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Nexus between Government Expenditure and Economic Growth in Pakistan: Comparative Analysis of Wagner's Law and Keynes's View

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ABSTRACT

Objective: The major objective of this study is to empirically investigate the existence of Wagner's rule, Keynes's views, and Wagner's additional versions in the short and long run for the case of Pakistan.

Design/Methodology/Approach: The simple OLS method is used to check the existence of Wagner's law, and its variants for the period of 1970 to 2021 in the case of Pakistan. For checking long-run relationships of Wagner's variants, the Johansen co-integration test was used.

Findings: The OLS results confirmed the existence of Wagner's in Pakistan. The Johansen co-integration results explored that there is no long-run co-integration for Pakistan's economy. The Granger causality results revealed that only three versions have bi-directional causality and favour Keynes's view.

Originality/Value: The study implicates the government's final consumption expenditure for public welfare that aims to spur the economic growth of an economy.

Theoretical/Practical Implications of the Findings: The policymakers should set conducive policies for the increase in government final consumption expenditure for public welfare. Developing countries such as Pakistan should follow Keynes's view.

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1. Introduction

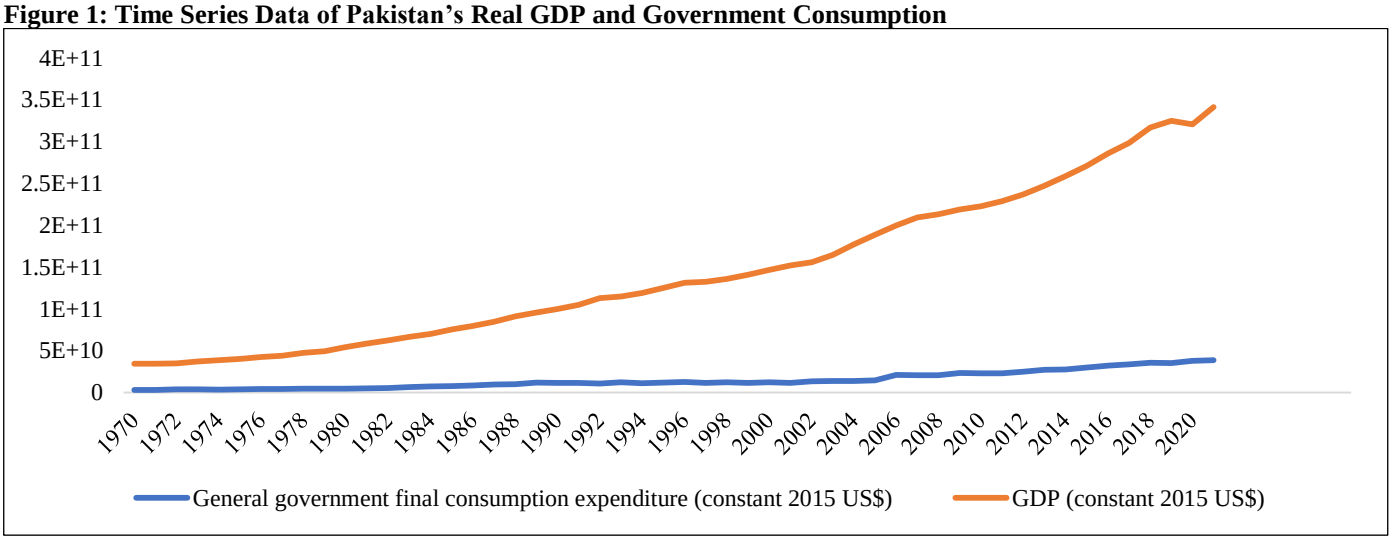
The increase in governmental expenditure accompanied an increase in real GDP. At the global level, the proportionate size of the governmental sector has demonstrated considerable development in both emerging and advanced countries. The relationship between government expenditures and national revenue was a topic of interest for economists during the Second World War. Adolph Wagner and John Maynard Keynes were two of the most popular economists of that time. Although it was the Industrial Revolution, economists were concerned about the nature of national revenue and public expenditure. A well-known German economist named Adolph Wagner presented a sophisticated model for determining public spending more than a century ago. He argued that there was a natural connection between economic progress and government activity.

Wagner's law states that in any culture, government spending will increase more quickly than local production. Wagner provided several justifications for the creation of his law, addressing issues of fundamental complementarity between the supply and demand for private and public goods and the structure of the state. Wagner hypothesized that the rapid growth in government spending is also attributable to economic progress. Wagner's hypotheses (WH) or the law of Wagner (WL) equated a rise in government expenditure with increased GDP. Very simple, growth in public sector expenditure is caused by growth in national income (Wagnerian Hypothesis). Furthermore, Wagner stated that government spending and national income have a long-term relationship in which spending on the government is seen because of rising national income and is therefore viewed as endogenous in the development of economic policy. Using data from Germany, Wagner's law of "growing state involvement" was studied for the first time and outlined numerous grounds for justifying the hypothesis, including social security and defense expenses, subsidies, infrastructure development, and service sector expenditures. Using the basic empirical results, he developed a law known as the "developing state expenses" that emphasized the burgeoning significance of administration and spending which are the crucial components of a progressive state (Bird, 1971). Wagner also highlighted the major drivers of rising government spending. These elements are as follows: First, as the country's economy grows, the federal administrative and defensive mechanisms will increase. Second, as the economy grows, the government's expenditure on culture and welfare, particularly education and health, will rise. Finally, in industrialized countries, technical advancement necessitates that the government perform some economic function of which the private sector is ashamed (Clement & Dickson, 2010).

Keynes (1936) provided his view against Wagner's law. Growth in national income is caused by growth in public sector expenditure (Keynes's view). Musgrave and Musgrave (1988) predicted trends that would emerge over the next 50-100 years, predicting that the development of modern industrial societies would increase political pressures on social progress and the continued expansion of the public sector (Clement & Dickson, 2010). However, the Keynesian perspective contends that government spending affects economic expansion. In other words, Keynes believes that government spending promotes economic growth, they view it as an exogenous tool for policymakers.

Pakistan and other developing nations have relatively low government spending on their GDP. In the end, socioeconomic factors are in the worst status. The worst socioeconomic indicators express low socioeconomic growth.

Figure 1: Time Series Data of Pakistan's Real GDP and Government Consumption



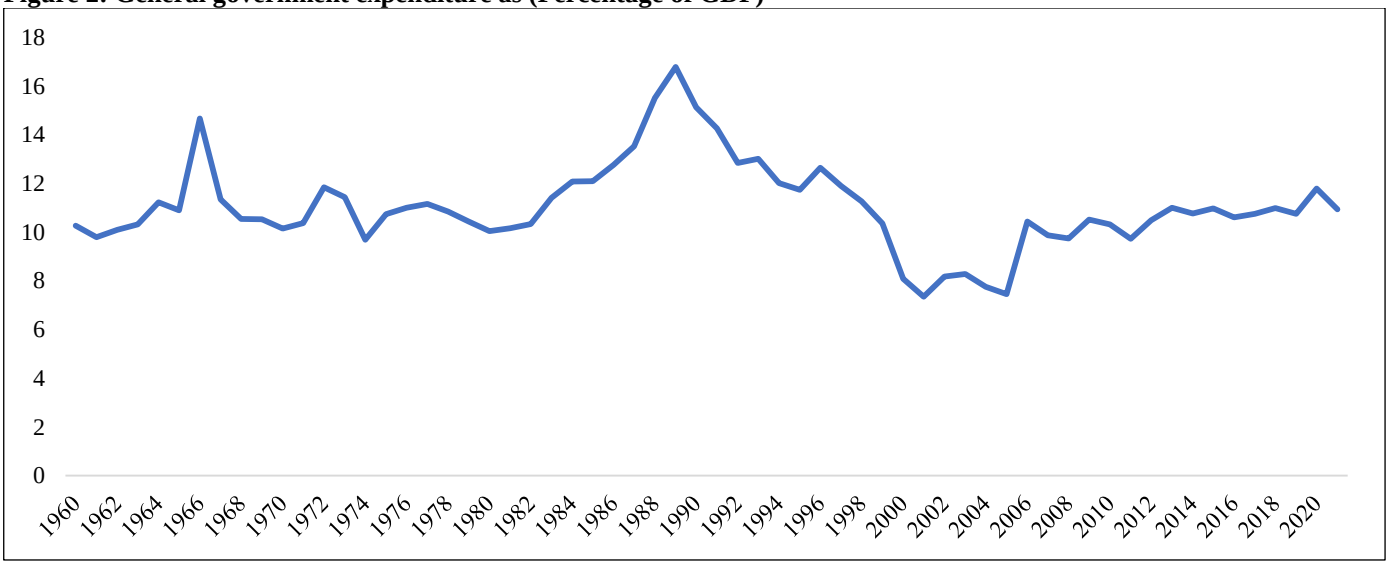
Data Source: World Bank (2021)

In Figure 1, Pakistan's economy is depicted by its actual GDP and overall final consumer expenditures from 1970 to 2020. It expresses that an increase in real GDP is much more than the increase in general government final consumption expenditure. The real GDP increases steeper, whereas the general

government's final consumption expenditure increases flatter providing evidence that the increase in real GDP is much greater in the general government's final consumption expenditure. In the era of COVID-19, the government's final consumption expenditure increases at the lowest rate as compared to GDP.

Figure 2 shows the general government expenditure of Pakistan's economy for the period of 1960-2020. The data in Figure 2 shows that, in 1989, the highest consumption of government expenditure at the general level was 16.78% of GDP, which further reached a minimum level of 7.46% in 2005 in the history of Pakistan. Finally, it shows that in 2021, the overall government budget as a percentage of the GDP was 10.94%.

Figure 2: General government expenditure as (Percentage of GDP)



Data Source: World Bank (2021)

The current study focuses on the research question: Are Wagner's law and its other versions (six formulations) and Keynes's views valid for Pakistan from 1970 to 2021? The major objective of this study is to empirically investigate the existence of Wagner's law and its additional variations in the short and long run for the circumstances of Pakistan. The study tries to fill the gap between the validity of Wagner's and Keynes's views in the case of Pakistan's general government's final consumption expenditure (aggregate level of expenditure) in the current period 1970-2021.

The study was divided into five sections. Section 1 describes the background of the study. The previous literature on Wagner's and Keynesian studies is included in Section 2. The model specification for this empirical investigation is described in Section 3. Section 4 summarizes the study's empirical findings. Section 5 includes the conclusion of this study.

2. Literature Review

Wagner's law has been analyzed by a number of studies in various countries, regions, and different periods (Huang, 2006; Rehman et al., 2007; Afzal & Abbas, 2010; Babatunde, 2011; Zaman et al., 2011; Rauf et al., 2012; Kesavarajah, 2012; Bojanic, 2013; Sekantsi & Molapo, 2017; Cheema & Iqbal, 2017; Eldemerdash & Ahmed, 2019; Ghazy et al., 2021; Arestis et al., 2021; Inchauspe et al., 2022; Gunay & Aygun, 2022). Numerous studies on Wagner's rule have been conducted. However, there is no definite behavior in the empirical results. Some studies support the existence of Wagner's law, whereas others discovered evidence that contradicts Wagner's law. In contrast, an additional set of researchers discovered a mixed conclusion about the validity of Wagner's rule, i.e., whether Wagner's law is valid or not. It is based on the nation's financial and societal circumstances. The bulk of the studies discussed previous literature based on Wagner's law.

The seminal work of this study was done by Singh & Sahni (1984). They compared India and Canada and indicated how government expenditure and GDP are related. They discovered a two-way link between GDP and overall government spending in both countries. Ram (1987) asserted that while confident time series research supports the idea, cross-section analyses do not. In addition, Wagner's rule was investigated in Britain for the data of 1870-1913, confirming the applicability of Wagner law (Oxley, 1994). An analysis of 20 countries by Mohsin et al., (1995) found a long-term relationship between public spending and GDP. Using data from Pakistan on public expenditure, income, and other control variables, the study assessed whether the approach (WL or Keynesian) is more reasonable. Chletsos & Kollias (1997) argued that evidence for Wagner's law can only be discovered for specific types of government spending in Greece. Wagner's law was tested in Chinese provinces by Narayan et al., (2006). Wagner's law is specified using two models. Chinese provinces were classified according to their income levels-specifically, the western, eastern, central, and entire provinces of China. For empirical investigation, four models were used. For Model 1, real GDP, and real government spending, in Model 2, real GDP per capita and real federal spending per capita were used. The results show that elasticity is greater for central and western China (supports Wagner law), whereas full panel and eastern provinces do not support Wagner law.

Rehman et al. (2007) used time series data from 1972 to 2004 to examine the existence of Wagner law in the Pakistani economy. For checking long-term relationships, they adopted the Johnson co-integration approach. Government spending (dependent), per capita income, trade openness, and financial development (independent variables) were used for the empirical analysis. The results revealed the non-existence of Wagner's law in Pakistan. Babatunde (2011) examined the applicability of Wagner's rule to the Nigerian economy using time series data spanning the years 1970 to 2006. For five variants of Wagner's hypothesis, he employed ARDL-bound testing methodology. According to the results, there is no proof that government expenditure and economic growth correlate with the Nigerian economy. Bagdigen and Beser (2009) used time series data from 1965 to 2000 to auction off research for the justification of Wagner legislation in the Turkish economy. The empirical results found that public spending was a consequence rather than a driver of GDP growth. Causality must move from GDP to government spending. The co-integration approach for long-run relationships and the Granger causality test indicated that there is no causation in either direction. Wagner's law does not apply to the Turkish economy.

Afzal and Abbas (2010) investigated the Wagner hypothesis in Pakistan from 1960 to 2007. The result indicates that Wagner's law does not exist in the case of Pakistan. Torun and Arica (2011) examined Wagner's proposition on inflation targeting using panel data from both developed and developing countries. The results discovered solid evidence supporting the validity of Wagner's proposition for 17 inflation-targeting nations. In addition, the applicability of Wagner's law in Pakistan from 1979 to 2009 was investigated by Rauf et al., (2012). The results determined no co-integration relationship between GDP and government expenditures after applying Wagner's criterion to five different models. To check the long-run relationship between GDP and government expenditure, the ARDL approach for co-integration analysis was used. Further, an examination of co-integration analysis revealed that no causation exists between GDP and government expenditure using Toda & Yammato's (1995) co-integration approach. As a result, they demonstrated that Wagner's law does not apply to the Pakistani economy.

Ageli (2013) examined the validity of Wagner's rule for oil and non-oil resources in the Saudi economy from 1970 to 2012 using six extended versions of Wagner's law. A simple basic OLS model is used for Wagner's law specification. The law of Wagner and the Keynesian hypothesis were both supported by Abu-Eideh's (2015) investigation of Palestinians between 1994 and 2013. The research discovered a bidirectional relationship between the variables. Al-Fawwaz et al. (2016) evaluated the impact of Wagner's law on Jordan's economy from 1990 to 2010. To check the long-run relationship, VAR, and Johansen's co-integration approaches were applied. The findings showed that Jordan's economy defies Wagner's law. Kyissima et al. (2017) conducted a comprehensive study that included additional factors in analyzing Wagner's law. Wagner's law was tested in Tanzania from 1996 to 2014. The results support Granger's causality, which extends GDP to government expenditure & confirms Wagner's law. The Granger causality test revealed that FDI and gross domestic savings were unrelated to GDP. The study conducted by Amin &

Jannat (2017) in Bangladesh, discovered that Wagner's law was supported. The Granger causality test was used to confirm that the connection between the two variables in the two tested laws was bidirectional. The long-term co-integration between GDP and government spending in Egypt was determined using ARDL co-integration and verified using ECM. Government expenditure and GDP support Wagner's rule, according to Eldemerdash & Ahmed (2019). Mann's version was used in the research. Wagner's law was used in another study to examine how governments affect economic growth, e.g., El Husseiny's (2019). Its primary objective was to determine the ideal size for the government. Empirically supporting the long-run co-integration link between government final consumer spending and real gross domestic product for Egypt relied on brand new research by (Ghazy et al., 2021).

Arestis et al. (2021) empirically favored the existence of Keynes's view in the case of Turkey. Alawin et al. (2022) examined the existence of Wagner's law on GCC countries from 1992 to 2020. The Panel data results indicated that Wagner's hypothesis is valid for GCC countries. For the Indonesian case, Inchauspe et al., (2022) analyzed the high economic growth period, Wagner's law is applicable because high GDP motivated prices, ultimately increasing public expenditure. A panel data study on SSA countries was conducted by Gunay & Aygun (2022). The finding shows the consistency of public expenditure and economic growth. A very recent study was conducted by Nokam & Soh (2023) in Cameroon from 1977 to 2016. In the case of Cameroon, the results favored the existence of Wagner's law.

A number of studies have been conducted to evaluate the applicability of Wagner's principle to Pakistan's economy using different periods (Khan, 1990; Rehman et al., 2007; Afzal & Abbas, 2010; Zaman et al., 2011; Rauf et al., 2012; Cheema & Iqbal, 2017). Some studies have shown the validity of Wagner's law, while others claimed the invalidity of this law.

The above-mentioned studies show mixed results in different countries. We examine the time series characteristics of the data to establish the direction of causation and the long-run relationship between public spending and economic development. Therefore, we used elasticity estimations with the time series econometrics approach such as co-integration, VAR, and Granger causality to examine the short-run and long-run relationship between public expenditure and economic development in terms of Wagner's Law and Keynes's view of Pakistan.

3. Data and Methodology

Wagner's law is based on national income and government spending. In this empirical study, the six variations of Wagner's law have been examined (Peacock & Wiseman, 1961; Gupta, 1967; Michas, 1975; Goffman, 1968; Pryor, 1968; Musgrave, 1969; Mann, 1980). These versions differ from the variable. Finally, all models are nearly identical. Only the scope and metrics of government spending and economic expansion are different. Table 1 explains the different variants of Wagner's law. Peacock & Wiseman (1961) used the first combination (Model 1), "Public spending should rise at a faster rate than GDP". By asserting that the proportion of public consumer spending to national GDP is rising in emerging nations, Pryor (1968) developed Model 2. In the same year, Goffman (1968) developed the Model 3. GDP per capita growth during the development process ought to be slower than the rate of growth in the activities of the public sector. Model 4 states that as the GDP per capita increases, the public sector's share in the economy grows, according to Musgrave (1969). In Model 5, According to (Gupta, 1967; Michas, 1975) study, there is a correlation between per capita GDP and per capita expenditures by the government. The Model 6 structure, created by Mann in 1980, states that public spending as a percentage of GDP is an indicator of GDP.

Table 1: Variants of Wager's law

Model No.	Version	Function
1	Peacock and Wiseman (1961)	GFCE=f(GDP)
2	Pryor (1968)	GFCE=f(GDP)
3	Goffman (1968)	GFCE=f(GDP/POPU)
4	Musgrave (1969)	(GFCE/GDP)=f(GDP/POPU)
5	Gupta (1967) and Michas (1975)	(GFCE/POPU)=f(GDP/POPU)

6	Mann (1980)	(GFCE/GDP)=f(GDP)

Sources: Author's Compilation

All these variables have been examined to check the validity of Wagner's law and Keynes's proposition. The general government's final consumption expenditure (GFCE), per capita income (GDP/POPU), total population (POPU), and GDP are used.

3.1. Data Sources

This empirical study uses actual long-term information on final consumer spending by the general government (GFCE), total population, and real GDP data gathered from the World Development Indicator (WDI, 2021), World Bank. The total of all expenses is included in the government's final consumption expenditure on the acquisition of goods and services, including staff remuneration and defense spending. All variables are obtained for the period 1970-2021.

3.2. Model Specification

The major aim of this research is to determine the existence of Wagner's law and Keynes's proposition using the OLS model, as well as to examine the long-term connection (co-integration) of Wagner's law and its variants. First, the validity of Wagner's law is checked by applying the simple OLS method to six versions of Wagner's law. Next, the co-integration for each model is examined. Government consumption spending is used in place of the long-term government spending relationship, which is needed to examine Wagner's law because the data is not available for Pakistan. As a result, Pryor (1968) is the most significant type examined in this study since it was the first to include consumption expenditures by the government. In addition, the studies of (Gupta, 1967; Michas, 1975; Goffman, 1968; Musgrave, 1969; Mann, 1980) examined government consumer expenditures as a stand for government expenditure. Due to similarities between Pryor's version and the use of government governmental expenditure on consumption, Peacock-Wiseman's (1961) version is not evaluated. Instead, it uses government spending as a proxy for government consumption expenditure, producing identical findings. Based on Table 1 functions of Wagner's law, the econometric models are as follows.

$$L(GFCE_t) = \alpha + \beta LGDP_t + \mu_t \quad (1)$$

$$L(GFCE_t) = \alpha + \beta LGDP_t + \varepsilon t \quad (2)$$

$$L(GFCEt) = \alpha + \beta L\left(\frac{GDPt}{POPt}\right) + \theta t \quad (3)$$

$$L\left(\frac{GFCEt}{GDPt}\right) = \alpha + \beta L\left(\frac{GDPt}{POPt}\right) + \pi t \quad (4)$$

$$L\left(\frac{GFCEt}{POPt}\right) = \alpha + \beta L\left(\frac{GDPt}{POPt}\right) + \epsilon t \quad (5)$$

$$L\left(\frac{GFCEt}{GDPt}\right) = \alpha + \beta L(GDPt) + \vartheta t \quad (6)$$

Where L represents the natural log which is used to reduce the large value and finally reduce the chances of heteroskedasticity in the models. By taking the log for each variable, the result is interpreted in the elasticity form. The α and β represent the constant and estimated coefficient of each model respectively. The Ɛ, π, ϵ, ϑ, μ, and θ represent error term in the model.

3.2.1. Stationary of the Variable

If the average, covariance, and variance of a series remain constant across time, the series is said to be stationary, or if the data shows no trend. A stationary model is a critical tool for data appropriateness. If the series is non-stationary, the regression results will be misleading or spurious. For the empirical analysis, first, check the stationery of a series. Different tests are used to check the stationary of a variable, such as ADF, PP, and KPSS. To evaluate the stationary property of the variables, the ADF test is used to determine

if a unit root exists. The ADF unit root test, which is used to confirm the presence of the unit root test, is given by the following equations:

$$\Delta Yt = \alpha Yt - 1 + \sum_{i=1}^{m} \beta i \Delta Yt - 1 + \delta + \gamma t + \varepsilon t \quad (7)$$

$$\Delta\Delta Yt = \alpha \Delta Yt - 1 + \sum_{i=1}^{m} \beta i \Delta\Delta Yt - 1 + \delta + \gamma t + \varepsilon t \quad (8)$$

Where Δy is the initial variation in the series, m is the number of lags, and t is time. Yt is the series of general government consumption expenditures. The null hypothesis states that Yt is a non-stationary series.

If the variables being examined are stationary, i.e., they lack unit roots, the sequence is denoted as I(0) in equation (7). The variables under investigation are said to be I(1) if they are non-stationary in their level form, but they are still in their initial difference form, implying that the variable has a unit root at the level. The variable is incorporated into equation (8), or I(2) if it is constant at the second variation.

3.2.2. Co-integration Test

To investigate the connection between variables across the long-run and short-run, a co-integration test is employed. Granger (1980) proposed the long-run equilibrium's initial connection with irregular series. Furthermore, the notion of co-integration was developed and introduced by Engle & Granger (1987). Johansen (1988) and Johansen and Juselius (1990) proposed that the variable under consideration should be tested for long-run correlations among the variables. The Johansen co-integration approach is applied to I(1) parameters because the analysis is predicated on the assumption that the variables used have a unit root or else additional limitations must be implemented. The first step is to identify the order of variable integration. To achieve this, we run the ADF test for all variables. The next step is to choose the optimal number of lags using different criterion. The optimal lag length is obtained at the lags where the AIC, SBC, and FPE criterion values are the smallest. The third step is to select the best model for the deterministic component of the multivariate system. As a result, we estimate the following models and then compare them based on their trace statistics, and the Max-Eigen value on their critical value. If the trace statistics and Max-Eigen values exceed the critical value, it indicates the number of co-integration equations or the rank of co-integration. If co-integration exists, then apply the variance error correction term; otherwise, variance autoregression (VAR). The VAR model indicates the short-run estimate. Granger causality analysis is used to determine the short-run direction of a relationship. The Granger causality test is the causal link between the variables under consideration. The F-test is used to test the null hypothesis of non-causality. According to Amin et al. (2014), the null hypothesis states that parameter X has no direct impact on variable Y. The following equation shows the Granger cause of the X and Y variables.

$$\Delta Yt = \alpha + \sum_{i=1}^{m} \beta i \Delta Yt - 1 + \sum_{j=1}^{n} \beta \varphi i \Delta Xt - 1 + \varepsilon t \quad (9)$$

$$\Delta Xt = \delta + \sum_{i=1}^{m} \emptyset i \Delta Xt - 1 + \sum_{j=1}^{n} \mu i \Delta Yt - 1 + \tau t \quad (10)$$

Where βi, φi, and $\emptyset i \; and \; \mu i$ are coefficients of Yt and Xt variables. εt and τt are error terms used in this model.

4. Empirical Results

The empirical results are based on descriptive statistics, correlation analysis, OLS, co-integration, and the Granger causality test.

4.1. Descriptive Statistics and Correlation Analysis

The descriptive statistics and correlation analysis are presented in the Table 2. For each variable, the mean value is greater than its standard deviation. This shows that data is properly dispersed. The standard deviation value of all variables has less values indicates that steeper curve of the normal distribution. The skewness and kurtosis show the shape of the bell curve. The symmetry of normal distribution is measured by skewness. The results of all variables indicate positive skewness. The value lies between -0.5 to 0.5 shows that distribution is symmetrical. The kurtosis value indicates the degree of peakedness of a bell-

shaped curve. The kurtosis value of all variables is less than three, indicating less outlier in the data i.e. (Platykurtic).

Table: 2: Descriptive Statistics and Correlation Analysis

Value	LGDP	LGE	LPCI	LPOP
Mean	2.075616	2.042926	2.078449	1.997167
Median	2.003744	1.958295	2.008895	2.010524
Max	2.688815	2.665042	2.505196	2.183619
Min	1.499226	1.439825	1.731772	1.767454
St. Dev	0.347293	0.328795	0.229657	0.122802
Skewness	0.292147	0.316677	0.506597	0.25576
Kurtosis	1.846034	2.215565	1.891248	1.912832
J.B.	2.718687	1.651773	3.869245	2.345839
Prob.	0.256829	0.437847	0.144479	0.309462
Obs	39	39	39	39
Correlation Analysis				
	LGDP	**LGE**	**LPCI**	**LPOP**
LGDP	1	0.975196	0.972213	0.972492
LGE	0.975196	1	0.971921	0.940292
LPCI	0.972213	0.971921	1	0.935906
LPOP	0.972492	0.940292	0.935906	1

Sources: Authors' Estimations

The J.B. test is used to check whether the distribution is normal or not. The null hypothesis of J.B. states that the distribution is not normal i.e., a probability value less than 0.05 indicates that the distribution is not normal, otherwise normal. The results indicate that the prob. value of all variables is greater than 0.05, indicating that the distribution is normal. The correlation results expressed positive and significant correlations among variables used in this study.

4.2. OLS Analysis

The OLS results of this study are given in Table 3. The OLS results for the six versions are interpreted as the elasticity of the coefficients (Afzal & Abbas, 2010). The fact that the coefficient value is greater than one, demonstrates the applicability of Wager's law. Furthermore, coefficients less than one suggest poor applicability of Wagner's law, whereas coefficients value less than zero imply non-applicability of Wagner's law or applicability of Keynes's view (Afzal & Abbas, 2010).

Table 3: OLS Results of the Six Versions

No.	Version	Dep. Variable	Ind. Variable	Constant	Coefficient	R^2
1	Peacock-Wiseman	L(GFCE)	L(GDP)	-1.66 (0.255)*	1.058 (0.0236)*	0.97
2	Pryor	L(GFCE)	L(GDP)	-1.66 (0.255)*	1.058 (0.0236)*	0.97
3	Goffman	L(GFCE)	L(GDP/POPU)	2.24 (0.130)*	2.637 (0.0441)*	0.98
4	Gupta-Michas	L(GFCE/POPU)	L(GDP/POPU)	-1.51 (0.160)*	1.178 (0.055)*	0.897
5	Musgrave	L(GFCE/GDP)	L(GDP/POPU)	-1.49 (0.162)*	0.17194 (0.0548)*	0.154
6	Mann	L(GFCE/GDP)	L(GDP)	-1.63 (0.257)*	0.058 (0.0230)*	0.116

Source: Author's compilation

Note: standard error is in parentheses. *, ** and *** represent 1%, 5% and 10% significance levels, respectively.

According to empirical results, the Peacock-Wiseman (1961), Pryor (1968), Goffman (1968), and Gupta (1967) and Michas (1975) models are valid for the existence of Wagner's law in Pakistan's economy. The remaining models such as Musgrave (1969) and Mann (1980) version coefficient values are less than 1, indicating the poor existence of Wagner law in Pakistan during 1970-2021. The empirical results of this study are similar to the findings of (Khan, 1990; Rehman et al., 2007; Afzal & Abbas, 2010; Zaman et al., 2011; Rauf et al., 2012; Cheema & Iqbal, 2017).

4.3. Unit Root Analysis and Lag Selection Criteria

The outcomes of the stationary test are displayed in Table 4. The Augmented dickey fuller (ADF) test was used to determine whether each series has a unit root or not. The results revealed that all the series of this study confirmed the rejection of H0 (series has unit root). According to the findings, every series is stationary at the first difference.

Table 4: Stationary Result of Variables

Variable	ADF	First Difference	ADF	Results
L(GDP)	-1.61*	ΔL(GDP)	-5.44*	I(1)
L(GFCE)	-0.63*	ΔL(GFCE)	-8.83*	I(1)
L(GFCE/GDP)	-2.55*	ΔL(GEFC/GDP)	-9.39*	I(1)
L(GFCE/POPU)	-0.613*	ΔL(GFCE/POPU)	-8.80*	I(1)
L(GDP/POPU)	0.22***	ΔL(GDP/POPU)	-5.98*	I(1)

Source: Authors' Estimations

Note: *, ** and *** represent 1%, 5% and 10% significance level

The AIC criteria are used to select the optimal lag length. The optimal lag length results are shown in Table 5. This indicates that for models 1, 2 and 6, the AIC criteria agreed on a lag length of 3. For models 3, 4, and 5, the optimal lag length is 1.

Table 5: Optimum Lag Selection Criteria

No.	Model	Optimum lag selection order	AIC
1	Peacock-Wiseman	3	-10.45
2	Pryor	3	-10.45
3	Goffman	1	-10.62
4	Musgrave	1	-10.44
5	Gupta-Michas	1	-10.40
6	Mann	3	-10.48

Source: Authors' Estimations

4.4. Co-integration Test Results

By performing a unit root test using ADF, it was discovered that each variable is integrated into order one. Some scholars opt not to use the Johansen co-integration technique with parameters that do not have the same order I(1) of integration. According to Abu-Bader and Abu-Qarn (2003), apply the Johansen co-integration method when the parameters have the same order I(1) of integration. This is because the test is predicated on the premise that the variables employed have a unit root, absent which further limitations must be imposed. In this study, all variables have I(1), which indicates the application of the Johansen co-integration technique. The most appropriate number of lags for the VARs is determined by comparing the lag of variables specified by the various information criterion. If a long-run relationship exists between government consumption spending and GDP, it can be found using the Johansen co-integration method. The estimate is computed using a VAR model with the Johansen co-integration test, which considers the maximum Eigenvalue and trace statistics as its two main statistics. The null hypothesis states that there are precisely "n" co-integrating vectors, whereas the actual number is often n-1. The likelihood ratio test was used to evaluate the number of co-integration vectors. This test is based on the maximal Eigenvalues and trace statistical analysis of the randomized matrix of the Johansen (1988) process. The Johansen co-integrated test results (both Eigenvalues and trace test) are shown in Table 6. Both the maximum eigenvalue test and the Johansen co-integration rank test rule out the alternative hypothesis, showing that there is no co-integration relationship between real government consumption expenditures and real GDP.

Table 6: Johansen Co-integration Test

Version		Trace				Max-Eigenvalue		
		Eigenvalue	Trace	Significance 5%		Eigenvalue	Max-Eigen Stat	Significance 5%
Pryor	None	0.085	11.58***	15.47	None	0.085	8.96***	14.06
	At most 1	0.071	3.72*	3.84	At most 1	0.071	3.72*	3.84
Gupta-	None	0.09	4.82***	15.52	None	0.09	4.68***	14.26

Michas								
	At most 1	0.002	0.14***	3.84	At most 1	0.003	0.146***	3.84
Goffman	None	0.2287	18.45***	15.45	None	0.2287	18.4*	15.46
	At most 1	0.0034	0.051***	3.74	At most 1	0.0034	0.051***	3.74
Mann	None	0.085	8.18***	15.56	None	0.085	4.46***	14.26
	At most 1	0.071	3.72*	3.84	At most 1	0.071	3.72*	3.84
Musgrave	None	0.089	4.82***	15.46	None	0.089	4.68***	14.26
	At most 1	0.003	0.141***	3.84	At most 1	0.002	0.14***	3.84

Source: Authors' Estimations
Note: * ** and *** represent 1%, 5%, and 10% significance levels

The co-integration results for the five Wagner's hypotheses show that there is no long-run relationship between government consumption expenditure and real GDP. The outcomes show that trace statistics for the five Wagner law versions are less than the critical level of 5%. This shows that between 1970 and 2021, there was no co-integration between Pakistan's real GDP and final spending by government expenditures. Afzal and Abbas (2010), and Rauf et al. (2012) investigated the absence of co-integration between government expenditure and real GDP in Pakistan. The current study matches the findings of (Afzal & Abbas, 2010; Rauf et al., 2012; Zaman et al., 2011). All variants of Wagner's law have no co-integration or long-run relationship. Therefore, there exists no VECM estimation.

To check the short-run relationship between variables, the VAR estimation was calculated. Table 7 shows the VAR model results for all variants of Wagner's law.

Table 7: Estimation of the VAR Model

Model	**Equation**		**Variables**	
Peacock and Wiseman (1961)	1		LGFCE	LGDP
		LGFCE(-1)	0.7301 (0.100)	.0070 (.026)
		LGDP(-1)	0.2802 (0.1)	0.9855 (0.027)
		C	-.3677 (0.246)	0.1077 (0.064)
Goffman (1968)	2		LGFCE	L(GDP/POP)
		LGFCE(-1)	0.566 (0.12)	0.056 (0.031)
		L(GDP/POP)(-1)	1.131 (.324)	0.854 (0.088)
		C	1.021 (0.267)	-0.121 (0.074)
Musgrave (1969)	3		L(GFCE/GDP)	L(GDP/POPU)
		L(GFCE/GDP) (-1)	0.708 (0.102)	0.015 (0.025)
		L(GDP/POPU) (-1)	0.054 (0.441)	0.991 (0.011)
		C	-.451 (-0.211)	0.024 (0.591)
Gupta (1967) and Michas (1975)	4		L(GFCE/POPU)	L(GDP/POPU)
		L(GFCE/POPU)	0.724 (0.10)	0.015 (0.025)
		L(GDP/POPU)	0.331 (0.12)	0.981 (0.031)
		C	-.431 (-.191)	0.024 (0.511)
Mann (1980)	5		L(GFCE/GDP)	LGDP
		L(GFCE/GDP) (-1)	0.723 (0.102)	0.007 (0.026)
		LGDP(-1)	0.017 (0.015)	0.993 (0.004)
		C	-0.473 (0.242)	0.107 (0.06)

Source: Authors' Estimations
Note: Standard errors are in parenthesis

However, Johansen's co-integration approaches do not show the direction of the long-run relationships. From the objectives of the study, the Wagnerian hypothesis states that rising national income causes rising public sector spending, while the Keynesian hypothesis states that rising public sector spending causes rising national income. It fulfills the credence of Wagner's law claims that rising government spending is a necessary component of economic growth because of the need for a larger administrative role for the government, increased spending on welfare, such as education and health, and the government's propensity to provide services that the private sector will avoid, such as making sizably large capital investments.

4.5. Granger Causality Results

The Granger causality result is shown in Table 8. It shows that the five variants of the null hypothesis suggesting no causal relationship between general government spending on consumption and GDP are rejected for orientations at a level of significance equal to 5%. Wagner's law shows a brief causal connection between real GDP and expenditures in their respective forms. The Pryor (1968) version of the result argued that the probability value is greater than 5% however, reject H0 and accept H1. It is evidenced that GDP causes government final consumption expenditure. It favors the Keynesian hypothesis, which claims that income is caused by the government's final consumption expenditure.

Table 8: Granger Causality Results

Model	H_0	F-statistics	Lag	H_0	F-stat
Pryor (1968)	ΔL(GDP) does not Granger cause ΔL(GFCE)	6.8*	1	ΔL(GFCE) does not Granger cause ΔL(GDP)	0.073***
Gupta (1967)-Michas(1975)	ΔL(GDP/POPU) does not Granger cause ΔLGFCE/POPU)	6.78*	1	ΔL(GFCE/POPU) does not Granger cause ΔL(GDP/POPU)	0.351***
Goffman (1968)	ΔL(GDP/POPU) does not Granger cause ΔL(GFCE)	12.16*	1	ΔL(GFCE) does not Granger cause ΔL(GDP/POPU)	3.25***
Mann (1980)	ΔLGDP does not Granger cause ΔL(GFCE/GDP)	1.09***	1	ΔL(GFCE/GDPC) does not Granger cause ΔL(GDP)	0.07***
Musgrave (1069)	ΔL(GDP/POPU) does not Granger cause ΔL(GFCE/GDP)	1.5***	1	ΔLGGFCEGDPC does not Granger cause ΔL(GDP/POPU)	0.35***

Source: Authors Estimations

Note: * ** and *** represent 1%, 5%, and 10% significance levels

For the Gupta (1967) or Michas (1975) model, per capita income has a Granger cause to per capita government final consumption expenditure. It also favored the Keynesian model. Goffman's (1968) version favors (Keynesian's advanced version) that per capita income is caused by the government's final consumption expenditure. Mann's (1980) and Musgrave's (1969) versions have bidirectional causality.

5. Conclusions

The current study investigates the applicability of Wagner's and Keynes's views on Pakistan from 1970 to 2021. Wagner's law extended to six further versions. To check the validity of Wagner's in Pakistan, the simple OLS method is applied. The empirical results indicated that for Peacock-Wiseman (1961), Pryor (1968), Goffman (1968), and Gupta-Michas (1967), the elasticity is greater than 1, indicating that Wagner's law is valid for these four versions. The stationary of the variables is checked by the ADF test. The results indicated that each variable is stationary at the first difference. To check co-integration on six versions of Wagner's law, the Johansen (1988) co-integration technique is applied. The co-integration results indicated no co-integration relation for all six versions of Wagner's law. To check the direction of causality, the Granger causality test is applied to the sixth version of Wagner's law. The results revealed that Pryor (1967), Goffman (1968), Gupta (1967) and Michas (1975) versions follow Keynes's version. Considering the empirical data provided in this work, one may cautiously propose that, contrary to Wagner's law, public spending increase in Pakistan is not a direct result of economic expansion. Public expenditure is the outcome of several choices taken considering shifting economic conditions. The administration may push for government involvement in almost every facet of the Pakistani economy, making the policy implications of the results presented here particularly significant. Although this study's findings show that government spending and economic activity have a bidirectional causal relationship, they also offer some justification for such an agenda. The present authorities would do well to keep in mind that not so long ago, rash government actions led to the worst instance of hyperinflation a nation has ever seen during a period of peace. These findings also suggest that the Pakistani government should increase development spending to boost GDP growth.

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