.68	45.1	44.2	2.74
-Imports of Goods and Services	161.13	189.51	33.9	34.1	3.3
Total GDP	475.67	555.70	100.	100.	3.16

Source: Ministry of Planning 2002

The development and utilization of mineral resources is one of the most promising ways of increasing and diversifying the sources of national income. Although non-oil revenues have increased over the course of previous development plans (see Table1.11), such improvements are not yet sufficient.

Table 1.11
Annual Government Revenues and Expenditures: Saudi Arabia
(Millions of S.R)

Year	Oil Revenue	Non-Oil revenue	Total Revenue	Total Expenditure	Budget (Deficit/ Surplus)
1969	5,119	549	5,668	5,872	-204
1970	7,122	818	7,940	6,418	1,522
1971	9,685	1,435	11,120	8,303	2,817
1972	13,480	1,888	15,368	10,148	5,220
1973	39,285	2,420	41,705	18,595	23,110
1974	94,190	5,913	100,103	32,038	68,065
1975	93,481	9,903	103,384	81,784	21,600
1976	121,191	14,766	135,957	128,273	7,684
1977	114,042	16,617	130,659	138,048	-7,389
1978	115,078	16,427	131,505	147,971	-16,466
1979	189,295	21,901	211,196	188,363	22,833
1980	319,305	28,795	348,100	236,570	111,530
1981	328,594	39,412	368,006	284,650	83,356
1982	186,006	60,176	246,182	244,912	1,270
1983	145,123	61,296	206,419	230,185	-23,766
1984	121,348	50,161	171,509	216,363	-44,854
1985	88,425	45,140	133,565	184,004	-50,439
1986	42,464	34.034	76,498	137,422	-60,924
1987	67,405	36,406	103,811	173,526	-69,715
1988	48,400	36,200	84,600	134,850	-50,250
1989	75,900	38,700	114,600	149,500	-34,900
1990	62,150	43.134	105,284	155,860	-50,576
1991	246,297	70,342	316,639	457,477	-140,838
1992	128,790	40,857	169,647	211,340	-41,693
1993	105,976	35,469	141,445	187,890	-46,445
1994	95,505	33,486	128,991	163,776	-34,785
1995	105,728	40,772	146,500	173,945	-27,445
1996	135,982	43,103	179,085	198,117	-19,032
1997	159,985	45,515	205,500	221.272	-15,772
1998	79,998	61,610	141,608	190,060	-48,452
1999	104,447	43,007	147,454	183,841	-36,387
2000	214,424	43,641	258,065	235,322	22,743

Source: SAMA, 2002

Data presented highlights the attention given by the successive development plans to expenditures of development agencies. Table 1.12 shows the changing priorities and areas of focus over the first five development plans, 1970 to 1994. Average expenditure on infrastructure development during the First and Second Development Plans reached 41.4 and 49.3 percent respectively of the total actual expenditure of the development agencies, exceeding average expenditure on the development of economic, human, social and health resources, thus establishing an integrated base of infrastructure needed to accelerate socio-economic development.

Table (1.12)

Actual Expenditures by Development Agencies

During the First Five Development Plans

(1970-1994)

	1970-1975		1975-1980		1980-1985		1985-990		1990-1995	
	Billions of S.R	%	Billions of S.R	%	Billions of S.R	%	Billions of S.R	%	Billions of S.R	%
Economic Resource Development	9.5	27.7	97.3	28	192.2	30.7	71.2	20.4	34.1	10
Human Resource Development	7.0	20.6	51	14.7	115	18.4	115	33	164.6	48
Social and Health Development	3.5	10.3	27.6	8	61.2	9.8	61.9	17.7	68	20
Infrastructure Development	14.1	41.4	171.3	49.3	256.8	41.1	100.7	28.9	74.2	22
Total	34.1	100	347.2	100	625.2	100	348.9	100	340.9	100

Source: Ministry of Planning 2000.

Table 1.12 also shows the attention given by the development plans to expenditures on human resource development. For example, the share of expenditure on human resources development over the last three plans rose from 18.4 percent of total actual expenditure by development agencies during the Third Plan to 33 percent during the Fourth Plan and 48 percent in the Fifth Plan, thereby reflecting the increasing importance of human resources development.

1.4: BARRIERS AND LIMITATION OF THE STUDY

The study focused on testing mathematically and statistically the relationship between government expenditure and GDP according to various notions of Wagner's Law. Since our purpose here is not go further than Wagner's Law application and because of the problem of data availability, I believe that adding any new elements such as demographical change or productivity will create a new result of the study's goals.

1.4.1: The Demographic Characteristics

The implications of population growth differ considerably among developing countries. Countries with unused natural resources could in the long run, provide for more people; but rapid population growth makes it hard for them to develop the human skills and administrative structures that are needed to exploit their resources. In Saudi Arabia, the flow of foreign labor immigration had noticeably increased the country's population. In 1979 the birth rate was estimated to be seven children per Saudi family. However, the government does not wish to lower the national fertility rate as in other Third World countries. At this time, Saudi Arabia encourages large families because the country has a relatively small population compared to its labor needs. Saudi Arabia is considered to be a unique situation because it desires a high population growth because it does not have sufficient indigenous labor.

The Saudi population has been growing by about 3% annually between 1974 and 1990. At the same time, the non-Saudi population has had a rapid growth rate at approximately four times the rate of the native population due to immigration. It climbed to 13.3% annually by 1980.

However, since population statistic on the various elements of growth in Saudi Arabia were not readily available in any source and the age distribution of Saudi population is not entirely accurate, I preferred to focus on the population in general (Saudi and Non-Saudi and those who are ready to participate in labor force and those who are not).

1.4.2: Productivity Issue

There are obvious problems with classification of government functional expenditure categories and omitted factors affecting the growth process. So it is difficult to draw supportive conclusions regarding the productivity and the impact of government expenditure on growth in this study. Instinctively, productivity of different categories of government expenditure may be judged by their effectiveness in enhancing income. Although some government expenditure may affect in practice individual incomes hence national income, they may be regarded as unproductive in theory. Thus the general recommendation to increase government expenditure based on productivity measurement in developing countries could, in this context, be misleading.

Finally, I promised to follow the origin of Wagner theme which excluded any specific factors other than government expenditure, GDP and population. Therefore, I found it necessary to follow this origin without including any specific elements such as demographic distribution or productivity in our study.

CHAPTER 2

LITERATURE REVIEW

2.1. Overview

The study of government expenditure and its relationship to GDP growth have captured the attention of many economists during the last three centuries. This Chapter presents the related literatures starting with Classical Studies including Adolf Wagner contribution to the field and some discussion about its validity, Keynesian approach, Current Studies (Starting from the 1950s) and Saudi Case Studies.

2.2. Classical Studies and Adolf Wagner

The economic models used in these studies are based on the economic thought of Adam Smith's, *An Inquiry into the Nature and Causes of the Wealth of Nations,* published in 1776, which reflects thoughts following Britain's Industrial Revolution. In these origins of economic growth, Schumpeter (1954) found that Smith and his followers criticized any attempts by the government to interfere with the market as likely to damage growth.

One of the earliest theories was presented by Adolf Wagner in 1893 titled "The Law of Expanding State Activity". Over one hundred years ago Adolph Wagner, a leading German economist of the day, formulated a "Law of expanding state expenditures" which pointed to the growing importance of government activity and expenditure as an "inevitable" feature of a "progressive" State. According to

Wagner, there are inherent tendencies for the activities of different layers of a government (such as central, state and local governments) to increase both intensively and extensively. There is a functional relationship between the growth of an economy and the growth of the government activities so that the governmental sector grows faster than that of the economy. In the original version, it is not clear whether Wagner was referring to an increase in (a) absolute level of public expenditure, (b) the ratio of total government expenditure to GNP or (c) the proportion of the public sector to the total economy. Wagner offered three reasons why this development would come about with respect to the administrative and protective functions of the State.

In addition, new needs for public regulative and protective activity would develop as a result of the increased complexity of legal relationships and communications that inevitably accompanied the greater division of labor with industrialization. In later writings, Wagner anticipated many subsequent authors' questions by adding the increase in population density and urbanization (which he saw accompanying industrialization) as additional factors leading to increased public expenditures on law and order and on economic regulation, in order to maintain the efficient performance of the economy in the face of the increased frictions of urban life.

Secondly, Wagner also explicitly predicted a considerable relative expansion of cultural and welfare expenditures, especially with respect to the execution and the redistribution of income. Though the reasons why he thought these activities would expand were left unclear in his exposition, he appears to have assumed, in essence, that they constituted "superior goods" or "luxuries". In other words, the income elasticity of demand for these public services was greater than unity, so that more of them would be demanded as income rose.

Finally, Wagner suggested that the predictable changes in technology and the increasing scale of investment required in many activities would create an increasing number of large private monopolies whose effect would have to be offset, or the monopolies taken over, by the State in the interests of economic efficiency.

Several comments must be made about this "Law" and the reasoning underlying it. One important point is that these ideas were formulated in Germany in the later nineteenth century. Not surprisingly therefore, Wagner's Law was framed to refer only to states in which income was rising as a result of industrialization. The conditions under which one might expect the "Law" to operate would therefore seem to be (1) rising per capita incomes (2) technological and institutional change of particular sort, and (3) at least implicit democratization (in the sense of wider political participation) of the polity.

A second point is that Wagner himself thought of the "Law" as a proposition in the positive theory of public expenditures, which refers to that body of economic and political analysis which attempt to understand and explain the observed pattern and level of government expenditures and the changes in those expenditures over time. In fact, however, his exposition of the "Law" was inextricably entangled with his own normative assumptions as to the nature of the state and the state activity. Thus it should not be surprising if the reasons Wagner offered in support of his general positive proposition do not stand up very well to a critical analysis, for on the whole they were simply statements of what he thought ought to happen as the economy became industrialized. This criticism is especially relevant to his arguments on the increase in public production and the rise in cultural and welfare expenditures. As Bird (1971) said "...formulated a 'Law' of expanding state expenditure; which pointed to the growing importance of government activity and expenditure as an inevitable feature of progressive state" (p. 1).

Dutt and Ghosh (1995) showed that the study of spending and growth relationship began when Adolf Wagner in 1893 found that the Law of expanding country activity holds to higher levels of economic development in German experience in the nineteenth century that caused rapid economic growth.

Research has proceeded along two different approaches: definably single country time series analysis and country cross section studies. Since there is a huge debate about the efficiency of using and applying Wagner's Law, this dynamic of Wagner's should be studied over time (Ram, 1986c).

According to Musgrave (1959), Wagner did not explain the nature of the public sector growth in terms of absolute sense. In terms of absolute sense, the growth in government output would be a normal good with positive elasticity between zero and one. A number of time series empirical studies have in the past found support for Wagner's Law. These, however, might not be reliable because they did not employ a new techniques such co-integration test to establish stationarity in the relevant variable, (Peacock and Wiseman, 1961; Musgrave, 1969; Bird, 1971; and Beck, 1982).

Mann (1980) applied his empirical time series analysis of Mexico during its period of industrialization. By using the elasticity approach, his result rejects

Wagner's Law. Nagarajan and Spreares (1990) commented on Mann's findings on theoretical grounds where their studies ignored the statistical time series properties of the variables used.

Murthy (1993) adds some results and finds evidence supporting Wagner's Law, using Mexican data for the period 1950-80. Murthy considered the non-stationary nature of the relevant variables. His evidence is mixed, with some support for Wagner's Law in the latter period and rejection of the same for the earlier period. Thus, the results of research on Wagner's Law are inconclusive and hence the need for this study.

2.3. Keynesian Approach:

One of the most important explanations which lay at the foundations of Wagner's Law is the number of public services that are income elastic. For example, education and cultural activities, Wagner argued, fall into this category, as do health services. Also, the importance of natural monopolies, especially infrastructure services, increase as the economy grows. It follows from the above discussion that public expenditure in Wagner's Law can be treated as a result, or an endogenous factor and not a cause of growth in national income. On the other hand, there is another approach which is associated with Keynes. Here, public expenditure is seen as an exogenous factor which can be used as a policy instrument. The former requires the causality to run from national income to public expenditure whereas in the latter from expenditure to national income.

The Keynesian proposition on public expenditure is supported by developing countries, which strongly base their economic growth on the growth in their public sector. In traditional Keynesian macroeconomics, Keynes (1933) found that many kinds of public expenditures, even of a recurrent nature, can contribute positively to economic growth, through multiplier effects on aggregate demand. Several attempts have been made to model the factors which influence government expenditure behavior. The Keynesian effective demand principle states that as government expenditure increase so does national income (Keynes, 1936).

2.3. Current Studies (Starting from the 1950s):

Efforts have been made to estimate the determinants of government's expenditure during the 1950s. Martin and Lewis (1956) indicated that a nation's expenditure is not driven by its income, but by the nation's conception of the role of the government. Government has grown rapidly in all industrial countries over the past 126 years. However, growth in public spending was not fully symmetrical across countries. The neoclassical growth theory can be traced back to the mid 1950s and is normally attributed to Robert Solow (1956). The simple Solow model (1956) has the economy producing a single output which exhibits constant returns-to-scale in production and diminishing marginal productivity in the two factors of production, homogeneous labor and physical capital. By estimating Solow model and investigating the cause of growth, Temple (1998) found that increasing the capital-labor ratio means increasing the amount of capital per worker, thus increasing productivity and per capita incomes. The rate of investment and the labor force growth rate, both exogenous to the model, are determined by the savings rate and the population growth rate respectively. By increasing the rate of investment beyond the rate of population (and hence labor force) growth, the capital-labor ratio would be increased (i.e., capital-deepening) and growth would occur. In other studies that established a link between government revenue and government spending, Friedman (1982) stated "an increase in taxes would mean that not only we have a large a deficit, but also a higher level of government spending" (p.45).

If the neoclassical model is correct, the data should support a number of testable hypotheses. First, the neoclassical growth model predicts that the growth rates of various countries will ultimately converge. In a free market environment, each country will have access to similar technologies, and mobile factors of production will be drawn to the areas where they are able to earn the highest rate of return. Secondly, countries with high rates of population growth should exhibit slower per capita GDP growth. This is due to the fact that any capital stock would be spread out among larger numbers of people, thus decreasing the capital-labor ratio (i.e., capital shallowing).

By studying a sample of 65 different developing countries over the 1960-1980 period, Landau (1983) found the government "consumption" expenditure to have adversely affected economic growth. Ram (1986b) used the Granger Causality test for 63 countries in 1986. In his argument about the nature of the relationship between government size and economic growth, Ram said "it is difficult not to conclude that government size has a positive effect on economic performance and growth, and the conclusion appears to apply in a vast majority of the settings considered" (p. 193).

Sahni and Singh (1984) analyzed the Granger Causality test of the Canadian case. Also, Graigwell and Rock (1984) stated that a two causality relationship between government expenditure and government revenue has been found in the Barbados case. Grier and Tullock (1989) argue that the actual relationship between public spending and growth is not very much understood and there is a necessity for more empirical studies.

Endogenous-growth models assume constant returns to a broad concept of capital. Barro (1990a) examined an endogenous growth model that suggests a possible relationship between the share of government spending in GDP and growth rate per capita GDP. Barro (1990b) extends these models to include tax-financed government services that affect production. Growth and saving rates decrease with an increase in expenditures. Empirical evidence across countries supports some of the hypotheses about government and growth. The key feature of Barro's model is the presence of constant returns to capital that broadly includes private capital and private services. However, as Barro (1990b) suggested, since the impact of government spending may vary depending on the component of government expenditure, in the next step of the analysis Barro decomposed total government spending into its major components, consumption and investment. In this case too, the analysis found no evidence that changes in government consumption or changes in government investment can contribute to economic growth. Barro (1991) used the data for 98 countries during the period 1960-85 and estimated that the growth rate of real GDP has a positive relationship to initial human capital and negative relationship to the initial (1960) level of real GDP. The possibility of linkage between the size of government and economic growth is a major contribution of endogenous growth models which treat public services as input to production.

In contrast to traditional growth models, as those developed by Solow (1956) and Cass (1965), the attractiveness of endogenous growth models is that they do not depend on exogenous technological changes of labor growth (Romer, 1986; Lucas, 1988; Becker, et al., 1990; and Rebelo, 1991).

Growth is inversely related to the share of government consumption in GDP, but insignificantly related to the share of public investment. Jones (1995) studied the U S economic growth model according to the endogenous growth theory and he found that the permanent changes in certain policy variables have permanent effects on the rate of economic growth. The U.S. growth rates exhibit no large persistent changes.

The recent study developed by Karras (1997) was different from earlier studies in a number of important ways that may help to explain the discrepancies in earlier results. The first difference is that he used a fixed effects estimation model that controls for country- and time- specific effects. Earlier studies have typically used cross-section data and thereby been unable to control for such important factors that influence the growth rate because the cross-section parameter estimates are biased. The second difference is that Karras, (1997) in contrast to many previous studies that include both developed and developing countries, limited his sample to OECD countries. It has been shown that results are sensitive to the countries included, and limitation to the relatively homogenous OECD members helps to reduce some of the potential estimation biases. The third difference is that his measure of government size is more inclusive in the sense that interest payments on pre-existing debt are included. Interest payments on debt are a substantial component of government spending and, thus, may have an impact on economic performance. Finally, using panel data, Karras (1997), examines the data for 118 countries including the subset of 15 European economies, respectively. He finds that in all country groups, government services are productive in the sense that their marginal product is positive and significantly different from zero. Karras (1997) was unable to reject the hypothesis that government services are optimally provided in some world regions, but not in others. Overall, his findings indicate that government services are over provided in Africa, under provided in Asia, and optimally provided everywhere else.

Huang and Tang (1992), in the case of Taiwan, on the basis of data for the period 1951-1987, found that there is a feedback between GNP and Government expenditure, as well as government revenue and GNP, but there is only one-way causality running from government revenue to government expenditure. Even though their finding limited to the relationship between government expenditure and total revenue, it found to be very important in determine the nature of long-run direction for both variables. Lindauer and Valenchik (1992) consider the relationship between government spending and growth is very important for developing countries, which experienced a massive public expenditure over time. Lin (1994) states some essential ways in which government expenditure can cause growth. These ways include prerequisite of public goods and infrastructure, social services and targeted intervention (such as export subsidies). Hsieh and Lai (1994) used data on G-7 countries (1885-1987) and found evidence of causality, but government expenditure had a marginal effect on growth.

In a recent study, Agell, et al. (1999), show that theoretical and empirical evidence does not allow any conclusion on whether there is a relationship between the rate of economic growth and the size of the public sector. Wan (1998) concludes that in the field of Public Finance, the majority of the Granger Causality test has been conducted in two directions. The first one is on the relationship between economic growth and government expenditures. Wagner's Law states that as an economy grows, government expenditures also increase.

In one of the most important and current debates for presenting the evidence for OECD countries, Folster and Henrekson (1999) state that the relationship between government spending and economic growth is negative, while Agell, et al. (1999) presents the same idea describing this relationship as non-significant.

2.4. Saudi Case Studies

Saudi Arabia has the largest proven oil reserves in the world: over 260 billion barrels of oil, or about 25 percent of the world's known reserves. As the world's foremost oil exporter, it also dominates the Organization of Petroleum Exporting Countries (OPEC). The petroleum sector accounts for about 90 percent of export earnings and has been bolstered by higher oil prices in 1999-2000. The Saudi government has undertaken moderate fiscal reforms and cut back government spending in recent years to reduce budget deficits. The Saudi government encourages foreign investment by approving a new law in April 2000. Saudi Arabia's foreign investments have increased by 1% in 2001. From this review of Saudi Arabia's economic condition, empirical evidence on this issue would clarify the nature of the causal relationship between government spending and growth and provide useful recommendations for the Saudi government concerning its size and its role in the economy.

Ghamdi (1983) used the data from 1960 to 1980 to test the relationship between public spending and economic growth, emphasizing the application of the old version of Wagner's Law (five system equation) and analyzing the main variable elasticities. Therefore, reevaluating this relationship with new methods of empirical testing is very important to measure the new phase of Saudi Arabia's economic growth and to find out the impact of government spending on economic growth. Attempts to evaluate this relationship were made by a few case studies of Saudi Arabia in the last four decades (Asfaur, 1965; Wills, 1974; Seifert and Kettani, 1976; and Sayigh, 1978)

Khalifa (1997) studied the relationship between real GDP growth rate and the change in the government expenditure share. In his study of the Saudi Arabian case, Khalifa divided government expenditure into two sectors: investment and consumption from 1960 to 1996. Khalifa said "The empirical analysis found no consistent evidence that changes in the share of government spending have an impact on changes in the real per capita output growth in Saudi Arabia". Khalifa concludes his result by saying "...changes in government spending in Saudi Arabia have no effect on changes in per capita GDP growth and, therefore, shrinking the size of government seems to be the appropriate measure towards reducing the budget deficit..." The recent developments in time series analysis shows that most macroeconomic time series have a unit root (a stochastic trend) and this property is described as difference stationary, so that the first difference of time series is stationary (Nelson and Plosser, 1982).

Another study on the Saudi Arabia case by Kireyev (1998) shows the relationship between changes in growth in the non-oil sector and real government expenditure using the Granger Causality test from 1969- 1997. This result shows us that the growth in the non-oil private GDP was significant and positively correlated with government expenditure where, if government expenditure increases by one percent, it will generate about one-half percent in the GDP private sector. In terms of solving government deficits, Khalifa (1997) considered that shrinking the size of the government can be a potentially important factor for solving the budget deficit and that the causality test was a good method to use in this case.

In this work, I will investigate whether the Saudi Arabian case supports Wagner's Law or not. By testing aggregate Saudi Arabia data for the period 1970-2001, I will look at the time series properties of the data, and then I will test for the existence of unit roots to see whether these variables (Government Expenditure and GDP) are stationary or non-stationary. If they are stationary, then we need to see from which level of differences. To have a more accurate result, we need to find out the order of integration. And, since we have single equation model, we need to apply a co-integration test. There are at least three reasons for investigating the validity of Wagner's Law in the Saudi Arabia case. First, we need to update and analyze the relationship between government expenditure and economic growth since the last study of the Saudi Arabia case was done twenty years ago by Ghamdi (1983). Ghamdi used the data from 1960 to 1980 and the economic condition of Saudi Arabia is quite different now than in Al-Ghamdi's time. The actual government revenues grew at an average annual rate of 1.2 percent in 1998 while actual government expenditure grew at 4 percent, which indicates a new trend in the relationship between government expenditure and GDP size. The main reason for the low growth in government revenues was the adverse developments in international oil prices.

Also, in the 1990s, the growth of government expenditure was driven by the government's commitment to provide basic services for citizens in the face of relatively high population growth. Measures to rationalize government expenditure during this period reduce government desire to increase spending on the public goods. This contained adverse impacts on the budget balance. Second, Saudi Arabia in the last two decades has faced massive spending overall in government sectors. Third, the new functional form of Wagner's Law has six versions, so we need to apply this new form to the Saudi Arabian case to see its consistency with the Saudi economy with its new framework especially, with the establishment of the Supreme Economic Council (SEC) in August 1999 to formulate and better coordinate economic development policies in order to accelerate institutional and industrial reform. As with other empirical studies, it is difficult to draw a unique conclusion regarding the impact of government spending on growth. I hope that this study will become a new contribution in regional economics and growth theory. This study can be a first step in addressing the issue of Saudi Arabia's economic growth in its new framework.

CHAPTER 3

METHODOLOGY

Overview

Most of the studies hypothesized a positive correlation between the share of total government expenditure (TEX) and gross domestic product (GDP) or GDP per capita (GDP/P). While Wagner hypothesized causality from GDP to share of total government expenditure, the macroeconomic framework suggests that government expenditure accelerates the pace of economic growth.

Most of the empirical studies have been conducted on the basis of cross-sectional data sets in spite of the fact that there are large differences in socio-economic and demographic structures of different countries. The statistical methodologies employed by researchers who used time series data were the simple Granger-type causality tests assuming that data on variables were stationary (for example Ram, 1986 and 1987).

It is well known in the recent years that many macroeconomic time series are not stationary and contain unit roots which give rise to many econometric problems. Also, the possibilities of spurious regression relationships among variables exist unless an appropriate statistical test of long-run relationship takes into account important characteristics of the time series data used. The time series on the variables in the model should be tested for their long-run relationship prior to testing for causality between them. The results of these studies which did not take into account these facts are unreliable. Thus the focus of this work besides testing different versions of Wagner's Law is to examine the long-run relationship and its direction between economic growth and government expenditure for the case of Saudi Arabia.

In this chapter, we introduced our methodologies of applying an elasticity analysis for six versions of Wagner's Law. Then we introduced the time series properties of the variables, namely, the integration level of the variables. Next, we presented an introduction of using co-integration analysis for our model. Following this, we introduced the general steps of running a causality test.

3.1. Applying Wagner's Law

In this work we will investigate statistically the existence of a long-run relationship between public expenditure and GDP (Wagner's Law) using data for Saudi Arabia over the period 1970-2001. Recent advances in time series analysis have permitted the investigation of the long-run relationship between public expenditure and GDP in terms of co-integration analysis.

However, to support Wagner's Law would require unidirectional causality from GDP to public expenditure. Therefore co-integration should be seen as a necessary condition for Wagner's Law, but not sufficient. Hence, conditional on co-integration results, it is necessary to look at the causality properties of the model(s). Using the Engle and Granger co-integration test, the Granger Causality test and the Saudi time series aggregate data for the period 1970-2001, we will try to find empirical support for Wagner's Law

As stated earlier, over a hundred years ago, a simple model for the determination of public expenditures was offered by Adolph Wagner, a leading German economist of the time. On the basis of his empirical findings, he "formulated a `Law' of expanding state expenditures; which pointed to the growing importance of government activity and expenditure as an inevitable feature of `progressive state'" (Bird, 1971: 1). He was the first scholar to recognize the existence of a positive correlation between the level of economic development and the size of the public sector.

After the publication of English translations of Wagner's works in 1958, Wagner's Law has become very popular in academic areas and it has been analyzed and tested by many researchers, for example, Musgrave (1969), Bird (1971), Krzyzaniak (1974), Mann (1980), Sahni and Singh (1984), Abizadeh and Gray (1985), Ram (1986a, 1987), Henrekson (1992), Courakis et al. (1993), Murthy (1993), Oxley (1994), Ansari et al. (1997) and Chletsos and Kollias (1997). Some of these researchers have applied traditional regression analysis, even as some others have used causality testing. More recently co-integration analysis has also appeared in the literature.

Empirical tests of Wagner's Law have results that differ considerably from country to country and period to period. Wagner's Law argues that public expenditure increases at a faster rate than that of national output. On the other word, income elasticities grater than one. There are at least six versions of this Law (Table 2.1) which have been empirically investigated in the last for decades using simple regression to estimate elasticities of government expenditures with respect to GDP.

Table 2.1

The Six Versions of Wagner's Law

#	Function Form	Version
1	Log E* = a + b Log GDP	Peacock-Wiseman [1967]
2	Log C = a +b Log GDP	Pryor [1969]
3	Log E = a + b Log (GDP/P)	Goffman [1968]
4	Log (E/GDP) = a +b Log (GDP/P)	Musgrave [1969]
5	Log (E/P) = a + b Log (GDP/P)	Gupta [1967]
6	Log (E/GDP) = a + b Log GDP	"Modified" version of P-W suggested by Mann [1980]

* "E" is denoted for Total Government Expenditure, "C" for Total Government Expenditure for Consumption and "P" for population.

3.2. Co-integration Techniques

Co-integration is one of the most current techniques that is used to estimate economic relationship among time series variables and to test hypotheses about these relationships according to economic theory.

3.2.1. The Concept of Co-integration

The concept of co-integration, introduced into economic literature for the first time by Granger (1981), is related to the problem of the determination of long-run or 'equilibrium' relationships in economics. Statistically, since co-integration is a long-term relationship it means that the variables move together over time so that short-term disturbances from the long-term trend will be corrected (Manning and Andrianacos, 1993). In other words, co-integration is the statistical implication of the existence of a long-run relationship between economic variables (Thomas, 1993). The basic idea behind co-integration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant. Actually, many early researchers who looked at Wagner's Law ignored the stationarity requirement of the variables. However, the standard regression techniques are invalid when applied to non-stationary variables.

In other words, "...static regressions among integrated series are meaningful if and only if they involve co-integrated variables" (Banerjee, et al. 1993). This practice led to substantial literature dealing with the spurious regression problem. In conclusion, aim of testing for co-integration is to determine whether stochastic trends in the series are indeed related to each other.

3.2.2. Stationarity and Unit Root Tests

The investigation of stationarity (or nonstationarity) in a time series is closely related to the tests for unit roots. Existence of unit roots in a series denotes non-stationarity. A number of alternative tests are available for testing whether a series is stationary or not. In order to establish the order of integration of the variables in our data set, we employed ADF[2] tests. To avoid the potential problem of estimating spurious relationships, it is necessary to test the time series properties (of the variables under investigation) for unit roots. If a variable is stationary, i.e., it does not have unit roots, it is said to be I(0) (i.e., integrated of order zero). If a variable is not stationary in its level form but stationary in its first-differenced form, it is said to be integrated of order one, or I(1). More generally, the series Xt will be integrated of order d, that is,

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[2] The Augmented Dickey-Fuller (ADF) tests for unit roots examine whether we can statistically reject the null-hypothesis that a variable has a unit root.

Xt~I(d), if it is stationary after differencing d times, so Xt contains d unit roots. A popular unit roots test is the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981).

The Null hypothesis for unit roots is H (0): $\alpha = 0$. We applied this test to each of the variables and determine the stationary property in their levels as well as in their first differences. The ADF test for unit roots (Dickey and Fuller, 1979; 1981) is used to determine whether an individual series, say *Yt,* is stationary or not. This test is based on OLS regression equations (3.1) and (3.2) presented below. The general form of the ADF test can be written as follows:

$$\Delta y_t = \alpha y_{t-1} + \sum \beta_i \Delta y_{t-i} + \delta + \gamma_t + \epsilon_t \quad \text{(for levels)} \quad (3.1)$$

$$\Delta\Delta y_t = \alpha \Delta y_{t-1} + \sum \beta_i \Delta\Delta y_{t-i} + \delta + \gamma_t + \epsilon_t \quad \text{(for first differences)} \quad (3.2)$$

Where Δy are the first differences of the series, m is the number of lags (where, $i = 1, 2, 3, \ldots m$) and t is time. "The practical rule for establishing the value of [*m*] ... is that it should be relatively small in order to save degrees of freedom, but large enough not to allow for the existence of autocorrelation in ϵ_t. For example, if for [*m*]=2 the Durbin-Watson autocorrelation statistic is low, indicating first order autocorrelation, it would be sensible to increase m with the hope that such autocorrelation will disappear"(Charemza and Deadman, 1992, p. 135). If the time-series variables are found to be non-stationary and integrated of the same order, tests can be performed to see if the variables are co-integrated. An identified co-integrating relationship among variables implies there exists a long-term equilibrating relationship (at least in a statistical sense) among those variables. Generally, a set of variables are I(d), is stationary. Intuitively, if Xt~I(d) and Yt~I(d), a regression is run, such as:

$$Yt = \beta * Xt + \epsilon_t \qquad (3.3)$$

If the residuals (ϵ_t) from the regression are I(0), then Xt and Yt are said to be co-integrated. Clearly, the series need to be integrated of the same order for co-integration to be possible. Note, if ϵ_t are stationary, differences among the variables tend to die out, and therefore the variables are thought to exist in a long-run equilibrating balance. The constant and trend values can be included in equation (3.3) as needed. Johansen and Juselius (1990) Co-integration test was performed, assuming a co-integration relationship as specified by equation (3.4).

$$Ln(GDP_t) + \alpha Ln(TEX_t) + C = \epsilon_t \qquad (3.4)$$

In summary, the ADF test proceeds as follows: equations such as (3.1) and (3.2) are estimated, adding as many terms of differenced variables as are necessary to achieve residuals that are non-autocorrelated. Although we will include trend in levels, but we will excluded it in the first differences.

Applications of co-integration analysis have been widespread in the literature following Engle and Granger's ground-breaking work in this area.

3.3. Causality Tests:

3.3.1. Granger Causality

In this study, the long-run relationship between real government expenditure and real gross domestic product will be tested using aggregate time series of Saudi

Arabia data for the period 1970-2001. Then, we will include a dummy variable to capture the effects of Gulf War I, which occurred in 1991. Next, we will employ the Johansen Maximum Likelihood estimation to confirm the uniqueness of the co-integration vector among the variables under study. Finally, we will use formal Granger Causality testing procedure to determine the direction of causality. Using annual data for Saudi Arabia over the period 1970-2001, we will investigate the evidence of Wagner's Law using appropriate estimation methods.

Assuming that the two series contain all the information necessary for prediction

X Granger-causes Y if lagged X's help predict Y (when Y is regressed on its own past values/lags).

In our case we will test the causality between GDP and TEX.

Where,

GDP = Gross Domestic Product,

TEX = Total Expenditure.

$$GDP_t = \sum_{i=1}^{p} \alpha_i TEX_{t-i} + \sum_{j=1}^{p} \beta_j GDP_{t-j} + u_{1t} \tag{3.5}$$

$$TEX_t = \sum_{i=1}^{m} \lambda_i TEX_{t-i} + \sum_{j=1}^{m} \delta_j GDP_{t-j} + u_{2t} \tag{3.6}$$

Assuming u_{1t} and u_{2t} are uncorrelated.

To simplify this approach, there are 4 possible cases:

1) TEX → GDP : $\sum \alpha_i \neq 0 \quad and \quad \sum \delta_j = 0$ (unidirectional causality)

2) GDP → TEX: $\sum \alpha_i = 0$ *and* $\sum \delta_j \neq 0$ (unidirectional causality)

3) Feedback/bilateral causality: all sets of coefficients are significant

4) Independence from each other (No causality)

Note: for unidirectional causality from GDP to TEX, one should have case 2 holding while case 1 not holding.

According to Ansari, Gordon and Akuamoah (1997), he stated that it is not necessary either Wagner's hypothesis, with causal ordering from national income to expenditure, or Keynes's hypothesis, with causal ordering from expenditure to national income hold true. Ansari et al., said" Sorting out the causal relationship between government expenditure and national income is essential if the effectiveness of public expenditure as a policy instrument for economic development is to be assessed" (Ansari et al., 1997, pp 544)

Based on our methodology presentation in Chapter 3, Chapter 4 presented the empirical findings of applying Wagner's Law, using a co-integration test and running a causality test according to the following. In the first section, we utilized Wagner's Law to empirically analyze public expenditure growth in Saudi Arabia. The empirical result of applying Wagner's Law included the analysis of six versions separately, theoretically, as well as empirically, for the case of Saudi Arabia using data for the period 1970 to 2001. Also in this section we discussed the question of whether or not the aggregate data for Saudi Arabia is consistent with Wagner's Law. Second section, we analyzed the empirical results of using a co-integration test and whether it can be applied to determine the existence of a long-run relationship between the variables or not. The analysis was based on Engle and Granger (1987) methods for modeling the relationship between co-integrated variables. The empirical analysis of co-integration test included ADF unit root tests in order to determine which one of these variables used in the six versions of Wagner's Law is I(1). Finally, the direction of causality between GDP and public expenditure of Saudi Arabia case was analyzed and discussed in section three of Chapter 4 by using causality testing techniques in the Granger (1969) sense.

In Chapter 5, first section focused on the long-run relationship between government functional expenditure and GDP in five categories according to Wagner's Law logic. Second section tested for co-integration between the above two variables in these five categories separately. In last section, we used Granger Causality test to determine the direction of the long-run relationship between government functional expenditure and GDP in these five categories.

In Chapter 6 the study ended with the conclusion, where summary of the findings is presented. Based upon the empirical results and the descriptive analysis of the GDP size and the government expenditure behavior in Saudi Arabia, this study proposes a framework that may identify the best economic policy to cope with massive public spending.

CHAPTER 4

EMPIRICAL ANALYSIS FOR THE SIX VERSIONS OF WAGNER'S LAW: CASE OF SAUDI ARABIA

4.1. Overview

Based on our methodology presentation in previous chapter, here we presented the empirical findings of applying Wagner's Law, using a co-integration test and running a causality test. In the first section, we tried to utilize Wagner's Law to empirically analyze public expenditure growth in Saudi Arabia. The empirical result of applying Wagner's Law included the analysis of six versions separately, theoretically, as well as empirically, for the case of Saudi Arabia using data for the period 1970 to 2001. Also in this section we discussed the question of whether or not the aggregate data for Saudi Arabia is consistent with Wagner's Law. In the second section, we analyzed the empirical results of using a co-integration test and whether it can be applied to determine the existence of a long-run relationship between the variables or not. The analysis was done according to Engle and Granger (1987) methods for modeling the relationship between co-integrated variables. The empirical analysis of co-integration test included DF/ADF unit root tests in order to determine which one of these variables used in all the six versions of Wagner's Law is I(1). Finally, the direction of causality between GDP and public expenditure of Saudi Arabia case is analyzed and discussed in section three of this chapter by using causality testing techniques in the Granger (1969).

4.1.1 The Empirical Analysis

Size of government expenditure has been as issue of debate for decades. More than one hundred years ago Adolph Wagner proposed a positive correlation (known as Wagner's Law) between level of economic development and growth of public sector (Wagner, 1893).

Since then economists have tried to find support for the proposed relationship on empirical grounds using both cross sectional and time series data. This study will be an attempt to use different techniques to prove this relationship in Saudi Arabian economy case and its direction. There are differences about the direction of Wagner's relationship where most of the studies hypothesized a positive correlation between the share of government expenditure (TEX) of gross domestic products (GDP) or GDP per capita. While Wagner hypothesized that causality flows from GDP to share of government expenditure, the macroeconomic framework especially the Keynesian school of thought, on the other hand, suggested that government expenditure accelerates economic growth. Furthermore, some government expenditure is necessary to boost up the GDP at least in the initial stages of development and thus government expenditure is regarded as exogenous that change the aggregate output. While Landau (1983) and Barro (1991) found decline in economic growth for developed and less developed countries from the growth of public sectors, Ram (1986b, 1987) and Singh and Sahni (1984) did not.

The statistical methodologies employed by researchers who used time series data were simple Granger-type causality tests assuming that data on variable are stationary (for example Ram, 1986b, 1986c, and 1987). But it is now well known that many macroeconomic time series are not stationary and contain unit roots which give rise to many econometric problems. The possibilities of spurious regression relationships among variables exist unless an appropriate statistical test of long run relationship takes into account important characteristics of the time series data used. The time series on the variables in the model should be tested for their long run relationship prior to testing for causality between them. The results of studies which did not take into account these above facts are unreliable. Thus the purpose of this study is to examine the long relationship and its direction between economic growth and government expenditure for Saudi Arabia case using appropriate statistical procedures. The variables used are defined as: LTEX= log of total government expenditure; LGDP = log of gross domestic products; LTEXC = log of government expenditure for consumption; $L\left(\frac{GDP}{P}\right)$ = log of gross domestic products per capita; $L\left(\frac{TEX}{P}\right)$ = log of total government expenditure per capita; $L\left(\frac{TEX}{GDP}\right)$ = log of the ratio of total government expenditure to gross domestic products.

4.1.2 Why Logarithm Form?

An equation that specifies a linear relationship among the variables gives an approximate description of some economic behavior. An alternative approach is to consider a linear relationship among log-transformed variables. This is a log-log model where the dependent variables as well as all explanatory variables are transformed to logarithms. Since the relationship among the log variables is linear some researchers call this a log-linear model.

Different functional forms give parameter estimates that have different economic interpretation. The parameters of the linear model have an interpretation as marginal effects. In contrast the parameters of the log-log model have an interpretation as elasticities. So the log-log model assumes a constant elasticity over all values of the data set. The log transformation is only applicable when all the observations in the data set are positive. Gujarati [1995, p.387] notes that this can be guaranteed by using a transformation like, log (TEX) where TEX is a positive scalar chosen to ensure positive values.

Slope: $$\frac{dTEX}{dGDP} = \beta \cdot \left[\frac{TEX}{GDP}\right]$$

Elasticity: $$E = \frac{\left[\frac{dTEX}{dGDP}\right]}{\left[\frac{TEX}{GDP}\right]} = \beta$$

For more simplification,

Elasticity: $$E = \left[\frac{dTEX}{dGDP}\right] \cdot \left[\frac{GDP}{TEX}\right] = \beta$$

$$\text{Log (TEX)} = \alpha + \beta \text{ Log (GDP)}$$

A one percent increase in *TEX* results in a change in *GDP* of approximately β percent. This is sometimes called the "power" function. It is also called the log-linear function, because it is linear in the logarithms, and the constant elasticity function, because the elasticity is equal to β everywhere. All observations of the *TEX* and *GDP* variables must be positive since the log is undefined for zero and negative numbers.

In this chapter, the empirical results analysis, the economic model and evaluation methods will be presented and discussed in the following sections. In section one, the six versions of Wagner's Law that exist were tested in the Saudi Arabia case. Following that, the examination and evaluation of co-integration techniques are presented in this section for supporting our results from testing Wagner's Law versions. In the last section, Granger Causality Test was used to examine and discuss in supporting the results for testing Wagner's Law Versions.

4.2. Examining the Existing Six Versions of Wagner's Law.

Wagner stated his idea as established fact for determining relationship between government expenditure and GDP. As a consequence, different interpretations appeared that led to six formulations of his hypothesis (Mann 1980). The functional form TEX = f (GDP) could be called the Peacock and Wisman (1967) or (traditional) version because they represented government expenditure against income and tested visually that relationship through time. Version TEXC = f(GDP) is considered by Pryor (1969) by adding government expenditure for consumption idea. Formulation TEX = f(GDP/P) represents Goffman's (1968) interpretation. Version TEX/GDP = f(GDP/P) was favored by Musgrave (1969) and many other empirical researches. Version TEX/P = f(GDP/P) is linked with Gupta (1967) and TEX/GDP = f(GDP) is referred to as the "modified" Peacock-Wisman share version by Mann (1980). This section will present results of various elasticities of government expenditures according to Wagner's suggestions. First, the standard methods that enables the estimation of elasticity will be employed. This is followed by the presentation of results based on econometric estimates.

4.2.1 Econometric estimates of Government Expenditure elasticity: results based on OLS.

The regression will be fitted using annual data. Hence each regression consists of 32 observations. The OLS method is employed to estimate the coefficients. In other words, we are estimating coefficients

The relevant formulas are:

$$\text{Log (TEX)} = \alpha + \beta \text{ Log (GDP)} \qquad (4.1) \qquad \text{[Log-Log Model]}$$

$$E = \frac{\left[\frac{dTEX}{dGDP}\right]}{\left[\frac{TEX}{GDP}\right]} = \beta \qquad (4.2a) \quad \text{[Elasticity]}$$

For simplification, E can be written as:

$$\left[\frac{dTEX}{dGDP}\right] \cdot \left[\frac{GDP}{TEX}\right] = \beta \qquad (4.2b) \quad \text{[Elasticity]}$$

Where,

TEX stands for Government Expenditure while GDP denotes Gross Domestic Products for the economy as a whole.

In the upper part of equation (4.2a), $[\frac{d\,TEX}{d\,GDP}]$, numerator can be interpreted as the percent change of government expenditures, while the denominator refers to the percent change of gross domestic products, that is, the growth rate of GDP.

The elasticity (*E*) is thus interpreted as the percent change of government expenditure for every one percent change of GDP.

This regression just measures how the dependent variable (TEX) changes when the independent variable (GDP) changes. Statisticians refer to this as the correlation between two variables. An important fact to always remember is that correlation does not imply causation. Just because two variables move together, does not mean that one causes the other. We need a model or theory that explains how one variable causes another. In this study, the relationship between government expenditure and GDP will be our target according to macroeconomic theory. The results of regression analysis can support this theory, but they can never prove it. Since the best fit model in this study is log-log model, where the log-log function is quick and easy (and generated the elasticity without additional work), it assumes the elasticity is constant across all data points. This can be quite restrictive and therefore we did assess the impacts of this assumption on the elasticity.

β coefficient represents elasticity in log-log model and the Adjusted R-Squared gives us the overall fit of the model.

$$\bar{R}^2 = 1 - \frac{\text{SSR}/(n-k-1)}{\text{SST}/(n-1)}$$

Where the addition of an explanatory variable will cause $\bar{R}^2$ to increase if and only if the variable's *t*-statistic is greater than one and to guarantee more improvement in our model, we used log-log model.

This model can be turned into a normal regression model by taking logs of both sides of the equation:

$$Y = \alpha + \beta X + \epsilon$$

To be:

$$\log Y = \hat{\alpha} + \hat{\beta} \log X + \epsilon \qquad (4.3)$$

Note that to run this regression we need to first transform our data. Although our regression is run on the transformed data, the coefficients that we get are obviously the coefficients that apply to the original model.

This form of model is also often referred to as the log-log model. What makes this model particularly attractive is that it is easy to show elasticity directly from regression outcomes. In the case of equation (4.3), the elasticity will be $\epsilon = \beta$

Because the elasticity turns out to be a constant, it is often referred to also as the constant elasticity model. We obviously estimate this elasticity by using our regression estimate.

4.2.2.1 Peacock-Wisman Version (Traditional Version)

Reacock and Wiseman (1967) tested the traditional version of Wagner's Law which stated that

$E = f(GDP)$ under two conditions: $f' > 0$ and $f'' \geq 0$.

Where,

E represents the level of Government Expenditure in real terms and GDP represents the Gross Domestic Products in real terms (economic activities measurements in Wagner's Traditional Form). For simplicity, we did choose logarithm form as following:

$$\text{Log TEX} = \alpha + \beta \text{ Log GDP} + \epsilon$$

Where,

α & β are parameters and ϵ is the disturbance term.

β is elasticity (E) of expenditure with respect to GDP.

Where,

$$\text{E} = \left(\frac{d\,TEX}{d\,GDP}\right) \cdot \left(\frac{GDP}{TEX}\right) > 0 \qquad (4.3)$$

Using EView software, we managed to obtain what we hope to be the best log-log estimates of the equation coefficients and by using Ordinary Least-Squared (OLS) equation, we obtained such elasticity directly. The following is a brief presentation of the results and interpretations of the coefficients and other empirical results.

The elasticity form of government expenditure in Peacock-Wisman version is stated as.

$$\text{E}_{\text{(Peacock-Wisman)}} = \frac{\left[\dfrac{\text{d}(TEX)}{\text{d}(GDP)}\right]}{\left[\dfrac{TEX}{GDP}\right]}$$

For simplification, E can be written as:

$$\left[\frac{\text{d}(TEX)}{\text{d}(GDP)}\right] \cdot \left[\frac{GDP}{TEX}\right]$$

The log-log form of this version is represented by the following equation (4.3.1)

$$\text{Log TEX} = \alpha + \beta \text{ Log GDP} + \epsilon \qquad (4.3.1)$$

$$\text{Log TEX} = \underset{(-5.335451)}{-6.570659} + \underset{(25.62982)}{1.193003} \text{ Log GDP} \qquad (4.3.2)$$

N = 32

$R^2 = 0.96$

Adjusted $R^2 = 0.95$

DW statistic = 1.07

F-Statistic = 656.89

Std. error = 0.045

The numbers between parentheses are t-statistics for each estimated parameter and intercept. The value of R^2 reflects the regression equation's ability to determine the dependent variable's performance. The adjusted R^2 is basically for the degrees of freedom. The Durbin-Watson statistic indicates the presence or absence of serial correlation among the residuals. In general, the closer the DW statistic is to 2, the better is the result, as it indicates absence of serial correlation among the error terms.

The t-statistic measures the significance of each estimated coefficient of the independent variables at a given confidence level. The closer or greater the t-statistic is to 2, the more likely it is that the corresponding explanatory variable is significant.

Finally, the F-statistic tests for the "goodness of fit." The hypothesis that the coefficient in the equation is not significantly different from zero is tested against the alternative hypothesis that the coefficient is significantly different from zero, at a given confidence level. Moreover, using log linear transformation yielded better regression estimates.

Differentiating equation (4.3.2) with respect to GDP in order to obtain the growth rate (Elasticity), we will get elasticity (coefficient) value directly as: E = 1.193003 > 0. This value means an increase of 1% unit in GDP generates a 1.193% unit increase Government Expenditure (TEX). The independent variable (GDP) explains 96% of the variations in TEX, leaving only 4% to be explained by the stochastic disturbance term ϵ. Equation (4.3.2) indicates that the elasticity of government expenditure with respect to GDP equal 1.19. The gross domestic product, which determines the level of the capacity of the economy, is elastic in the expenditure equation where a 1% increase in GDP increases government expenditure level by 1.19%. This finding is consistent with Wagner's Law of increasing state activities which states the income elasticity of demand for public goods is greater than unity. Since we have the above results that indicate, the expenditure elasticity with respect to GDP (β) is greater than unit (1.19); therefore, Wagner's Law, according to the traditional version (Peacock and Wiseman, 1967), is confirmed in the sense that economic growth has caused government expenditure to increase at a faster rate than that of national income. This result is significant because of the very low standard error (0.047) and the high t-test (25.63), indicating that we would expect the majority of the observations might not to vary from either side of fitted line (See Figure 4.1).

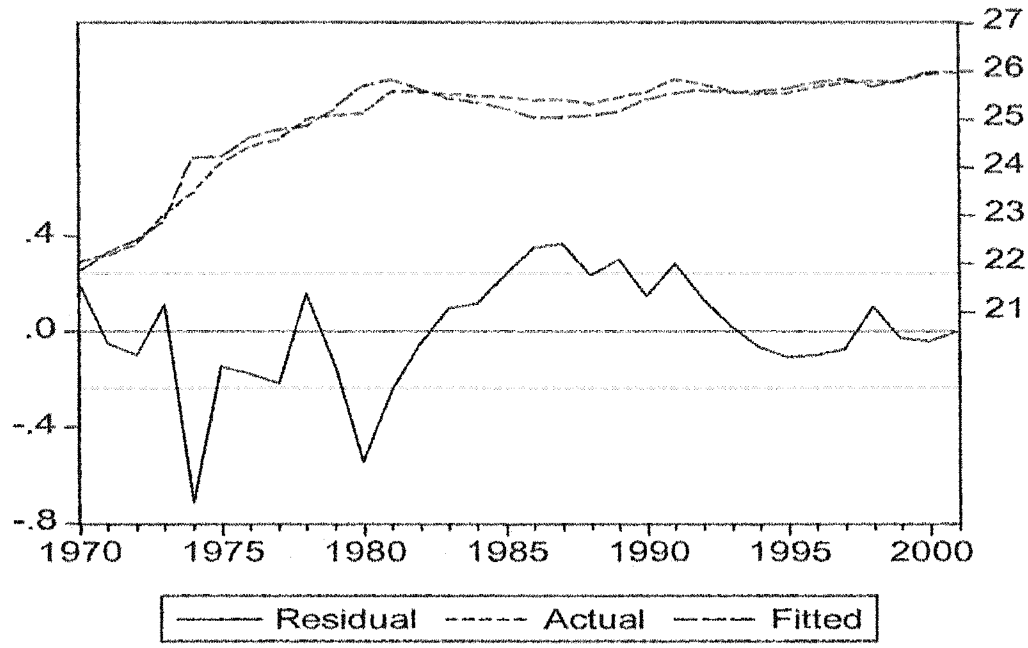

Figure 4.1 Observations position between actual and fitted lines.

Finally, $\bar{R}^2$, equals 95 % indicating that changes in the government expenditures are 95 % explained by the changes in GDP.

4.2.2.2. Pryor Version

Pryor (1969) presented a new interpretation of Wagner's Law using government expenditure for consumption as dependent variable. Pryor argues, "Wagner …asserted that in growing economies the share of government for consumption in the GDP increases." Pryor states that government expenditures are classified into two categories: government expenditure for internal and external security and government expenditure for "culture and welfare" that include expenditures for education, health, transportation, banking, etc. In this version government expenditure elasticity will be in the following format:

$$E_{(Pryor)} = \frac{\left[\frac{d(TEXC)}{d(GDP)}\right]}{\left[\frac{TEXC}{GDP}\right]}$$

For simplification,

$$E_{(Pryor)} = \left[\frac{dTEXC}{dGDP}\right] \cdot \left[\frac{GDP}{TEXC}\right]$$

The log-log formulation of this version would presented as following

$$\text{Log TEXC} = \alpha + \beta \text{ Log GDP} + \epsilon \qquad (4.4.1)$$

$$\underset{(-15.77415)}{\text{Log TEXC} = -20.53570} + \underset{(24.25231)}{1.193368} \text{ Log GDP} \qquad (4.4.2)$$

N = 32

$R^2 = 0.95$

Adjusted $R^2 = 0.95$

DW statistic = 0.87

F-Statistic =588.17

Std. error = 0.049

The differentiation of equation (4.4.2) with respect to GDP gives us the growth rate (Elasticity) directly as: E =1.230126 > 0.

This value means an increase of 1 unit in GDP generates a 1.19 unit increase in Government Expenditure for consumption (TEXC). The independent variable (GDP) explains 95 % of the variations in TEX, leaving only 5% to be explained by the stochastic disturbance term ϵ.

The TEXC is elastic with respect to change in gross domestic products (GDP) where for example a 1% increase in GDP leads the government to increase its expenditure level by 1.19%.

Based on Pryor version, it is estimated that during war times and massive military activities, expenditures for external security will increase not as a result of aggression, but to prevent an attack (Ghamdi, 1983). For example, Gulf War I in 1991 caused spending on external security to increase that led to increase total expenditure by 13 %. As for government expenditures for internal security, they will increase to maintain law and order.

Pryor (1969) is more concerned with increase in expenditures for "culture and welfare". He argued that these expenditure are the major components of overall government expenditures, therefore, they may be expected to increase during development, because the public sector can provide for such needs efficiently and effectively compared to private sector. Furthermore, development increases people's demand for more and more from the public sector.

By testing this version for the case of Saudi Arabia, the results obtained for this period were consistent with Pryor's finding.

4.2.2.3. Goffman Version

Goffman (1968) in his explanation of Wagner's Law argued that when nation experiences economic development and growth, an increase must occur in the activity of public sector. This when changed into rate of growth in GDP per capita, would cause the increased expenditure terms. The elasticity format in Goffman version can be written as following:

$$E_{(\text{Goffman})} => \frac{\left[\dfrac{d(TEX)}{d\left(\dfrac{GDP}{P}\right)}\right]}{\left[\dfrac{TEX}{\dfrac{GDP}{P}}\right]}$$

The simple regression of this version can be run based on equation (4.5.1) as following

$$\text{Log TEX} = \alpha + \beta \text{ Log GDP/P} + \epsilon \qquad (4.5.1)$$

$$\text{Log TEX} = 10.24574 + 1.449982 \text{ Log GDP/P} \qquad (4.5.2)$$
(6.208702) (8.943431)

N = 32

$R^2 = 0.73$

Adjusted $R^2 = 0.72$

DW statistic = 0.24

F-Statistic = 79.98

Std, error =0.162

Differentiating equation (4.5.2) with respect to GDP per capita in order to obtain the growth rate (Elasticity), we get elasticity directly as: E= 1.449982 > 0. Elasticity in Goffman version explains that an increase of 1% unit in GDP per capita generates 1.45% unit increase in Government Expenditure (TEX). The independent variable (GDP/P) explains 73% of the variations in TEX, leaving 27% to be explained by the stochastic disturbance term ϵ which means GDP per Capita almost explained two-third of the changes in the government expenditure changes. This implies that there may be other factors that cannot be explained by this simple regression.

In this model, elasticity shows us that the gross domestic product per capita, which determines the level of the economic well-being for individuals, is elastic in the expenditure equation. Since elasticity is greater than unity, applying Goffman suggestion of Wagner's Law on the Saudi case was consistent.

4.2.2.4. Musgrave's Version

Musgrave (1969) tested for presence of Wagner's Law by looking at the ratio of government expenditure relative to GDP per capita. In this form of test, his finding indicated that this elasticity was greater than zero was interpreted as yielding support for Wagner's Law. Elasticity of government expenditure in Musgrave version will be:

$$E_{(Musgrave)} = \left[\frac{d\left(\frac{TEX}{GDP}\right)}{d\left(\frac{GDP}{P}\right)} \right] \cdot \left[\frac{\left[\frac{GDP}{P}\right]}{\left[\frac{TEX}{GDP}\right]} \right]$$

$$\text{Log TEX/GDP} = \alpha + \beta \text{ Log GDP/P} + \epsilon \qquad (4.6.1)$$

$$\underset{(-4.455264)}{\text{Log TEX/GDP} = -3.354147} + \underset{(2.511316)}{0.185749} \text{ Log GDP/P} \qquad (4.6.1)$$

N = 32

R^2 = 17 %

Adjusted R^2 = 15 %

DW statistic = 0.81

F-Statistic = 6.07

Std. error = 0.073

Differentiating equation (4.6.2) with respect to GDP per capita in order to obtain the growth rate (Elasticity), we get elasticity directly as $E = 0.185749 > 0$.

This value means an increase of 1% unit in GDP per capita generates only a 0.18% unit increase in the ratio of government expenditure. The independent variable (GDP/P) explains only 17% of the variations in TEX/GDP, leaving 83% to be explained by the stochastic disturbance term ϵ which means that there exist other factors which explain the variations in the ratio of government expenditure. In the other words, there is only 17% of the time that growth in GDP is responsible for growth in government expenditure which may give us an indication that this version emphasize the effects of government expenditure on non-economic factors (Ghamdi 1983).

In this model, gross domestic products per capita, which determined the level of the economic well-being for individuals is inelastic in the expenditure equation where a 1% increase in GDP per capita increases the ratio of government expenditure to GDP per Capita level by 0.18%.

In summary, Musgrave version does not support Wagner's Law in Saudi Arabia case since we have insignificant result. The elasticity (*E*) interpreted as the percent change of the ratio of government expenditure to GDP for every one percent change of GDP per capita is found to be inelastic.

4.2.2.5. Gupta Version

Gupta (1967) substituted original version with per capita variable to Wagner's Law (traditional version). His emphasis was to determine whether elasticity of government expenditure per capita with respect to GDP per capita is greater than unity (E > 1) or not. According to Gupta version, the elasticity format will be as following:

$$E_{(Gupta)} = \frac{\left\{\left[\dfrac{d\left(\dfrac{TEX}{P}\right)}{d\left(\dfrac{GDP}{P}\right)}\right]\right\}}{\left\{\dfrac{\left[\dfrac{TEX}{P}\right]}{\left[\dfrac{GDP}{P}\right]}\right\}}$$

For simplification, E can be written as:

$$E_{(Gupta)} = \left\{\left[\dfrac{d\left(\dfrac{TEX}{P}\right)}{d\left(\dfrac{GDP}{P}\right)}\right]\right\} \cdot \left\{\dfrac{\left[\dfrac{GDP}{P}\right]}{\left[\dfrac{TEX}{P}\right]}\right\}$$

$$\text{Log TEX/P} = \alpha + \beta \text{ Log GDP/P} + \epsilon \qquad (4.7.1)$$

$$\underset{(-4.455264)}{\text{Log TEX/P} = -3.354147} + \underset{(16.03128)}{1.85749} \text{ Log GDP/P} \qquad (4.7.2)$$

N = 32

$R^2 = 0.90$

Adjusted $R^2 = 0.89$

DW statistic = 0.81

F-Statistic = 257.0

Std. error = 0.073

Differentiate equation (4.7.2) with respect to GDP per capita in order to obtain the growth rate (Elasticity), we will get elasticity directly as $E = 1.85749 > 1$.

Elasticity result indicates that an increase of 1% unit in GDP per capita generates 1.86 % unit increase in government expenditure per capita (TEX/P). The independent variable (GDP/P) explains 90% of the variations in TEX, leaving 10% to be explained by the stochastic disturbance term ϵ. This means 90% of the time the growth of GDP per capita is responsible for the growth of government expenditure per capita. Elasticity of government expenditure per capita with respect to GDP per capita is greater than unity or (elastic) in the expenditure equation (4.7.2). Therefore, Gupta version supports Wagner's Law in the case of Saudi Arabia where $E > 1$.

4.2.2.6. Mann's Version

Mann (1980) in his study of Mexican case relates the shares of government expenditure in GDP to their GDP/P as the share specification is thought to be more closely approximate the turn framework of Wagner's hypothesis. "This probably is the formulation used most frequently in empirical work" (Ram, 1987). Mann made use of six different formulations of the Law, four of which are non-share specifications. This model was under consideration in double loge or specification in the general log-log form:

$$\text{Log TEX/GDP} = \alpha + \beta \text{ Log GDP} + \epsilon \qquad (4.8.1)$$

Mann's formulation (model) represents the proxy for economic development because using real variables is more logical than using nominal. In this study we did partially replicate Mann (1980) but we did not use his percentage urban population variable used. In his study, Mann finds out that the non-share versions of Wagner's Law (Peacock and Wiseman, 1967; Pryor, 1969; Goffman, 1968; and Gupta, 1967) were significant for Mexico during the period of the study. Only the share versions yielded results more contradictory results. However, Mann considers the share versions to be more logical when trying to examine the course and pattern of government expenditures during development.

Government expenditure elasticity based on Mann suggestion is:

$$E_{(\text{Mann})} = \frac{\left\{ \dfrac{d\left(\dfrac{TEX}{P}\right)}{d(GDP)} \right\}}{\left\{ \dfrac{\left[\dfrac{TEX}{P}\right]}{[GDP]} \right\}}$$

Log TEX/GDP = $\alpha + \beta$ Log GDP + ϵ (4.8.1)'

Log TEX/GDP = -6.570659 + 0.193003 Log GDP (4.8.2)
(-5.335451) (4.146364)

N = 32

$R^2 = 0.36$

Adjusted $R^2 = 0.34$

DW statistic = 1.07

F-Statistic = 17.19

Std. error = 0.046

Differentiating equation (4.8.2) with respect to GDP, we get elasticity directly as E = 0.193003 > 0.

This value means an increase of 1% unit in GDP generates only a 0.19% unit increase in the ratio of government expenditure to GDP (TEX/GDP). The independent variable (GDP) explains only 36% of the variations in TEX/GDP, leaving 64% to be explained by the stochastic disturbance term ϵ that indicates almost two-third of the time the growth of GDP per capita is not responsible for the growth of government expenditure. This also means there are other factors which can be used to explain the causes of the growth of government expenditure. In addition, gross domestic products per capita, which determines the level of the economic well-being for individuals, is inelastic in the expenditure equation where a 1% increase in GDP increases government expenditure per capita level by 0.19%.

Nagarajan and Spreares (1990) in their comments on Mann's study indicated the straight income elasticity in order to validate the hypothesis would need to be ($E > 1$) and the ratio income elasticity need only be ($E > 0$). And they concluded that because the ratio income elasticities are greater than zero, Wagner's Law in the case of Mexico is validated.

Almost all versions use either absolute government expenditure or the ratio of government expenditure to GDP as the dependent variable. Bird (1970) supports the use of Musgrave version that defines the government spending ratio as the total government expenditure divided by GDP, the most widely accepted measure of the size of government activity. Government expenditure can be divided into two broad components, exhaustive and non exhaustive (Bird, 1970). Exhaustive expenditures are those expenditures on goods and services that affect resources allocation, whereas non exhaustive expenditures include transfer payments only.

Table 4.1
Summary of Elasticities Estimation

Version of Wagner's Law	Dependent Variable	Constant	Independent Variable	Coefficient of Independent Variable	$\bar{R}^2$	DW	t-test
Peacock/ Wiseman (1967)	Log TEX	-6.57065	Log GDP	1.193003	0.95	1.07	25.63
Pryor (1969)	Log TEXC	-20.5357	Log GDP	1.193368	0.95	0.87	24.25
Goffman (1968)	Log TEX	10.2457	Log GDP/P	1.449982	0.72	0.24	8.943
Musgrave (1969)	Log EXP/GDP	-3.35414	Log GDP/P	0.185749	0.15	0.81	2.511
Gupta (1967)	Log TEX/P	-3.35414	Log GDP/P	1.85749	0.89	0.81	16.03
Mann (1980)	Log TEX/GDP	-6.57065	Log GDP	0.193003	0.34	1.07	4.146

4.3 Co-integration Technique[3]

Economic theory generally deals with equilibrium relationships and, to a large extent, most empirical econometric studies are an attempt to evaluate such relationships by summarizing economic time series using statistical methods. Co-integration analysis is currently one of the most popular techniques to estimate economic relationships among time series variables and test hypotheses about these relationships according to an economic theory. The idea of integration was first developed by Granger (1983) and expanded by Engle and Granger (1987). Since then, a variety of methods have been developed to estimate co-integration relationships.

An integrated time series possesses properties which make standard estimation problematic. Specifically, integrated time series are subset of the more general class of random variables known as non-stationary time series. Generally speaking, non-

[3] Definition: The components of the vector Xt are said to be co-integrated of order d, b, denoted Xt ~CI(d, b), if (i) all components of X_t are I(d); (ii) there exists a vector α ($\neq 0$) so that Zt = α 'X_t ~ I(d-b), b > 0. The vector α is called the co-integration vector. (Engle & Granger, 1987).

stationary series are time-dependent in mean and/or variance. An integrated time series is a non-stationary series which has a unit root, giving the series as stochastic trend (Figure 4.2).

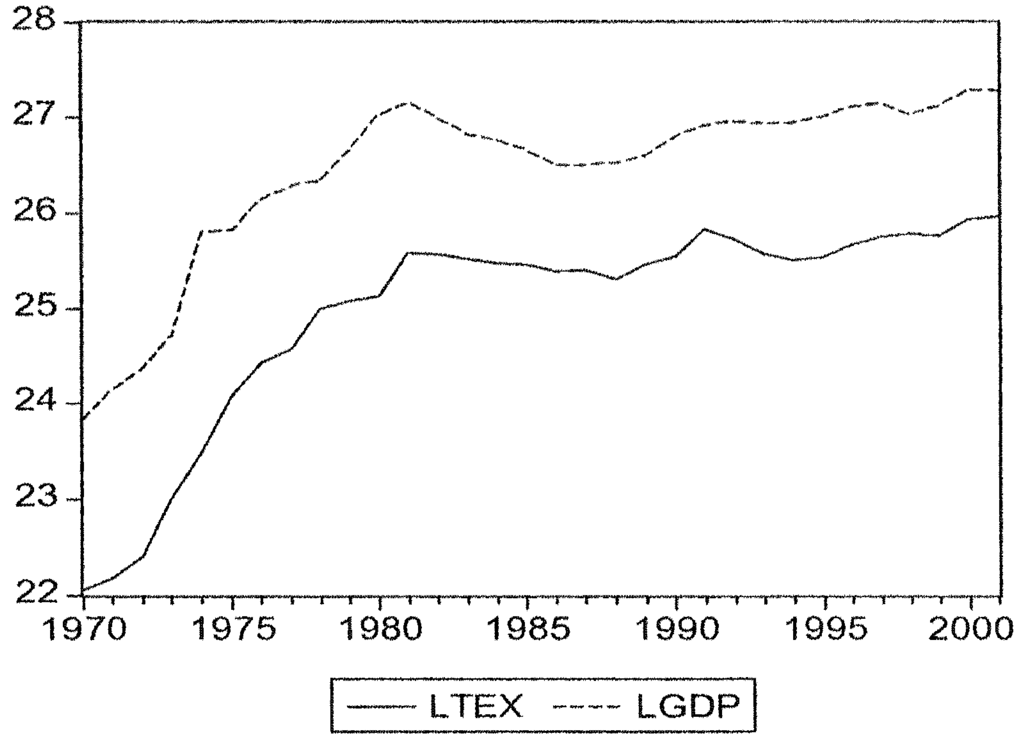

Figure 4.2 shows the non-stationrity characteristic of LTEX and LGDP.

Co-integrated series are two or more series which contain the same stochastic trend, such that they move through the time together. The relationship among the series which hold them together as they are being pushed through time is called co-integrating vector which describes the long-run equilibrium relationship between them.

The application of the Engle-Granger estimation procedure relies on the property of co-integration, which should be established in order to appeal to the consistency properties of the OLS estimator.

As co-integration involves verifying that estimated error-correction term (or the residuals from the OLS regression) is stationary, conventional unit root tests may be employed in order to test for the co-integration vector. One should verify that all the variables employed in the static regression are indeed of the same order of integration; once again, unit root tests may be used for this purpose.

In testing for the presence of unit roots, and hence for the degree of integration of individual series, and for integration between variables, a number of statistical testes may be used. The most popular one is that developed by Dickey and Fuller (1979, 1981).

4.3. 1. Unit Root and Co-integration

The basic idea of Dickey-Fuller (DF) test was very simple. It is a statistical test for examining the order of the time series. This can be written in the case of Saudi Arabia's total government expenditure in t as:

$$TEX_t = \mu + \alpha TEX_{t-1} + \epsilon_t \qquad (4.9)$$

Expression in equation (4.9) permits the evaluation of the unit root null hypothesis, ($\alpha = 0$) against the alternative hypothesis ($\alpha \neq 0$), through a t-ratio test of stationarity around a deterministic trend. Once the order of integration is determined by the Dickey-fuller (DF) test, the next step is to examine whether the series are co-integrated or not and if they are, to identify the co-integrating (long-run equilibrium) relationship.

Using Johansen co-integration test for Saudi Arabia case for testing the long-run relationship between the two variables for all six versions (LTEX and LGDP in Peacock-Wiseman version; LTEXC and LGDP in Pryor version; LTEX and GDP/P in Goffman version; LTEX/GDP and GDP/P in Musgrave version; LTEX/P and GDP/P in Gupta version and LTEX/GDP and GDP in Mann version), we found that all variables are integrated at the same order.

A co-integration test can be applied to determine the existence of a long-run relationship between the variables. The Engle and Granger (1987) two step procedure for modeling the relationship between co-integrated variables has received a great deal of attention in recent years. One of the benefits of this approach is that the long-run equilibrium relationship can be modeled by a straightforward regression involving the levels of the variables (Iender, 1993). According to Holden and Thomson (1992: 26),"this approach is attractive for two reasons: First, it reduces the number of coefficients to be estimated and so, reduces the problem of multicollinearity [Of course, this is not a problem with our model(s)]. Second, the first step can be estimated by ordinary least squares." Before testing for co-integration, that is, in order to establish the existence or otherwise of a long-run relationship between two economic time series, say x and y, it is first necessary to test whether variables are integrated to the same order. Applying DF/ADF unit root tests, we found that each of the variables used in all six versions of Wagner's Law is either I(1) or I(2). Since all series are integrated of the same order, the series can be tested for the existence of a long-run relationship between them.

4.3.2. Testing for Unit Root

Before estimating any relationships between government expenditure and its explanatory variable (GDP), we need to check for the stationarity of each series. This property is best tested using the augmented Dickey-Fuller (1979) test for a unit root. The equation to be estimated is:

$$X_t = \mu + \alpha X_{t-1} + \epsilon_t$$

If the coefficient α is not significant we fail to reject the Null hypothesis of stationarity and can conclude that the series is $I(d)$. This procedure is repeated on higher levels of differenced data until we reject $H0$. The order of differencing corresponds to the variable's order of integration. The ADF results for the two series involved in our equation are presented in Tables 4.2 and 4.3.

Table 4.2

ADF Unit Root Test in Levels

Variables	LGDP	LTEX	LTEXC	LTEX/GDP	LTEX/P	LGDP/P
ADF-t-stat	-1.38763*	-2.00349*	-1.31242*	-2.231403*	-2.69415**	-2.83043**
ADF (1%)	-3.670170	-3.670170	-3.670170	-3.670170	-3.670170	-3.670170
ADF (5%)	-2.963972	-2.963972	-2.963972	-2.963972	-2.963972	-2.963972
ADF (10%)	-2.621007	-2.621007	-2.621007	-2.621007	-2.621007	-2.621007

* 4 Lags significant in all levels (1%, 5% and 10%

** 4 lags significant in only in level of (1% and 5%)

Table 4.3

ADF Unit Root Test in First Difference

Variables	LGDP	LTEX	LTEXC	LTEX/GDP	LTEX/P	LGDP/P
ADF-t-stat	-4.401786*	-3.82868*	-3.0234**	-3.851336*	-3.31676**	-4.49967*
ADF (1%)	-3.6959	-3.6959	-3.6959	-3.6959	-3.6959	-3.6959
ADF (5%)	-2.9750	-2.9750	-2.9750	-2.9750	-2.9750	-2.9750
ADF (10%)	-2.6265	-2.6265	-2.6265	-2.6265	-2.6265	-2.6265

* 4 Lags significant in all levels (1%, 5% and 10%)
** 4 Lags significant in only in level of (5% and 10%)

Basically the Dickey-Fuller Procedure was used to test for unit roots. If the Null hypothesis that the variable contains a unit root cannot be rejected, the next step would be to test for co-integration by testing the residual from the co-integrating regression to see if they are stationary I(0). For GDP, a unit root in logarithm of real GDP was tested for.

Based on this test, the Null hypothesis that LGDP contains a unit root cannot be rejected at the 1%, 5% or 10% level of significant. In terms of absolute value, the test is -1.38763 and the corresponding critical values are -3.670170 at 1%, -2.963972 at 5% and -2.621007 at 10% (See Table 4.2). This is almost the same when applied to first difference where, the t-stat is -4.401786 and the corresponding critical values are -3.6959 at 1%, -2.9750 at 5% and -2.6266 at 10% (See Table 4.3).

For total government expenditure (TEX), the same tests were performed on the logarithm of LTEX with results reported in Tables 4.2 and 4.3. Based on these results, the hypothesis of unit roots for LTEX cannot be rejected. The test statistic are -2.003496 and -3.828682 in absolute terms for both ADF Unit Root in Levels and ADF Unit Root in First Difference tests respectively with 1%, 5% and10% critical value of -3.670170 at 1%, -2.963972 at 5% and -2.621007 at 10% (See Table 4.2) for Unit Root in levels and -3.6959 at 1%, -2.9750 at 5% and -2.6266 at 10%, (See Table 4.3) for Unit Root in First Difference tests respectively.

The similar tests were used on the logarithm of LTEX/P in the case of total government expenditure per capita TEX/P, as what we reported in Tables 4.2 and 4.3. According to these results, the hypothesis of unit roots for LTEX/P cannot be rejected for 1% and 5% in ADF level test and 5% and 10% in ADF first difference test. The t-statistic are -2.69415 and -3.31676 in absolute value for both Levels and I(1) tests respectively with 1%, 5% and10% critical value of -3.6959 at 1%, -2.9750 at 5% and -2.6266 at 10% (See Table 4.2) for Unit Root in levels and -3.670170 at 1%, -2.963972 at 5% and -2.621007 at 10% (See Table 4.3) for Unit Root in First Difference tests respectively. In this case, the statistic tests in levels indicated that LTEX/P with (4) lags was significant in only in level of 1% and 5% and LTEX/P with (4) lags was significant in only in level of 5% and 10% in the first difference.

For total government expenditure for consumption (TEXC), the same tests were performed on the logarithm of LTEXC with results reported in Tables 4.2 and 4.3. Based on these results, the hypothesis of unit roots for LTEXC cannot be rejected. The test statistic are -1.31242 and -3.0234 in absolute terms for both ADF Unit Root in Levels and ADF Unit Root in First Difference tests respectively with all significant levels 1%, 5% and 10% critical value of -3.670170 at 1%, -2.963972 at 5%

and -2.621007 and -3.6959 at 1%, -2.9750 at 5% and -2.6266 at 10% respectively. This indicates that LTEXC with (4) lags was significant in all levels 1%, 5% and 10% and LTEX/P with (4) lags was significant in only in level of 5% and 10% in the first difference.

For GDP/P, a unit root in logarithm of real GDP/P was tested for. Based on this test, the Null hypothesis that LGDP/P contains a unit root cannot be rejected at the 1%, 5% but we can reject the Null hypothesis in10% level of significant. In terms of absolute value, the test is -2.83043 and the corresponding critical values are -3.670170 at 1% and -2.963972 at 5% (See Table 4.2). This Null hypothesis cannot be rejected at all level of significant 1%, 5% and 10% when applied to first difference where, the t-test is -4.499677 and the corresponding critical values are -3.6959 at 1%, -2.9750 at 5% and -2.6266 at 10%.

Finally, the similar tests also were performed on the logarithm of LTEX/GDP in the case of the share of total government expenditure to the GDP, as what we reported in Tables (4.2) and (4.3). Based on these results, the hypothesis of unit roots for LTEX/GDP can be rejected at ADF level test where t-statistic is -2.231403 and cannot be rejected at all levels of significant in ADF first difference test where t-statistic is -3.851336 in absolute value with 1%, 5% and 10% critical values -3.6959 at 1%, -2.9750] at 5% and -2.6266 at 10%.

Based on these tests it can be concluded that all variables tested (LGDP, LTEX, LTEXC, LTEX/P, LTEX/GDP and GDP/P) with (4) lags are contained a unit root in significant level of 5% for both ADF Unit Root in Levels and ADF Unit Root in First Difference. Having established the presence of a unit root, the second step would be to test whether the two variables in the six relationships (versions) of Wagner's Law are co-integrated (have the same unit root). However, testing co-integration involves a unit root test on residuals performed by regressing total government expenditure (TEX) on a constant and real GDP or real GDP per capita in Wagner's version format. Then, the first difference of the residuals should be on its lagged level and lagged dependent variable. In all six versions, the results reject the Null hypothesis of no co-integration between LTEX and LGDP in Wagner's versions format.

Table 4.4 shows that co-integration relationship were found for all six versions (Peacock and Wiseman, 1967; Pryor, 1969; Goffman, 1968; Musgrave, 1969; Gupta, 1967; and Mann, 1980) where the test support the existence of a unique co-integration relationship in the (Peacock-Wiseman (1967) between LTEX and LGDP, Pryor (1969) between LTEXC and LGDP, Goffman (1968) between LTEX and LGDP/P, Musgrave (1969) between LTEX/GDP and LGDP, Gupta (1967) between LTEX/P and LGDP/P and Mann (1980) between LTEX/GDP and LGDP) tests pointed to the existence of at least one co-integration vectors.

4.3.3. Co-integration Results

Testing for co-integration in our six versions is to determine whether stochastic trends in the series are indeed related to each other. If the order of integration is determined by the Augmented Dickey Fuller test, the next step is to test whether the series are co-integrated or not, and if they are, to identify the co-integrating (long-run equilibrium) relationship.

Table 4.4 shows that co-integration relationship were found for all six version (Peacock and Wiseman, 1967; Pryor, 1969; Goffman, 1968; Musgrave, 1969; Gupta, 1967; and Mann, 1980) where the test support the existence of one co-integration equations in the relationship between LTEX and LGDP in the case of Saudi Arabia.

Table 4.4

Summary of Co-integration Test*

Version	Statistic in I(1)				
The Six Versions of Wagner's Law	Eigen-Value	Trace Test or (L. R)	Critical Value at 5%	Critical Value at 1%	CE(s) No.
Peacok-Wiseman (LTEX & LGDP)	0.407518	15.76206	12.53	16.31	(1)*
Pryor. (LTEXC & LGDP)	0.425269	16.96660	12.53	16.31	(1)* & (1)**
Goffman. (LTEX & LGDP/P)	0.292252	14.26813	12.53	16.31	(1)*
Musgrave (LTEX/GDP & LGDP/P)	0.416050	16.21481	12.53	16.31	(1)*
Gupta. (LTEX/P & LGDP/P)	0.416050	16.21481	12.53	16.31	(1)*
Mann. (LTEX/GDP & LGDP)	0.407518	15.76206	12.53	16.31	(1)*

Eigen V: Eigen. Value Max.
L. R: Likelihood Ratio Test.
CE(s) No: Co-integration Equation Numbers.
* Indicate the significance level at which the number of co-integration equation(s) is identified in 5%
** Indicate the significance level at which the number of co-integration equation(s) is identified in 1%

Trace test pointed to the existence of co-integration vector since t-test value exceeded critical value in 5% level of significant (See Table 4.4). That means the co-integration tests are statistically significant at five percent level for determining the long-run relationship between LTEX and LGDP.

For all six versions, the two variables are I(1). The result showed that over the long-run, LGDP was positively related to total government expenditure in the case of Saudi Arabia for all these versions where the results referring to (Peacock and Wiseman, 1967; Pryor, 1969; Goffman, 1968; Musgrave, 1969; Gupta, 1967; and Mann, 1980) appear in Table 4.4. For rank of (L. R) and (Trace) statistics show that the Null hypothesis is not rejected for H0: $\beta_1 = 0$ is tested against H1: $\beta_1 \neq 0$ which suggested the existence of co-integration (positive) relationship between LTEX and LGDP in all six versions with the existence of a constant, restricted in the co-integration space.

In the case of Pryor version which represented the long-run relationship between total government expenditure for consumption and GDP in terms of logarithm, the Null hypothesis is not rejected for H_0: $\beta_1 = 0$ is tested against H_1: $\beta_1 \neq 0$ too which suggested the existence of co-integration (positive) relationships between each of these variables with 5% level of significant and one co-integration (positive) relationship between each of these variables with 1% level of significant (See Figures 4.3 and 4.4)

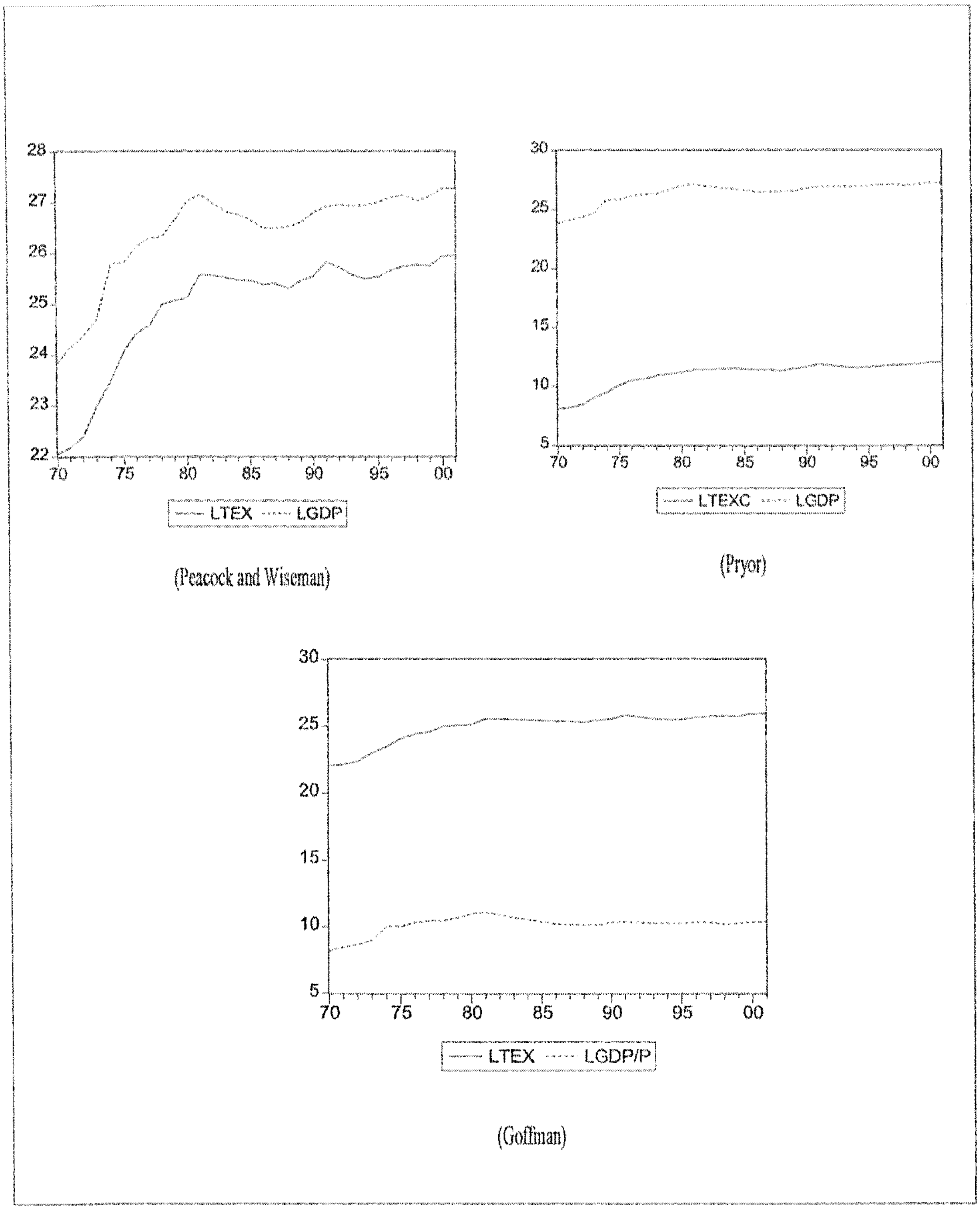

Figure 4.3 shows the long-run relationship LTEX and LGDP that appeared by using co-integration test for Peacock and Wiseman (1967), Pryor (1969) and Goffman (1968) versions

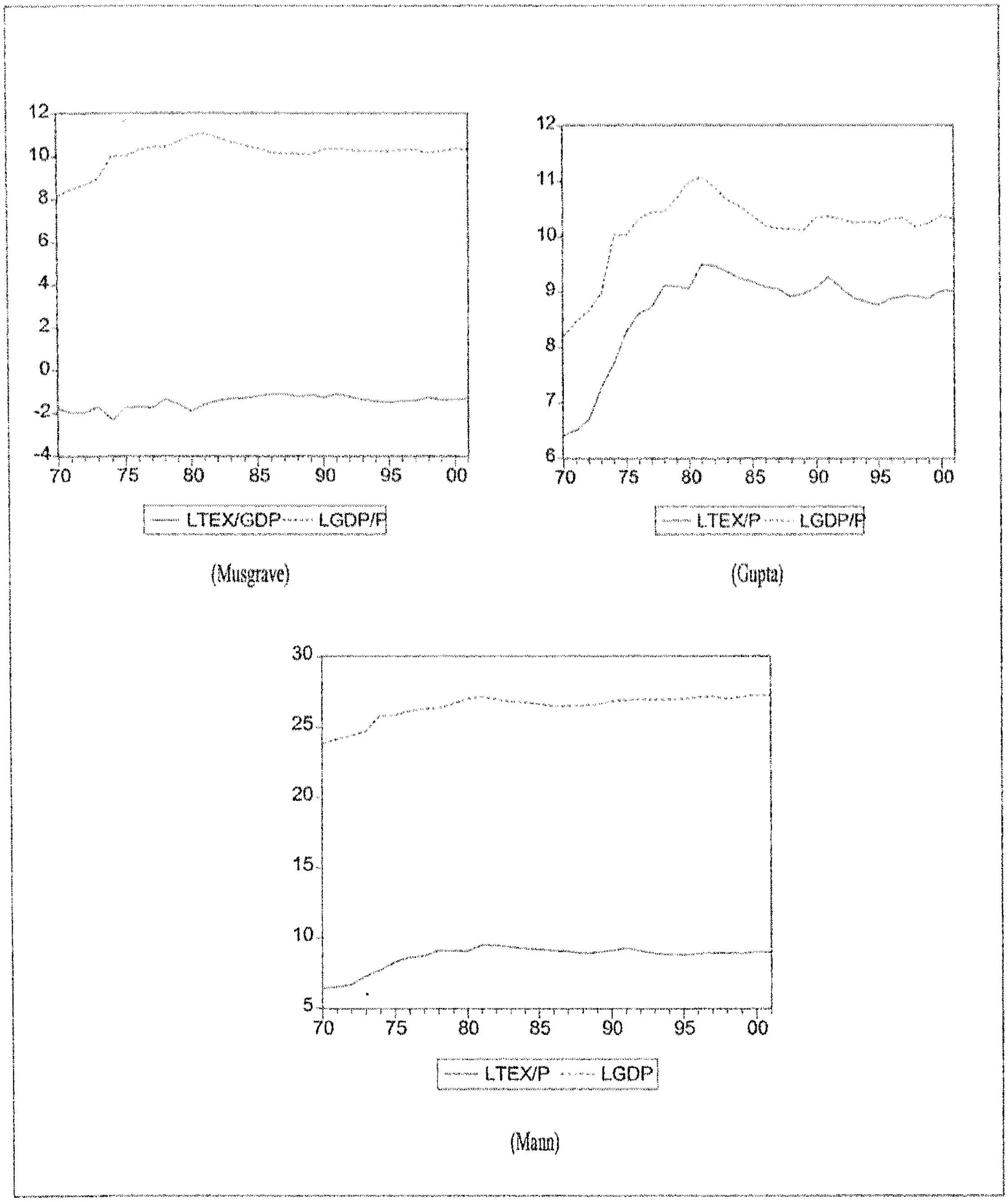

Figure 4.4 shows the long-run relationship LTEX and LGDP that appeared by using co-integration test for Musgrave (1969) Gupta (1967) and Mann (1980) versions.

4.4 CAUSALITY TEST

4.4.1 Overview

In economics, correlation does not necessarily imply causality. If we find a set of time series to co-integrated, then a Granger causality test can be constructed by an appropriate test. The following analysis is to test for causality between GDP and Government Expenditure for those versions.

As mentioned earlier, there are four patterns of causality that could be defined as: 1) Unidirectional Causality from GDP to government expenditure as hypothesized by Wagner. Further over the time, the role of government in providing public goods, improving health, education facilities as their citizen increase. Thus process of economic development causes government expenditure to grow. 2) Unidirectional Causality from government expenditure to GDP. Following the basic macroeconomic framework, causal sequence from government expenditure to GDP can be predicted particularly in the case of Saudi Arabia. It experienced a normal stage of economic development which required government to invest in infrastructures to accelerate the development process which in turn leads to increase in government expenditure causing GDP to increase. 3) Bidirectional Causality from one to another when there is interdependence between government expenditure and GDP due to reasons mentioned in (1) and (2) resulting in each of them to have an impact on the other. 4) No Causality between dependent variable and independent variable. It is possible that both government expenditure and GDP move together with no correlation between them where neither influencing the other with changes in both occurring due to external factors.

In the next section, we used Granger Causality Test (GCT) with two lags to determine the direction of the long-run relationships between government expenditure and GDP that are represented by the following versions of Wagner's Law in the case of Saudi Arabia.

4.4.2 Causality between LTEX and LGDP (Peacock and Wiseman's Version)

Table 4.5 presents the causality test result based on probability values from Granger Causality Test (GCT). The reported F-statistics are standard test for joint hypothesis that LGDP does not Granger Cause LTEX. The probability for accepting the Null-Hypothesis was only 1.1% while 98.9% rejecting this hypothesis which means LGDP causes LTEX by around 98.9% all of the time in Peacock and Wiseman's Version in the case of Saudi Arabia which is consistent with Wagner's Law suggestion. Table 4.5 presented feedback causality (Bidirectional) from LTEX to LGDP where the probability for accepting the Null-hypothesis was only 7.5% while 92.5% rejecting the hypothesis which means LTEX cause LGDP by about 92.5% all of the time in the case of Saudi Arabia.

Table 4.5

Granger Causality Tests for the Relationship between LTEX and LGDP

Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LTEX	30	5.32759	0.01182
LTEX does not Granger Cause LGDP	30	2.86879	0.07557

4.4.3 Causality between LTEXC and LGDP (Pryor's Version)

Table 4.6 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis - LTEX does not Granger Cause LGDP- was only 14.4% and 85.6% rejecting this hypothesis which means LTEXC cause LGDP by around 85.6% all the time in Pryor's Version in the case of Saudi Arabia which is consistent with Wagner's Law suggestion to some extend. But there is strong feedback causality (Bidirectional) between LGDP and LTEXC. The reported F-statistics are standard test for joint hypothesis that LGDP does not Granger Cause LTEXC where the probability for accepting the Null-Hypothesis was only 0.8% and 99.2% rejecting this hypothesis which means LGDP cause LTEX by around 98.9% all the time in case of Saudi Arabia.

Table 4.6

Granger Causality Tests for the Relationship between LTEXC and LGDP

Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LTEXC	30	2.09309	0.14439
LTEXC does not Granger Cause LGDP	30	5.78682	0.0086

4.4.4 Causality between LTEX and LGDP/P (Goffman's Version)

Table 4.7 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis – LGDP/P does not Granger Cause LTEX- was only 2.9% and 97.1% rejecting this hypothesis which means LGDP/P cause LTEX by around 97.1% all the time in Goffman Version in the case of Saudi Arabia which consistent with Wagner's Law suggestion. In the other direction, the probability for accepting the Null-hypothesis of LTEX does not Granger Cause LGDP/P only 3.4% and 96.6 rejecting this hypothesis which means LTEX cause LGDP/P by around 97.1% all the time in the case of Saudi Arabia. The result of causality test indicate that the existence of strong feedback causality (Bidirectional) between LTEX and GDP/P in the long-run as shown in Table 4.7.

Table 4.7

Granger Causality Tests for the Relationship between LTEX and LGDP/P

Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDPP does not Granger Cause LTEX	30	4.06512	0.02961
LTEX does not Granger Cause LGDP/P	30	3.8615	0.03456

4.4.5 Causality between LTEX/ GDP and GDP/P (Musgrave's Version)

Table 4.8 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis – LGDP/P does not Granger Cause LTEX/GDP- was only 6.7% and 93.3% rejecting this hypothesis which means LGDP cause LTEX by around 93.3% all the time in Musgrave's Version in the case of Saudi Arabia which is consistent with Wagner's Law suggestion. The results obtained in Table 4.8 presented strong evidence of the existence of strong feedback causality (Bidirectional) between LTEX/GDP and GDP/P in the long-run. The probability for accepting the Null-Hypothesis LTEX/GDP does not Granger Cause LGDP/P- was only 5.9% and 94.1% rejecting this hypothesis which means LTEX/GDP cause LGDP/P by around 94.1% all the time in the case of Saudi Arabia.

Table 4.8

Granger Causality Tests for the Relationship between LTEX/GDP and LGDP/P

Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDPP does not Granger Cause LTEXGDP	30	3.00675	0.06759
LTEXGDP does not Granger Cause LGDPP	30	3.1636	0.0596

4.4.6 Causality between LTEX/ P and GDP/P (Gupta's Version)

Table 4.9 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis – LGDP/P does not Granger Cause LTEX/P- was only 0.4% and 99.6% rejecting this hypothesis which means LGDP/P cause LTEX/P by around 99.6% all the time in Gupta's Version in the case of Saudi Arabia which consistent with Wagner's Law suggestion. In the other direction, the probability for accepting the Null-hypothesis of LTEX/P does not Granger Cause LGDP/P is only 5.1% and 94.9% rejecting this hypothesis which means LTEX/P cause LGDP/P by around 94.9% all the time in the case of Saudi Arabia.

The result of causality test indicate the existence of feedback causality (Bidirectional) between LTEX/P and GDP/P in the long-run but it is not stronger than the inverse direction as shown in Table 4.9.

Table 4.9

Granger Causality Tests for the Relationship between LTEX/P and LGDP/P

Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDPP does not Granger Cause LTEXP	30	6.78451	0.00443
LTEXP does not Granger Cause LGDPP	30	3.1636	0.0596

4.4.7 Causality between LTEX/GDP and GDP (Mann's Version)

Table 4.10 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis - LGDP does not Granger Cause LTEX- was only 4.8% and 95.2% rejecting this hypothesis which means LGDP cause LTEX by around 95.2% all the time in Mann's Version in the case of Saudi Arabia which is consistent with Wagner's Law suggestion. The results obtained in Table 4.10 show strong evidence of the existence of feedback causality (Bidirectional) between LTEX/GDP and GDP in the long-run. The probability for accepting the Null-Hypothesis –LTEX/GDP does not Granger Cause LGDP- was only 7.5% and 92.5% rejecting this hypothesis which means LTEX/GDP cause LGDP by around 92.5% all the time in the case of Saudi Arabia.

Table 4.10

Granger Causality Tests for the Relationship between LTEX/GDP and LGDP

Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LTEXGDP	30	3.41226	0.04895
LTEXGDP does not Granger Cause LGDP	30	2.86879	0.07557

4.3.8. Summary of Results

The test results for the six versions used to examine the direction of causality between the government expenditure and GDP series are reported in Tables 4.11 and 4.12 and Figures 4.5 and 4.6.

Table 4.11

Summary of the test for Granger Causality (1970-2001)*

Variables		F-Ratio					
Effect	Cause	One Lag		Two Lags		Three Lags	
LGDP	LTEX	15.3421	(0.00052)*	5.32759	(0.01182)	5.94559	(0.00396)
LTEX	LGDP	0.05430	(0.81743)**	2.86879	(0.07557)	1.20521	(0.33112)
LGDP	LTEXC	6.98642	(0.01330)	2.09309	(0.14439)	2.30552	(0.10475)
LTEXC	LGDP	0.30733	(0.30733)	5.78682	(0.0086)	3.05415	(0.04952)
LGDP/P	LTEX	5.13970	(0.03130)	4.06512	(0.02961)	6.14278	(0.00339)
LTEX	LGDP/P	1.70212	0.20263)	3.8615	(0.03456)	1.80133	(0.17639)
LGDP/P	LTEX/GDP	8.07919	(0.00826)	3.00675	(0.06759)	1.56098	(0.22713)
LTEX/GDP	LGDPP	0.79977	(0.37879)	3.1636	(0.0596)	1.18913	(0.33682)
LGDP/P	LTEX/P	21.3042	(0.00007)*	6.72845	(0.00443)	4.41309	(0.01418)
LTEX/P	LGDP/P	0.79977	(0.37879)	3.1636	(0.0596)	1.18913	(0.33682)
LGDP	LTEX/GDP	10.0337	(0.00370)	3.41226	(0.04895)	1.64708	(0.20741)
LTEX/GDP	LGDP	0.05430	(0.8174)**	2.86879	(0.07557)	1.20521	(0.33112)

P-value of the F-ratio represented in parentheses.

* The probability for accepting the Null-Hypothesis -LGDP does not Granger Cause LTEX- was 0% and 100 % rejecting this hypothesis.

** The probability for accepting the Null-Hypothesis -LGDP does not Granger Cause LTEX- was 82% and only 18 % rejecting this hypothesis

Table 4.12

Type of Causality between TEX and GDP (two lags) in Wagner's Law Versions

Wagner's Version		Causality		
Versions (TEX & GDP Direction)		Unidirectional Causality only from one to another	Feedback/ Bidirectional Causality	No causality
V-I	LTEX → LGDP	No	Yes, by 98.9 %	No
V-I	LGDP→ LTEX	No	Yes, by 92.5 %	No
V-II	LTEXC → LGDP	No	Yes, by 85.6 %	No
V-II	LGDP→ LTEXC	No	Yes, by 99.2 %	No
V-III	LTEX→ LGDP/P	No	Yes, by 97.1 %	No
V-III	LGDP/P→ LTEX	No	Yes, by 96.6 %	No
V-IV	LTEX/GDP→ LGDP	No	Yes, by 93.3 %	No
V-IV	LGDP→ LTEX/GDP	No	Yes, by 94.1 %	No
V-V	LTEX/P→ LGDP/P	No	Yes, by 95.6 %	No
V-V	LGDP/P→ LTEX/P	No	Yes, by 94.1 %	No
V-VI	LTEX/GDP→ LGDP	No	Yes, by 95.2 %	No
V-VI	LGDP→ LTEX/GDP	No	Yes, by 92.5 %	No

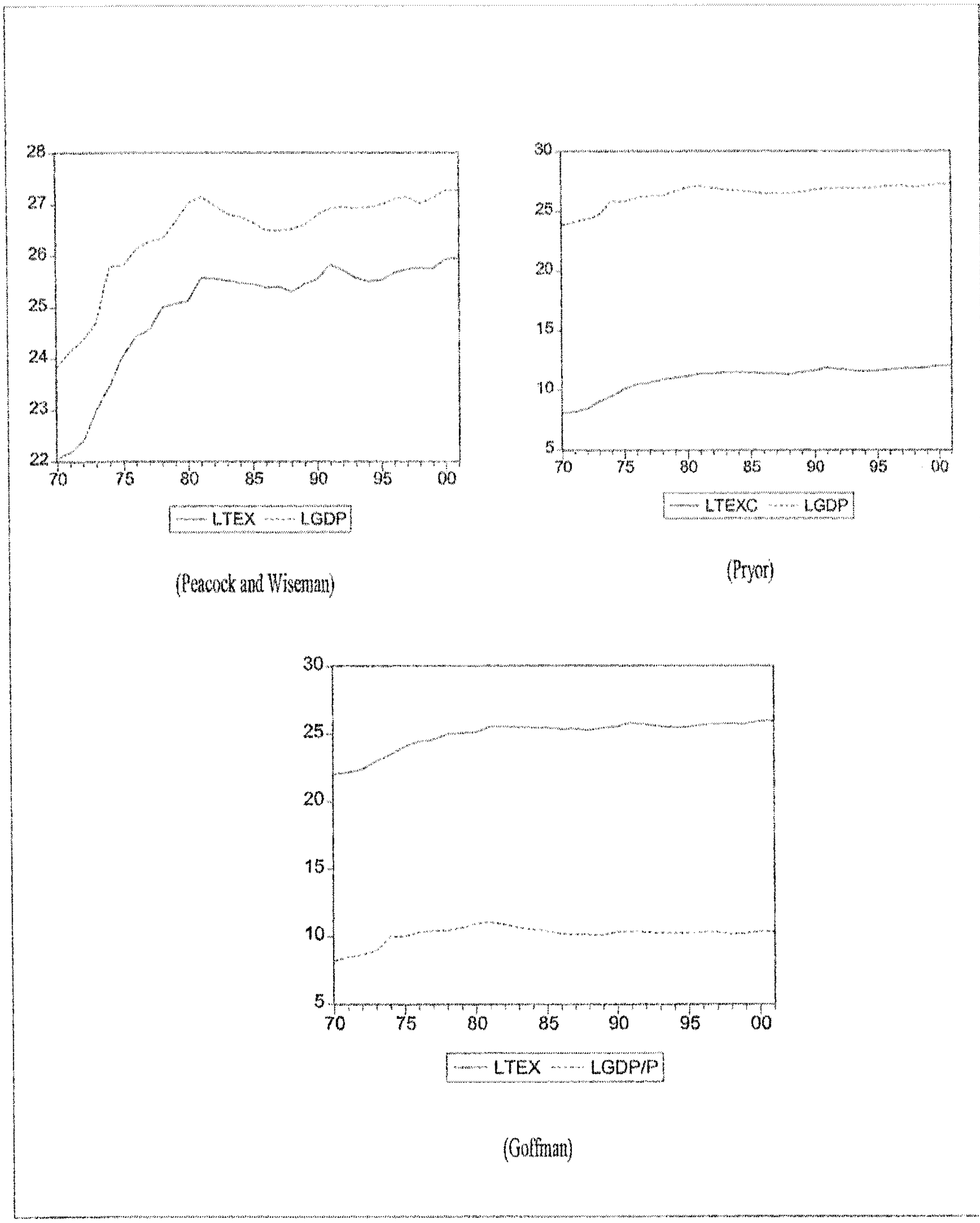

Figure 4.5 causality direction in the long-run for Peacock-Wiseman (1967), Pryor (1969) and Goffman (1968) versions

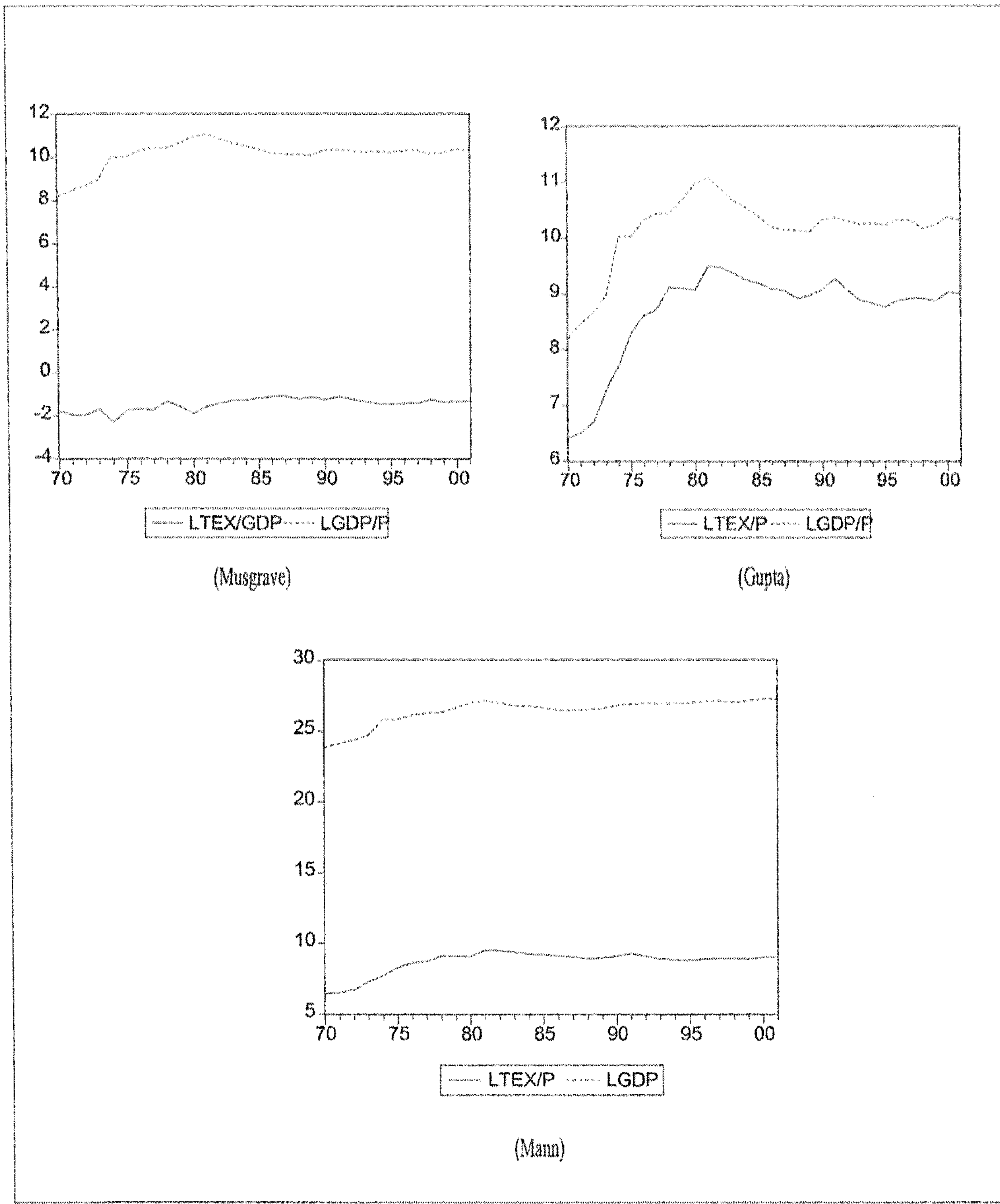

Figure 4.6 Causality direction in the long-run for Musgrave (1969), Gupta (1957) and Mann (1980) versions.

CHAPTER: 5

APPLICATION OF WAGNER'S LAW AND THE LONG-RUN RELATIONSHIP BETWEEN GOVERNMENT FUNCTIONAL EXPENDITURE AND GDP

5.1 Overview

Functional Expenditure as we mentioned in Chapter 1 included all the functional classification relates to government spending in the social and economic sectors. These categories shown in Figure 1.2 covered Defense, Education, and Health, Social Security and welfare, Housing Community and other spending for economic services. Since these categories have some weight in GDP, it became very important to analyze their relationship to the growth of GDP according to Wagner's Law hypothesis. The percentage shares of those five categories of government functional expenditure in GDP of Saudi Arabia over the last three decades are given in Table 5.1. Based on the ratios shown in Table 5.1, there is general tendency for those five categories to increase except the ratio of government spending on defense fluctuated during 1990s and was almost steady in the mid of 1970s. The reason behind increase in education, health, social security and welfare system and housing and community is that there was an increase in oil revenues during this period which encouraged government sectors to start spending more in development. This kind of spending behavior supported Wagner's Law since development expenditures are increased in relation to GDP during the development process.

Table 5.1
The percentage share of these five categories to the GDP

Year	GDP	DEF/GDP Share (%)	EDU/GDP Share (%)	HTH/GDP Share (%)	SSWS/GDP Share (%)	HCA/GDP Share (%)
1970	174,439	1.0342%	0.2689%	0.0877%	0.0138%	0.0327%
1971	203,916	0.9322%	0.3114%	0.0848%	0.0132%	0.0363%
1972	245,423	1.0292%	0.3068%	0.1080%	0.0130%	0.0354%
1973	301,047	1.8814%	0.3880%	0.1080%	0.0106%	0.0495%
1974	369,725	2.5081%	0.4384%	0.1420%	0.0127%	0.0422%
1975	373,853	4.6738%	0.8222%	0.2209%	0.0217%	0.0000%
1976	418,304	6.4563%	1.0213%	0.2601%	0.0249%	0.0007%
1977	447,075	6.0390%	1.2649%	0.3082%	0.0421%	0.0060%
1978	442,634	8.2291%	1.7373%	0.3800%	0.0382%	0.0095%
1979	485,965	8.4230%	1.8413%	0.4659%	0.0391%	0.0286%
1980	517,956	8.3019%	2.2846%	0.4759%	0.0423%	0.3884%
1981	543,026	10.6547%	2.3612%	0.6234%	0.0405%	0.4447%
1982	486,611	9.9652%	3.4042%	0.9759%	0.0567%	0.5489%
1983	448,402	11.5608%	3.7605%	1.2750%	0.0647%	0.7134%
1984	433,633	11.6066%	4.2605%	1.3973%	0.0805%	0.9907%
1985	409,654	10.9868%	4.6693%	1.5984%	0.0835%	1.0946%
1986	430,824	9.1543%	4.3022%	1.4753%	0.0752%	0.9995%
1987	415,656	9.5680%	4.5028%	1.5876%	0.0801%	1.0295%
1988	449,767	7.7269%	4.0248%	1.3113%	0.0676%	0.9238%
1989	450,087	8.9600%	4.9924%	1.5328%	0.0678%	1.1169%
1990	487,242	9.1283%	2.9846%	0.2219%	0.0946%	0.0332%
1991	530,707	10.8817%	6.2181%	1.8965%	0.1244%	0.3109%
1992	555,051	9.9059%	4.9311%	1.7962%	0.0728%	0.9754%
1993	555,183	9.0140%	4.8663%	1.3333%	0.0702%	0.8237%
1994	558,415	7.9498%	4.6256%	1.3606%	0.0702%	0.8057%
1995	557,956	8.0463%	4.7617%	1.4395%	0.0932%	0.8255%
1996	576,737	8.8533%	4.8871%	1.6047%	0.1063%	0.9247%
1997	591,794	9.4425%	5.1111%	1.7153%	0.1303%	0.9625%
1998	608,504	9.2474%	5.0964%	1.7645%	0.1369%	0.9604%
1999	603,589	7.0056%	7.5154%	2.8034%	0.0966%	1.1945%
2000	632,906	8.4381%	7.5853%	3.4604%	0.1199%	1.4152%
2001	640,413	8.0854%	7.7694%	3.0310%	0.1132%	1.4250%

Calculating the income elasticities of these different categories of functional government expenditure enables us to understand the precise relationship between the changes in the functional expenditure and the change in GDP. Income elasticities of functional government expenditure measure the relative change in functional government expenditures with respect to relative changes in GDP. We estimated such elasticity by the same method that used in all versions of Wagner's Law and using the same time series data for the period of 1970 to 2001 in the case of Saudi Arabia. In this Chapter, we provide an insight into trends in expenditures of the major Saudi government sectors over the period from 1970 to 2001. The focus here was on explaining and analyzing the changes in the major components of government functional expenditure over time.

5.2. Government Functional Expenditure

Our analysis covered three major sections. First section, we attempted to utilize Wagner's Law to empirically analyze government functional expenditure growth in Saudi Arabia. For that reason, the empirical result of applying Wagner's Law included the analysis of five categories of functional government expenditure separately, theoretically as well as empirically, for the case of Saudi Arabia using data for the same period from 1970 to 2001. Also in this section we discussed the question of whether or not the aggregate data of these five categories for Saudi Arabia is consistent with Wagner's Law. In the second section, we analyzed the empirical results of using a co-integration test and whether it can be applied to determine the existence of a long-run relationship between the variables or not. The analysis was based to Engle and Granger (1987) methods for modeling the relationship between co-integrated variables. The empirical analysis of co-integration test included ADF unit root tests in order to know which one of these variables used in all five categories of Wagner's Law is I(1). Finally, the direction of causality between GDP and government functional expenditure is analyzed and discussed in section three of this chapter by using causality testing techniques in the Granger (1969).

Following the same approach used in Chapter 4, the Log-Log functional forms represent a non-linear relationship between GDP and government functional expenditure, with one percentage point change in the rate of GDP leading to constant unit change in government functional expenditure GFEX. In terms of computing these elasticities, we used the following logarithmic regression equation:

$$\text{Loge } TEX_{funi} = \alpha + \beta \text{ Log GDP}.$$

Where,

$i = 1, 2, 3, 4$ and 5

TEX_{funi} is *ith* government functional category in real terms such (Defense, Education, Health, Social Security & Welfare and Housing & Community Amenities).

GDP = Goss Demotic Products in Real Terms.

Our focus here is to determine the degree of sensitivity of such classification's expenditure to the changes in GDP, using the elasticity coefficient (β) as an interpreter. The results were as follows:

5.2.1 Expenditure on Defense

$$\text{Log EDEF} = \alpha + \beta \text{ Log GDP} \qquad (5.1a)$$

$$\text{Log EDEF} = -56.93504 + 3.020156 \text{ Log GDP} \quad (5.1b)$$
$$(14.12002)$$

N = 32

Adjusted R^2 = 0.87

DW statistic = 0.406

F-Statistic = 20.72

Std. error = 0.2138

Equation (5.1b) showed that Income elasticity of Defense Expenditure (EDEF) 3. 025 is much greater than unity where,

Elasticity format is:

$$E_{(EDEF)} = \frac{\left[\dfrac{d(EDEF)}{d(GDP)}\right]}{\left[\dfrac{EDEF}{GDP}\right]}$$

For simplification,

$$E = \left[\frac{d(EDEF)}{d(GDP)}\right] \cdot \left[\frac{GDP}{EDEF}\right] = 3.025 > 1$$

That means an increase in GDP by 1% unit generates 3.02% increase in government expenditure on defense.

5.2.2 Expenditure on Education

$$\text{Log EEDU} = \alpha + \beta \text{ Log GDP} \quad (5.2a)$$

$$\text{Log EEDU} = -81.21561 + 3.889350 \text{ Log GDP} \quad (5.2b)$$
$$(12.97153)$$

N = 32

Adjusted R^2 = 0.84

DW statistic = 0.414

F-Statistic = 168.26

Std. error = 0.299

Equation (5.2b) showed that Income elasticity of Expenditure of Education (EEDU) is greater than unity where,

Elasticity format is:

$$E_{(EEDU)} = \frac{\left[\dfrac{\mathrm{d}(EEDU)}{\mathrm{d}(GDP)}\right]}{\left[\dfrac{EEDU}{GDP}\right]}$$

For simplification,

$$E = \left[\frac{\mathrm{d}(EEDU)}{\mathrm{d}(GDP)}\right] \cdot \left[\frac{GDP}{EEDU}\right] = 3.88 > 1$$

That means an increase in GDP by 1% unit caused government expenditure on education to increase by 3.88%.

5.2.3. Expenditure on Health

$$\text{Log EHTH} = \alpha + \beta \text{ Log GDP} \qquad (5.3a)$$

$$\text{Log EHTH} = -83.62930 + \underset{(10.08311)}{3.933676} \text{ Log GDP} \qquad (5.3b)$$

N = 32

Adjusted $R^2 = 0.77$

DW statistic = 0.810

F-Statistic = 101.6691

Std. error = 0.390

Equation (5.3b) showed that Income elasticity of Expenditure of Health (EHTH) is greater than unity where,

Elasticity format is:

$$E_{(EHTH)} = \frac{\left[\frac{d(EHTH)}{d(GDP)}\right]}{\left[\frac{EHTH}{GDP}\right]}$$

For simplification,

$$E = \left[\frac{d(EHTH)}{d(GDP)}\right] \cdot \left[\frac{GDP}{EHTH}\right] = 3.93 > 1$$

That means an increase in GDP by 1% unit generated an increase in government expenditure on health equal to 3.93%.

5.2.4. Expenditure on Social Security and Welfare

$$\text{Log ESSW} = \alpha + \beta \text{ Log GDP} \qquad (5.4a)$$

$$\text{Log ESSWS} = -62.29791 + \underset{(11.83440)}{3.040626} \text{ Log GDP} \qquad (5.4b)$$

N = 32

Adjusted $R^2 = 0.82$

DW statistic = 0.432076

F-Statistic = 140.0531

Std. error = 0.256931

Equation (5.4b) showed that Income elasticity of Expenditure of Social Security and Welfare System (ESSWS) is greater than unity where,

Elasticity format is:

$$E_{(ESSWS)} = \frac{\left[\dfrac{d(ESSWS)}{d(GDP)}\right]}{\left[\dfrac{ESSWS}{GDP}\right]}$$

For simplification,

$$E = \left[\frac{d(ESSWS)}{d(GDP)}\right] \cdot \left[\frac{GDP}{ESSWS}\right] = 3.04 > 1$$

That means an increase in GDP by 1% unit lead to government expenditure on the social security and welfare system to increase by 3.04 %.

5.2.5. Expenditure on Housing & Community Amenities

Log EHCA = $\alpha + \beta$ Log GDP (5.5a)

Log EHCA = -96.38011 + 4.365630 Log GDP (5.5b)
(4.552441)

N = 32

Adjusted R^2 = 0.39

DW statistic = 0.406531

F-Statistic = 20.72

Std. error = 0.958965

Equation (5.5b) showed that Income elasticity of Expenditure of the Housing and Community Amenities (EHCA) is greater than unity where,

Elasticity format is:

$$E_{(EHCA)} = \frac{\left[\dfrac{d(EHCA)}{d(GDP)}\right]}{\left[\dfrac{EHCA}{GDP}\right]}$$

For simplification,

$$E = \left[\frac{d(EHCA)}{d(GDP)}\right] \cdot \left[\frac{GDP}{EHCA}\right] = 4.36 > 1$$

That means an increase in GDP by 1% unit caused government expenditure on the housing and community amenities to increase by 4.36 %. These results imply that expenditures for these categories have a significant t-test with different degrees of explanation of Adjusted R^2.

Table 5.2 summarized elasticities estimation for these five categories. In the case of government expenditure on defense (See equation 5.1b), the independent variable (GDP) explains 87% of the variations in (EDEF), leaving only 13% to be explained by the stochastic disturbance term ϵ which means there are other factors that explain the variations in the ratio of government expenditure on defense.

Table 5.2
Summary of Elasticities Estimation

Government Functional Expenditure	Dependent Variable	Constant	Cofficient of Independent Variable (LGDP)	$\bar{R}^2$	DW	t-test
Defense	Log EDEF	-56.935	3.020156	0.87	0.40	14.12002
Education	Log EEDU	-81.215	3.889350	0.84	0.41	12.97153
Health	Log EHTH	-83.629	3.933676	0.77	0.81	10.08311
Social Security & Welfare System	Log ESSWS	-62.297	3.040626	0.82	0.42	11.83440
Housing & Community Amenities	Log EHCA	-96.380	4.365630	0.39	0.40	4.552441

On the other word, 87% of the time that growth in GDP is responsible for growth in government expenditure on defense. This may be the same as the case of government expenditure on education (See equation 5.2b) where the independent variable (GDP) explains 84% of the variations in (EEDU), leaving only 16% to be explained by the stochastic disturbance term ϵ which means there are other factors that explain the variations in the ratio of government expenditure on education. On the other word, 84% of the time growth in GDP is responsible for growth in government expenditure on education. The case of government expenditure on health (see equation 5.3b) is different from education and defense where, the independent variable (GDP) explains 77% of the variations in (EHTH), leaving 23% to be explained by the stochastic disturbance term ϵ which means there are other factors that explain the variations in the ratio of government expenditure on health. On the other hand, 77% of the time growth in GDP is responsible for growth in government expenditure on health. Defense, education and health are the highest three categories of government expenditure where their share together in 2001 equal to 69.8% (see Table 1.5) of the total government expenditure. Even though social security and welfare system and housing & community amenities have the smallest share to the total government expenditure, they have almost the same degree of responsiveness of the change in GDP. For example, In the case of government expenditure on social security and welfare system (see equation 5.4b), the independent variable (GDP) explains 82% of the variations in (ESSWS), leaving only 18% to be explained by the stochastic disturbance term ϵ which means there are other factors that explain the variations in the ratio of government expenditure on social security and welfare system. On the other word, there is 82% of the time that growth in GDP is responsible for growth in government expenditure on social security and welfare system which implies that government expenditure on social security and welfare system tends to increase only proportionally to the increase in GDP (see equation 5.5b)

5.3. Functional Expenditure Categories and Co-integration Test:

5.3.1 Testing for unit Root:

Among very popular statistic test for unit roots are Augmented Dickey Fuller (ADF) which is based upon the estimation of OLS of the auxiliary regression and which we applied here.

Applying the ADF, we tested the Null hypothesis of a unit root.

Where, the Null hypothesis is:

H0: $\beta = 0$

H0: $\beta_1 = 0$ is tested against H_1: $\beta_1 \neq 0$ by comparing the calculated t-ratio of β_1 with the Mackinnon critical value from tables. If calculated t-ratio is less than critical t-value, then the Null hypothesis of unit root (non-stationary) is rejected and E_{funt} is determined to be integrated of order zero I(0). If we found that by using ADF test that an individual time series is integrated of order one I(1), then that series is said to be (non-stationary) with stochastic trend.

According to Maddala and Kim (1998), Null hypothesis shows that there is a unit root in the variable and it would not be rejected unless there is overwhelming evidence against it. Dickey Fuller (DF) test assumes that errors are statistically independent and have constant variance.

Table 5.3 shows the results of both tests on all six variables (First Difference). As we expected, using first difference leads us to stationarity. Based on the results in Table 5.2, by differencing these variables, we reject the Null hypothesis of non-stationarity. That means the variables are I(1).

Table 5.3

Level Series

Variables	LGDP	LDEF	LEDU	LHTH	LSSWS	LHCA
ADF t-stat	-1.0002*	- 0.56991*	- 0.7126*	-1.622548**	-1.61403*	- 0.77810*
ADF (1%)	-2.6522	-2.6522	-2.6522	-2.6522	-2.6522	-2.6522
ADF (5%)	-1.9540	-1.9540	-1.9540	-1.9540	-1.9540	-1.9540
ADF (10%)	-1.6223	-1.6223	-1.6223	-1.6223	-1.6223	-1.6223

*significance in 1%, 5% and 10% levels

** significance in 1%, 5%

In Table 5.3, we presented the results of level series where all variables passed the test of non-stationarity, ADF, hence accepting the Null hypothesis of a unit root at all significance levels in most variables. Based on these results, all variable (LGDP, LDEF, LEDU, LHTH, LSSWS and LHCA) rejected the Null hypothesis in 1%, 5% and 10% level of significance and rejected the Null hypothesis only in 1% and 5% level of significance for LHTH.

Table 5.4

First Difference

Variables	LGDP	LDEF	LEDU	LHTH	LSSWS	LHCA
ADF-t-stat	-2.0431**	-3.23227*	-2.1736**	-1.7509***	-1.93354**	-2.56541**
ADF (1%)	-2.6560	-2.6560	-2.6560	-2.6560	-2.6560	-2.6560
ADF (5%)	-1.9546	-1.9546	-1.9546	-1.9546	-1.9546	-1.9546
ADF (10%)	-1.6226	-1.6226	-1.6226	-1.6226	-1.6226	-1.6226

* significance in 1%, 5% and 10% levels

** significance only in 5% and 10% levels

*** significance only in 10% level

Table 5.4 shows the results of both tests of all six variables (First Difference). As we expected, using first difference leads us to stationarity. Based on the results in Table 5.4, by differencing these variables, we reject the Null hypothesis of non-stationarity in10% levels of significance for all variables (LGDP, LDEF, LEDU, LHTH, LSSWS, LHCA and accept the Null hypothesis in 5% and 10% level of significance in all variables except LHTH. On the other hand, we accept the Null hypothesis in all level of significance (1%, 5% and 10%) only for LDEF.

Tables 5.4 summarized our results based on testing our hypothesis in ADF First Difference. The Null hypothesis is that the estimated error term is non-stationary (it does have a unit root) which leads to co-integration relation.

The test with a constant and (4) lag result in an estimated t-value (t-statistic) of -2.04309 and a critical value of -1.9546 at a 5% level in LGDP for example (See Table 5.4). Since in absolute terms the estimated t-value exceeds the critical value at a 5% level, the Null hypothesis of no co-integration is rejected.

5.3.2 Co-integration Technique:

As we did before in Wagner's Law versions for testing co-integration, we tested co-integration for functional government expenditure using the following type of equation:

$$E_{fun,t} = \beta_o + \beta_1 GDP_{t-1} + \epsilon_t \qquad (5.6)$$

Where, $E_{fun,t}$ is the individual category of government functional expenditure, β is parameter, GDP is the Gross Domestic Product and ϵ_t is the error term.

Again, a set of variables is co-integrated if a linear combination of their individual integrated series I(d) is stationary. This procedure needs an estimation of the co-integration regression of the form of equation (5.6) and testing whether the residual series ϵ_t has a unit root, then the variables are said to be co-integrated and hence interrelated with each other in the long run. In other word, after testing for unit root, next step is to test whether these stochastic trends in the series are co-integrated to avoid spurious regression.

5.3.3 Co-integration Results:

Testing for co-integration in our six variables is to determine whether stochastic trends in the series are indeed related to each other. If the order of integration is determined by the Dickey Fuller test, the next step is to examine whether the series are co-integrated or not, and if they are, to identify the co-integrating (long-run equilibrium) relationship. Table 5.5 showed that one co-integration relationship were found for all five categories except for LHTH where the test does not support the existence of a co-integration that represented the long-run relationship between government spending on health and GDP.

The co-integration tests are statistically significant at five percent level for all five relations except the relationship between spending on Health (LHTH) and GDP. For all five categories the two variables are I(1).

Table 5.5

Summary of Co-integration Test

TEX Categories	Statistic in I(1)				
Functional Gov. Expenditure	Eigen-Value.	Trace Test or (L. R)	Critical Value. at 5%	Critical Value. at 1%	CE(s) No.
Defense	0.515217	21.99623	12.53	16.31	(1)*
Education	0.452557	18.65880	12.53	16.31	(1)*
Health	0.318819	11.62454	12.53	16.31	(1)***
Social Security & Welfare System.	0.345123	12.70284	12.53	16.31	(1)**
Housing & Community A.	0.200929	16.094871	12.53	16.31	(1)**

L. R: indicates Likelihood Ratio Test
CE (s): indicates number of co-integration equations
* L.R. test indicates 1 co-integrating equation at 1% and 5% significance levels
** L.R. test indicates 1 co-integrating equation at only 5% significance level
*** L.R. test indicates no co-integrating equation at any level of significance

The result showed that over the long run GDP was positively related to government functional expenditure in the case of Saudi Arabia except LHTH since computed value (Trace Test = 11.62454) is less that Critical Value at both levels of significance (at 5% = 12.53) and (at 1% =16.31).

The result referring to LDEF, LEDU, LSSWS and LHCA appear in Table (5.5). For spending on defense and education categories both (LDEF and LGDP) and (LEDU and LGDP) rank (L. R) or (Trace) statistics show that the Null hypothesis is not rejected for H_0: $\beta_1 = 0$ is tested against H_1: $\beta_1 \neq 0$ which suggested the existence of one co-integration (positive) relationship at both 1% and 5% level of significance between (LDEF and LGDP) and (LEDU and LGDP) with the existence of a constant, restricted in the co-integration space. In the case of LSSWS and LHCA the Null hypothesis is not rejected for H_0: $\beta_1 = 0$ is tested against H_1: $\beta_1 \neq 0$ which too suggested the existence of one co-integration (positive) relationships at only 5% level of significance between each of these variables and LGDP. In the case of LHTH the Null hypothesis is rejected for H_0: $\beta_1 = 0$ is tested against H_1: $\beta_1 \neq 0$ which too suggested there does not exist of any co-integration relationships at any level of significance between LHTH variable and LGDP (see Figures 5.1 and 5.2).

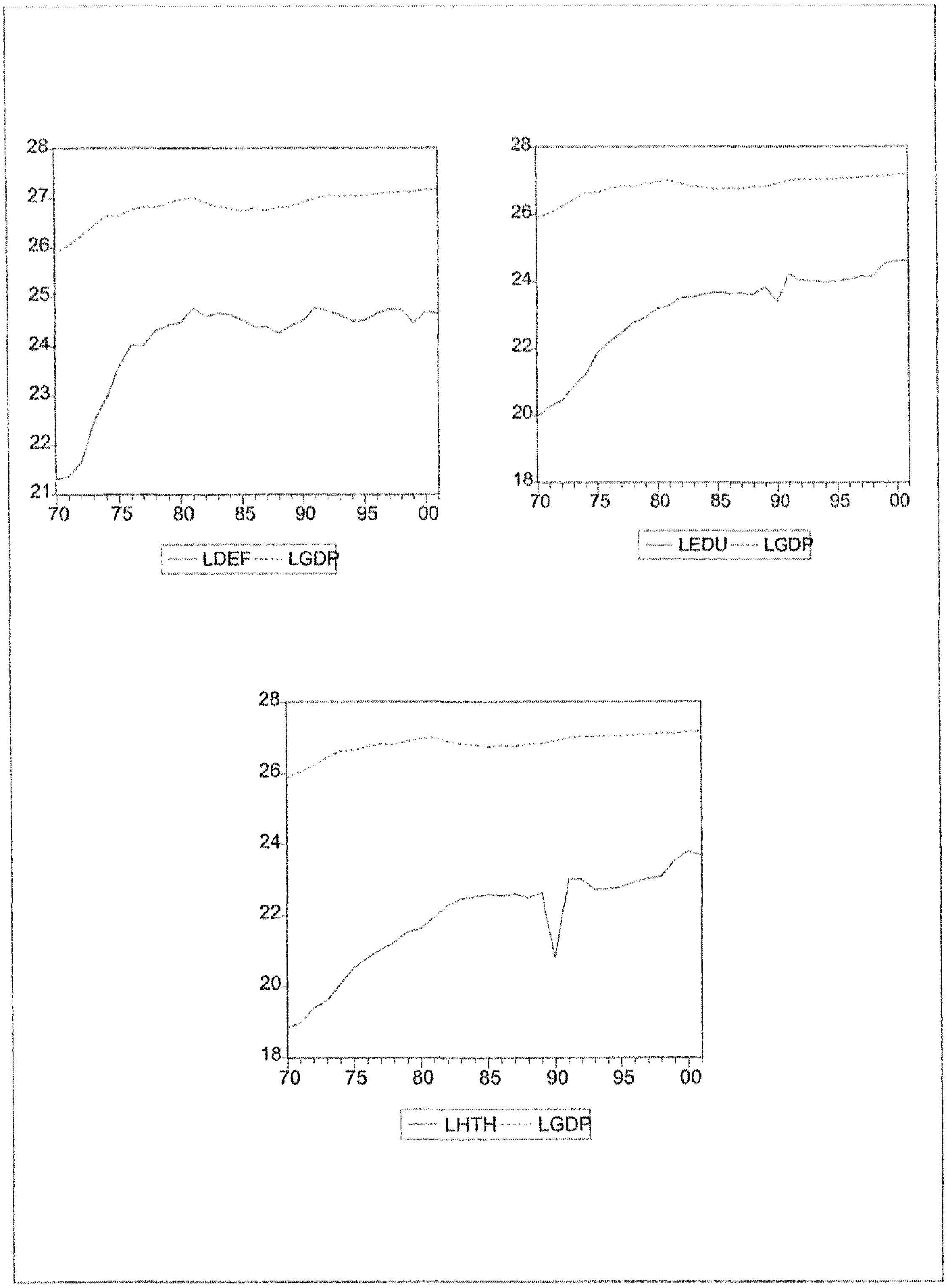

Figure 5.1 shows the long-run relationship for the LDEF, LEDU and LHTH categories based on co-integration test.

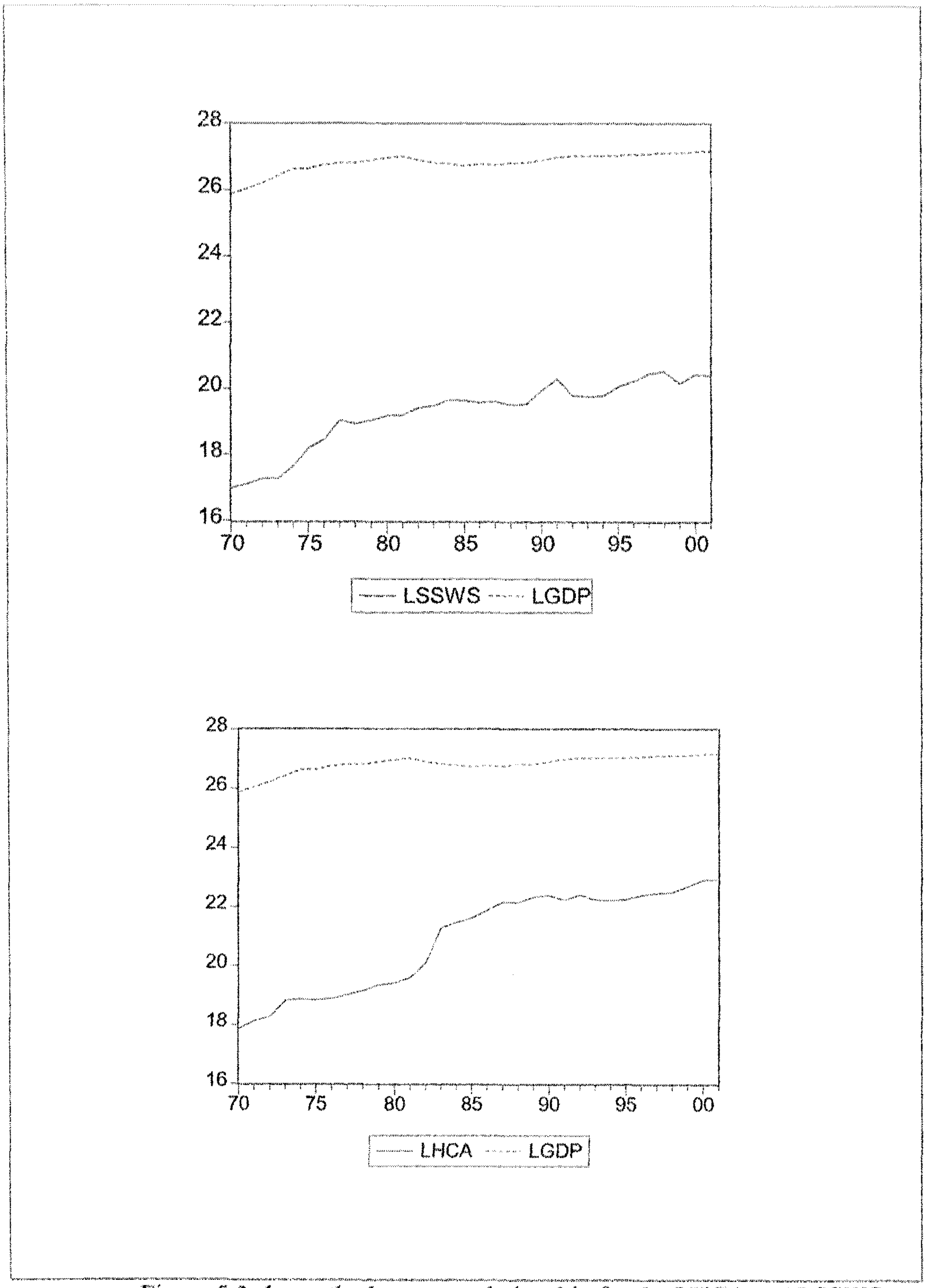

Figure 5.2 shows the long-run relationship for the LHCA and LSSWS categories based on co-integration test.

5.4 Causality Test for Government Functional Expenditure Categories.

5.4.1 Overview

As we mentioned in section one of this Chapter, correlation does not necessarily imply causality. If we have a set of time series to be co-integrated, then a Granger causality test can be an appropriate test. The following analysis is to test for causality between GDP and Government Functional Expenditure for five categories.

As mention earlier, there are four patterns of causality that could be defined based on the relationship between Expenditure and GDP in these five categories as: 1) Unidirectional Causality from GDP to government functional expenditure as hypothesized by Wagner. Thus process of economic development leads government expenditure to grow, 2) Unidirectional Causality from government functional expenditure to GDP. Following the basic macroeconomic framework causal sequence from government functional expenditure to GDP can be predicted particularly in the case of Saudi, 3) Bidirectional Causality from one to another when there is interdependence between government functional expenditure and GDP resulting in each of them to have an impact on the other, 4) No Causality between dependent variable and independent variable.

As mention earlier, it is possible that both government functional expenditure and GDP move together with no correlation between them where neither influencing the other with changes in both occurring due to external factors. In the following analysis, we applied causality test with two lags to determine the direction of the relationship between government functional expenditure in five categories and GDP in terms of logarithms.

5.4.2 Causality between LDEF and LGDP

Table 5.6 presents the causality test result based on probability values from Granger Causality Test (GCT). The reported F-statistics are standard test for joint hypothesis that LGDP does not Granger Cause LDEF. The probability for accepting the Null-Hypothesis was only 27.9% and 72.1% rejecting this hypothesis which means LGDP cause LDEF by around 72.1% all the time in the case of Saudi Arabia which is consistent with Wagner's Law. Our results from Table 5.6 presented feedback/Bidirectional causality where reported F-statistic is standard test for joint hypothesis that LDEF does not Granger Cause LGDP. The probability for accepting the Null-Hypothesis was only 17.5% and 82.5% rejecting this hypothesis which means LDEF cause LGDP by around 82.5% of all the time, indicating that the possibility of having causality from LDEF to LGDP direction is stronger than the possibility of having causality from LGDP to LDEF in the case of Saudi Arabia.

Table 5.6

Granger Causality Tests for the Relationship between LDEF and LGDP

Pairwise Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LDEF	30	1.34338	0.27916
LDEF does not Granger Cause LGDP	30	1.87010	0.17504

5.4.3 Causality between LEDU and LGDP

Table 5.7 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis

LGDP does not Granger Cause LEDU was almost 0.1% and 99.9% rejecting this hypothesis which means LGDP cause LEDU by around 99.9% of all the time in the case of Saudi Arabia which is consistent with Wagner's Law. In the other direction, the probability for accepting the Null-hypothesis of LEDU does not Granger Cause LGDP is about 59.1% and 40.9% rejecting this hypothesis which means LEDU cause LGDP by only 40.9% of all the time in the case of Saudi Arabia. The result of causality test indicates that the existence of feedback causality (Bidirectional) between LEDU and GDP in the long-run is not strong enough (there is a possibility of no causality) as shown in Table 5.7.

Table 5.7

Granger Causality Tests for the Relationship between LEDU and LGDP

Pairwise Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LEDU	30	8.31313	0.00171
LEDU does not Granger Cause LGDP	30	0.53625	0.59152

5.4.4 Causality between LHTH and LGDP

Table 5.8 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis – LGDP does not Granger Cause LHTH- was only 6.5% and 93.5% rejecting this hypothesis which means LGDP cause LHTH by around 93.5% all the time in the case of Saudi Arabia which is consistent with Wagner's Law. On the other hand, the results obtained in Table 5.8 presented strong evidence of no causality existing from LHTH to GDP in the long-run. The probability for accepting the Null-Hypothesis –LHTH does not

Granger Cause LGDP- was about 94.5% and 5.5% rejecting this hypothesis which means LHTH cause LGDP by only 5.5% all the time in the case of Saudi Arabia.

Table 5.8

Granger Causality Tests for the Relationship between LHTH and LGDP

Pairwise Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LHTH	30	3.03707	0.06596
LHTH does not Granger Cause LGDP	30	0.05593	0.94572

5.4.5 Causality between LSSWS and GDP

Table 5.9 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis - LGDP does not Granger Cause LSSWS- was only 10.8% and 89.2% rejecting this hypothesis which means LGDP cause LSSWS by around 89.2% of all the time in the case of Saudi Arabia which is consistent with Wagner's Law. On the other direction, the probability for accepting the Null-hypothesis of LSSWS does not Granger Cause LGDP is about 66.5% and 33.5% rejecting this hypothesis which means LSSWS cause LGDP by only 33.5% of all the time in the case of Saudi Arabia. The result of causality test indicates that the existence of feedback causality (Bidirectional) between

LEDU and GDP in the long-run is not strong enough (there is a possibility of no causality) as shown in Table 5.9.

Table 5.9

Granger Causality Tests for the Relationship between LSSWS and LGDP

Pairwise Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LSSWS	30	2.43138	0.10842
LSSWS does not Granger Cause LGDP	30	0.41430	0.66525

5.4.6 Causality between LHCA and GDP

Table 5.10 presents the causality test result based on probability values from Granger Causality Test (GCT). The probability for accepting the Null-Hypothesis - LGDP does not Granger Cause LHCA- was only 23.8% and 72.2% rejecting this hypothesis which means LGDP cause LHCA by around 72.2% of all the time in Peacock-Wiseman's Version in the case of Saudi Arabia which is consistent with Wagner's Law. Table 5.10 presented causality result from LHCA to LGDP where the probability for accepting the Null-hypothesis was about 79.1% and only 20.9% rejecting the hypothesis which means LHCA cause LGDP only by about 20.9% of all the time in the case of Saudi Arabia which indicates that there is no scientific indication for the existence of causality in this direction.

Table 5.10

Granger Causality Tests for the Relationship between LHCA and LGDP

Pairwise Granger Causality Tests			
Sample: 1970 2001			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
LGDP does not Granger Cause LHCA	30	1.52116	0.23800
LHCA does not Granger Cause LGDP	30	0.23646	0.79117

5.5. Summary of Results

The test results for the five categories used to examine the direction of causality between the government functional expenditure and GDP series with (one lag, two lags and three lags) are reported in Tables 5.11 and 5.12 and Figures 5.3 and 5.4.

Table 5.11
Summary of Testing Test for Granger Causality (1970-2001)

Variables		F-Ratio					
Effect	Cause	One Lag		Two Lags		Three Lags	
LGDP	LDEF	5.79626	(0.02290)	1.34338	(0.27916)	0.94234	(0.43713)
LDEF	LGDP	5.77442	(0.02313)	1.87010	(0.17504)	2.01243	(0.14157)
LGDP	LEDU	10.4837	(0.00309)	8.31313	(0.00171)	3.94998	(0.02146)
LEDU	LGDP	0.63612	(0.43183)	0.53625	(0.59152)	0.56932	(0.64109)
LGDP	LHTH	9.39240	(0.00478)	3.03707	(0.06596)	2.72225	(0.06890)
LHTH	LGDP	1.18251	(0.28612)	0.05593	(0.94572)	0.71208	(0.55518)
LGDP	LSSWS	6.15171	(0.01941)	2.43138	(0.10842)	2.10746	(0.12833)
LSSWS	LGDP	0.12742	(0.72380)	0.41430	(0.66525)	1.17367	(0.34238)
LGDP	LHCA	2.85028	(0.10247)	1.52116	(0.23800)	5.16993	(0.00742)
LHCA	LGDP	1.70795	(0.20188)	0.23646	(0.79117)	0.57548	(0.63718)

P-value of the F-ratio represented in parentheses.

Table 5.12

Type of Causality between Government Functional Expenditure and GDP (two lags)

Relationship		Causality		
(Government Functional Expenditure & GDP Direction)		Unidirectional Causality only from one to another	Feedback/ Bidirectional Causality	No causality
DEF	LDEF → LGDP	No	Yes, by (72.1 %)	No
DEF	LGDP→ LDEF	No	Yes, by (82.5 %)	No
EDU	LEDU → LGDP	No	No	No
EDU	LGDP→ LEDU	Yes, by (99.9 %)	No	No
HTH	LHTH→ LGDP	No	No	No
HTH	LGDP→ LHTH	Yes, by (94.5%)	No	No
SSWS	LSSWWS→ LGDP	No	No	No
SSWS	LGDP→ LSSWS	Yes, by (89.2 %)	No	No
HCA	LHCA→ LGDP	No	No	No
HCA	LGDP→ LHCA	Yes, by (79.1)	No	No

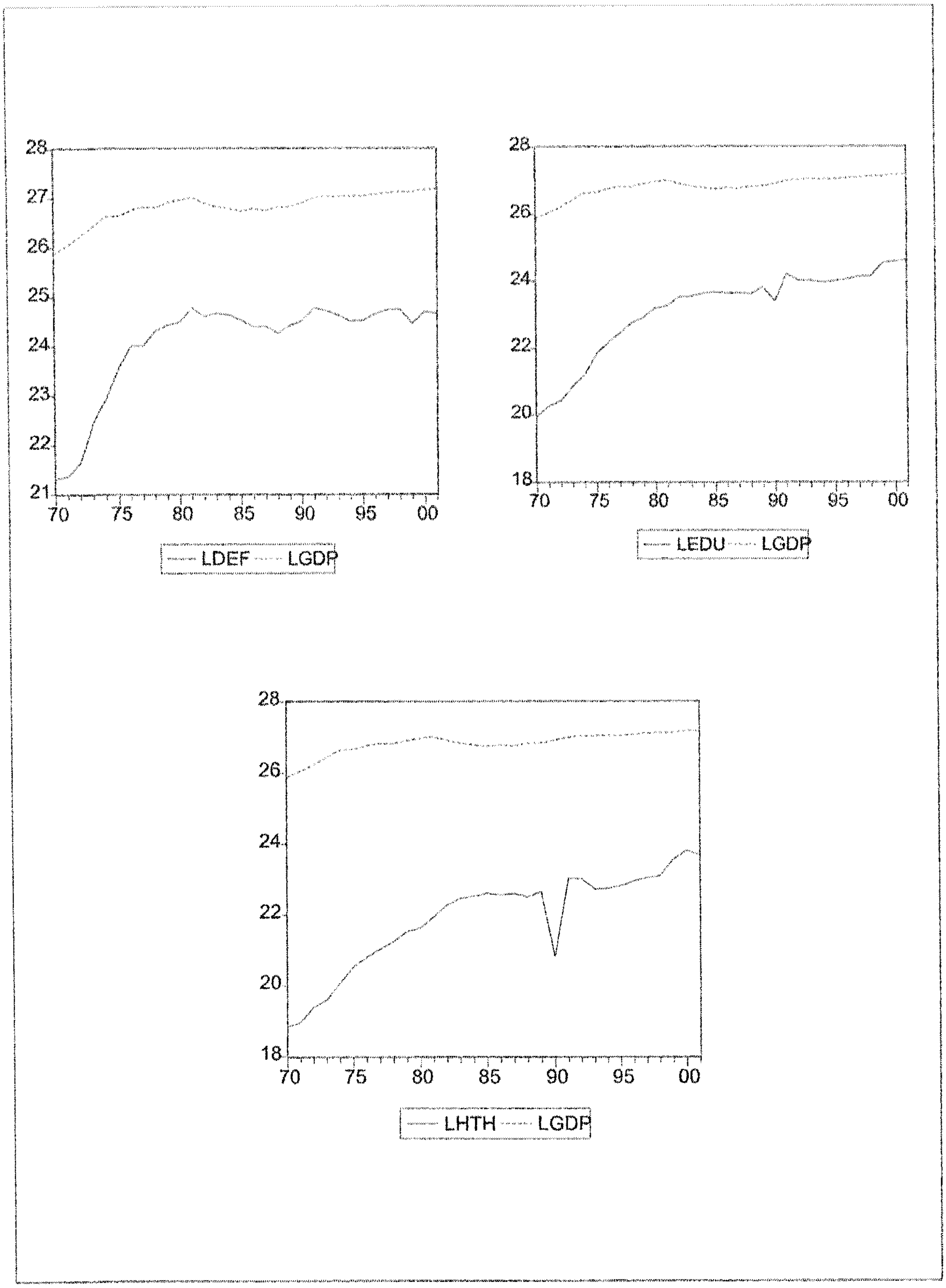

Figure 5.3 Causality results between government functional expenditure and GDP in LDEF, LEDU and LHTH categories.

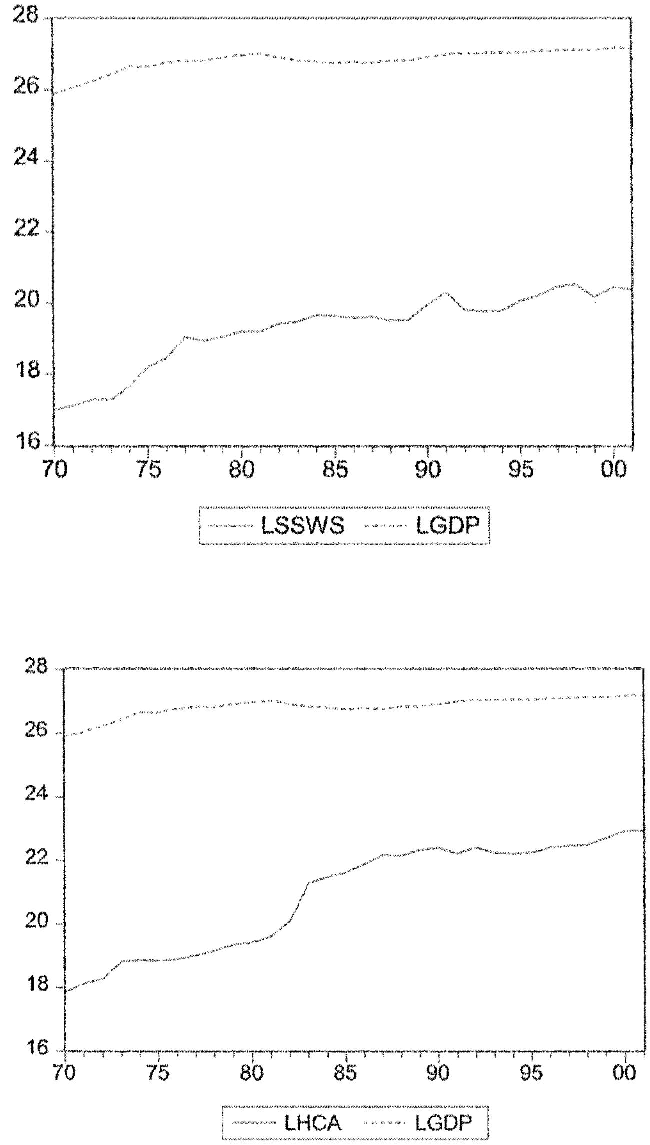

Figure 5.4 Causality results between government functional expenditure and GDP in LSSWS and LHCA categories.

CHAPTER: 6

DISCUSSION AND SUMMARY

6.1 Overview

Economists in any nation need to understand the economic conditions of their nation as well social conditions first to understand and analyze the growth of government expenditure during a certain period. This Chapter attempts to shed further analysis on the issue of the link between government expenditure and GDP in the Wagner's Law versions format in the case of Saudi Arabia.

Saudi Arabia economy has experienced an extraordinary transformation for over three decades (1970-2001). The government of Saudi Arabia decided that, during this period of extraordinary gains in revenues and general economic surplus, two channels of ensuring the future growth of the kingdom would be through the development of substantial physical infrastructure and human resources development bases (see Table 1.12).

Saudi Arabia's achievements have not come cheaply. For the past six development plans, Saudi Arabia has spent SR 34.1 billion in the First plan (1970-1975), SR 347.2 billion for the Second plan (1975-1980), SR 625.2 billion for the Third plan (1980-1985), SR 348.9 billion for the Forth plan (1985-1990), SR 340.9 billion for the Fifth plan (1990-1995) and SR 413.1 billion for the Sixth plan (1995-2000), for cumulative expenditure of SR 2.1114 trillion ($563.04 billion). Saudi Arabia's enormous achievements in social services and rapid growth in economy have been well-documented and have been the subject of a number of studies and reports.

As can be seen from all available statistical information, Saudi Arabia has made financial commitment toward its development.

6.2 Summary of Findings:

The purpose of this study had been to shed some light on the determination of the causal relationships between government expenditure and GDP growth and its effects in Saudi Arabia economy. It has attempted to estimate the economic determination of relationships represented by Wagner's Laws. Several theoretical and empirical approaches have been incorporated into this study. The major aim of this study had been to investigate the long-run relationship between government expenditure and GDP that represented by six versions of Wagner's Law with the support of co-integration and Granger-Causality techniques in the case of Saudi Arabia to determine the causal relationship between these two variables. The second aim of this study is to investigate the long-run relationship between five government functional expenditure and GDP based on Wagner's hypothesis with the support of co-integration techniques in the case of Saudi Arabia and to determine the causal relationship between these two variables in five categories of government functional expenditure.

Using data for Saudi Arabia, we discussed the implications of the six existing versions of Wagner's Law for the period between 1970 and 2001. After testing the long-run relationship represented by these six versions of Wagner's Law, testing for co-integration and applying Granger-causality-testing, the analysis showed a high level of consistency with Wagner's hypothesis.

The empirical results suggest that testing the six existing versions of Wagner's Law provides an adequate explanation of the long-run relationship between government expenditure and GDP and its direction in Saudi Arabia.

This study contains two chapters dealing with the explanation of the growth that was observed in government expenditure and its impact on GDP growth, where the major hypothesis that tested here is Wagner's Law of expanding state activities.

In Chapter (4), our empirical results bring out strong evidence that they are supportive of such Law in the case of Saudi Arabia especially, in the non-share versions. The six most known versions of Wagner's Law are[4]:

1). Peacock-Wiseman [1968]: Log TEX = a + b Log GDP. (Non-Share)

2). Pryor [1969]: Log TEXC = a +b Log GDP. (Non-Share)

3). Goffman [1968]: Log TEX = a + b Log (GDP/P). (Non-Share)

4). Musgrave [1969]: Log (TEX/GDP) = a +b Log (GDP/P). (Share)

5). Gupta [1967]: Log (TEX/P) = a + b Log (GDP/P). (Non-Share)

6). Mann [1980]: Log (TEX/GDP) = a + b Log GDP. (Share)

The empirical findings of Saudi Arabia indicate that there are four versions out of six which are statistically significant. The study showed that the elasticity coefficient of government expenditure with respect to GDP were greater than unity in these four versions (Peacock and Wiseman, 1968; Pryor, 1969; Goffman, 1968; and

[4] TEX= Total Government Expenditure, GDP= Gross Domestic Products, TEXC= Total Government Expenditure for Consumption, GDP/P= Gross Domestic Product Per Capita, TEX/GDP= The Ratio of Total Government Expenditure to Gross Domestic Product and TEX/P= The Total Government Expenditure Per Capita.

Gupta, 1967) which are in accordance with Wagner's hypothesis. The empirical results also indicate that the elasticity coefficient of government expenditure with respect to GDP is inelastic that (Musgrave, 1969) and (Mann, 1980) are statistically insignificant.

According to Mann (1980), he found out that four non-share versions of Wagner's Law (Peacock and Wiseman, 1968; Pryor, 1969; Goffman, 1968; and Gupta, 1967) were substantial for Mexico during the period of the study.

However, Mann considers the share versions to be more logical when trying to examine the course and pattern of government expenditures during development. Comparing our findings with Mann's findings in Mexican case, this study came up with similar results in non-share and share regards. Non-share versions (which include, Peacock and Wiseman, 1968; Pryor, 1969; Goffman, 1968; and Gupta, 1967) in the case of Saudi Arabia support Wagner's prediction since most of the statistic indicators were significant. On the other hand, the two share versions (Musgrave, 1969) and (Mann, 1980) were less significance which leads to poor evidence of supporting Wagner's predictions.

For the purpose of supporting Wagner's Law, we did use some econometrics techniques such as co-integration test and Granger Causality test. Based on our approach in Chapter 4, the annual unit-root testing and co-integration methodology are used to examine behavioral relationship between government expenditure (TEX) and gross domestic product (GDP) on the basis of annual data in Saudi Arabia from 1970 to 2001 using the same six cases (variables) that represented the six versions of Wagner's Law. Unit-root tested for Augmented Dickey-Fuller statistics (ADF-Level) was found statistically significant at 1% and 5% level of significance for all variables (LGDP, LTEX, LTEXC, LTEX/P, LTEX/GDP and LGDP/P) and statistically significant at 10% level of significance for all variables except (LTEX/P and LGDP/P).

The ADF was used to test for stationarity of data. The Null-hypothesis is that the data is non-stationary (i.e. it has a unit root). The data was tested in level form and in first difference form. The results of the unit root tests are summarized in Table 6.1.

Table 6.1

Summary of ADF Unit Root Test in Levels and Differences (Six Versions)

Unit Root test		
Variables	ADF t-stat (levels)	ADF t-stat (differences)
LGDP	-1.38763*	-4.40178*
LTEX	-2.00349*	-3.82868*
LTEXC	-1.31242*	-3.02340**
LTEX/GDP	-2.23140*	-3.85133*
LTEX/P	-2.69415**	-3.31676**
LGDP/P	-2.83043**	-4.49967*

Critical Values: at 1% = -3.670; at 5% = -2.963; at 10% = -2.621
* Significant at all levels (1%, 5% and 10%)
** Significant at the two levels (1% & 5% in Level and 5% & 10% difference)

Table 6.1 shows that the ADF test statistic for the data in level form implies rejection of Null hypothesis at 1% and 5% significance level for all the variables. The results were found the same when the data are expressed in first difference. The ADF test statistics indicated rejection of the Null hypothesis of non-stationary at 5% and 10% significance level for all variables.

Econometricians and time series analysts theorized that the possibility of running regression between two non-stationary variables in levels. The argument here is that although any two variables to be regressed may be non-stationary, their linear combination would be stationary. Since our purpose is to find a common trend among these series to support Wagner's Law assumption, the presence of co-integration indicates a linear combination of these non-stationary series. In our six versions using the natural log of the variables, the Null-Hypothesis that there is at most zero co-integrating vector is rejected at 5% level of significance. Hence employing the annual data, there is an evidence of at least one co-integration vector. On the other hand, based only on the trace test the results of the annual data support the evidence of co-integration.

We conclude that the six variables have a unit root and thus are integrated in process I(1). In addition, evidence was found that the two variables in the six versions are co-integrated.

In the last section of Chapter 4 for supporting six versions of Wagner's Law versions, we discussed the issue of causality that can be applied for testing the directions of the variables in these six versions. Our major aim here was to investigate the casual relationship between government expenditure and GDP according to these six versions as hypothesized by Granger (1969).

Using data for Saudi Arabia during 1970-2001, Granger causality-testing procedures as described in Chapter 4 were applied for the analysis. The analysis showed a clear evidence of consistent results across the six versions that there is a significant or casual (bidirectional) relationship between government expenditure and GDP in all six versions in the case of Saudi Arabia as shown in Table 6.2. The casual (bidirectional) relationship between government expenditure and GDP supports both Wagnerian and Keynesian hypothesis. On the other word, if the causality is Wagnerian, government expenditure is relegated to an inactive role which means government expenditure plays no role in economic growth, and therefore cannot be relied upon as a policy instrument. If causality represents Keynesian hypothesis, it obtains the status of an important policy variable which means government expenditure becomes a policy variable which can be used to influence economic growth.

Table 6.2
Summary of the Granger-Causality Test for the six versions

Versions	TEX → GDP (Only)	GDP→ TEX (Only)	TEX↔ GDP
Peacock and Wiseman(1967)	No	No	Yes
Pryor (1969)	No	No	Yes
Goffman (1968)	No	No	Yes
Musgrave(1969)	No	No	Yes
Gupta (1967)	No	No	Yes
Mann (1980)	No	No	Yes

In Chapter 5, the study focused on testing Wagner's Law for the major components of the government functional expenditure separately. The focus was on the following five categories:

1). Expenditure on Defense: $\text{Log EDEF} = \alpha + \beta \text{ Log GDP}$.

2). Expenditure on Education: $\text{Log EEDU} = \alpha + \beta \text{ Log GDP}$.

3). Expenditure on Health: $\text{Log EHTH} = \alpha + \beta \text{ Log GDP}$.

4). Expenditure on Social Security & Welfare: $\text{Log ESSWS} = \alpha + \beta \text{ Log GDP}$.

5). Expenditure on Housing & Community: $\text{Log EHCA} = \alpha + \beta \text{ Log GDP}$.

The computed elasticities of such categories are found to be dramatically high and greater than unity in all categories. According to some of Wagner's Law interpretations, the involvement of government sector during development process results in economic growth in the relative share of government sector in GDP as a result of growth in demand for government services. Many studies showed that government sector's role during development is very important as well as crucial issue in both political and social levels.

Based on our findings in Chapter 5, we have examined the role of the five categories of government functional expenditure in terms of promoting growth in real GDP in Saudi Arabia. Our results suggested that increase in DEF, EDU, HTH, SSWS and HCA are caused by an increase in Saudi Arabia GDP with a positive long-run relationship where causality run in one direction from GDP to government functional expenditure in the cases of EDU, HTH, SSWS and HCA. The case was different in government spending on defense DEF where causality runs from government functional expenditure to GDP.

In short, Chapter 5 showed that the government sector of Saudi Arabia exhibits a tendency to increase its expenditures that relate to the functional purposes.

The empirical findings of Saudi Arabia indicate that in all of the five models of government functional expenditure are statistically significant. The study showed that the elasticity coefficient of government functional expenditure with respect to GDP is greater than unity in five categories (Defense, Education, Health, Social security & Welfare System and Housing & Community Amenities) which are in accordance with Wagner's hypothesis.

In Chapter 5 we did use the econometrics techniques that used in Chapter 4 such as co-integration test and Granger Causality test for the purpose of supporting Wagner's Law only. Based on that, the unit-root testing (in an annual term) and co-integration methodology were used to examine behavioral relationship between government functional expenditure ($TEX,_{fun}$) and gross domestic product (GDP). This was on the basis of annually data in Saudi Arabia from 1970 to 2001 using six (variables) that represented the five categories of government functional expenditure.

Unit-root test was found statistically significant at 1% and 5% level for all variables (LDEF, LEDU, LHTH, LSSWS and LHCA) and statistically significant at 10% level all variables except (LHTH)

The Augmented Dickey-Fuller statistics (ADF) was used to test for stationarity of data. The Null-hypothesis is that the data is non-stationary (it has a unit root). The data was tested in level form and in first difference form. The results of the unit root tests are summarized in Table 6.3.

Table 6.3 shows that the ADF test statistic for the data in level form implied rejection of Null hypothesis at 1% and 5% significance level for all variables (LGDP, LDEF, LEDU, LHTH, LSSWS and LHCA). But when the data is expressed in first

Table 6.3

Summary of ADF Unit Root Test in Levels and Differences (Five Categories)

Unit Root test		
Variables	ADF t-stat (levels)	ADF t-stat (first differences)
LGDP	-1.00226*	-2.04309**
LDEF	-0.56996*	-3.23227*
LEDU	-0.71267*	-2.17360**
LHTH	-1.62254**	-1.75095***
LSSWS	-1.61403*	-1.93354**
LHCA	-0.77801*	-2.56541**

Critical Values: at 1% = -2.656; at 5% = -1.954; at 10% = -1.622
* Significant at all levels (1%, 5% and 10%)
** Significant at two levels (1% & 5% in level and 5% &10% in difference)
*** Significant at one level (1% in level and 10% in difference)

differences, the ADF test statistics indicated rejection of the Null hypothesis of non-stationary at 10% significance level for all variables, at 5% and 10% all variables except (LHTH) and at all levels of significant (1%, 5% and 10%) only in (LDEF) variables.

Econometricians and time series analysts theorized that the possibility of running regression between two non-stationary variables in levels. The argument here is that even though any two variables to be regressed might be non-stationary, their linear combination would be stationary. While our focus is to determine a common trend among these series for supporting Wagner's Law assumption, the presence of co-integration indicates a linear combination of these non-stationary series.

In our five categories using the natural log of the variables, the Null-Hypothesis that suggested there is zero co-integrating vector is rejected at 5% level of significance except the case of spending on Health, the Null hypothesis is not rejected. Hence employing the annual data, there is evidence of at least one co-integration vector based on Trace test.

We conclude that the six variables (LGDP, LDEF, LEDU, LHTH, LSSWS and LHCA) have a unit root and thus are integrated in process I(1). In addition, evidence was found that all two variables in the five categories are co-integrated except in the case of government spending on Health where Trace test indicate that there is no co-integration equation found between LHTH and LGDP.

As we used in Chapter 4 for supporting six versions of Wagner's Law versions, last section of Chapter 5 discussed the issue of causality that can be used for testing the directions of the variables in these five categories. The major objective here was to investigate the casual relationship between government functional expenditure and GDP according to these five categories as hypothesized by Granger (1969).

Using data for Saudi Arabia from 1970-2001, Granger causality-testing procedures as described in Chapter 5 were applied for the analysis. The analysis showed a clear evidence of consistent results across the five categories and was in only one case which exhibited bidirectional relationship between government expenditure on defense and GDP. Four cases have unidirectional causality relationship from GDP to government expenditure on education, health, social security & welfare system and housing & community amenities. In these four categories of government functional expenditure there is only one way causality from GDP to government functional expenditure as shown in Table 6.4.

Table 6.4

Summary of the Granger-Causality Test for the five categories

Versions	$TEX_{(fun)} \rightarrow$ GDP (Only)	GDP$\rightarrow$ $TEX_{(fun)}$ (Only)	$TEX_{(fun)} \leftrightarrow$ GDP
DEF	NO	NO	Yes
EDU	NO	Yes	NO
HTH	NO	Yes	NO
SSWS	NO	Yes	NO
HCA	NO	Yes	NO

Table 6.4 shows that causality studies run from GDP to TEX in all four categories (EDU, HTH, SWSS and HCA) but LDEF. LDEF shows bidirectional causality. General speaking, all the five categories of government functional expenditure are supporting Wagner's hypothesis in terms of causality direction. Whether changes in national income growth help predict changes in public expenditure growth or public expenditure growth help predict changes in national

income, it remains an important issue of sustained interest in the empirical public finance literature.

6.3 Why Defense has a high level of significant and Health has low level of significant?

Economic impact on military expenditure has been the issue of many empirical studies like (Joerding, 1986; Chowdhury, 1991; Lacivita and Frederiksen, 1991; Alexander, 1995; Madden and Haskhurst, 1995; Chatterji, 1992 and Kusi, 1994).

Fan and Fan (1998) in their cross sectional study for 68 developing countries in the world, found that on disaggregating the total government expenditure into defense and health subgroups, a strong negative effect on the defense expenditures and a positive effect of the health expenditures on the nation's economic-social well-being can be established.

Chowdhury (1990) in his empirical study of 55 countries, investigate the direction of causality between defense and economic growth and found that there were only 15 countries which indicated that military spending causes economic growth causality from DEF to GDP. Also found were unidirectional causality in 7 countries from GDP to DEF, bidirectional between DEF and GDP for only three countries and no significant relationship between military expenditure and economic growth between the variables was found for 30 countries.

In this study, the empirical results show that there is a bidirectional relationship between spending on defense and GDP in the case of Saudi Arabia.

Theoretically, there are grounds to believe that defense spending and economic growth should have some causal relationship in the developing countries. According to Benoit (1973), investments in infrastructure and human capital development in economies operating below full employment as evidenced in these economies are bound to have positive effect on the economy due to military expenditure. However, there is law and security needs of any country, the effects of defense spending can not be ignored.

In general there are two important purposes for increasing spending on defense in Saudi Arabia and in many developing countries: it absorbs the idle labor in society, while at the same time, meeting the security needs of the country. Based on these two purposes, I believe that policy makers should select levels of defense spending that yields maximum benefits.

In the case of Health spending, the situation in Saudi Arabia is a quite different because of massive spending on this sector. During the last two decades, health service took the fourth highest place in priority of the government spending in the development plans. Health services expenses increased because government provides most of these services for Saudi resident for free including hospital and public health care. Moreover, Saudi government encouraged the growth in health care services through greater participation in financing the establishment of health facilities and increased investment in the manufacturing of pharmaceuticals and medical equipment. In addition, the labor costs in this sector are very high which adds some expenses to government spending in health services.

6.4. What is New in this Study Comparing to Ghamdi's Study in 1983?

This study presented some new features of Saudi Arabian economy. Using the extension time series of Saudi economy from 1970 to 2001 which added more than twenty years to Ghamdi Study, enable us to analyze the long run relationship between government expenditure and GDP in more details. Ghamdi (1983) used the data from 1960 to 1980 to test the relationship between public spending and economic growth, emphasizing the application of the old version of Wagner's Law (five system equation) and analyzing the main variable elasticities. Even though, number of observations, economics conditions and level of development were different in both studies, the size of elsticities in the first five versions of Wagner's Law (which include, Peacock and Wiseman, 1968; Pryor, 1969; Goffman, 1968; Musgrave, 1969 and Gupta, 1967) were found almost the same and consistence with Wagner hypothesis in the case of Saudi Arabia.

Therefore, reevaluating this relationship with new methods of empirical testing is very important to measure the new phase of Saudi Arabia's economic growth and to find out the impact of government spending on economic growth.

The new thing about this study in terms of applying Wagner's Law is testing Mann's version in Saudi Arabia economy which considers the share version (TEX/GDP) to be more logical when trying to examine the cause and pattern of government expenditures during development. Another feature of this study is using the time series techniques such as Co-integration and Granger Causality to have more details about the nature of the long-run relationship between GDP and government expenditure and its direction.

Initially, the data series used were found to be non-stationary in levels, but stationary in differences. As a result the models were found to be co-integrated. Co-integration is essential for the valid test of Wagner's Law. The flow of causality seems to running in the two-way direction (bidirectional) from output GDP to government expenditure and from government expenditure. Therefore an important implication of the analysis for conduct of policy in Saudi Arabia is that the government should enlarge its size and increase its role in economy. Table 6.5 presents the major differences between this study and the 1983's study made by Ghamdi.

Table (6.5)

The major differences between this study and the 1983's study made by Ghamdi

Issue	This Study	Ghamdi's Study
1) Observations	It covered the period between 1970 to 2001	It covered the period between 1960 to 1980
2) Versions	It tested the existing six version of Wagner's Law.	It tested the first five versions of Wagner's Law
3) Base year	It used the 1999 as the base year.	It used 1970 as the base year.
4) Economic Condition of Saudi Arabia	Data used translated the current economic condition of Saudi Arabia.	Data used translated the economic condition of Saudi Arabia in 1960s and 1970s.
5) Tests	It used OLS, Co-Integration and Granger Causality techniques	Only OLS estimation
6) Direction of the long-run relationship	Determined by using Granger Causality techniques	Not determine
7) General focus of the Study	The main focus was on the functional government expenditure (FGE).	It studied the government expenditure for consumption (GEC) in general.
8) Specific focus of the study	It analyzed effect of "Rationalized Spending Policy" (1997).	It studied the effect of the massive spending in the 1960s and 1970s especially, on the infrastructure.

6.5 CONCLUSION

One can not conclude the discussion without mentioning some fundamental factors that determines potential tendency of Saudi Arabia development. Since the beginning of the 1970s, Saudi Arabia has seen a creation of lot of government measures. These were designed at promoting the development of the government sector. It is important to point out that the increasing size of government activity has influenced the function of both government sector and private sector. However, the growing government defense expenditures in the 1980s had some serious repercussions on governmental finance. In addition, a country's potential for growth and development depends, to a large extent, on its endowment of natural and human resources since government expenditure in education and health care are in fact investments which could be more important than the incentive effect of spending on luxury good.

In our study, the results of the long-run analysis in Chapter 4 indicated that all elasticties of government expenditure are greater than one in all six versions except the share versions (Musgrave and Mann) which are in accordance with Wagner's hypothesis. These results supported by Co-integration technique and causality test for determining the nature of long-run relationship and the direction of this relationship. Our investigation through the period between 1970 and 2001 does not support policy makers to reduce government expenditures.

We obtained the same results in Chapter 5 from our elasticity analysis of determining the relationship between government functional expenditure and GDP with support of Co-integration technique and causality test for the nature and direction of long-run relationship. Our results indicate that all elasticities in the five categories are greater than unity which gives us an indication that an increase of spending on these five categories would caused by the increase in GDP. Our findings are supported by the results of co-integration and Causality test for determining the nature and direction of the long-run relationship. These findings do not support decision makers in Saudi Arabia for focusing on spending cuts on these categories.

6.6: SUGGESTIONS FOR FURTHER RESEARCH

6.6.1: The Evaluation of Government Expenditure on Infrastructure

It can be argued that at least for now, more than adequate level of infrastructure is in place, and even with a recovering of the economy, Saudi Arabia will not have to worry about restricted accesses due to the lack of infrastructure for some time. It will, however, be unfortunate if by the time economic diversification takes hold, it is discovered that the existing infrastructure is no longer appropriate, whether due to age, inadequate maintenance, or geographical concentration.

Due to inadequate planning and rapid implementation, the development of infrastructure in Saudi Arabia has resulted in overcapacity in some components and areas, while others are still underserved. It would have been advisable to have implemented the policy toward infrastructure more slowly, as infrastructure needs are difficult to predict, especially in a rapidly changing economy subject to vast structural transformations. The cost of this policy has been the opportunity cost of capital associated with overcapacity, the cost of additional infrastructure to accommodate inflows of labor to work on infrastructure (infrastructure "feeding itself"), the additional maintenance cost and in the future, the possibility that some of the infrastructure may be abandoned. At this time, government should make a comprehensive assessment of the existing infrastructure to determine the specifics of several policy options. Because of the lack of empirical study in subject, one can specify an independent unit for evaluating government expenditure on infrastructure

6.6.2: Privatization and the Growth of Government Expenditure

The main objective of the privatization program is to improve the efficiency of the utilities - and rationalize public expenditure. Meanwhile, receipts from sell-offs could be used to redeem the national debt. The government of Saudi Arabia declared privatization as the "strategic choice" for the Kingdom. It devoted to encourage more private investment in infrastructure and management projects. The power and telecommunication sectors have been corporatized, ahead of their privatizations. Therefore, I believe it is very important to give the issue of "strategic choice" and its impact on the growth of government expenditure some consideration and analyzed the impact of privatization in Saudi Arabia.

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APPENDICES

Appendices A.1 and A.2 provide examples of the aggregate data of Saudi economy. Appendix A.1 illustrates the government expenditure for consumption (TEXC) which obtained from subtracting non-government total expenditure for consumption (Non-TEXC) from total government expenditure (TEX). Appendix A.2 illustrates the percentage share of the five government functional expenditure categories to the GDP.

Appendix A.1

TEXC = TEX – Non-C*

Year	TEX	Non-C	TEXC
1970	3,797,000	498,000	3,299.000
1971	4,286,000	570,000	3,716.000
1972	5,336,000	562,000	4,774.000
1973	9,863,000	1,098,000	8,765.000
1974	15,910,000	2,239,000	13,671.000
1975	28,882,000	4,098,000	24,784.000
1976	41,035,000	3,884,000	37,151.000
1977	47,034,000	5,593,000	41,441.000
1978	71,905,000	16,850,000	55,055.000
1979	77,564,000	12,728,000	64,836.000
1980	81,914,000	10,139,000	71,775.000
1981	128,527,000	37,179,000	91,348.000
1982	126,904,000	36,570,000	90,334.000
1983	121,625,000	23,902,000	97,723.000
1984	115,647,000	14,619,000	101,028.000
1985	114,388,000	16,220,000	98,168.000
1986	106,367,000	15,563,000	90,804.000
1987	107,707,000	15,673,000	92,034.000
1988	97,417,000	13,354,000	84,063.000
1989	114,299,000	13,429,000	100,870.000
1990	124,704,000	7,570,000	117,134.000
1991	165,000,000	16,500,000	148,500.000
1992	148,965,000	18,718,000	130,247.000
1993	127,779,000	11,151,000	116,628.000
1994	119,562,000	10,347,000	109,215.000
1995	122,849,000	10,148,000	112,701.000
1996	140,255,000	14,560,000	125,695.000
1997	151,651,000	15,344,000	136,307.000
1998	156,650,000	15,732,000	140,918.000
1999	154,094,000	6,748,000	147,346.000
2000	183,804,000	12,131,000	171,673.000
2001	188,695,000	13,198,000	175,497.000

*Non-C denoted to Non Government Expenditure for consumption

Appendix A.2

The percentage share of the five government functional expenditure categories to the GDP

Year	GDP	DEF/GDP Share (%)	EDU/GDP Share (%)	HTH/GDP Share (%)	SSWS/GDP Share (%)	HCA/GDP Share (%)
1970	174,439	1%	0.26%	0.08%	0.03%	0.03%
1971	203,916	0.90%	0.31%	0.08%	0.01%	0.03%
1972	245,423	1%	0.30%	0.10%	0.01%	0.03%
1973	301,047	1.80%	0.38%	0.10%	0.01%	0.04%
1974	369,725	2.50%	0.40%	0.14%	0.01%	0.04%
1975	373,853	4.60%	0.80%	0.22%	0.02%	0.00%
1976	418,304	6.50%	1%	0.26%	0.02%	0.00%
1977	447,075	6%	1.26%	0.30%	0.04%	0.01%
1978	442,634	8.20%	1.70%	0.37%	0.03%	0.01%
1979	485,965	8.40%	1.80%	0.46%	0.03%	0.02%
1980	517,956	8.30%	2.28%	0.47%	0.04%	0.30%
1981	543,026	10%	2.36%	0.62%	0.04%	0.40%
1982	486,611	9%	3.40%	0.97%	0.05%	0.50%
1983	448,402	11%	3.76%	1.27%	0.06%	0.70%
1984	433,633	11%	4.26%	1.39%	0.08%	0.90%
1985	409,654	10%	4.66%	1.59%	0.08%	1.09%
1986	430,824	9%	4.30%	1.47%	0.07%	0.90%
1987	415,656	9%	4.50%	1.58%	0.08%	1.02%
1988	449,767	7.70%	4%	1.31%	0.06%	0.90%
1989	450,087	9%	4.99%	1.53%	0.06%	1.11%
1990	487,242	9%	2.98%	0.22%	0.09%	0.03%
1991	530,707	10%	6.21%	1.89%	0.10%	0.30%
1992	555,051	10%	4.93%	1.79%	0.07%	0.97%
1993	555,183	9%	4.86%	1.33%	0.07%	0.88%
1994	558,415	7.90%	4.62%	1.36%	0.07%	0.81%
1995	557,956	8%	4.76%	1.43%	0.09%	0.82%
1996	576,737	8.80%	4.88%	1.60%	0.10%	0.92%
1997	591,794	9.40%	5.11%	1.71%	0.10%	0.96%
1998	608,504	9.20%	5.09%	1.76%	0.10%	0.96%
1999	603,589	7%	7.51%	2.80%	0.09%	1.19%
2000	632,906	8.40%	7.58%	3.46%	0.10%	1.41%
2001	640,413	8%	7.76%	3.03%	0.10%	1.42%