Investigating the Keynesian View and Wagner's Law on the Size of Government and Economic Growth in Iran

Mosayeb Pahlavani[1], Davoud Abed and Farshid Pourshabi
Faculty of Economics, University of Sistan and Baluchestan, Iran

Abstract

In this paper we examined the causal relationship between size of the government (measured as the share of total expenditure in GDP) and economic growth in Iran during the period of 1960–2008. Empirical analysis is performed by using a developed cointegration test proposed by Pesaran et al (2001) and Granger causality test based on the error correction model (ECM) and finally, we used a modified version of the Granger causality test by Toda and Yamamoto (1995), for more confident. The results of bound test indicated that economic growth is cointegrated with size of government. So, economic growth is the long-run forcing variable on size of government. Also Granger causality test based on ECM and Toda and Yamamoto approach show that a unidirectional causal flows from economic growth to size of government. On the other hands, Wagner's law is confirmed in Iran during the period of this study.

Keywords: Wagner's law, Cointegration, Causality test, Toda-Yamamoto.

JEL Classification: H50. C22

1. Introduction

Recognition and how to mutual influence of important variables such as government spending and economic growth always have been regarded by economists and policymakers. On the one hand Government spending can be considered as an exogenous factor and affect economic growth in the form of policy instruments (Keynes's view) and on the other hand, this kind of expenditure as an exogenous factor may be the result of growth (Wagner's law). Adolf Wagner (1883) realized the positive relationship between public spending and rates of economic growth based on diachronical tendency. The public expending is one of the main factors to increase the expense of the private costs. (Dritsakis and Adamopoulos, 2004). Wagner expressed that state have to expand scope of public activity due to some reasons. First, rising the complication of legal relationship and communications, crowding and increasing of urbanization. Second, to be greater than unity the income elasticity of demand for public- provided goods education and health expenditures. Third, to provide the large amount of capital for private sector activities because of technological needs (Chang *et al*, 2004).

The structural adjustment process is an aspect that has been handled by developing countries. The expanding and inefficient public sector accompany with structural imbalances are the result of high fiscal deficits. So it is necessary to examine by economists to find the linkage between fiscal deficits and economic performance, the growth of public expenditures as a proportion of GNP(samudram *et al*, 2009). In recent studies have been used cointegration test, Error correction model and causality test for investigating the long- run relationship between government expenditure and GNP (Ghorbani and Firooz Zarea, 2009).

There are at least six different empirical versions of Wagner's Law that have been showed in table 1.

Table 1. Six versions of Wagner's law

Number	Function of Form	Version
1	$LG = a_1+a_2LGDP$	Peacock & Wiseman (1967)
2	$LC = a_1+a_2LGDP$	Pryor (1969)
3	$LG = a_1+a_2L(GDP/P)$	Goffman (1968)
4	$L(G/GDP) = a_1+a_2L(GDP/P)$	Musgrave (1969)
5	$L(G/P) = a_1+a_2L(GDP/P)$	Gupta (1967)
6	$L(G/GDP) = a_1+a_2LGDP$	Mann (1980)

2. Literature Review

Over the past two decades a vast amount of research has been devoted to testing Wagner's hypothesis which states that as economic activity grows there is a tendency for government activities to increase (Chang *et al*, 2004).

1 - The Corresponding Author, Associate Professor of Economics, University of Sistan and Baluchestan, Iran
pahlavani@eco.usb.ac.ir

Some of the studies in the literature used the cross-sectional, cross-country analysis and some of them used time series models for testing Wagner's law. Empirical tests of this law had different results from country to country. Some of these researches, found evidence supporting Wagner's law for example: Samudram *et al* (2009), Ghorbani and Firooz Zarea (2009). Some of other researches, found no evidence supporting Wagner's law for example: Ju Huang (2006), Islam (2001). And there are few studies that found mixed results for supporting Wagner's law that refer to study of Afzal and Abbas (2010), Narayan *et al* (2008). Table 2 shows the empirical findings of the test of Wagner's law.

Table 2. Selected empirical findings on Wagner's law

Athour(s)	Country(s)	Method	Main results
Oxley (1994)	Britain	Granger causality test	Support Wagner's law during the period 1870-1913
Islam (2001)	USA	Johansen- Juselius cointegration test	Strong Support for Wagner's law for the USA during the period 1929-1996
Halicioglu (2003)	Turkey	Johansen- Juselius cointegration and Granger causality test	Does not Support Wagner's law during the period 1960-2000
Ju Huang (2006)	China and Taiwan	Bound test and Unrestricted Error Correction Model(UECM)	Does not Support Wagner's law during the period 1979-2002
Aregbeyen (2006)	Nigeria	Johansen Cointegration test and Granger causality test	Support Wagner's law during the period 1970-2003
Pradhan (2007)	India	Engle and Granger and (ECM) Model	Does not Support Wagner's law during the period 1970 to 2004 but Keynesian view is stablished during this period
Sinha *et al* (2007)	Thailand	ARDL and Toda-Yamamoto (1995) causality test	Does not Support Wagner's law during the period 1950-2003
Narayan *et al*. (2008)	Fiji islands	Johansen Cointegration test	Support Wagner's law during the period 1970-2002
Narayan *et al*. (2008)	China's provinces	panel cointegration and Granger causality testing approach	find mixed evidence in support of wagner's law for China's central and western provinces and There is less support for Wagner's law for China as a whole
Samudram *et al*. (2009)	Malaysia	ARDL (bound test)	Support Wagner's law for expenditures on defense, education, development and agriculture (1970-2004)
Ghorbani and Firooz Zarea(2009)	Iran	Engle and Granger - ECM	Support Wagner's law during the period 1960-2000
Aziz and Abul Kalam (2009)	Bangladesh	Johansen's cointegration test and Granger Causality test	Support Wagner's law during the period 1976-2007
Afzal and Abbas (2010)	Pakistan	Johansen cointegration test Granger Causality test	Wagner's hypothesis does not hold for three periods (1961 - 2007, 1973 - 1990, 1991 - 2007). Wagner's law holds for the period 1981 – 1991)

3. Data and Methodology

Annual time-series data which cover the period 1960–2008, used in this study contained Gross Domestic Production (GDP) and real total government expenditure (G) were obtained from Central Bank of the Islamic Republic of Iran.

3.1. The (ARDL) bounds test and ECM

We employ the Autoregressive Distributed Lag (ARDL) bounds test proposed by Pesaran *et al*. (2001) to examine the cointegration relationship between size of government and economic growth. The statistics have a non-standard distribution and depend on whether the variables are individually I(0) or I(1). (Odhiambo, 2009). An advantage of the ARDL approach is that, while other cointegration techniques require all of the regressors to be integrated of the same order, it can be applied irrespective of their order of integration (Harvie and Pahlavani, 2006). The cointegration test under this bound test involves the comparison of the critical value and F-statistic.

The bound test involves two asymptotic critical value bounds, depending on whether the variables are I(0) or I(1) or a mixture of both. If the test statistic exceeds their respective upper critical values, then there is evidence of a long-run relationship, if the F-statistic was below the critical value, we cannot reject the null hypothesis of no cointegration and if F statistic lies between the two bounds, inference is inconclusive (Morley, 2006).

According to Odhiambo (2010), The ARDL model used in this study can be introduced as follows:

$$\Delta \ln size g_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} \Delta \ln size g_{t-i} + \sum_{i=0}^{k} \alpha_{2i} \Delta \ln y_{t-i} + \alpha_3 \ln size g_{t-1} + \alpha_4 \ln y_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta \ln y_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} \Delta \ln y_{t-i} + \sum_{i=0}^{k} \beta_{2i} \Delta \ln size g_{t-i} + \beta_3 \ln y_{t-1} + \beta_4 \ln size g_{t-1} + \varepsilon_t \quad (2)$$

Where $\ln size g_t$ is the log of size of government (measured as the share of total government expenditure in GDP); $\ln y_t$ is real Gross domestic Production of Iran; Δ the first difference operator; ε_t the error term. The null hypothesis (that implying no cointegration) in eq.(1) is($H_0: \alpha_3 = \alpha_4=0$) against the alternative hypothesis($H_1: \alpha_3 \neq \alpha_4 \neq 0$). In eq.(2) the null hypothesis of no cointegration is ($H_0: \beta_3 = \beta_4=0$) against the alternative hypothesis ($H_1: \beta_3 \neq \beta_4 \neq 0$). In the first step is tested by computing a general F-statistic using all the variables appearing in log levels. The calculated F-statistic is compared with the critical value tabulated by Pesaran *et al*. (2001). The null hypothesis of no cointegration will be rejected if the calculated F-statistic is greater than the upper bound. If the null hypothesis rejected by bound testing and the existence of a long-run relationship between size of government and GDP confirm, we applied ECM model for determining the direction of causality between the variables. The direction of the causality is determined by the F-statistic and the lagged error-correction term. While the t-statistic on the coefficient of the lagged error-correction term represents the long-run causal relationship, the F-statistic on the explanatory variables represents the short-run causal effect (Odhiambo, 2009; 2010).

3.2. The Toda-Yamamoto approach

Toda and Yamamoto (1995) have developed a simple procedure that involves testing for Granger non-causality in level VARs irrespective of whether a series is I(0), I(1) or I(2), non-cointegrated or cointegrated (Karimi, 2009). The approach proposed by TY is to employ a modified Wald test for restriction on the parameters of the VAR (k) where k is the lag length of the VAR system. We must the identify the maximum order of integration, dmax. The VAR model used for testing based on The Toda-Yamamoto procedure can be introduced as follows:

$$\ln y_t = \alpha_0 + \sum_{i=1}^{k+d\,max} \alpha_{1i} \ln y_{t-i} + \sum_{i=1}^{k+d\,max} \alpha_{2i} \ln size g_{t-i} + \varepsilon_t \quad (3)$$

$$\ln size g_t = \beta_0 + \sum_{i=1}^{k+d\,max} \beta_{1i} \ln size g_{t-i} + \sum_{i=1}^{k+d\,max} \beta_{2i} \ln y_{t-i} + \varepsilon_t \quad (4)$$

In model (3) and model (4), The null hypothesis of no causality is not rejected if $\alpha_{2i} = 0$ and $\beta_{2i} = 0$, respectively. In The VAR system is estimated using a seemingly unrelated regression procedure. The lag structure of the VAR system is determined using Akaike Information Criteria and a standard Wald statistic, distributed as a Chi-square, is computed given a number of constraints (equal to the degrees of freedom).(Squalli, 2007).

4. Empirical Results

4.1. Stationary test

Although the bounds test for cointegration does not require that all variables be integrated of order 1[I(1)], it is important to conduct the stationarity tests in order to ensure that the variables are not integrated of order2[I(2)]. In fact, the F-test would be spurious in the presence of I(2) because both the critical values of the F-statistics computed by Pesaran *et al*.(2001) and Narayan(2005) are based on the assumption that the variables are I(0) or I(1).(Odhiambo, 2009: 620). Also for using from the Toda-Yamamoto approach (1995) we need to determine the maximum order of integration of the variables in the system. Thus, before causality test it is essential to determine the order of integration for each of variables. The results of Augmented Dickey–Fuller test (ADF) fail to reject the null hypothesis of unit root in both series at 1% significance level so the variables are not stationary in levels, while for data series to be stationarity after first differencing. The order of integration of two series using ADF Test is reported in Table 3.

Table 3. Unit root test on the variables

Variables	Test in	ADF Test Statistic	Prob	Order of integration
$\ln Y$	Level	-1.4778	0.536	I(1)
	First difference	-3.7896*	0.005	
$\ln sizeg$	Level	-1.6895	0.430	I(1)
	First difference	-6.9683*	0.000	

*, are significant at the 1% significance level

4.2. Cointegration test

Having determined that all series are integrated of order one I(1), we proceed for the testing of cointegration in order to determining long run relationship between size of government and economic growth. For this purpose, the ARDL-bounds testing is used to determine this relationship between two variables. The ARDL model used in this study already introduced in methodology. The optimal lag for both equations (1) and (2) is obtained from using Schwartz Bayesian Criterion (SBC). The results of the cointegration test are reported in Table 4. The results reported in Table 4 show that when the real GDP ($\ln Y$) is used as the dependent variable in eqation(1), the calculated F-statistics are lower than the lower-bound critical values reported in Pesaran *et al*. (2001) at the 5 percent level. However, when the size of government ($\ln sizeg$) in equation (2) is used as dependent variables, the calculated F-statistic is higher than upper-bound critical value at the 5 percent level. So the existence of long-run relationship is accepted from GDP to size of government. This implies that there is a unique cointegration vector in equation (1).

Table 4. Bounds F-test for cointegration

Dependent variable	F-test statistic	Equation	Long-run Relationship
$\ln Y$	2.7397	1	no
$\ln sizeg$	11.3335	2	yes

4.3. Analysis of causality test based on (ECM)

According to Odhiambo (2010), after cointegration test and determining existence of the long-run relationship between variables in equation (1), we must capture the directional of Causality between the variables by testing the significance coefficient of the lagged error-correction term (λ) and F-statistic. The ECM model can be estimated as follows:

$$\Delta \ln sizeg_t = a + \sum_{i=1}^{k} \beta_i \ln sizeg_{t-i} + \sum_{i=1}^{m} \delta_i \ln y_{t-i} + \lambda ECM_{t-1} + \varepsilon_t \qquad (5)$$

The results of estimated equation (5) are reported in table 5. The results show that there is a unidirectional causal flow from GDP to size of government, that is, Wagner's law is supported.

Table 5. Causality test based on (ECM)

Dependen t variable	Direct Of Causality	F-statistic of model	t- test on ECM	R^2
$\ln sizeg$	$\ln sizeg \rightarrow \ln y$	7.6622** [.000]	-4.6332**	0.43

**, denote statistical significance at 1% level.

4.4. Non Causality test based on Toda-Yamamoto approach (1995)

Finally, for more confident, Toda-Yamamoto approach (1995) is used for determining direction of Granger causality between two variables using a modified Wald test to verify if the coefficients α_{2i} and β_{2i} of the lagged variables are significantly different from zero in the respective equations 3 and 4. For this purpose, first, the optimal Lag, k has to be determined. In order to, we used the Akaike Information Criteria (AIC) to select the optimal lag. After determining that the optimal lag length as k=3 and dmax=1. The Optimum order of the VARs (k) is reported in Table 6. The results of the T-Y causality test are reported in Table (7).

Table 6. Optimum order of the VARs (k)

Lag	AIC	SBC
0	1.756585	1.836881
1	-4.253987	-4.013099*
2	-4.329253	-3.927772
3	-4.407960*	-3.845887
4	-4.395398	-3.672733

Notes: AIC and SBC stand for the Akaike and Schwartz Information Criteria, respectively. Term k* is the selected order of the VARs. In the case of conflicting results between the AIC and SBC, we use the AIC results, as suggested by Stock (1994),Chiang Lee(2006) and Rufael(2010).

Table 7. Toda–Yamamoto causality tests

Null hypothesis	Equation	Wald statistics
$\ln sizeg$ does not Granger cause $\ln y$	3	5.764149 (0.1237)
$\ln y$ does not Granger cause $\ln sizeg$	4	9.128108 (0.0276)

Notes: Modified Wald chi-square statistics to test whether the k lags are equal to zero are displayed with probability values in parentheses.

The results are reported in table 7 show that the null hypothesis that $\ln y$ does not Granger cause $\ln$ sizeg is rejected at the 5% significance level. Thus, Wagner's law is confirmed for Iran economy during the period of this study But Keynes view is not support for Iran.

5. Conclusion and Policy Implications

In this paper, we examined the long run and causal relationship between size of government (measured as the share of total expenditure in GDP) and economic growth for investigating Keynesian view and Wagner's law in Iran during the period of 1960–2008. By using the bounds test approach to cointegration developed by Pesaran *et al*. (2001), and using the Toda and Yamamoto (1995) version of the Granger causality test, we found that there was a unidirectional causality running from economic growth to size of government. Our empirical findings, confirm the validity of Wagner's law in Iran economy, that is Economic growth has been the major factor in the public sector growth. Non-establishment of Keynesian view has indicated that the growth of public sector was not efficient policy. Therefore, the government should reduce unnecessary costs. It requires more attention to privatization by policy makers in the country.

References

Abul Kalam, M., Aziz, N.(2009)," Growth of Government Expenditure in Bangladesh: An Empirical Enquiry into the Validity of Wagner's Law" , Global Economy journal,9(2).1-18.

Afzal, M., Abbas, Q. (2010), "Wagner's law in Pakistan: Another look, Journal of Economics and International Finance, 2(1), 012-019.

Aregbeyen, O. (2006). "Cointegration, Causality and Wagner's Law: A Test for Nigeria" Central Bank of Nigeria, economic and financial review, 44(2), 1-18.

Chang, T., Liu, W., Caudill, S. (2004), "A Re-Examination Of Wagner's Law For Ten ountries Based On Cointegration And Error correction Modelling Techniques", Applied Financial Economics, 14(8), 577–589.

Chiang Lee, C., (2006), "The causality relationship between energy consumption and GDP in G-11 countries revisited", Energy Policy, 34(9), 1086–1093.

Dritsakis, N., Adamopoulos, A. (2004), "A Causal Relationship between Government Spending and Economic Development: An Empirical Examination of the Greek Economy", Applied Economics, 36(5), 457-464.

Ghorbani, M., Firooz Zarea, A. (2009), "Investigating Wagner's law in Iran's economy", Journal of Economics and International Finance, 1(5), 115-121.

Halisioglu, F. (2003), "Testing Wagner's Law for Turkey, 1960–2000", Review Middle East Economic and Finance, 1(2), 129-140.

Harvie, c., Pahlavani, M. (2006), "Sources of Economic Growth in South Korea: An Application of the ARDL Analysis in the Presence of Structural Breaks – 1980-2005 ", University of Wollongong Economics Working Paper Series.

Islam, A, M. (2000), "Wagner's law revisited: cointegration and exogeneity tests for the USA" Applied Economics Letters, 8(8), 509 – 515.

Ju huang, C. (2006)," Government Expenditures in China and Taiwan: Do They Follow Wagner's Law? , Journal of Economic Development, 31(2), 139-148.

Karimi, M S., Yusop, Zulkornain. (2009), "FDI and Economic Growth in Malaysia", University Putra Malaysia, Munich Personal RePEc Archive.

Morley, B., (2006), "Causality between economic growth and immigration: An ARDL bounds testing approach", Economics Letters, 90(1), 72-76.

Narayan, P., Nielsen, I., Smyth, R. (2008), "Panel Data, Cointegration, Causality and Wagner's Law: Empirical Evidence from Chinese Provinces", China Economic Review, 19(2), 297–307.

Narayan, p., Prasad, A., Singh, B. (2008), "A test of the Wagner's hypothesis for the Fiji islands", journal of Applied Economics, 40(21), 2793-2801.

Odhiambo, N. (2009), "Energy Consumption And Economic Growth Nexus In Tanzania: An ARDL Bounds Testing Approach", Energy Policy, 37(2), 617–622.

Odhiambo, N. (2010), "Energy consumption, prices and economic growth in three SSA countries: A comparative study", Energy Policy, 38(5), 2463–2469.

Oxley, L. (1994). "Cointegration, Causality and Wagner's Law: A Test for Britain 1870-1913" , Scottish Journal of Political Economy, 41(3), 286-298.

Pesaran, M., Shin, Y., Smith, J. (2001), Bounds Testing Approaches To The Analysis Of Level Relationships, Journal Of Applied Econometrics, 16(3), 289–326, 2001.

Pradhan, p p. (2007), "Wagner's Law: Is It Valid in India?" The IUP Journal of Public Finance, 5(2), 7-20.

Rufael, Y W., Menyah, K., (2010), "Nuclear energy consumption and economic growth in nine developed countries", Energy Economics, 32(3), 550–556.

Samudram, M., Nair, M., Vaithilingam, S. (2009)," Keynes And Wagner On Government Expenditures And Economic Development: The Case Of A Developing Economy", Empirical Economics, 36(3),697-712.

Sinha, D. (2007),"Does the Wagner's Law hold for Thailand? A Time Series Study", Ritsumeikan Asia Pacific University, Japan, Macquarie University, MPRA Paper, No.2560.

Toda, H., Yamamoto, T. (1995). "Statistical inference in vector autoregressions with possibly integrated processes", journal of econometrics, 66(1-2), 225-250.