



## The Wagner's Law and the Income Elasticity of Government Expenditure in Iran (1985-2018)

Elham Khorasani Kordeh Koochi<sup>a\*</sup>, Reza Najarzadeh<sup>b</sup>

a. Department of Economic, Tehran University, Tehran, Iran.

b. Department of Economic, Tarbiat Modares University, Tehran, Iran.

---

### Article History

Received date: 29 June 2020

Revised date: 30 November 2020

Accepted date: 02 January 2021

Available online: 21 April 2021

---

### JEL Classification

H51

H52

C12

B23

---

### Keywords

Gross Domestic Product (GDP)

Wagner's Law

Government Expenditure

Vector Error Correction Model-  
(VECM)

---

### Abstract

Wagner's Law states that the relative size of public sector increases with the growth of per capita income. This study examines whether there is empirical evidence that Wagner's law holds in the Iranian economy using time series annual data over the period 1985-2018 in Iran, applying cointegration and vector error correction modelling (VECM) techniques. In particular, this study provides a special focus on examining the validity of the versions of Wagner's hypothesis, which supports the existence of long-run relationship between public expenditure and economic growth. The results of the estimates demonstrate that this law holds in Iran. The elasticity of the government expenditures with respect to national income must be greater than one for the Wagner's law to hold. However, government's spending on health and education has been less than expected. Therefore, considering all the government's spending, Wagner's law is valid in Iran. On the other hand, by examining government expenditures in health and education sector as the most important part of the government expenditures, it is seen that the revenue elasticity of government expenditures in the health and education sectors is less than one. Accordingly, our estimates for Iran do not confirm this law. Although the absolute size of the public sector grows when the income increases, its rate of growth in these sectors is substantially lower than the growth of income. This could suggest that the government does not pay enough attention to health and education sectors and that these are not priorities of the government.

---

### Highlights

- Wagner's law is valid in Iran.
- The revenue elasticity of government expenditures in the health and education sectors is less than one.
- Although the absolute size of the public sector grows when the income increases, its rate of growth in these sectors is substantially lower than the growth of income.

---

\* [Elham\\_khorasani69@yahoo.com](mailto:Elham_khorasani69@yahoo.com)

DOI: 10.22099/ijes.2021.37702.1687

© 2020, Shiraz University, All right reserved

## 1. Introduction

The relationship between public expenditures and gross domestic product (GDP) has been well debated in economy literature. The role of governments and the reasons for the existence of states have been studied extensively during the past decades (Peacock & Wiseman, 1961). In general, some economists believe in the least interference of states in economies, whereas others believe that state interference is necessary to run a smooth economy. Along with such viewpoints, there are factors that can explain the size and the growth of governments in different countries. A theoretical discussion of the relationship between the general size of public sector and GDP is Wagner's law, according to which increased production results in increased government spending (Wagner, 1883). As a consequence, government services, such as judiciary system, education, health and infrastructure lead to economic growth. It needs to be mentioned that other theories such as the state-run development perspective of state spending, as expressed by Musgrave and Rostow (1989), and the Baumol's (1967) theory of growth, do explain the expansion of government size, but Wagner's theory concentrates on the relationship between GDP and government spending (Ogba, 1999).

For Wagner's law to hold, it is necessary that the public goods provided by the government have income elasticity greater than one (Kumar et al., 2012). In this study the existence of Wagner's Law in the Iranian economy is examined by estimating the income elasticity of government expenditures in the health and education sectors. Moreover, in case the Wagner's law holds, we aim to show how long it takes for the government size (spending) to grow at the same rate as GDP does.

The hypotheses we are testing in this study are: 1) The Wagner's Law holds in Iran. 2) It takes more than one year for GDP to impact government expenditures. 3) Public education and health have an income elasticity greater than one.

While there are a number of studies (Dilrukshini, 2004, Herath, 2010) to have estimated the relationship between public expenditures and economic growth, there is no clear consensus among these studies on the exact relationship between these two variables. Hence, this paper takes an important step towards the above direction to contribute to the existing literature by shedding light on the relationship between public expenditures and economic growth in Iran by using time series econometrics techniques over the period 1985-2018. The data sources for public expenditure, gross domestic product, and population have been obtained from various issues of the annual report of the Central Bank of Iran and the World Bank.

This is the first study that concentrates solely on Iran, utilizing a large dataset available for the country. A version of Wagner's law is tested using disaggregated government expenditures in two key sectors of the Iranian economy: health and education. Statistics on different types of government expenditures in 2018, which are presented in the appendix, reveal that the government spending in the health

and education sectors is one of the highest government expenditure as retrieved from the data available.

The paper is structured as follows. Section 2 briefly reviews the theoretical explanations on Wagner's law. Section 3 provides an overview of empirical literature on Wagner's law. Section 4 brings out the sources of data and methodological framework adopted in the study to test Wagner's hypothesis in more detail. Section 5 presents the empirical evidence from time series perspectives. This will give a more quantitative insight. Section 6 summarizes the major findings of the study.

## 2. The Wagner's Law

The relationship between government expenditures and economic growth was first examined by the German economist Adolph Wagner (1835-1917). As the result of his studies, Wagner revealed that the speed of increase in government expenditures was higher than the speed of increase in national income (Kumar et al., 2012). In other words, he showed that the income elasticity of demand for government expenditures was higher than 1 so that the expenditures would increase at a higher rate than that of national income (Koop & Poirier, 1995). Therefore, the opinion that Wagner adopted is characterized as the "Law of Governmental Expenditure Increase" in the economy literature. Wagner assumes that there is a direct relationship between government expenditures and production level. He also emphasized that the growth of the public sector is faster than the economic growth. At the same time, market inefficiencies, in particular with regard to external implications or privileged goods, require government intervention to provide an optimal supply line of goods and services by providing subsidies or direct supply. Wagner also states that goods offered by the public sector are of high income elasticities (Dadgar, 2013).

Government expenditures are regarded as an endogenous variable and the direction of causality is from economic growth to such expenditures (Bird, 1971). This opinion, asserted as a hypothesis by Wagner, which was then named as "Wagner's Law", constituted the basis for many theoretical and empirical studies to follow. Wagner's law contains six versions which have been empirically tested by different economists over the years. Despite the fact that Wagner did not present his hypothesis in a mathematical form, over the decades different economists have used different mathematical models for testing this hypothesis.

Public expenditures are classified in terms of developmental and nondevelopmental categories so as to assess their welfare impact. The developmental expenditure mainly includes expenditure on economic services such as agriculture, industry, energy, communication, transport, science, technology, environment, and so on, and social services including education, health, employment, nutrition, housing, etc.. The remaining categories such as government administration, interest payments, pensions, defense, and other nonproductive services constitute nondevelopmental expenditure. The economic growth is normally more responsive to developmental expenditure.

Empirically, Wagner's law refers to the long-term relationship between government size (usually government spending) and income (GDP). Since there are different criteria for measuring the government size, such as the ratio of government expenditure to income, per capita government expenditures and consumption expenditures, and also there are various criteria for income measurement such as income and per capita income, we face different empirical versions of Wagner's Law as follows:

$$\text{Peacock-Wismen (1967)} \quad \beta > 1 \quad \text{Ln}G_t = \alpha + \beta \text{Ln}GDP_t + \varepsilon_{1t} \quad (1)$$

$$\text{Pryor (1969)} \quad \beta > 1 \quad \text{Ln}GC_t = \alpha + \beta \text{Ln}GDP_t + \varepsilon_{2t} \quad (2)$$

$$\text{Gupta (1967)} \quad \beta > 1 \quad \text{Ln}\left(\frac{G}{P}\right)_t = \alpha + \beta \text{Ln}\left(\frac{GDP}{P}\right)_t + \varepsilon_{3t} \quad (3)$$

$$\text{Goffman (1967)} \quad \beta > 1 \quad \text{Ln}G_t = \alpha + \beta \text{Ln}\left(\frac{GDP}{P}\right)_t + \varepsilon_{4t} \quad (4)$$

$$\text{Musgrave (1969)} \quad \beta > 0 \quad \text{Ln}\left(\frac{G}{GDP}\right)_t = \alpha + \beta \text{Ln}\left(\frac{GDP}{P}\right)_t + \varepsilon_{5t} \quad (5)$$

$$\text{Man (1980)} \quad \beta > 0 \quad \text{Ln}\left(\frac{G}{GDP}\right)_t = \alpha + \beta \text{Ln}GDP_t + \varepsilon_{6t} \quad (6)$$

Where  $\text{Ln}G_t$  is the Log of government expenditures,  $\text{Ln}GC_t$  is the Log of consumption expenditure,  $P$  stands for population,  $\text{Ln}\left(\frac{G}{P}\right)_t$  is the Log of per capita government expenditure,  $\text{Ln}\left(\frac{G}{GDP}\right)_t$  is the Log of the share of government expenditures from income,  $\text{Ln}GDP_t$  is the Log of income, and  $\text{Ln}\left(\frac{GDP}{P}\right)_t$  is the Log of per capita income. For the realization and confirmation of Wagner's hypothesis in the above models, it is necessary that the estimated coefficient ( $\beta$ ) is equal to the values given above.

### 3. Literature Review

Hussain et al. (2010) examined the validity of Wagner's Law and the relationship between economic growth, population and exports in Pakistan. The ARDL Bounds Cointegration and the Error Correction Model (ECM) were utilized for the long and short-run equilibrium for the period of 1972-2007. With an increase in GDP, government expenditures may or may not increase. The empirical results of this study indicate that Wagner's Law does hold, as economic growth is significantly and positively correlated with government expenditures. However, population and exports also have significant and positive impacts on government expenditures both in the short and long-run. The coefficient of the error correction term in the ECM is negative and significant which indicates that after a GDP shock, the long-run equilibrium will again converge towards its equilibrium at about 70.82 percent within a year.

Srinivasan (2013) investigated the causal nexus between public expenditure and economic growth in India using Cointegration approach and the ECM. The analysis was carried out for the period 1973 to 2012. The Cointegration test results confirm the existence of a long-run equilibrium relationship between public expenditure and economic growth in India. The empirical results based on ECM show that a one-way causality from economic growth to public expenditure exists in the short-run and long-run supporting the Wagner's law of public expenditures.

Ageli, Mohammed Moosa (2013) explored the validity of Wagner's Law in Saudi Arabia during the period 1970-2012 for GDP including oil revenues and GDP excluding oil revenues. In previous studies, all versions of Wagner's law have been tested to support the existence of long-run relationship between government expenditure and economic growth. He used the method of time series econometrics techniques to examine the validity of Wagner's Law in the Saudi economy. The results obtained from the analyses reveal that the Wagnerian proposition can explain the relationship between government expenditure and economic growth in Saudi Arabia, which holds for both oil and non-oil income cases. The findings also indicate the existence of strong causality for all of Wagner's law versions in the long run.

Abu Eideh (2015) studied the causal relationship between public expenditure and the GDP growth in the Palestinian territories during 1994-2013. They found that a two-way causal relationship exist between public expenditures and GDP growth in Palestine.

Paparas et al. (2016) investigated the relationship between government expenditures and economic growth for one single Central and Eastern European country namely Romania. Using a dataset ranging from 1995 to 2015, they applied econometric time series techniques such as unit root test, Johansen cointegration and Granger causality test. The cointegration tests indicate the support for Wagner's law in five versions, thus suggesting the existence of long-run relationship between government spending and national outcome. The causality tests exhibit the absence of any short-run relationship from economic outcome to government expenditure in three out of five versions. However, taking into consideration the fact that in its original formulation Wagner's law explored the secular correlation between output and government commitments, we can state that the long run cointegration is more consistent with Adolph Wagner's perspective.

Afonso et al. (2016) revisited the Wagner's law of increasing state expenditures typically known as government expenditures. Using data of 14 European countries between 1996 and 2013, they applied panel data and SUR methods to assess public expenditure-income elasticities, and found that some functions of government spending for a few countries (e.g. Austria, France, the Netherlands, and Portugal) validate Wagner's law. For the Netherlands, expenditures with environment protection increase more than what is proportionate to economic growth, and for France that is the case of spending in housing and community amenities. In addition, Greece is the only country where two public spending items react more than one-to-one to growth.

Paparas et al. (2018) examined the Wagner's law validity, and whether it could explain the U.K. public spending expansion for the period 1850-2010. According to Wagner's Law, economic development is the key determinant to public sector growth. Accordingly, the public sector grows over-proportionally compared to national income when economies expand. They tested this hypothesis for the U.K. The data covers a period in when the U.K. economy

experienced increased economic growth, government spending and met most of the assumption of Wagner's Law (industrialization, urbanization, and increased population). Furthermore, the long data set ensures the reliability of the results in terms of statistical and economic conclusions. They applied unit root tests with structural breaks, cointegration techniques and the Granger causality test. The results indicate the presence of a long run relationship between national income and the government spending, while the causality is bi-directional, thus we can find support for Wagner's hypothesis versions.

[Dadgar and Nazari \(2012\)](#) examined Wagner's Law during 1980-2010 for the New Industrialized Countries in Southeast Asia NIC<sub>s</sub> (Hong Kong, South Korea, Malaysia, Singapore, and Iran) using Panel data. The results of this study show that the role of government in the economies of NIC<sub>s</sub> can be justified, and that the increase in GDP in the economy of these countries contribute to the expansion and growth of government. The growth rate of GDP at constant prices is one of the most important macroeconomic indicators used to measure the performance of any economic system. In a sense, this indicator reflects the overall result of economic activity of each country. Therefore, by examining its trend, we can find out the general progress of the economic system and its economic prosperity or recession. In this study, the state of Iran's economy from the beginning of the period under study due to the initial difficulties of the war imposed during 1980-1989, GDP has been declining at a fixed price, and since 1989, with the end of the war and the implementation of the reconstruction programs, economic growth started to improve in the country. Also, except for a few years, the economies of the East Asian countries have experienced a stable economic growth during this period. In this study, the index of the ratio of government expenditures to GDP for five countries of Hong Kong, Iran, South Korea, Malaysia and Singapore has been analyzed and compared. The size of government in Hong Kong and South Korea has been relatively stable, while Malaysia and Singapore, despite fluctuations in some stages, have a stable trend. They showed that the size of the government in Iran has been accompanied by many ups and downs.

[Haji et al. \(2015\)](#) estimated the impact of the economy size (income and per capita income) on the size of the government (government expenditure, government expenditure relative to income and per capita government expenditure) in the form of four Alternative Specifications of the Wagner's law for the provinces of Iran in 2001-2012 using panel data. Based on the theory, by increasing income in these countries, the government expenditure has increased more. Most of the studies conducted on the Wagner's law in Iran or between a pair of countries have been conducted at macro-level. Only one study has been conducted in provinces of the country through cross section data for 1994. For this purpose, the effect of income, population density, the urbanization rate and the unemployment rate are examined on the size of the government. The results indicate the acceptance of Wagner's law in the provinces of Iran.

Mohamadi and Mazhari (2017) in their paper, in addition to the traditional versions of the Wagner's Law test, used the generalized version of the Wagner Inheritance Law (1994) to find a significant long-term relationship between government spending and economic development in Iran. The main purpose of this study is to investigate the short-term and long-term relationships between government spending (per capita) and GDP (per capita) using annual data for the Iranian economy in the period 1978-2013. Therefore, in this paper, the validity of these relationships is investigated by 6 different formulations of Wagner's law and the causality between variables is described using the F-edge test and the ECM error correction model. In the models under consideration, the conditions for establishing Wagner's law from the point of view of income elasticity exist only in the versions of Peacock, Musgrave and the generalized version. The results of the Bound Test indicate the existence of a long-term relationship between the variables in three versions of the study of Wagner's law. In addition, the results of causality using the error correction model indicate one-way causality from revenue to government expenditures for a short period in 5 versions of the models studied. In general, the results confirm the Wagner's law in the Iranian economy in 3 versions of models in the short- and long-terms.

Considering that the linear relationship between production and spending can lead to misleading results, Heidari (2019) examined the asymmetric adjustment of government size and production in the Iranian economy, using the seasonal data of the 1969-1996 period. He applied the Threshold Vector Error Correction Model (TVECM) to re-examine Wagner's law in Iran. The results of the study indicate that Wagner's law is valid for Iran's economy, however, there is a causal relationship between GDP and the ratio of government expenditure to gross domestic product. Therefore, the Wagner's law in a normal regime (a regime with shrinking shocks) and in the regime of boundaries (the regime with incremental shocks) is established. In the case of a deviation from the long-run equilibrium, Heidari showed that in the second regime the Wagner's law is faster than in the first regime.

As can be seen, most of the research conducted on the Wagner's Law in Iran has been done at a macro level. But in this study, in addition to studying Wagner's Law, we will also examine the income elasticity of education and health sectors as public goods, and the time lag of the impact of GDP on government spending.

On the other hand, due to the U.S. sanctions against Iran in recent years and the need to reduce the dependence of the government budget on oil revenues, GDP is divided into two parts; GDP without oil revenues and GDP including oil revenues. This was done to examine the impact of oil revenues on the Iranian economy with regard to the Wagner's Law.

#### 4. Methodology and Data

Johansen's (1988) cointegration approach and a VECM have been employed to investigate the causal relationship between public expenditures and economic growth in Iran. Before performing cointegration analysis, it is necessary to test

the stationarity of the series. Generally, most of the time series variables are nonstationary, containing a unit root. Therefore, in this situation, a standard regression with nonstationary data can lead to the problem of spurious (spurious problem can occur when two time series variables in a regression are highly correlated, whereas there is no actual relationship between them. High correlation is due to the existence of time trend in both time series variables). In an attempt to avoid the spurious problem, the difference of the variables has to be included for the cointegration analysis. The first step for cointegration test is to examine the stationery properties of all variables. The [Augmented Dickey Fuller \(1979\)](#) test is employed to examine the properties of time series variables and to determine the order of integration for each series in this study. If the series are non-stationary at levels and stationary in differences, then there is a chance of cointegration relationship between them which reveals the long-run relationship between the series. Johansen's cointegration test has been used to investigate the long-run relationship between the two variables. Additionally, the causal relationship between GDP and public expenditure was investigated by estimating the following VECM ([Johansen, 1988](#)).

$$\Delta X_t = \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t ; \varepsilon_t | \Omega_{t-1} \sim \text{distr}(0, H_t) \quad (7)$$

Where  $\Delta$  denotes the first difference operator,  $\varepsilon_t$  is a  $2 \times 1$  vector of residuals with mean zero and time-varying covariance matrix,  $H_t$ . The VECM specification contains information on both the short- and the long-run adjustment to changes in  $X_t$ , via the estimated parameters  $\Gamma_i$  and  $\Pi$ , respectively.  $X_t$  is a  $2 \times 1$  vector of log of public expenditure and log of GDP.

There are two likelihood ratio tests that can be applied to identify the cointegration between the two series. The variables are cointegrated if and only if a single cointegrating equation exists. The first statistic  $\lambda_{trace}$  tests the number of cointegrating vectors: zero or one, and the other  $\lambda_{max}$  tests whether a single cointegrating equation is sufficient or if two are required. In general, if the  $r$  cointegrating vector is correct, the following test statistics can be constructed as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \widehat{\lambda}_i) \quad (8)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \widehat{\lambda}_{r+1}) \quad (9)$$

Where  $\widehat{\lambda}_i$  are the Eigen values obtained from the estimate of the  $\Pi$  matrix and  $T$  is the number of usable observations. The  $\lambda_{trace}$  tests the null that there are at most  $r$  cointegrating vectors against the alternative that the number of cointegrating vectors is greater than  $r$  and the  $\lambda_{max}$  tests the null that the number of cointegrating vectors is  $r$ , against the alternative of  $r+1$ . Critical values for the  $\lambda_{trace}$  and  $\lambda_{max}$  statistics are provided by [Osterwald-Lenum test statistics \(1992\)](#).

In this study, the annual time series data of the variables under consideration, namely the Gross Domestic Product without oil (GDP) and the public expenditure of Iran, run from the year 1985 to 2018. The GDP is used as a proxy for economic growth in Iran, and we represent the economic growth by using the constant value of GDP measured in Iranian money (Rial). The total expenditure of the central government (G) has been considered for public expenditure under the study, oil



revenues (OIL), gross domestic product per capita without oil (GDPP), oil per capita (OILP), government spending on health (HY), and government spending on education (ED). All variables are logarithmic, and therefore the estimated coefficients are elasticity measures. All necessary data for the sample period are obtained from the Central Bank of Iran.

## 5. Empirical Results and Discussion

In this study, given that per capita GDP (GDP/P) and the ratio of government expenditures to income (G/GDP) (equations (2) to (6)) do not have unit roots, they cannot be used in a VECM model. Only Wagner's law presented by Peacock-Wismen (equation (1)) which does not have this restriction is estimated. First, we examine the variables in terms of stationarity, and then we estimate the model. We will then estimate the revenue elasticity of health and education expenditures provided by the government.

Peacock-Wismen's model states that GDP (income) is the reason for rising government spending.

We have GDP divided into two parts:

1. GDP without oil at the base price of 2002
2. Oil Revenues at the base price of 2002

As a result, we have:

$$\ln G_t = \alpha + \beta \ln GDP_t + \varepsilon_t$$

According to Wagner's law, as the per capita income grows in any economic system, the relative size of the public sector increases. Since government expenditures in the health and education sectors are part of government expenditures, it is important to pay attention to the revenue elasticity of these two sectors. In order to estimate the revenue elasticity of government expenditure in health (HY) and education (DE), we use the following equations respectively:

$$ED = \alpha_1 + \beta_1 \ln(GDP/P)_t + \varepsilon_t \quad (10)$$

$$HY = \alpha_2 + \beta_2 \ln(GDP/P)_t + \varepsilon_t \quad (11)$$

### 5.1 Unit Root Test

The Augmented Dickey-Fuller test (ADF) was employed to test the stationarity of the variables. The null hypothesis is that the variables in level have unit root and therefore are nonstationary, while the opposite hypothesis means that the variables in level are stationary. The test reveals that all variables become stationary when their first differences are used, so it can be concluded that they have unit roots. In other words, all variables are integrated in order of one, I(1). The results of first difference ADF test of these variables are presented in Table 1.

**Table 1. Augmented Dickey-Fuller test for unit roots**

Variable	ADF-statistic	t-statistic (1%)	t-statistic (5%)	Prob
LG	-3.440327	-3.421023	-2.943927	0.0157
LGDP	-4.088576	-3.605593	-2.936942	0.0027
LOIL	-3.794875	-3.621023	-2.943427	0.0064
LGDP	-3.952156	-3.605136	-2.886954	0.0040
ED	-7.192053	-3.59669	-2.975236	0.0000
HY	-7.730797	-3.625606	-2.981593	0.0000

*Source: Research Findings*

### 5.2 Determining the Optimum Lag Length of the VAR Model

The estimation of the Johansen's Cointegration model requires the estimation of a system of VAR equations. However, to obtain this, an optimal lag length is required.

Among various criteria used to determine an optimal lag, Akaike Information Criterion (AIC), Schwarz-Bayesian (SC), Hannan Quinn (HQ), Final Prediction Error (FPE) and the Likelihood Ratio (LR) were used. The statistical results are shown in Table 2 with lengths of L=1, 2 and 3 lags.

**Table 2. VAR Lag Order Selection Criteria**

Lag Length	LR	FPE	AIC	SC	HQ
0	NA	0.002505	2.524162	2.660208	2.569937
1	214.5944	2.65e-06	-4.330189	-3.786004	-4.147087
2	21.68654	2.02e-06	-4.618832	-3.666509	-4.298404
3	9.178022	2.43e-06	-4.472422	-3.111960	-4.014668

*Source: Research Findings*

In general, when the number of observations or sample size is less than 100, the Schwarz criterion yields better results than other criteria. Based on the Schwarz criterion, the optimal lag length is 1.

### 5.3 Johansen's Cointegration Test

Once the optimum lag is determined and the VAR model is estimated. Johansen's Cointegration Test (1998) is performed to examine the long-run relationship between public expenditure and other variables. Johansen test uses the maximum likelihood method to determine the cointegration relationship. If the variables are cointegrated, it means that they move together over time, so that short-term disturbances are corrected in the long run. The results are presented in Table 3.

**Table 3. Johansen's Cointegration Test**

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None * ( $r=0$ )	0.727643	54.31922	29.79707	0.0000
At most 1 ( $r\leq 0$ )	0.252955	11.39801	15.49471	0.1882
At most 2 ( $r\geq 0$ )	0.052345	1.774234	3.841466	0.1829

Source: Research Findings

Notes: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

The Johansen's cointegration test results reject the null hypothesis of no cointegration at the 5 percent significance level. Thus, it can be concluded that GDP, public expenditure (G) and LOIL are cointegrated which means they co-move in the long run. The above-mentioned results allow us to estimate the VECM model with cointegration vectors.

#### 5.4 Estimation of the VECM Model

This model relates the volatility of short-term variables to their long-term values and considers the short-term dynamic response among variables. In this section, the results of estimating error correction equations are presented in Table 4.

**Table 4. Vector Error Correction Estimates**

Variables	D(LG)	D(LGDP)	D(LOIL)
Error Correction	0.015686 (0.02002) [0.78357]	0.010468 (0.00629) [1.66347]	0.111483 (0.025350) [4.39860]

Source: Research Findings

$$D(LG) = 3.424176 LGDP(-1) + 6.653224 LOIL(-1)$$

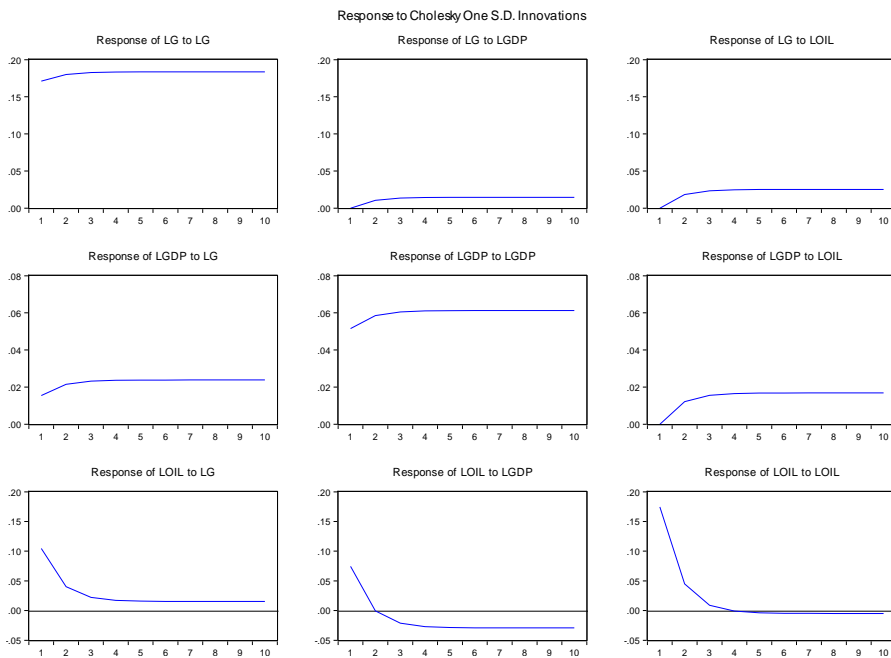
se	(0.72800)	(0.90785)
t	[4.70355]	[7.32856]

The coefficients of the equation show that GDP growth will increase government spending indicating that Wagner's law holds in Iran. Also, if oil revenues increase one percent, government expenditure increase 6.65 percent.

The government expenditures elasticity with respect to GDP and oil revenues are estimated to be higher than one, and the government's response to rising oil revenues is approximately twice as high; this indicates that government expenditures depend on oil revenues. The t-statistic implies a significant causality running from GDP to public expenditure in the short-run.

### 5.5 Impulse Response Functions

The Impulse response function (IRF) analysis is a practical way to visualize the behavior of a time series in response to various shocks in the system (Enders, 1995). The plot of the IRF shows the effect of one standard deviation shock to one of the innovations on current and future values of the endogenous variables. These functions are a moving average of the VAR model and enable the characterization of the dynamic interactions among variables and allow us to observe the speed of adjustment of variables in the system. Figure 1 plots the response of public expenditure to shocks in GDP and vice versa. The effect of a GDP shock on government expenditures is increasing over time. In fact, it will take about four years to have an impulse-free GDP shock on government spending.



**Figure 1. Impulse Response Functions**

*Source: Research Findings*

### 5.6 Estimating Income Elasticity of Government Expenditures on Health and Education

To estimate the income elasticity of government expenditures in the two sectors of health and education, we use Vector Error Correction Estimation as shown in Table 5.

**Table 5. Vector Error Correction Estimates**

Variables	LGDP
	10356.40
ED	(5651.14)
	[1.83262]
Error Correction	3003.369
HY	(240.187)
	[12.5043]

*Source: Research Findings*

From Table 5 the following estimated equations for ED and HY are obtained:

$$ED = \alpha_1 + 10356.40 \text{ LGPPP}$$

$$HY = \alpha_2 + 3003.369 \text{ LGDPP}$$

From the above equations income elasticities for health and education are calculated and presented in Table 6.

**Table 6. Income Elasticities of Government Expenditures on Health and Education**

Variables	Variables	
	Health	Education
Income Elasticity	0.95	0.40

*Source: Research Findings*

Elasticity of government spending on health is 0.95. If GDP grows 1%, government spending on health will increase 0.95%. Therefore, the government expenditures in the health sector are not bigger than one, but close to one. Income elasticity of government spending in the education sector is 0.40. If GDP increases by one percent, government spending in the education sector will increase by 0.4%.

## 6. Conclusions and Policy Recommendations

In this study, we assumed the causality between the two variables: government spending and GDP, and from GDP to government spending. According to Wagner "as the per capita income grows in any economic system, the relative size of the public sector increases," in order for this law to be implemented in an economy, it is essential that government spending have an income elasticity greater than one. Since government expenditures in the health and education sectors are among the government's expenditures in these sectors, it is important to pay attention to the income elasticity of these two sectors.

The purpose of this study was to investigate the causal nexus between public expenditures and economic growth in Iran using cointegration approach and Error Correction Model. The analysis was carried out for the period 1985 to 2018. The Wagner's Law explains the relationship between GDP growth and government expenditures. Wagner believed that the growth of the public sector is faster than that of economic growth. At the same time, market inefficiencies, especially with regard to privileged goods, necessitate government intervention in the economy. He also claims that goods offered by the public sector have a high income

elasticity. Generally speaking, most economies become more complex as countries move towards higher degrees of industrialization and societies move away from traditional ways. Urbanization and high levels of urban life usually lead to congestion and external side effects that will require government interventions and regulations in the public sector which will in turn intensify the need to increase the provision of public goods and services such as education and health. In addition, services such as education, health and welfare services tend to have high income elasticities. Therefore, when real income in a country increases, so do government expenditures. As a result, we can say that rising income following industrialization requires more government and public sector intervention.

Wagner's Law has been expressed in different versions. In this study, we estimated the Peacock and Wismen's version. Considering the positive and significant coefficient estimates, we conclude that Wagner's Law holds in Iran (validity of the first hypothesis). According to the estimates, it takes four years for a GDP shock to fully affect the government expenditures. Therefore, the second hypothesis in which it takes more than one year for the GDP effect to be fully realized is confirmed. Income elasticities of government spending on health and education was estimated to be less than one. Accordingly, the third hypothesis in which the income elasticity of health and of education is higher than one, is rejected.

With respect to oil revenues, much of the government's response depends on this variable and GDP without oil has no power to explain changes in government spending, which indicates the high contribution of oil revenues in explaining the government expenditures. Consequently, GDP without oil plays a very small role in adjusting government expenditures. This indicates a strong dependence of the Iranian economy on oil resources. On the other hand, the share of government spending in health and education sectors in the overall government spending is negligible. This could suggest that the government fails to pay enough attention to health and education. One can conclude that health and education are not priorities of the government in allocating proper budget share to these sectors.

Regarding the significant effect of oil revenues on government spending, it can be said that since Iran is an oil-dependent economy and on the other hand, oil price fluctuations are frequent over time, therefore, oil revenues are very important to the government. This is because these revenues cover a significant portion of government's financial expenditures. According to the results, oil revenues have a decisive share in government spending; instead, non-oil revenues play a small role in adjusting government spending. This indicates that the government uses oil revenues to cover its expenditures whenever it faces a lack of funding. Perhaps these revenues should be spent on economic growth and development.

Therefore, instead of financing its expenditures from oil revenues, the government should first cover these expenditures from non-oil revenues and then reduce its expenditures. Economic policymakers should plan to allocate these

resources to generate more revenues for the country and ultimately use this revenue as a tool for development and Economic growth of the country.

On the other hand, the income elasticity of less than one for government expenditures in the education and health sectors indicates that the government does not pay enough attention to the development of these two sectors. Therefore, economic policy makers must plan for the development of the above two sectors by allocating more budget to the mentioned sectors.

### **Acknowledgment**

The initial version of this article was published at the “RAIS Conference Proceedings-The 14th International RAIS Conference on Social Sciences and Humanities, 14, 17-24”, <http://rais.education/proceedings-of-the-14th-rais-conference-2/>

## References

- Abu-Eideh, O. (2015). Causality between public expenditure and GDP growth in Palestine: An econometric analysis of Wagner's Law. *Journal of Economics and Sustainable Development*, 6(2), 189-199.
- Afonso, A., & Alves, J. (2016). Reconsidering Wagner's Law: Evidence from the functions of the government. *Department of Economics, Applied Economics Letters*, 24(5), 346-350.
- Ageli, M. M. (2013). Wagner's Law in Saudi Arabia 1970 - 2012: An econometric analysis. *Asian Economic and Financial Review*, 3(5), 647-659.
- Aschauer, D. A. (1989). Is public expenditure productive? *Journal of Monetary Economics*, 23(2), 177-200.
- Baumol, W. J. (1967). Macroeconomics of unbalanced growth: The anatomy of urban crisis. *The American Economic Review*, 57(3), 415-426.
- Bird, R. M. (1971). Wagner's 'Law' of expanding state activity. *Public Finance*, 26(1), 1-26.
- Dadgar, Y. (2013). *Public economics (3rd ed.)*. Qom, Mofid University Press.
- Dadgar, Y., & Nazari, R. (2012). Wagner's Law test in selected countries and Iran (1980-2010). *Journal of Economic Growth and Development Research*, 6(1), 149-172.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimates for autoregressive time series with a unit root. *Journal of American Statistical Association*, 74(366), 427-431.
- Dilrukshini, W. A. (2004). Expenditure and economic growth in Sri Lanka: Co-integration analysis and causality testing. *Staff Studies*, 34(1), 51-68.
- Enders, W. (1995). *Applied econometric time series*. New York: John Wiley & Sons, Inc.
- Goffman, I. J. (1968). On the empirical testing of Wagner's Law: A technical note. *Public Financ*, 23(2), 359-364.
- Goffman, I. J., & Mahar DJ. (1971). The growth of public expenditures in selected developing nations: Six caribbeannations. *Public Financ*, 26(1), 57-74.
- Gupta, S. P. (1967). Public expenditure and economic growth: A time series analysis. *Public Financ*, 22, 423-466.
- Haji, G., Komajani, A., & Hozhabrkiyani K. (2015). The effect of the factors affecting the size of government in the provinces of Iran. *Quarterly Journal of Applied Economics Studies in Iran*, 4(2), 113-136.
- Halicioglu, F. (2003). Testing Wagner's Law for Turkey, 1960-2000. *Review of Middle East Economics and Finance*, 1(2), 31-42.
- Heidari, H., & Aghayari, P. (2019). Asymmetric adjustment in order to re-examine the size of government and production of Wagner's law in Iran. *Journal of Econometric Modeling-Fourth Year*, 13(1), 33-52.
- Herath, S. (2010). Size of the government and economic growth: An empirical study of Sri Lanka. *SRE—Discussion Papers, WU Vienna University of Economics and Business*, 14(1), 1-29.



- Hussain, T., Iqbal, A., & Siddiqi, M. W. (2010). Growth population, exports and Wagner's Law: A case study of Pakistan (1972-2007). *International Journal of Human and Social Sciences*, 5(5), 318-323.
- Im, K. S., Pesaran, H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.
- Johansen, S. (1988). Statistical analysis and cointegrating vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on co-integration with applications for the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.
- Khodaparast, M., & Falahi, M. A. (2012). Validity of Wagner's law and the Keynesian view for the Iranian economy a time series analysis. *Queensland Journal of Educational Research*, 12(1), 87-112.
- Koop, G., & Poirier D. J. (1995). An empirical investigation of Wagner's hypothesis by using a model occurrence framework. *Journal of the Royal Statistical Society*, 158(1), 123-141.
- Kumar, S., Webber, D., & Fargher, S. (2012). Wagner's Law revisited: Cointegration and causality tests for New Zealand. *Applied Economics*, 44(5), 607-616.
- Mohamadi, M., & Mazhari, R. (2017). Cointegration, causality and augmented Wagner's Law: New evidence for the Iranian economy. *Quarterly Journal of Fiscal and Economic Policies*, 5(17), 27-49.
- Musgrave, R. A., & Musgrave P. M. (1989). *Public finance in theory and practice*. New York, McGraw hill.
- Najarzadeh, R., & khorasani, E. (2019). A review of Wagner's Law and income elasticity of the government expenditures in Iran (1985-2018). *RAIS Conference Proceedings-The 14th International RAIS Conference on Social Sciences and Humanities*, 14, 17-24.
- Ogba L. (1999). Elements of public finance. *T.O.Abayomi Industrial Packaging Ltd, Agege*.
- Osterwald-Lenum, M. (1992). A note with quantiles of the asymptotic distribution of the maximum likelihood cointegration rank test statistics: Four cases. *Oxford Bulletin of Economics and Statistics*, 54(3), 461-472.
- Paparas, D., & Stoian, A. (2016). The validity of Wagner's Law in Romania during 1995-2015. *MPRA Paper, University Library of Munich*.
- Paparas, D., & Richter, C. (2018). The validity of Wagner's Law in the United Kingdom during the last two centuries. *International Economics and Economic Policy*.
- Peacock, A. T., & Wiseman, J. (1961). *The growth of public expenditure in the United Kingdom*. Princeton University Press (p. 35 - 51).
- Peacock, A. T., & Wiseman, J. (1979). Approaches to the analysis of government expenditure growth. *Public Finance Quarterly*, 7, 3-23.
- Pesaran, M. H. (2003). A simple panel unit root test in the presence of cross section dependence. *Mimeo University of Southern California*.

- Phillips, P. C. B., & Perron, P. (1988). Testing for unit roots in time series regressions. *Biometrika*, 75(2), 335-346.
- Pryor, FL. (1969). *Public expenditures in communist and capitalist nations*. George Allen and Unwin, London.
- Ranjan, R., & Abhishek K. C. (2013). An application of Wagner's Law in the Indian economy: 1970-71 to 2010-11. *Knowledge Horizons - Economics*, 5 (4), 138-144.
- Samadi, A., & Abolhassan Beigi, K. (2012). Testing Wagner's Law in selected OIC member states evidence from panel cointegration tests. *Journal of Economic Research and Policies*, 20 (64), 115-130.
- Srinivasan, P. (2013). Causality between public expenditure and growth: The Indian case. *Journal of Economic and Management*, 335-347.
- Souri, A. (2014). *Econometrics*. Vol. II, Farhangshenasi Publishing, Third Edition
- Wagner, A. (1883). *Three extracts on public finance*. In R. A. Musgrave and A. T. Peacock eds 1958. *Classics in the Theory of Public Finance*, London: Macmillan.

## Appendix

***Government expenditures by duties***

<b>Government expenditure</b>	<b>Billion Rial</b>
Public Services	96,651
Public debt transactions	7,974
Defense	68,773
Public order and security	37,687
Agriculture, forestry, fishing and hunting	22,316
Fuel and energy	84,983
Mining, industry and construction	18,168
Transportation	55,489
connections	3,026
Environmental Protection	1,141
Housing and urban facilities	17,930
Healthcare	61,153
Recreation, culture and religion	28,507
Education	126,628
Social support	297,086

*Source: Central Bank of the Islamic Republic of Iran*