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Does the type of government expenditure affect the cyclicality of fiscal policy? (Case study: Iran)

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Abstract

One of the main objectives of fiscal policy is to stabilize business cycles and macroeconomic stability. Procyclical fiscal policy intensifies business cycle fluctuations and increases the economy's vulnerability to external shocks. Determining the cyclical properties of various types of government expenditures helps the government to adopt an appropriate fiscal policy in times of economic crisis in a way that ensures economic stability. The purpose of this paper is to evaluate the cyclical features of fiscal policy and its determinants with respect to the various types of government expenditures in Iran. Using Iran's time series data from 1980 to 2019 and a regression-based method with a two-stage autoregressive distributed lags model, this study shows that fiscal policy in Iran is procyclical and therefore does not pursue stabilization. In addition, among the various types of government expenditures, government investment in machinery and total government investment has the highest level of procyclicality. Adding control variables intensifies the procyclicality of government investment in construction and government investment in machinery and total government expenditures, and reduces the procyclicality of government consumption and total government investment.

Keywords: business cycle, procyclical fiscal policy, countercyclical fiscal policy, government expenditures
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1 Introduction

Fiscal policy is an important tool that governments use to achieve macroeconomic stability in developing countries, including Iran. Stabilizing fiscal policy is critical in mitigating the effects of macroeconomic shocks on the economy. Stabilizing fiscal policy means that the government spends more during recessions and less during booms. Such policy is countercyclical fiscal policy. Countercyclical fiscal policy should lessen the business cycle, not strengthen it [24]. To achieve the important purpose of fiscal policy, which is the stabilization of macroeconomics, countercyclical fiscal policy is required. Countercyclical fiscal policy means increasing expenditures and reducing taxes during the boom and reducing expenditures and raising taxes during the recession [1, 10].

Procyclical fiscal policy, on the other hand, means that fiscal policy intensifies the business cycle and thus increases the economy's vulnerability to external shocks. This policy implies that when there is more money, more costs are incurred, and as income decreases, expenditures decline [15]. Empirical evidence shows that fiscal policy in most developing countries, including Iran, has been procyclical. That is, those policies exacerbate instability, especially

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aftershocks [4, 19]. Therefore, according to what has been stated, fiscal policy should be countercyclical, which means that fiscal policy should not be compatible with the business cycle, but should be opposing it [24].

The purpose of countercyclical fiscal policy is to neutralize the cycles: that is, contraction during the boom to prevent excessive economic surplus and expansion during the recession to stimulate economic activity [11]. In this regard, Lane [26] and Corden [11] state the reasons for preferring countercyclical fiscal policy: First, these policies can offset the negative effect of short-term economic fluctuations by boosting the economy during a recession and prevent Excessive economic surplus during the boom. Second, given the uncertainty as to whether the current crisis is temporary or permanent, these policies appear to be a more prudent political choice to deal with. Third, because governments tend to overspend during the economic boom due to political economy factors, countercyclical fiscal policy can require the government to curb spending during the boom. Fourth, the automatic stabilizers embedded in the budget allow governments to pursue countercyclical fiscal policies.

Iran's revenue is mainly dependent on oil, and Iran's economy is very vulnerable to oil price shocks. Therefore, Iran's revenue fluctuates widely under the influence of the global oil market. This intensifies the need for appropriate fiscal policy in order to stabilize business cycles and macroeconomic stability in the face of external shocks.

In foreign studies and limited domestic studies, the cyclicality of fiscal policy has been mainly measured and evaluated, but the cyclical effect of fiscal policy has not been considered due to the various types of government expenditures. This paper tries to fill this gap by addressing the cyclical effect of various government expenditures and examining the main determinants of procyclicality of fiscal policy in Iran's economy. The purpose of this study is to evaluate the cyclical features of fiscal policy in Iran's economy with respect to various types of government expenditures including government consumption, government investment in construction, government investment in machinery, total government investment and total government expenditures.

This paper is organized as follows: In the second part, theoretical and experimental literature is presented. The third section specifies the model, method of data analysis and description. Section four discusses initial diagnostic tests and empirical findings, and Section five provides results and policy recommendations.

2 Theoretical and experimental research literature

According to Keynesian theory, the economy does not respond to demand fluctuations immediately due to price and wage stickiness. Fiscal policy must therefore be countercyclical in order for the economy to respond more quickly to demand fluctuations. As Halland and Bleaney [19] pointed out, fiscal policy should regulate the business cycle by reducing taxes and increasing public expenditures during the recession and increasing aggregate demand, reducing public expenditures and increasing savings during the boom. According to neoclassical theory, the goal of fiscal policy should be to minimize deviations. In this regard, Ilzetzki and Vegh [22] state that procyclical fiscal policy is not optimal from both Keynesian and neoclassical perspectives.

Studies about the cyclicality of fiscal policy in developing countries have expanded following Gavin and Perotti [16], which showed that the fiscal policy in Latin American countries is procyclical. Manasse [29] and Kaminsky, Reinhart, and Vegh [23] state that procyclical fiscal policy is defined as the expansion of fiscal policy in the boom, and contraction in recession.

Mutuku [31], in a study entitled "Assessing Fiscal Policy Cyclicality and Sustainability: A Fiscal Reaction Function for Kenya", examined fiscal policy sustainability as well as fiscal policy responses to business cycles in Kenya. For this purpose, he used time series data from 1970 to 2013 and vector autoregressive and vector error correction models. According to the results of this study, fiscal behaviour is inconsistent with inter-period budget constraints. Moreover, if fiscal adjustments are not made, debt tends to accumulate continuously. Election expenses jeopardize Kenya's long-term stability. Fiscal shocks have no effect on the output gap. This means that fiscal policy towards business cycles is not countercyclical.

Ghasemi and Mohajeri [17], in a study entitled "Investigating the cyclical behaviour of fiscal policy in Iran", using data for the period 1966 to 2012, examined the countercyclical behaviour of fiscal policy in Iran. In this study, the model proposed by Lane [25] has been utilized to analyze the behaviour of government expenditures, taxes and budget deficit. The findings of this study show that the hypothesis that Iran's fiscal policy is countercyclical is not accepted. Moreover, the way in which the resources from oil exports enter the government budget and the contravention of fiscal rules are the two main components that describe the procyclical nature of fiscal policy in Iran. Therefore, institutional reforms, especially reforms of the budgeting structure in the country, can improve the performance of fiscal policy during economic cycles.

Zareii [38], in a study examines the behaviour of Iran's fiscal policy in the period 1979 to 2012 using the generalized method of moments (GMM). Following Woo [36], this study regresses the growth rate of government expenditure on the real GDP growth rate and then estimates the GDP growth rate coefficient. The results of this study show that fiscal policy in Iran is in line with business cycles and oil price volatility and the quality of institutions was identified as determining factor. In this study, using the model of Coutinho et al. (2013), the fiscal rules defined in the economic, social and cultural development laws and their effects on the cyclical behaviour of fiscal policy in Iran were evaluated. The results show that these rules did not have a significant effect on reducing the procyclicality of fiscal policy. Additionally, it can be pointed out that in order to prevent the impact of oil price volatility on the behaviour of fiscal policymakers, improving the quality of political and economic institutions takes precedence over defining rules and implementing them.

Ardanaz et al. [5], in a study entitled "Fiscal Policy in Good Times and Bad Times: Distributive motivations and procyclical spending", examine how public expenditures respond to changes in the business cycle in Argentina. An error correction model is used to estimate the short-run elasticity of government expenditure to the business cycle, as well as the long-run relationship. Using data on government expenditures in Argentina over a 100-year period, this paper concludes that procyclicality of fiscal policy is endogenous and a result of political conflicts arising from redistribution. The results show that fiscal policy in Argentina is procyclical. The elasticity of government expenditure to GDP is 0.82, which is high and significant. The coefficients of the residuals of the first stage show that the error correction process is relatively fast so that 43% of adjustment is made in each period. There is strong evidence that Peronist governments pursue more procyclical policies. Expenditures, under military rule, are less procyclical or even acyclical which is in line with the expectations. The results show that the short-term elasticity of expenditure to production, under military rule, is at its lowest.

Fasoye [14], in a study entitled "Cyclicality of Fiscal Policy in Nigeria (1999–2017)", examines the response of state governments in Nigeria to the change in fiscal policy between 1999 and 2017. This article is motivated by the recent financial crisis in Nigeria. This study examines the role of institutional quality in the state government response to changes in fiscal policy during the study period. The method used in this study includes the use of a generalized method of moments (GMM) to estimate cyclical fiscal policy. The empirical findings of this study show that the fiscal policy of the state governments in Nigeria is highly procyclical. This increases the economy's vulnerability to external shocks, especially oil price shocks. Besides, it was found that the financial dependence of state governments is a key factor in intensifying procyclical fiscal policy in Nigeria.

Given that most studies have used government expenditures as a proxy for fiscal policy, it seems logical that in the present study, government expenditures should be used in the analysis. According to Kaminsky, Reinhart, and Vegh [23], tax revenue, which depends on both the tax rate and the tax base, cannot be considered a suitable proxy for fiscal cyclicality because the tax base is positively related to the business cycle. Mackiewicz [28] states that the budget balances can not properly reflect the policymakers' precautions. According to the findings of Ilzetzki and Vegh [22]; Frankel, Vegh and Vuletin [15]; Badinger [8], tax revenue and budget balance are not disciplinable by the government because they are endogenous within business cycles due to the performance of automatic stabilizers in budget systems. Therefore, in this study, government expenditure is utilized as a proxy for fiscal policy because it can be considered as a real response of fiscal policy to the business cycle in practice.

3 Methodology

3.1 Model specification

In existing literature, two methods have been utilized to study the cyclical behavior of fiscal policy. Correlation-based method [26, 35], and regression-based method [4, 12, 18, 27, 28, 30, 31, 36]. In this study, a regression-based method with a two-stage autoregressive distributed lags model has been employed.

In the first stage, the following regression is used to obtain the level of fiscal cyclicality of various types of government expenditures.

$$LG_t = \alpha + \sum_{j=0}^{p} \beta_j LGDP_{t-j} + \sum_{i=0}^{q} \Upsilon_i LG_{t-i} + \varepsilon_t \tag{3.1}$$

Peronism is a political movement in Argentina based on the ideology and legacy of the late Argentine President Juan Peron (1895-1974). The ideology of this movement is a combination of nationalism, laborism and populism.

LG_t is the log of various types of real government expenditures in year t in Iran and $LGDP_t$ is the log of real GDP in year t. The lagged values of real GDP and real government expenditures are included in this equation to control the impact of economic growth and government expenditures in recent years on current government expenditures. p and q are the number of lagged values used in the log of GDP and the log of government expenditures, respectively.

The coefficient $\beta_0 > 0$ indicates the procyclical behavior and shows that an increase (decrease) in government expenditures is associated with a turn up (down) in the cycle. $\beta_0 > 1$, specifies that a one percent increase in GDP increases by more than one percent of expenditures, and in fact the response of government expenditures to GDP fluctuations is superfluous. In contrast, $\beta_0 < 0$ indicates a countercyclical fiscal policy in which the government tends to neutralize the cycle. An insignificant β_0 indicates an acyclical fiscal policy.

In the second stage, in order to identify the determinants of cyclicality of fiscal policy, the regression Equation (3.2) is estimated for various types of government expenditures:

$$LG_t = \alpha + \sum_{j=0}^{p} \beta_j LGDP_{t-j} + \sum_{i=0}^{q} \Upsilon_i LG_{t-i} + \gamma Z_t \times LGDP_t + \varepsilon_t \tag{3.2}$$

where Z_t is a set of control variables affecting fiscal policy behavior including trade openness (OPEN), public sector size (GOVSIZ), government debt to GDP ratio (DETGDP), inflation rate (INFL); Furthermore, following Asiama et al. [6], a dummy variable is included to Z to examine the effect of elections. Total revenue to GDP ratio (TRGDP) has entered Z as a proxy for fiscal institutions capacity in producing budget surplus. All control variables are included in the form of interaction terms to estimate the effect of these variables on cyclicality of fiscal policy. This is because the interaction term coefficient measures the change in the β_0 coefficient when each control variable changes by one unit [34], in other words, it shows the effect of each control variable on cyclicality of fiscal policy.

3.2 Data resources

This study utilizes the annual fixed price data from the Central Bank of Iran for the period 1980-2019. The types of government expenditures applied in this study are government consumption (CONSUM), total government investment (INVTOT), government investment in construction (INVBUI), and government investment in machinery (INVMAC) as well as total government expenditures (EXPTOT)). Scrutiny over the annual data of Iran's government expenditures shows that government consumption accounts for approximately 60% of total government expenditures, followed by total government investment (38.5%), government investment in construction (26.1%), and government investment in machinery (12.4%).

In this study, five control variables which have been employed in the majority of existing literature, namely trade openness, total revenue to GDP ratio, public sector size, government debt to GDP ratio and inflation rate, have been utilized. In addition, a dummy variable is considered to assess the effect of the election.

Trade openness (OPEN) is included to assess the impact of credit constraints [3, 26, 28, 36]. The sum of exports and imports over GDP is considered as a proxy for the control variable.

Another control variable is "fiscal institutions capacity in producing budget surplus" (TRGDP), which is defined as the government total revenue to GDP ratio. The capacity to create budget surpluses by fiscal institutions is a key element in differentiating the fiscal structure of developed and developing countries. This ratio is lower for developing countries than for developed countries [2, 6].

Government Size (GOVSIZ) is included to examine whether the cyclical properties of fiscal policy vary depending on government size and is defined as the total government expenditure to GDP ratio (following Woo (2009)). Another control variable is "fiscal space" (DEBTRT), which is measured by the government debt to GDP ratio [27, 28]. Additionally, the inflation rate (INFL) is included in the model to examine the effect of changes in consumer price level on fiscal policy [31].

4 Research findings

4.1 Unit root test

In this study, Zivot–Andrews test and the Augmented Dickey-Fuller (ADF) test are utilized for the stationary test. The results of the unit root or stationary test for different types of government expenditures and control variables can

logarithm

be seen in Table 1. The Augmented Dickey-Fuller (ADF) test shows that all variables, except the inflation rate, are non-stationary at the level. This means that time series have a random trend and do not return to their long-term values after the shock, and distributions do not have a constant mean and variance. But when the variables are expressed in the form of the first difference, they become stationary. The Zivot–Andrews test confirms the results of the Augmented Dickey-Fuller (ADF) test.

Table 1: Results of unit root test: Zivot–Andrews test and Augmented Dickey-Fuller test

variable	symbol	Zivot –Andrews test		Augmented Dickey-Fuller test	
		Break Point	ZA Stat	With trend	without trend
log Government consumption	LCONSUM	1379	-3.577 (3)	-2.425 (0)	-1.470 (0)
Log Total government expenditures	LEXPTOT	1381	-3.912 (4)	-2.106 (0)	-0.969 (0)
log GDP	LGDP	1365	-4.934	-2.575 (1)	-0.254 (2)
log investment in construction	LINVBUI	1366	-4.190 (1)	-2.286 (0)	-0.918 (0)
log investment in machinery	LINVMAC	1380	-2.947 (1)	-1.876 (0)	-1.642 (0)
log total government investment	LINVTOT	1366	-3.841 (1)	-2.236 (0)	-1.157 (0)
Trade openness	OPEN	1369	-3.879 (2)	-2.382 (1)	-1.350 (1)
total government revenue to GDP ratio	TRGDP	1372	-4.290 (0)	-3.069 (0)	-3.250** (0)
Government size	GOVSIZ	1366	-2.772 (0)	-1.922 (0)	-1.223 (0)
government debt to GDP ratio	DETGDP	1369	-3.156 (2)	-1.980 (1)	-0.645 (0)
Inflation rate	INFL	1378	-5.523*** (1)	-4.128** (1)	-3.608** (0)
first dif of log government consumption	dLCONSUM	1369	-6.920***(0)	-5.551*** (0)	-5.556*** (0)
first dif of log total government expenditures	dLEXPTOT	1369	-5.553*** (0)	-4.447*** (0)	-4.506*** (0)
first dif of log GDP	dLGDP	1368	-6.329***(0)	-5.983*** (1)	-6.103***(1)
first dif of log investment in construction	dLINVBUI	1369	-5.912***(0)	-2.927 (3)	-11.728
first dif of log investment in machinery	dLINVMAC	1369	-6.009***(0)	-5.279*** (0)	-5.320*** (0)
first dif of log total government investment	dLINVTOT	1369	-5.738***(0)	-2.90 (3)	-4.837*** (0)
first dif of trade openness	dOPEN	1371	-5.870***(0)	-5.290*** (0)	-5.328*** (0)
first dif of total government revenue to GDP ratio	dTRGDP	1368	-8.026***(0)	-6.937*** (0)	-7.068*** (0)
first dif of government size	dGOVSIZ	1369	-5.762***(0)	-5.182*** (0)	-5.221*** (0)
first dif of government debt to GDP ratio	dDETGDP	1368	-6.801***(0)	-3.804** (1)	-5.588*** (0)
first dif of inflation	dINFL	1375	-6.930***(1)	-5.765*** (1)	-5.890*** (1)

*, ** and *** represent significance levels of 10, 5 and 1%, respectively. Log=log. Dif=Difference. Source: Research Findings

4.2 Cyclical properties of fiscal policy with respect to various types of government expenditures

In the first stage, the cyclical properties of each type of government expenditures are evaluated using time series analysis of Equation Form (3.1) with an autoregressive distributed lags model. As it is demonstrated in Table 1, the log of all types of government expenditures is non-stationary at the level.

Table 2 presents the log coefficients of GDP among various types of government expenditures. As it can be seen, all coefficients are significant at a one percent significance level and have a positive relationship with GDP. It is estimated that for each percentage unit increase in GDP, government consumption, government investment in construction, government investment in machinery, total government investment and total government expenditures will increase by 0.71, 0.75, 1.92, 1.71 and 1.09 percent, respectively. These results can be interpreted as saying that all types of government expenditures have a procyclical attitude and none of the types of government expenditures shows a countercyclical behaviour (significant negative coefficient), or acyclical pattern (insignificant coefficient), Which can be interpreted as saying that procyclical behaviour of various types of government expenditures, is not offset by countercyclical behaviour.

Table 2: The level of cyclicality of various government expenditures (coefficients of log GDP)

dependent variable	symbol	F statistic	t statistic	Std. Error	Coefficient
log Government consumption	(LCONSUM)	53.8447	4.2444	0.167812	0.712261
log investment in construction	(LINVBUI)	68.6616	4.57372	0.165347	0.756252
log investment in machinery	(LINVMAC)	28.9616	2.99733	0.639311	1.916228
log total government investment	(LINVTOT)	54.158	3.2564	0.525448	1.711067
Log Total government expenditures	(LEXPTOT)	86.8056	4.58957	0.237825	1.091516

Source: Research Findings

In addition, government investment in machinery and total government investment, among various types of government expenditures, have the highest level of procyclicality, which is consistent with Ilzetzki [21] and Lane [26]. Lane [26] emphasizes the effect of government investment when production elasticity is more than one unit, and Ilzetzki [21] shows that production elasticity is more than one unit. This may be because government investment is the main type of government expenditure that policymakers set discretionary. Using government investment tools, policymakers can

adjust the amount of capital during different periods. Moreover, the results can be interpreted as saying that government investment and expenditures behaviour during the recession has been negatively affected by the procyclical behaviour of the government investment and expenditures during booms.

Table 3: Results of estimating various types of government expenditures with autoregressive distributed lags models

Dependent variable: LCONSUM				
variable	coefficient	Std. Error	t statistic	Prob.*
LCONSUM(-1)	0.750152	0.089988	8.336164	0
LGDP	0.712261	0.167812	4.244401	0.0002
LGDP(-1)	-0.626562	0.261745	-2.393785	0.0239
LGDP(-2)	0.332059	0.238902	1.389935	0.1759
LGDP(-3)	-0.327591	0.135559	-2.4166	0.0227
F-statistic: 53.84467	R-squared: 0.908853		selected model: ARDL(1, 3)	
Dependent variable: LEXPTOT				
variable	coefficient	Std. Error	t statistic	Prob.*
LEXPTOT(-1)	0.748317	0.091992	8.134574	0
LGDP	1.091516	0.237825	4.589572	0.0001
LGDP(-1)	-0.515111	0.393082	-1.310443	0.202
LGDP(-2)	-0.289644	0.332395	-0.871385	0.3918
LGDP(-3)	0.39169	0.298288	1.313126	0.2011
LGDP(-4)	-0.539539	0.17554	-3.073602	0.0051
F-statistic: 86.80557	R-squared: 0.954198		selected model: ARDL(1, 4)	
Dependent variable: LINVBUI				
variable	coefficient	Std. Error	t statistic	Prob.*
LINVBUI(-1)	0.81692	0.16354	4.995246	0
LINVBUI(-2)	-0.431781	0.214627	-2.011774	0.0547
LINVBUI(-3)	0.42381	0.229473	1.846886	0.0762
LINVBUI(-4)	-0.38562	0.158238	-2.436964	0.022
LGDP	0.756252	0.165347	4.573719	0.0001
F-statistic: 68.66155	R-squared: 0.929598		selected model: ARDL(4, 0)	
Dependent variable: LINVMAC				
variable	coefficient	Std. Error	t statistic	Prob.*
LINVMAC(-1)	0.669468	0.119061	5.622917	0
LGDP	1.916228	0.639311	2.997332	0.0061
LGDP(-1)	0.101554	1.035969	0.098028	0.9227
LGDP(-2)	-1.827591	0.905763	-2.017736	0.0545
LGDP(-3)	1.41517	0.823088	1.719342	0.0979
LGDP(-4)	-1.451182	0.479136	-3.028744	0.0056
F-statistic: 28.96159	R-squared: 0.874226		selected model: ARDL(1, 4)	
Dependent variable: LINVTOT				
variable	coefficient	Std. Error	t statistic	Prob.*
LINVTOT(-1)	0.655119	0.116777	5.61	0
LGDP	1.711067	0.525448	3.256397	0.0032
LGDP(-1)	-0.184706	0.861022	-0.21452	0.8319
LGDP(-2)	-1.170757	0.73074	-1.602153	0.1217
LGDP(-3)	1.137177	0.661911	1.71802	0.0982
LGDP(-4)	-1.140597	0.387862	-2.94073	0.007
F-statistic: 54.15798	R-squared: 0.928561		selected model: ARDL(1, 4)	

Source: Research Findings

Table 3 shows the dynamic relationships between explanatory variables and dependent variables. In all estimated autoregressive distributed lags models, there is an explanatory variable of the log of GDP as well as an explanatory lagged value of various government expenditures. In the consumption expenditure equation, the calculated number of lagged values of the dependent variable (The log of government consumption) is 1, and the calculated number of lagged values of the explanatory variable (The log of GDP) is 3. In the total government expenditures equation, the calculated number of lagged values of the dependent variable (the log of total government expenditures) is 1, and the calculated number of lagged values of the log of GDP is 4. In the government investment in construction equation, the calculated number of lagged values of the dependent variable (the log of government investment in construction) is 4, and the calculated number of lagged values of the log of GDP is zero. In the government investment in machinery equation, the calculated number of lagged values of the dependent variable (the log of government investment in machinery) is 1, and the calculated number of lagged values of the log of GDP is 4. In the total government investment equation, the calculated number of lagged values of the dependent variable (the log of total government investment) is 1, and the calculated number of lagged values of the log of GDP is 4.

The results show that the effect of GDP on various types of government expenditures continues even after three

or four periods. The first and third lagged values of GDP have a significant negative relationship with government consumption, and the second and third lagged values of GDP have a significant negative and positive relationship with government investment in machinery, respectively, at a ten percent significance level. The third lagged value of GDP has a significant positive relationship with total government investment at a ten percent significance level and the fourth lagged value of GDP has a significant negative relationship with government investment in machinery, total government investment and total government expenditures at one percent significance level.

The lagged value of the dependent variable is significant in all types of government expenditures at a one percent significance level, which confirms the autoregressive nature of the models. This result is consistent with the economic logic that the impact of fiscal policies and government expenditures could continue into the following years. The second and third lagged values of government investment in construction have a significant negative and positive impact, respectively, at a ten percent significance level, and the fourth lagged value of government investment in construction has a significant negative impact at a five percent significance level.

To ensure that the order of the autoregressive distributed lags models has the lowest Akaike Information Criteria, the diagrams related to the Akaike Information Criteria of the models of various types of government expenditures are presented in Figure 1.

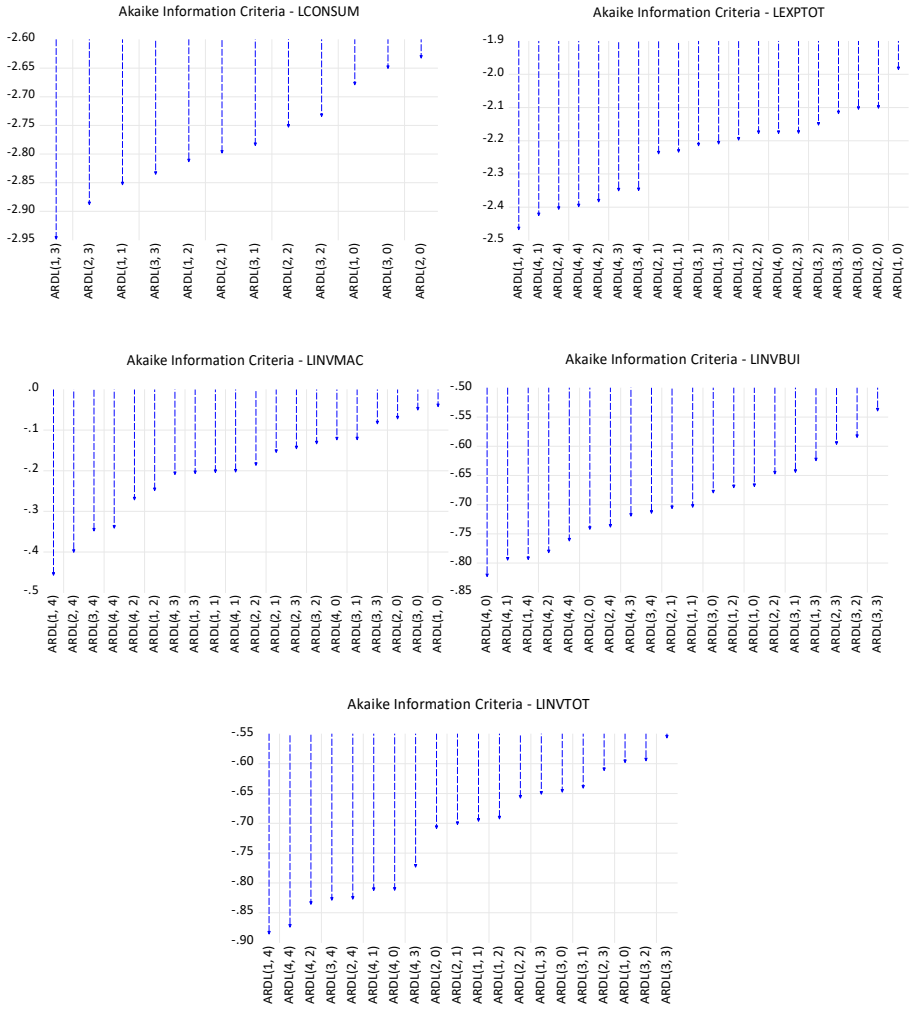

Figure 1: Akaike information criteria of various government expenditures models

4.3 Cyclical properties of various types of government expenditures after adding control variables

To further examine and validate the results, five control variables, commonly employed in existing literature, along with a dummy variable for election impact, are added to the models. The results of estimating the models are presented in Table 4.

Table 4: Results of estimating various government expenditures with autoregressive distributed lags models after adding control variables

variable	Dependent variable	LCONSUM	LEXPTOT	LINVBUI	LINVMAC	LINVTOT
LGDP	Coefficient	0.555 ***	1.219 ***	1.227 ***	2.623 **	1.227 **
	t statistic	4.762	18.933	6.448	2.839	2.981
LGDP(-1)	Coefficient	-0.005	-1.555 ***	0	0.323	0.861
	t statistic	-0.03	-8.479	0	0.326	1.667
LGDP(-2)	Coefficient	1.029 ***	0.713 ***	0	-2.660***	-0.566 *
	t statistic	5.67	3.371	0	-4.019	-1.917
OPENS*LGDP	Coefficient	-0.046 **	0	-0.081 ***	0.034	0.004
	t statistic	-2.921	0.046	-3.424	0.6	0.109
TRGDP*LGDP	Coefficient	-0.144 ***	-0.029 **	0.110 *	0.041	0.117 *
	t statistic	-5.3	-3.226	1.83	0.373	1.835
GOVSIZS*LGDP	Coefficient	0.251***	0.379***	0.392***	0.796***	0.422***
	t statistic	10.161	41.589	4.753	5.543	5.58
DEBTGDP*LGDP	Coefficient	-0.087***	-0.023***	0.035	0.077	-0.008
	t statistic	-5.61	-4.429	0.927	1.078	-0.161
INFL*LGDP	Coefficient	-0.025***	0.014***	-0.019	0.009	0.01
	t statistic	-4.507	5.103	-1.544	0.346	0.57
DUMMY*LGDP	Coefficient	-0.154***	0.056***	0.211**	-0.18	0.138
	t statistic	-4.731	5.192	2.519	-1.147	1.437
LCONSUM(-1)	Coefficient	-0.653***	0	0	0	0
	t statistic	-3.805	0	0	0	0
LCONSUM(-2)	Coefficient	-1.104***	0	0	0	0
	t statistic	-5.519	0	0	0	0
LEXPTOT(-1)	Coefficient	0	1.504***	0	0	0
	t statistic	0	9.568	0	0	0
LEXPTOT(-2)	Coefficient	0	-0.786***	0	0	0
	t statistic		-4.091	0	0	0
LINVBUI(-1)	Coefficient	0	0	0.243 *	0	0
	t statistic	0	0	2.069	0	0
LINVBUI(-2)	Coefficient	0	0	-0.550***	0	0
	t statistic	0	0	-3.768	0	0
LINVMAC(-1)	Coefficient	0	0	0	0.510 **	0
	t statistic	0	0	0	2.46	0
LINVMAC(-2)	Coefficient	0	0	0	0.551 **	0
	t statistic	0	0	0	2.361	0
LINVTOT(-1)	Coefficient	0	0	0	0	0.216 *
	t statistic	0	0	0	0	1.998
LINVTOT(-2)	Coefficient	0	0	0	0	-0.217 *
	t statistic	0	0	0	0	-1.949843
R-squared		0.997275	0.999897	0.990348	0.971045	0.992707
F-statistic		137.23***	3110.87***	123.13***	24.71***	88.47***

*, ** and *** represent significance levels of 10, 5 and 1%, respectively. Source: Research Findings

The optimal number of lagged values is determined based on the lowest Akaike Information Criteria. In estimating the autoregressive distributed lags models, it must be proved that the classical assumptions are not violated. Therefore, classical assumptions including serial autocorrelation, variance homogeneity, and normal distribution of the error terms should be tested. Table 5 presents the results of the Breusch-Godfrey test for detecting serial autocorrelation in the error terms of the estimated models.

Table 5: Breusch-godfrey serial correlation LM test

Dependent variable	symbol	F statistic	Prob. F
log Government consumption	LCONSUM	0.056952	0.9451
Log Total government expenditures	LEXPTOT	0.314311	0.7416
log investment in construction	LINVBUI	0.971559	0.3997
log investment in machinery	LINVMAC	0.847223	0.4527
log total government investment	LINVTOT	0.345818	0.7151

Source: Research Findings

Considering the F statistics and their probability, which is above 0.05, the null hypothesis that there is no autocorrelation between the error terms of the models is confirmed. To test for variance homogeneity, the Breusch-Pagan-Godfrey test is utilized, the results of which are presented in Table 6.

According to F statistics and their probability, which is higher than 0.05, the null hypothesis of variance homogeneity in all models is confirmed. However, to test the assumption of normal distribution of the error terms of the

Table 6: Heteroscedasticity test: breusch-pagan-godfrey

Dependent variable	symbol	F statistic	Prob. F
log Government consumption	LCONSUM	0.607137	0.842
Log Total government expenditures	LEXPTOT	0.616418	0.8314
log investment in construction	LINVBUI	1.299572	0.2951
log investment in machinery	LINVMAC	0.826254	0.657
log total government investment	LINVTOT	1.601039	0.1935

Source: Research Findings

models, the Jarque-Bera test is employed, the results of which are presented in Table 7.

Table 7: Jarque-Bera normality test

Dependent variable	symbol	Jarque-Bera	Prob.
log Government consumption	LCONSUM	0.22948	0.891598
Log Total government expenditures	LEXPTOT	1.720597	0.423036
log investment in construction	LINVBUI	0.29957	0.860893
log investment in machinery	LINVMAC	0.64918	0.722824
log total government investment	LINVTOT	0.448868	0.798968

Source: Research Findings

The results of the Jarque-Bera test indicate the normal distribution of the error terms. Given that the probability of the Jarque-Bera statistic is not in the critical region, the null hypothesis of a normal distribution of the error terms is not rejected. Besides, the results of the F-Bounds test indicate the existence of long-term convergence in the models. The results of the F-Bounds test are presented in Table 8.

Table 8: F-Bounds test

Dependent variable	symbol	F statistic	Significance (5%)	
			I(0)	I(1)
Government consumption log	LCONSUM	13.34596	2.55	3.68
log Total government expenditures	LEXPTOT	10.82672	2.55	3.68
log investment in construction	LINVBUI	14.62686	2.11	3.15
log investment in machinery	LINVMAC	2.227417	2.11	3.15
log total government investment	LINVTOT	16.67722	2.55	3.68

Source: Research Findings

The results of the F-Bonds test indicate that the value of the F statistic in all models is higher than the 95% confidence level, so the null hypothesis that there is no long-term relationship is rejected. Thus, although the log of all types of government expenditures is non-stationary at the level, long-term convergence in all models is confirmed.

All the coefficients of the log of GDP are statistically significant and have a positive sign, which confirms the procyclicality of various types of government expenditures. But the results show that after adding new control variables to the models, the coefficient of the log of GDP has increased, except in government consumption and total government investment models. Therefore, adding a set of control variables has led to a decrease in procyclicality of government consumption and total government investment and an increase in procyclicality of government investment in construction, government investment in machinery and total government expenditures.

The coefficient of trade openness is significant only for government consumption and government investment in construction, which has a negative sign in both cases. Increasing trade openness by one percent, while keeping other variables constant, reduces the level of procyclicality of government consumption and government investment in construction (the coefficient of the log of GDP) by 0.04 and 0.08, respectively. This finding is consistent with the results of Woo [36], which shows that greater trade openness makes the fiscal policy less procyclical, due to freer access to the international capital market.

The coefficient of government revenue to GDP ratio is significant and negative only for government consumption and total government expenditures. A one percent increase in the government revenue to GDP ratio reduces the procyclicality of government consumption and total government expenditures (the coefficient of the log of GDP) by 0.14 and 0.02, respectively. Therefore, the government revenue to GDP ratio is effective in reducing the procyclicality of government consumption and total government expenditures.

The government size has a positive and significant effect on all types of government expenditures, which means that the larger public sector is more inclined to implement procyclical fiscal policies. Existing literature provides

different empirical evidence. Woo [36] shows that government size is negatively correlated with procyclicality because it represents the power of automatic stabilizers, while Mackiewicz [28] shows that government size has no role in the procyclicality of fiscal policy.

The government debt to GDP ratio shows a significant negative impact on government consumption and total government expenditures. A one percent increase in the government debt to GDP ratio causes government consumption and total government expenditures to decrease by 0.08 and 0.02 percent, respectively, for each percent increase in GDP. High debt can reduce the incentive to increase costs and expenditures by raising concerns about fiscal sustainability in practice, meaning that high debt can motivate debt consolidation in fiscal policy [20], so it can reduce the level of procyclicality, especially during booms.

The election has a significant negative effect on government consumption and has a significant positive effect on total government expenditures and government investment in construction, indicating that the election leads to a reduction in procyclicality of government consumption and an increase in procyclicality of total government expenditures and government investment in construction. Most existing studies show that election increases the procyclicality of government expenditures, as governments typically spend more during election years [26].

The inflation rate shows a significant negative impact on government consumption and a significant positive impact on total government expenditures. The effect of inflation on other types of government expenditures is not significant. It is estimated that for every one percent increase in the inflation rate, the level of procyclicality of government consumption and total government expenditures decreases by 0.02 percent and increases by 0.01 percent, respectively.

In general, lagged values of various types of government expenditures have a significant effect on government expenditures. The first lagged value of all government expenditures, except government consumption, has a positive effect and the second lagged value of all government expenditures, except government investment in machinery, has a negative effect. Therefore, it can be concluded that the first lagged value of all government expenditures, except government consumption, increases the level of procyclicality while the second lagged value of all government expenditures, except government investment in machinery, reduces the level of procyclicality.

5 Conclusion

The empirical findings of this study indicate that governments in Iran have implemented their fiscal policy in a procyclical manner. The results show that government investment in machinery and total government investment, among all types of government expenditures, have the highest rate of procyclicality. This may be because government investment is the main type of government expenditure that Policymakers make it discretionary. Furthermore, the results of this study show that the control variables play an important role in determining the level of procyclicality of various types of government expenditures.

The trade openness reduces the procyclicality of government consumption and government investment in construction. This is because trade openness makes it easier to access the international capital market. The government revenue to GDP ratio is effective in reducing the procyclicality of government consumption and total government expenditures. The results of this study show that the larger size of the public sector increases the proclivity to implement procyclical fiscal policy. The government debt to GDP ratio shows a significant negative impact on government consumption and total government expenditures. It can therefore lower the level of procyclicality by raising concerns about fiscal sustainability.

Elections lead to a reduction in procyclicality of government consumption and an increase in procyclicality of total government expenditures and government investment in construction. Furthermore, the research findings show that the first lagged value of all government expenditures, except government consumption, has a positive effect and the second lagged value of all government expenditures, except government investment in machinery, has a negative effect on the level of procyclicality.

The results of this study are in line with the results of existing literature that the fiscal policy in developing countries, including Iran, is procyclical. The contribution of this study is based on the cyclical features of Iran's fiscal policy with respect to various types of government expenditures and shows that all government expenditures in Iran have behaved procyclically. Another offering of this study is to identify the factors that affect the level of procyclicality of various government expenditures in Iran. It can be recommended that Iranian policymakers, in conformity with cyclical features of various kinds of government expenditures, adopt appropriate countercyclical fiscal policies to reduce the level of procyclicality of fiscal policy.

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