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RELATIONSHIP BETWEEN PUBLIC EXPENDITURE AND NATIONAL INCOME: AN EMPIRICAL INVESTIGATION OF WAGNER'S LAW IN CASE OF PAKISTAN

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ABSTRACT

This study examine the applicability of Wagner's law (1883), national income led growth in public expenditure in the long run, in case of Pakistan for the period of 1979-2009. Moreover the study investigates the direction of causality between public expenditure and national income. To investigate the long run relationship, the ARDL approach to cointegration and for the causality Todo and Yamamoto approach is used in the study. The study concludes that there is no long run relationship between public expenditure and national income at aggregate level. Furthermore, Todo and Yamamoto causality results asserted that there is no causality at all from directions, national income to public expenditure and public expenditure to national income.*

Keywords: public expenditures, national income, cointegration and granger causality.

INTRODUCTION

The relationship between public expenditure and national income was first presented by a German Economist Adolph Wagner in a way that tendency of rapid rise in government spending is also due to development in the economy. Wagner's work is based on empirical observation in a number of industrialized countries. The basic assumption of Wagner's law is that public expenditure growth continuously linked with growth of output.

Consistent and rapid growth in public expenditures has been seen in both developed and developing countries since the last century, particularly aftermath of World War II. Pakistan has been also experiencing rapid growth in public expenditures, consequently high ratio of government spending to GDP, since its formation. Table 1 is showing trend

**Wagner, A (1883), "Three extracts on public finance", translated and reprinted in R.A.Masgrave and A.T. Peacock (eds), classics in the theory of public finance, London: McMillan, 1958.*

of government spending, GDP, and ratio of government spending to GDP from period 1980-2009.

Table 1:GE = government expenditure (Millions), GDP = Gross Domestic Product (Millions).

Year	GE*	GDP*	GE % of GDP
1980	46784	234179	20
1985	80899	472157	17
1990	222828	855943	26
1995	442364	1882071	24
2000	797422	3793436	21
2005	1117000	6547590	17
2006	1401800	7623295	18
2007	1675500	8673007	19
2008	2276500	10284380	22
2009	2391500	13095039	18

**State bank handbook 2005and annual reports of SBP.*

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Above figures shows the increasing trend of government spending along with GDP. Government spending is an important fiscal policy indicator. On the average the ratio of government expenditure to GDP is 20% which is a handsome share. The significance of this study is to check and analyze is there any relationship between important fiscal indicator government spending and output in the long run in case of Pakistan. This study is different and improved from previous studies, (Afzal M, 2010; Jamshaid-ur-Rehman 2010, Rehman, Ahamd and Awan, 2007) firstly, in respect that all the previous studies empirically investigate relationship between public expenditure and output along with other control variables in their conventional form, that will work as robustness of previous studies. Secondly most recent time series technique such as ARDL approach to cointegration and Todo Yamamoto causality approach. The advantage of these techniques are easy to apply, no need of prior knowledge of unit root and particularly useful for small sample data such as in our case.

The study is divided in five sections. Section 1 is the introduction of the study. 2 theoretical background and literature review , 3rd methodology and data discussion, 4th empirical results and 5th conclusion.

THEORETICAL BACKGROUND AND LITERATURE REVIEW:

Wagner's law of increasing state activities based on historical facts, primarily of Germany, was presented by German economist, Adolph Wagner (1835-1917). According to Wagner there are inherent tendencies between the growth of economy and Gov. Activities with the result that the governmental sector grows faster than the economy. Several reasons given about this inherent long term tendency recorded in history, such as defence became increasingly more expensive over time, the state activities were increasing in their coverage like social securities , subsidies etc., the need to provide and expend the range of public goods received an increasing attention, growing population, increase urbanization, increasing prices etc. however , the vital point of Wagner's law is only to the unidirectional causal link that is from national income to government expenditure. In contrast , Keynesian hypothesis (1936) emphasis over the unidirectional causal relationship that is from governmental sector is not clear whether Wagner was referring a)- absolute level of expenditures, b)- the ratio of governmental expenditures, c)- proportion of the public sector in total economy. However, all the governments had exhibited the same tendency of increasing public expenditures irrespective of their levels and size. Five of the model specifications are predominant in the literature to test the validity of Wagner's law. These are as follows:

Model: RGE = f(RGDP) Peacock-Wiseman (1967)

Model 2: RGE =f (RGDP)/N Goffman (1968)

Model 3: RGE/N = f (RGDP/N) Gupta (1967) Michas (1975)

Model 4: RGE/ RGDP =f (RGDP)/N Masgrave (1969)

Model 5: RGE/RGDP = f(RGDP) Mann(1980)

Here, RGE = real government expenditure, RGDP= real gross domestic product, N= population, RGDP/N = real GDP per capita, RGE/N = real expenditure per capita and RGE/RGDP= the ratio of real expenditure to real GDP. All five models are almost the same; the only difference is the size and measurement of the government expenditure and economic growth. Above models will be used in log linear functional form at the time of estimation.

Many empirical studies have been investigated the validity of Wagner's law both at the single country and cross country level. These studies have different forms and different econometrics techniques to find out the relationship between government expenditures and national income. These findings are mixed and ambiguous about the validity of law.

Haung. Chiung-Ju 2006 (china and Taiwan), found that Wagner's law does not hold for c china and Taiwan; Peters c. Amos 2007 (USA, Thailand, Barbados, and Haiti), results support the Wagner's law; Zaghini, Andera, 2008 (OECD countries), the empirical evidence provides indication of a structural

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positive correlation between public spending and per capita GDP which is consistent with the so called Wagner's law,; Karagianni, Stella 2008 (European Union economies), the results are very ambiguous and suggest that the validity or invalidity of Wagner's law is very sensitive to the method applied, Ram R, 1987 (115 countries) found 60% support for the Wagner's law in time series, while in cross sectional results seem to refute the hypothesis; Badigen , Muhlis and Cetintas, Hakan 2007 (turkey), neither Wagner law neither Keynes hypothesis is valid for Turkish case; Babatude, M. Adetunji, 2008 (Nigeria), empirical results suggest that there exist no long run relationship between government expenditure and output in Nigeria; Tang , T.C, 2009 (Malaysia), found empirical support of both Wagner's law and Keynesian view in Malaysia over 1960-2005; Don, Webber, 2009 (New Zealand), the results suggest that output measures Granger- Cause the share of government expenditure in the long run , Singh B and Sahni, 1984 (India), found neither conformation for Wagner's law nor for the Keynesian hypothesis; Rehamn, Ahmad and Awan, 2007 (Pakistan), the study found the long run relationship between government expenditure and per-capita income, Jamshidur Rehman, 2010 (Pakistan), the study found that there is a unidirectional causality running from GDP to government expenditure which support the Wagner's law; Afzal M, 2010 (Pakistan), found o evidence about Wagner's law and no causality between aggregate government expenditures and national income.

ECONOMETRIC METHODOLOGY AND DATA

In this study the Bound testing Approach for cointegration (2001) is used to check the long run relationship between government expenditure and national income. Todo Yamamoto approach is used to check the causality between the two. However before going to estimate the data it is necessary to check the unit root presence in the data and for that in this study the ADF and PP test is used in order to know the order of integration of the series. Although, unit root test is not necessary condition for ARDL cointegration approach but if any of the series is I (2), then bound test for cointegration will not hold.

Bound Testing Approach for cointegration

There are different approaches to measure the long run relationship between different variables through cointegration such as Engle Granger (1987), Johansen and Juelius (1990) and Gregory and Hansen (1996). ARDL approach which is used in this study was developed by Pesaran and Shin (1995 and 1998). There are few advantages of this approach over the others cointegration approaches like, it is simple as it is estimated through OLS, once the lag order of the model is selected, b- it can be used without knowing the prior order of integration of the variables, c- suitable for small data as compared to the other approaches of integration. Again, this approach will not hold if the order of integration is 2. The general form of the approach is

$$\Delta Z_t = C_0 + \beta_t + \Pi Z_{t-1} + \Sigma \Gamma j \Delta Z t\text{-}1 + ei \ldots\ldots\ldots\ldots\ldots 1$$

Where Π and Γj are matrices contain the long run multipliers and short run dynamics respectively. So according to equation 1, our model functional forms are,

$$\Delta IRGE = CO + \beta 1 IRGEt\text{-}1 + \beta IRGDPt\text{-}1 + \Sigma \varphi i \Delta IRGEt\text{-}I + \Sigma \varphi i \Delta IRGDPt\text{-}i + Ut \ldots\ldots..2$$

$$\Delta IRGE = CO + \beta 1 IRGEt\text{-}1 + \beta IRGDPt\text{-}1 + \Sigma \varphi i \Delta IRGEt\text{-}I + \Sigma \varphi i \Delta IRGDPt\text{-}i + Ut \ldots\ldots...3$$

$$\Delta IRGE = CO + \beta 1 IRGEt\text{-}1 + \beta IRGDPt\text{-}1 + \Sigma \varphi i \Delta IPRGEt\text{-}I + \Sigma \varphi i \Delta IRGDPt\text{-}i + Ut \ldots\ldots...4$$

$$\Delta IRGE = CO + \beta 1 IRGE\_RGDPt\text{-}1 + \beta IRGDPt\text{-}1 + \Sigma \varphi i \Delta IRGE\_RGDPt\text{-}i + \Sigma \varphi i \Delta IRGDPt\text{-}i + Ut \ldots\ldots...5$$

$$\Delta IRGE = CO + \beta 1 IRGE\_RGDPt\text{-}1 + \beta IRGDPt\text{-}1 + \Sigma \varphi i \Delta IRGE\_RGDPt\text{-}i + \Sigma \varphi i \Delta IRGDPt\text{-}i + Ut \ldots\ldots...6$$

Bound testing approach: The first step in the ARDL approach is to estimate equation by OLS in order to test the long run relationship among the variables by conducting F- statistics through Wald restriction test.

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HN : β1 = β2 = 0 (there is no cointegration)

HA : β1 = β2 = 0 (There is cointegration)

If the F-statistics value is above the upper bound value, the null hypothesis will be rejected that is there cointegration, irrespective of the order of integration of the variables. If the F-stat value falls below the lower bound value, null hypothesis accepted that there is no cointegration. And if F- stat value lies between upper and lower bound value then the result is inconclusive.

If null hypothesis rejected which mean there is long run relationship between said variables then we must proceed to second step which is to estimate ARDL long run model.

Zt =C0 + ΠZt-1 + ei……..7

In the third and final step, we obtain the short run dynamic parameters by estimating an error correction model.

ΔZt =C0 + ΣΓiΔZt-1 +φecmt-1 + ei…….8

Where Γi are the short run dynamic coefficients of the model convergence to equilibrium and φ is the speed of adjustment?

Todo and Yamamoto causality:

This is the alternative approach to the Granger causality approach. This approach is applicable irrespective of the property of integration and cointegration. This approach is augmented with extra lag determined by the order of integration of the series. The Todo and Yamamoto procedure uses a modified Wald test to the restriction on parameters of the VAR model. This test has an asymptotic chi-squared distribution with k degrees of freedom order in the limit when a VAR (k+dmax) is estimated. Two steps involved in the estimation of Toda and Yamamoto causality approach. The first step is to find the lag length (k) and the maximum order of integration of the variables. The second step is to apply Wald test to the first k VAR coefficients to check Granger causality. Suppose, we are estimating a VAR (2):

Xt = βo + β1Xt-1 + β2Xt-2 + β3Yt-1 + β4Yt-2 +et……9

HN : β3 = β4 =0 (Y does not cause X)

HA : β3 = β4 =0 (Y does cause X)

For this study annual data has been collected from handbook of statistics of SBP and annual reports of the same agency for the period of 1979-2009. The variables were in nominal form and were converted to the real terms by deflating with GDP deflator (2000-01).

Empirical analysis:

Unit root test:

Individual series are tested for their order of integration by Augmented Dicky Fuller and Phillips-Peron unit root tests at levels as well as 1st difference. The results are presented in table 1.

Table1: ADF and PP unit root test results

Variables level	ADF stat	PP stat	1st difference	ADF stat	PP stat	Results
Lrgdp	-2.959539	-2.90005	Dlrgdp	-5.78243*	-10.9046*	I(1)
Lrge	-2.03563	-2.11337	Dlrge	-5.79266*	-6.06262*	I(1)
Lrpge	-2.218087	-2.33802	Dlrpge	-5.7637*	-6.07773*	I(1)
Lrpgdp	-2.654467	-2.60325	Dlrpgdp	-5.82613*	-10.0674*	I(1)
Lrge/lrgdp	-2.01851	-2.20896	Dlrge/lrgdp	-6.02606*	-6.32204*	I(1)

*At level all series have unit root (non-stationary). *On 1st difference all series become stationary at 1% level of significance. So in our study all variables are I(1).*

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2- BOUND TESTING APPROACH FOR COINTEGRATION:

In table 2 there are the results of the bound testing approach. The computed F- stat for five models of Wagner's law in case of Pakistan is lower than the lower bound critical values even at 10% level. These results indicate that there exist no cointegration between RGE and RGDP in model 1, RGE and RPGDP in model 1, RPGE and RPGDP in model 3, RGE/RGDP and RPGDP in model 4 and RGE/RGDP and RGDP in model 5.

Table 2 Results of bound test cointegration

	Lags (SC)	F	Results
Model1	K=1	2.695777	No Cointegration
Model2	K=1	2.401134	No Cointegration
Model3	K=1	2.555724	No Cointegration
Model4	K=1	2.019818	No Cointegration
Model5	K=1	2.068746	No Cointegration

Critical value below/above, 1% level of significance 6.84 7.84, 5% level of significance 4.94 5.73, 10% level of significance 4.04 4.78

3- Todo – Yamamoto approach:

Table 3 present the Todo-Yamamoto causality approach for Pakistan. The results of this approach show that the independence of the government expenditures and national income in all five models of Wagner's law.

Table 3: Todo- Yamamoto Causality (modified Wald) test results

	Causes and effects	Test stat	Value	Df	Prob	results
Model1	GDP does not Granger cause expenditure	Chi-sq	3.0075	2	0.2223	H0 accept
	Expenditure does not Granger cause GDP	Chi-sq	0.2514	2	0.8819	Ho accept
Model2	GDP does not Granger cause expenditure	Chisq	2.6113	2	0.271	Ho accept
	Expenditure does not Granger cause GDP	Chi-sq	0.0411	2	0.9796	Ho accept
Model3	GDP does not Granger cause Expenditure	Chi-sq	2.2768	2	0.3203	Ho accept
	Expenditure does not Granger cause GDP	Chi-sq	0.3674	2	0.8322	Ho accept
Model4	GDP does not Granger cause expenditure	Chi-sq	1.5673	2	0.4567	Ho accept
	Expenditure does not Granger cause GDP	Chi-sq	3.4375	2	0.1793	Ho accept
Model5	GDP does not Granger cause expenditure	Chi-sq	1.4932	2	0.474	Ho accept
	Expenditure does not Granger cause GDP	Chi-sq	0.2514	2	0.8819	Ho accept

CONCLUSION

In this study we have examined the validity of Wagner's law for Pakistan over the period of 1979-2009. For this purpose we used ARDL approach to cointegration to check the Wagnerian long run relationship between government expenditure and national income. Five different versions of Wagner's law taken into account. But no cointegration found any of the five versions, which reveals that there is no long run relationship between government expenditure and national income. We also examined causality through Toda and Yamamoto approach and found that there growth does not cause expenditure nor Gov.Expenditure does cause income. The results are very much according to expectations. Although government spending has increasing trend along with output but increasing government spending is not merely due to growth in output in case of Pakistan but there are other important factors such as ever increasing defence expenditure, interest payments, high population growth rate, lack of developed private sectors, political instability etc. we may conclude that there are some other important factors/ variables which cause to rapid increase in government expenditures over the long period of time in case of Pakistan. Finally, neither Wagner's law nor Keynesian hypothesis holds in case of Pakistan.

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