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Government Spending, Inflation, and Economic Growth: A Simultaneous Equations Analysis

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Abstract

The study estimates the simultaneous equations system using the Two Stage Least Squares (2SLS) methodology in order to show how government spending, inflation, and economic growth are interrelated. The study concluded that economic growth has an impact on government spending, contrary to Keynes's view and confirming Wagner's view in this regard. Additionally, real GDP growth was not affected by government spending, investment, or economic openness, as they were not statistically significant; indicating the inability of government spending to enhance growth due to the predominance of current expenditure over capital investment and the ineffectiveness of project implementation. Accordingly, the study recommends redirecting expenditures toward productive investments, enhancing coordination between fiscal and monetary policies, and improving the investment environment. The study also found that inflation was affected by government spending with a one-year lag and money supply with a one-year lag; this confirms Friedman's statement that inflation is a monetary issue at all times and places, in addition to being a fiscal issue, confirming the joint role of both monetary and fiscal policies in this regard.

1 Introduction

Government spending refers to the total gross payments by the government. It is well known that government spending plays a vital role in determining the economy, as governments everywhere either expand or contract their spending in order to regulate the economy. The vital importance of government spending and its contribution to economic growth is more evident in developing countries, because private investments in these countries are limited, and the government is the main economic driver, owning most investments.

There is a worrying trend in the literature regarding the fact that the size of government spending has steadily increased, while the pace of economic growth has either steadily declined or fluctuated without any specific correlational rhythm. This is inconsistent with the basic logic that increased government spending is expected to translate into rapid economic growth. Keynes and his followers believed strongly in and advocated for expanding the government sector as a tool for achieving improved welfare for citizens, and efficient allocation and distribution of resources, although monetarists disagreed with the Keynesian position. Without completely abandoning Keynesian thought, recent studies have shown that increased government spending has not always been positively and statistically significantly associated with improved economic growth. It is important to note that the effect of government spending on economic growth will be determined wholly or partially by other variables such as; the inflation rate inherent in the economy, the exchange rate, the state of the monetary sector in the country, the political and socio-economic environment, and most importantly the productive value of this spending.

However, the relationship between government spending and inflation is fairly clear; many studies have shown that government spending is believed to have a significant relationship with inflation. [1] stated that budget deficits work to increase the inflationary situation, explaining that it increases the money

supply and thus tends to increase inflation. Similarly, [2], in their study on the relationship between government spending and inflation, concluded that in order to curb inflation, governments must appropriately reduce spending levels, and on the other hand, to reduce growth in the volume of public spending, policymakers should reduce price dynamics, thus demonstrating a dual causal relationship.

Furthermore, the Phillips curve illustrates an inverse relationship between inflation and unemployment. Consequently, moderate inflation that reduces unemployment may indirectly stimulate economic growth, given the well-established positive correlation between employment levels and economic expansion. From a theoretical perspective, economic growth tends to reduce inflationary pressures through increased productive capacity. Additionally, economic growth influences government spending patterns. In contrast, [3] found that customs duties, corporate income tax, general sales tax, and personal income tax revenues demonstrate positive long-run relationships with gross domestic product.

Generally, it is a clear fact that governments around the world have used their spending tool as a means to control inflation, reduce unemployment, regulate money supply, reduce poverty levels, etc. Although this deserves praise, the position of this study is that merely targeting government spending to specific issues/problems is not sufficient, rather the primary focus of government spending should be to stimulate economic growth, and this is necessary to help generate the resources needed for future government spending. It is also the only guaranteed means of ensuring a permanent solution to other economic problems.

This study examines the empirical relationships between government spending, inflation, and economic growth in Jordan from 1978 to 2021. It contributes to existing research by modeling the interconnected nature of these variables through a system of simultaneous equations estimated using two-stage least squares (2SLS). This approach avoids assuming unidirectional causality and addresses simultaneity bias that would arise from conventional ordinary least squares (OLS) estimation.

This study contributes to the economic literature on Jordan by employing a standard methodology that is rarely used in studies examining the determinants of government spending, economic growth, and inflation in an integrated framework, and by providing empirical evidence.

2 Theoretical Framework

Keynesians have examined the impact of government spending on economic growth. They view government spending as an effective mechanism for boosting aggregate demand and stimulating economic growth through a government spending multiplier that typically exceeds one.

In contrast, Monetarists such as Friedman believe that expansion in government spending may lead to crowding out of private investment (Crowding-out Effect) by raising interest rates, thereby reducing its effectiveness in stimulating growth. Proponents of Endogenous Growth Theory also emphasize that the quality of government spending is more important than its size, as spending on infrastructure, education,

and scientific research contributes to the accumulation of human and physical capital, and thus to long-term growth.

As for Wagner's Law, it assumes a reverse relationship, where economic growth is what leads to increased government spending and not vice versa, as a result of increased demand for public services with rising per capita income.

Keynesian theory indicates that excessive expansion in government spending, especially when it exceeds the productive capacity of the economy, creates demand-pull inflation. In contrast, the Quantity Theory of Money emphasizes that inflation is primarily a monetary phenomenon, and that financing government spending through money creation inevitably leads to an increase in the general price level.

Views vary on the nature of the relationship between inflation and economic growth. While the Phillips Curve indicates the existence of a short-term trade-off between inflation and unemployment, which may implicitly mean a positive relationship between inflation and growth, recent literature indicates the existence of a non-linear relationship, where moderate inflation levels can stimulate growth, while high levels lead to growth suppression after exceeding a certain threshold (Threshold Effect).

Numerous nations have examined the connection between government spending and economic growth, with varying degrees of success. [4] was one of the first to formally incorporate government spending as an endogenous variable in growth models, looking at the connection between government spending levels and rates of savings and economic growth. It was discovered that a drop in per capita GDP growth was linked to an increase in wasteful current government spending.

[5] measured the causal relationship between the size of the public sector (the ratio of government spending to gross national product) and real per capita income in the Pakistani economy, and the results concluded that government spending causes growth in real income in both the short and long term. [6] studied the relationship between the size of the public sector, inflation, and economic growth, and found that the relationship between growth and government spending may be positive, negative, or non-existent depending on the nature and composition of government spending. [7] examined the effect of government sector expansion on economic growth in Nigeria, showing that the large increase in government spending was due to the growth of current rather than capital spending, and that weak implementation of investment budgets led to the failure of government expenditure to stimulate economic growth and even negatively affected it in some years, and others such as [8], and [9].

[10] The objective was to investigate the connection between Jordan's budget deficit and macroeconomic factors from 2008 to 2023. It revealed a strong inverse link between the deficit and GDP. Similarly, [11] studied the nature of the relationship between real GDP and economic factors in Nigeria between 2004 and 2019. They found that government spending has a significant effect on economic growth, the effect of money supply and inflation was negative, and the effect of exchange rate was weak; in addition to other studies such as [12], and [13]. Furthermore, [14] demonstrated the existence of a long-term negative relationship between GDP and unemployment rate in Jordan, indicating the validity of

Okun's law in a small economy like Jordan. Similarly, [15] studied the relationship between inflation and unemployment, and proved that the unemployment rate has a negative effect on the inflation rate in the long term. [16], and [17] also examined these links.

Previous studies have focused on studying the relationship between growth, government spending, and inflation through unidirectional equations and did not examine their interconnection simultaneously, which could lead to bias. This study is distinguished by filling this gap by estimating the equations using the simultaneous equations method (or two-stage least squares estimation).

3 Model and Estimation Methodology

Two Stage Least Squares (2SLS) was used to estimate simultaneous equations to analyze the multiple interactions between economic growth, government spending, and inflation in this study, based on [18] as follows:

$$\text{govexp} = f(\text{inf}(-1), \text{ggdp}, \text{popg}) \quad (1)$$

$$\text{gdpg} = f(\text{govexp}, \text{inv}_{t-1}, \text{inf}, \text{topen}) \quad (2)$$

$$\text{inf} = f(\text{inv}_{t-1}, \text{govexp}_{t-1}, \text{M2}_{t-1}, \text{popg} \quad (3)$$

Where:

inf = Inflation

gGDP = Economic growth is proxied by the real GDP growth rate

popg = Population growth rate

govexp = Government expenditure

topen = Trade openness

inf_{t-1} = inflation (lagging one year)

inv_{t-1} = investment (lagging one year)

M2 = Broad money, proxy for money supply

The empirical model was specified as follows:

$$govexp_t = \alpha_0 + \alpha_1 inf_{t-1} + \alpha_2 gGDP_t + \alpha_3 popg_t + u_{1t} \quad (1')$$

$$ggdp_t = b_0 + b_1 govexp_t + b_2 inv_{t-1} + b_3 inf_t + b_3 topen_t + u_{2t} \quad (2')$$

$$inf_t = c_0 + c_1\ inv_{t-1} + c_2 govexp_{t-1} + c_3 M2_{t-1} + c_3 popg_t + u_{3t} \quad (3')$$

where u_i represents the error terms (or residuals), which are uncorrelated with any of the exogenous variables in each equation.

The simultaneous equations system specified above contains three endogenous variables: government expenditure (govexp), inflation (inf), and GDP growth rate (gGDP), while the remaining variables are exogenous. The first equation of the system explains government expenditure, whereas the second and third equations explain economic growth and inflation, respectively.

It is required to examine the identification condition, as we cannot estimate simultaneous equations when they are unidentified or underidentified. It was found that the system equations are identified; therefore, we can estimate them. The estimation will be conducted in two stages using the least squares method, as it is characterized by consistent and unbiased estimates.

The characteristics of the correlations between the variables are displayed in Fig. 1.

The model illustrates the simultaneous relationships between government expenditure (GOVEXP), economic growth (GGDP), and inflation (INF) estimated using Two-Stage Least Squares (2SLS) for Jordan (1978–2021). Blue boxes represent endogenous variables (dependent variables in the system), while orange boxes represent exogenous variables (predetermined or independent variables). Solid green arrows indicate statistically significant positive relationships, while dashed grey arrows represent non-significant relationships (NS). Significance levels: *** $p < 0.01$ (highly significant), ** $p < 0.05$ (significant), * $p < 0.10$ (marginally significant). The notation (t-1) indicates lagged variables (one period lag).

4 Data and Study Variables

Annual data covering the period from 1978 to 2021 was used, obtained from the World Bank database (2025).

Endogenous Variables:

- Government Expenditure (GOVEXP): Total final government expenditure as a percentage of GDP
- Inflation (INF): Inflation rate measured by the change in the Consumer Price Index
- Economic Growth (GGDP): The annual growth rate of real gross domestic product

Exogenous Variables:

- Population Growth (POPG): Refers to the annual rate of population growth
- Investment (INV): Represents gross fixed capital formation expressed as a percentage of GDP
- Money Supply (M2): Denotes broad money measured as a percentage of GDP
- Trade Openness (TOPEN): Calculated as the sum of exports and imports relative to GDP

5 Results

The equation that describes government spending (Table 1) demonstrates that all variable signs align with expected outcomes, while the impact of inflation values lagged by one period on government spending lacks statistical significance, even at the 10% threshold. This suggests that inflation does not serve as a robust factor in determining government spending in Jordan. Real GDP growth exhibits a positive and highly statistically significant impact on government spending (at the 1% level). This reveals that real GDP growth plays a substantial role in expanding government expenditure. This finding is unsurprising, given that higher production of goods and services in a nation guarantees greater financial resources for the government to meet its spending needs, whereas declining GDP constrains its spending capacity. This aligns with Wagner's theory, which posits that GDP drives government spending upward, contrary to the Keynesian perspective on this matter. Lastly, while population growth in Jordan shows a positive association with government spending, this relationship is not statistically significant.

Table 1
2SLS Estimation of Government Spending Equation

Dependent Variable: GOVEXP				
Instrument specification: C INF(-1) POPG INV(-1) M2(-1) TOPEN GOVEXP(-1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.14909	2.084740	7.266658	0.0000
INF(-1)	0.034414	0.187596	0.183448	0.8554
GGDP	1.236904	0.421467	2.934760	0.0055
POPG	0.442153	0.450408	0.981671	0.3322
R-squared	-1.058755	Mean dependent var		22.75000
Adjusted R-squared	-1.213162	S.D. dependent var		4.374317
F-statistic	3.442915	Durbin-Watson stat		0.993436
Prob(F-statistic)	0.025565	Second-Stage SSR		385.3874
J-statistic	7.028732	Instrument rank		7
Prob(J-statistic)	0.070988			

On the other hand, the non-significance of the lagged inflation variable (probability = 0.8554) in explaining government spending contradicts some literature indicating that inflation affects the purchasing power of government spending. The study by [19] indicated that countries with high inflation tend to adjust their government spending in response to inflationary pressures. However, the current result may reflect the fact that Jordan has maintained inflation rates within a relatively moderate range during most of the study period, or that automatic indexing mechanisms for government spending are ineffective. The non-significance of the population growth variable (probability = 0.3322) also contradicts [20] hypothesis about "cost disease" which assumes that population increase puts pressure on labor-intensive public services and thus raises government spending.

Table 2
2SLS Estimation of Economic Growth Equation

Dependent Variable: GGDP				
Method: Two-Stage Least Squares				
Instrument specification: C INV(-1) TOPEN INF(-1) POPG M2(-1) GOVEXP(-1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-12.37241	9.085421	-1.361788	0.1811
GOVEXP	0.300746	0.297932	1.009446	0.3190
INV(-1)	0.156793	0.163034	0.961717	0.3421
INF	-0.222285	0.562216	-0.395373	0.6947
TOPEN	0.061313	0.074497	0.823026	0.4155
R-squared	0.262587	Mean dependent var		4.622727
Adjusted R-squared	0.186955	S.D. dependent var		5.303613
F-statistic	2.405620	Durbin-Watson stat		1.197438
Prob(F-statistic)	0.065916	Second-Stage SSR		989.4552
J-statistic	2.303338	Instrument rank		7
Prob(J-statistic)	0.316109			

Methodologically, the negative value of the coefficient of determination (R^2 = -1.059) in the two-stage model (2SLS) is not necessarily problematic, as [21] explained, where R^2 in instrumental variables models can be negative or exceed one without meaning model failure. More important is the statistical significance of F (probability = 0.0256) which confirms the joint significance of independent variables. The Hansen J test (probability = 0.071) also indicates acceptance of the validity of the instruments used at the traditional 5% significance level, which enhances confidence in the estimates, although the value is close to the cut-off.

The economic growth equation presented in Table 2 revealed no significant impact from any of the variables examined on economic growth throughout the study period, not even at the 10% significance threshold. Investment demonstrated a positive influence on economic growth only when lagged by one period, at a rate of 5%. This reflects the sluggish pace of capital accumulation represented by investment in Jordan, accounting for why concurrent investment fails to significantly impact economic growth. Essentially, any investment requires an entire year before manifesting tangible effects on the economy, a consequence of the underdeveloped capital market. This finding stands in opposition to classical economic growth theory, particularly the endogenous growth models developed by [22] and [23], which emphasize the critical role of investment in sustaining long-term economic growth, with particular attention to human capital and technological advancement. Government expenditure likewise failed to influence economic growth during the study period, attributable to its orientation toward recurrent spending rather than productive investment. Inflation proved irrelevant in accounting for economic growth throughout the research period and exhibited a negative coefficient. Lastly, trade liberalization proved ineffective in stimulating growth.

Table 3
2SLS Estimation of Inflation Equation

Dependent Variable: INF				
Method: Two-Stage Least Squares				
Instrument specification: C INV(-1) GOVEXP(-1) M2(-1) POPG INF(-1)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-27.10091	9.362103	-2.894746	0.0062
INV(-1)	0.097636	0.124018	0.787273	0.4359
GOVEXP(-1)	0.685853	0.261916	2.618599	0.0125
M2(-1)	0.115804	0.054444	2.127029	0.0398
POPG	0.214263	0.248369	0.862680	0.3936
R-squared	0.287088	Mean dependent var		4.745455
Adjusted R-squared	0.213969	S.D. dependent var		5.064673
F-statistic	3.926299	Durbin-Watson stat		1.248127
Prob(F-statistic)	0.008987	Second-Stage SSR		786.3343
J-statistic	5.981149	Instrument rank		7
Prob(J-statistic)	0.050259			

In conclusion, the inflation equation (Table 3) demonstrates that the variables chosen to account for inflation had a substantial impact on inflation throughout the period under examination. This

underscores the significant role that government expenditure plays in determining inflation levels. Such findings align with Keynesian theory, which highlights how expansionary fiscal policy operates; inflationary pressures emerge from the demand side when government expenditure surpasses the economy's potential output capacity, a view supported by [24, 25, 26]. Additionally, M2 money supply contributed to explaining inflation dynamics, validating the quantity theory of money and Friedman's assertion that inflation represents a monetary phenomenon across time and space. Interestingly, population growth showed no direct impact on inflation, contrary to expectations that population increases in a given area would trigger a spike in actual demand relative to supply. The findings suggest, however, that the supply of food and other essential goods managed to adequately meet and favorably match the rising demand. This points to the Jordanian economy's capacity to successfully accommodate demographic expansions resulting from forced displacement without generating substantial inflationary pressures [27].

6 Conclusion

The study aimed to examine the interrelationships between government spending, inflation, and economic growth in Jordan during the period 1978 to 2021, using the simultaneous equations methodology with Two Stage Least Squares (2SLS) for estimation, which distinguishes it. The analysis showed that while inflation and population growth have no effect on government spending, real GDP significantly affects government spending. This is explained by Wagner's law, which states that economic growth increases government spending and not vice versa as in Keynesian theory. These three factors combine in their influence on government spending. However, government spending, investment (with a one-year lag), inflation, and trade openness did not affect economic growth. This is attributed to the nature of the country's trade, which is dominated by imports over exports, and the failure of government spending in Jordan to drive economic growth. The conclusion indicates the ineffectiveness of current fiscal policy in driving economic growth in Jordan. Government spending and money supply sufficiently explained the cause of inflation during this period, showing that inflation in Jordan is a mutual monetary and fiscal phenomenon, which necessitates coordination between monetary and fiscal policies.

Based on this, the study recommends restructuring government spending and increasing the share of productive capital expenditure, and creating new employment opportunities. It also recommends strengthening coordination between monetary and fiscal policies to ensure macroeconomic stability and avoid conflict between their respective objectives, improving the investment environment and encouraging public and private sector partnerships. It is also necessary to leverage trade openness as a driver of growth, diversify trading partners, and improve the competitiveness of Jordanian exports.

Declarations

Author Contribution

• Khaled (data collection, reviewing, and final approval of the version to be published)• Huda (built the conception, theoretical base, literature of the work, and data interpretation)• Hassan (developed the model and performed the analysis, and data interpretation)• Tamara (Literature, reviewing and final approval of the version to be published)• Mohammad (reviewing and final approval of the version to be published)

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Figures

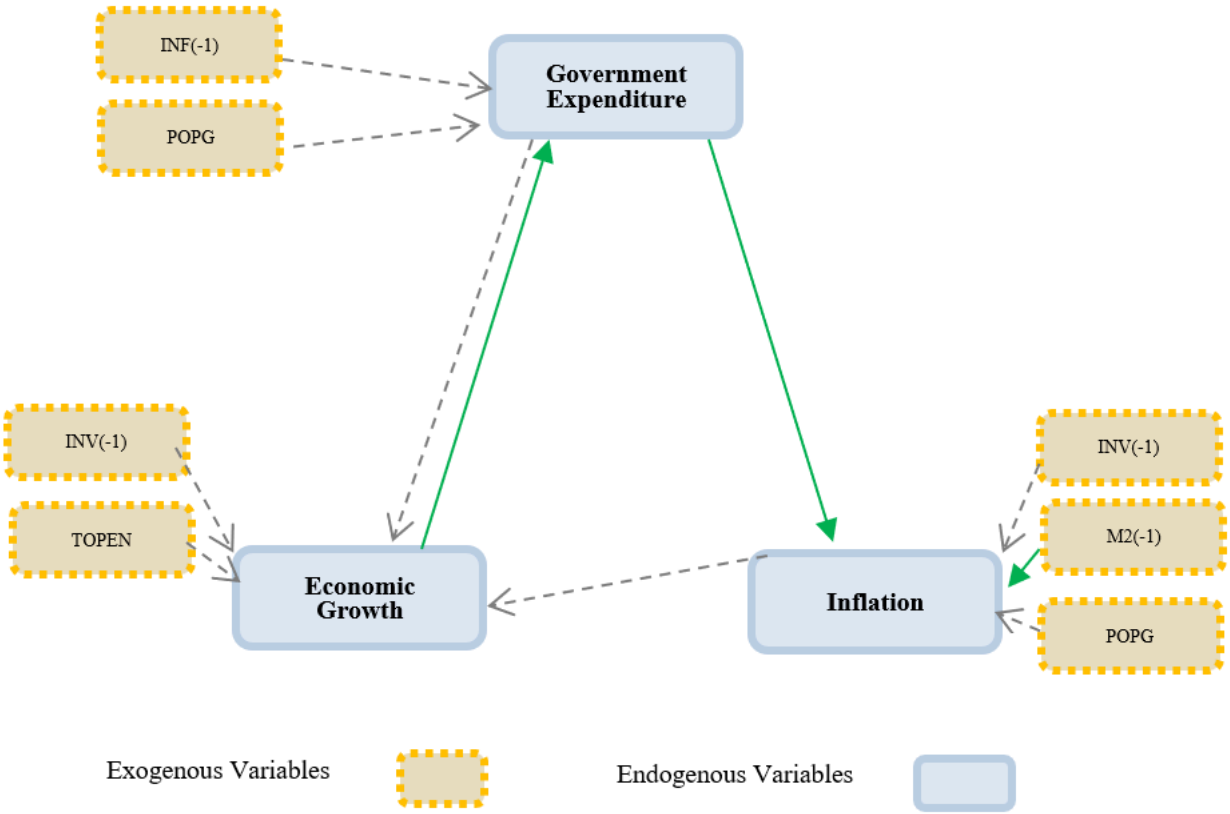


Figure 1

Conceptual Framework of the Simultaneous Equations System