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A STUDY ON THE EFFICIENCY OF GOVERNMENT SPENDING, OPTIMAL FISCAL POLICY AND INDIGENOUS ECONOMIC GROWTH IN IRAN ECONOMY

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Abstract

The optimal combination of the government current and capital expenditures is very important from the aspect of influencing on the optimal economic growth, so that lack of attention to the type of government spending leads to inefficiency of the government fiscal policies and failure to achieve the high-valued objectives of economy. In the present study, we used the production function and considering efficiency of the government current and capital expenditures to evaluate their effects on the optimal economic growth. Then, we proposed appropriate policy recommendations. To this aim, we used the modified Devarajan's model (1998) and vector error correction model for 1966-2013 time-series data. The results show that current and capital expenditures had respectively positive and negative effects on the optimal economic growth. In other words, in Iranian economy, current expenditures are more efficient than capital expenditures. This is in contradiction to the ideas about high efficiency of capital expenditures. The reason for this is the Iranian economy structure and the nature of government current and capital expenditures. So that capital expenditures despite accounting classification, have a non-development nature. This is

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because of low contribution of economic issues in capital expenditures and high contribution of economic issues in current expenditures. Moreover, due to non-flexibility of current expenditures over 70%, adopted current credits are allocated practically and only 10-30% of development credits are allocated. Selection of economic sectors for development expenditures is inefficient while, current expenditures leads to economic growth by creating real demand in the market.

Keywords: Efficiency of Government Spending, Optimal Fiscal Policy, Vector Error Correction Model

JEL Codes: H30, H61, G18

Introduction

Efficiency of current and capital expenditures in the production function affects the effectiveness of the government economic policy so that in some countries, it can be seen that increase in capital expenditures (despite theatrical foundations) does not lead to achieve high-valued economic objectives such as economic growth and improvement of the production sector. So, the economic policies related to reduction of the current expenditures ratio and increase in capital expenditures in the budget are failed. The combination of governments capital expenditures and type of spending, despite its accounting classification, have significant differences with each other. On the other hand, the priorities determined in governments capital expenditures also result in efficiency or inefficiency of capital expenditures. The present study aimed to analyze the efficiency of current and capital expenditures in Iranian economy. The main question is that which part of capital or current expenditures has more significant effect on the optimal economic growth? What are the conditions required for better effectiveness of expenditures on the optimal economic growth? What are the reasons for efficiency or inefficiency of current and capital expenditures in Iranian economy? To this aim, we used the basic Devarajan (1998) and Sugata (2006) models, and then we applied the vector error correction model (VECM) to analyze the effects.

Analysis of government revenue and expenditure in Iranian economy

This section analyzes Iranian fiscal policy instruments from 1966 to 2013. The first, revenue of Iranian government is constituted by oil and tax revenues with oil revenue as the main source. It plays a vital role

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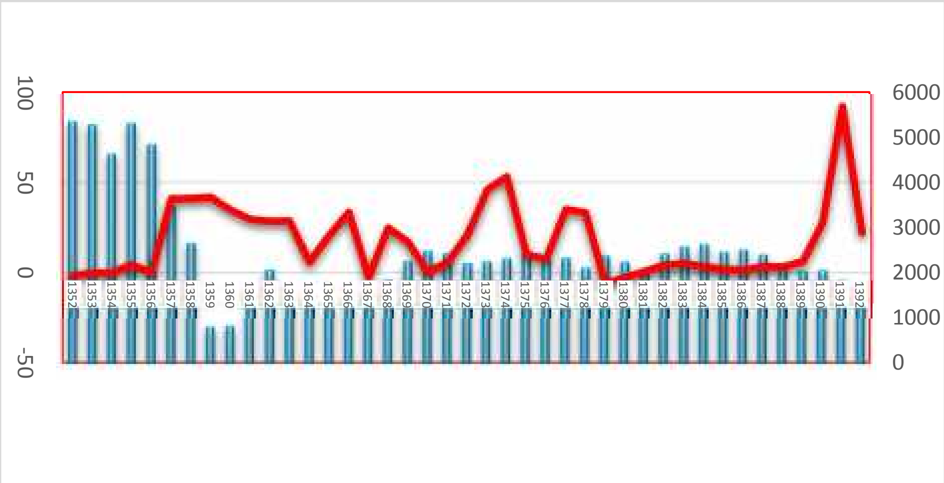
in supplying current and capital expenditures. Despite the fact that economic intellectuals have always believed that in the process of formulating development plans for Iran oil revenues should be allocated to development and infrastructural fields, in practice, however, current expenditures have gradually been affected by oil revenue so that this dependence has raised incrementally.

Iranian oil revenue is mainly under the influence of the fluctuations of the global price of oil (In addition, the sanctions over the past 10 years affected oil revenue). Whenever the global price of oil increases in global markets, Iranian oil revenues increase consequently. The amount of crude oil export and changes of exchange rate are two other influential factors. The price shock of 1975 has been the most important oil shock imposed to government revenue. It raised oil price in global markets. In addition, decreased oil exports from 1980 and 1986, the successive decrease of oil exports from 2005 to 2013 (oil export decreased from 2600 thousand barrels in 2005 to 1600 thousand barrels in 2013), the increased exchange rate in 1993 and 2012 and the decreased oil price in 1997 and 2012 imposed severe fluctuations to Iranian government oil revenue in recent decades. (graph1)

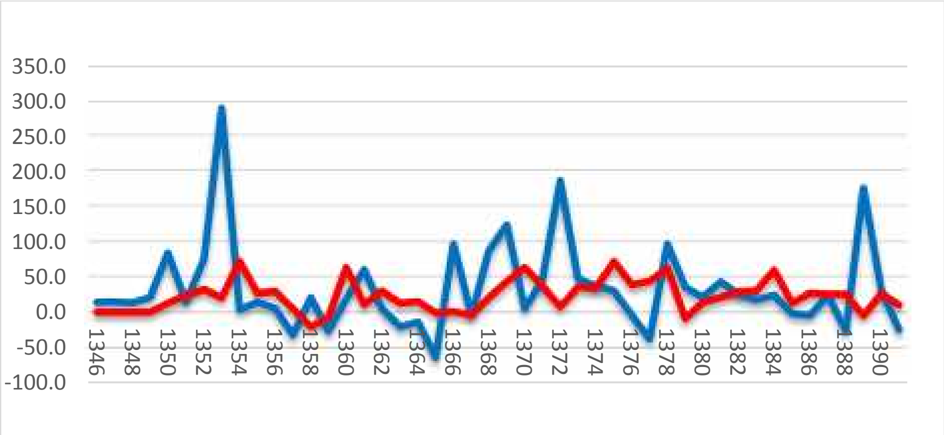


Graph 1: Exchange rate and oil export quotas: **Red line**: Exchange rate; **Blue line**: Crude oil exports (thousand barrels per day)

Source: Iran Central Bank time series)

As the second source of Iranian government revenues, tax revenues have had a moderate trend in years ending to 1973 so that during these years, tax revenue showed a proportional rise and did not experience sever fluctuations. The mean growth of tax revenue was 31% from 1966 to 1976. However, within this period the contribution of tax revenues to the total government revenues was low due to increased oil revenues so that tax revenues account for only 25.8% of total government revenue.

During 1977-1988, the trend of tax revenues was deviated from its moderate level and experienced strong decreasing and increasing fluctuations. During this period, and in some years, especially in 1981, tax revenues increased by 62% and in some years, especially in 1979, it decreased by 21%. This implies the fluctuations of tax revenues during this period. During 1977 to 1988, the contribution of tax revenue to total government revenues was 34.1% which was more than previous period. In some years, the contribution of tax revenue significantly increased and reached 60% of total revenues (in 1986) due to decreased oil revenues After 1988, upon the commencement of economic, social and cultural development plans, tax revenues increased due to making plan-oriented policies so that the mean change in tax revenues was 28.5% during 1988 to 2012. After 1988, total general revenues of Iran increased so that despite the significant increase of tax revenues, due to the increase of oil and other revenues at the same time, the contribution of tax revenues to total Iranian revenues remained near to fixed. (graph2)



Graph 2: The growth rate of government revenue (face values): **Red line**: Growth in tax revenue; **Blue line**: Growth in oil revenue

Source: Iran Central Bank time series

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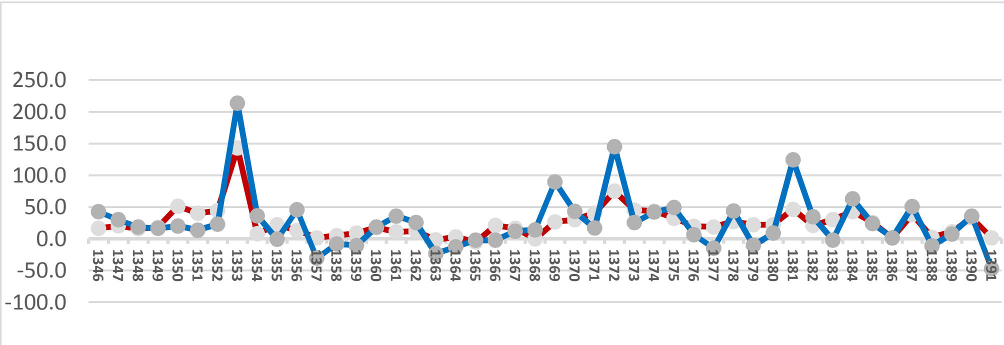
Current expenditures constitute the main part of government spending (almost 70%). On the other hand, the simultaneous review of government spending and revenues shows that the growth rate of government public spending was low in the years showing decreased general revenue so that in some years (e.g.:1978, 1984 and 2012) it is negative. The decrease of current expenditures are more reflected in capital expenditures because of the less-flexibility of government spending so that current expenditures increased, due to the nature of current expenditure, even in years with decreased government revenues. For example, in 1998 and simultaneous with deceased oil revenues, due to the reduction of oil price in global markets, capital expenditures decreased almost by 15% whereas current expenditures experienced even an increase by 19%. In 2012, however, capital expenditures decreased by 47.3%. In other words, current expenditures are not flexible to decreased government revenues and are sticky downward while they increase as revenues increase and are not sticky upward. Government spending showed a significant rise in some years. The reason will be explained below. In 1974, Iranian government revenue increased by 4 folds due to the significant increase of oil price that oil shock occurred in this year.



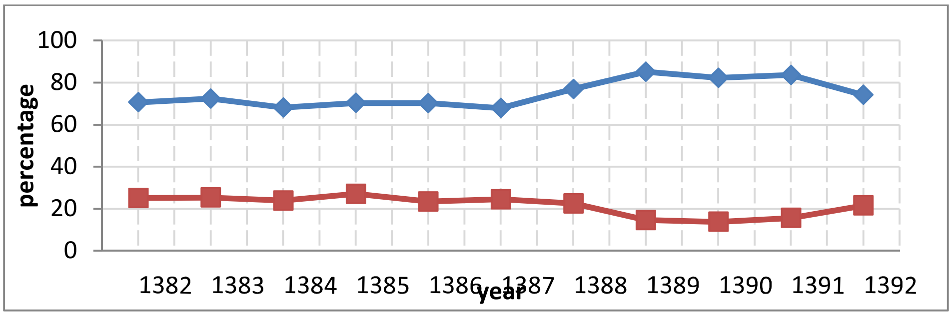
Graph 3: The growth rate of the government current and capital expenditures in nominal price: **Red line**: Growth rate of the government current expenditures; **Blue line**: Growth rate of the government capital expenditures.

Source: Iran Central Bank time series

The general expenditures experienced an increase by 163% in that year where the current expenditures and capital expenditures increased by 143% and 213%, respectively. In 1990, i.e. the year of the commencement of the first development plan of Iran, the public expenditures of government increased by 40.2% due to taking expansion fiscal policies for realizing the objectives of the first development plan where current and capital expenditures increased by 26.6% and 89.6%, respectively. In other words, capital expenditures accounted for the increase of government expenditures by which the government sought development objectives. In 1993, oil revenues (in Rials) were significantly increased due to the increase of exchange rate. In that year, the general expenditures of government showed a growth by 94% with current and capital expenditures increase by 74.7% and 145%, respectively. Again, in 2005 and 2008, oil revenues (in Rials) were significantly increased due to the increase of exchange rate. In the past 10 years, the highest decrease of government spending occurred in 2012 with a decrease by 10.7 % (graph3).

The comparison of expenditure to production ratio in international level in 2015 reveals that expenditure to production ratio is 17.2% and revenue to production ratio is 15.2% in Iran while in developed countries, including Germany, China, the U.S. and Turkey, both are higher than 30%. This index shows low influence of government in economy through changing fiscal policies.

Graph 4 shows that the realization of current and capital expenditures in Iranian economy is between 70 to 90%, and 10 to 30%, respectively. This suggests that the government compensated its budget deficit by reducing capital expenditures.



Graph 4: A comparison of the contribution of efficiency from the National Credit Act (percent) : **Red line**: Contribution of capital assets ownership; **Blue line**: Contribution of cost credit

Source: Iran Central Bank time series

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Background

There are different studies on the impact of government fiscal policies. Sameti (1998) showed in his study that the size of economic activities of Iranian government is excessively ideal and the growth of such activities in the neighborhood of optimal point has no inverse impact on GDP growth. However, higher rates are not permissible. In addition, the increase of current expenditure to GDP ratio beyond ideal level decreases GDP growth. Therefore, the government should decrease its expenditures. Hoseini et al (2007) adopted Barow model and evaluated the influence mechanism of the component of the general expenditures on the trend of economic growth in Iran during 1978 to 2006. According to their results, the contribution of government spending to GDP has a positive and significant impact on the economic growth of Iran.

In their study from 1959 to 2002, Nili et al (2007) showed that although the presence of the government in different economic sectors is an inevitable action, expanding government activities decreases economic growth. According to international studies, different fiscal policies have different impacts in terms of their impacts on economy in different inflation conditions. Indeed, if expected prices change proportional to current price, the supply graph will get a vertical shape and if expected prices go beyond current price, total supply graph will get a decreasing trend with a negative slope. Since prices are sticky to the shocks induced by unexpected changes of demand but are flexible to expected ones, this breaks total supply graph. Ball and Mankew (1994), Kandil (1995), Karras (1996) and Sheng Chen (2000) studies are some examples of such international studies. The primary condition of economy plays a vital role in the effectiveness of fiscal policies. In other words, fiscal policies may show different impacts economic depression and bloom conditions and Toma's study has confirmed this argument. The studies of Tsiddon (1991), caballero and Enge (1992) showed that a broader economic policy will absolutely have a stronger impact than a limited policy. This is due to wage stickiness or costly process of slight adjustment of prices. The studies of a group of economists including Summers and Delong (1998), Morgan (1993) and Rich and Rhee (1995) supported this argument. All of them show that production level and employment react to broad policies more than limited ones. This confirms the assumptions of wage stickiness and costly process of price adjustment. In some concepts published by the economists, asymmetry is explained using Gertler's credit limit theory (1998) stating that any decrease in supplying credits induced by economic crisis has less impact on large scale enterprises as they can supply their financial resources directly from the money market. However, during economic depression small scale enterprises experience high limitations than large scale ones in terms of financing compared with economic boom condition. The review of the experimental study of Blanchard and Perroti (2002) shows that positive shocks of fiscal policies have a positive impact on actual activities and production which differ from negative shocks so that the latter has a decreasing impact on investment. The results of Bashar, Bhattacharya and Wohar (2017) study for OECD countries show that the slope (growth) of government consumption is found to be positively correlated with real GDP. Also Bhattarai and Trzeciakiewica (2017) investigations in UK find that government consumption and investment yield the highest GDP multipliers in the short-run, whereas capital income tax and public investment have dominating effect on GDP in the long-run. The study by Attinasi and Klemm (2016) for the EU countries show that expenditure-based measures are found to have a slightly lower detrimental effect on growth compared to revenue measures .expenditure cuts, reductions in government investment and consumption are found to be growth reducing. Among revenues, indirect tax increases are found to have a particularly strong negative impact. the other investigation by Cavallari and Romano (2017) in Italy and France emphasis in expectation role in fiscal policy effects. Their findings suggest that fiscal policy is effective when it is not "crowded out" by expectations of reversals. also Hollmayr and Matthes (2015) studies show that uncertainty about fiscal policy affects the impact of fiscal policy changes on the economy when the government tries to counteract a deep recession. Karagöz and Keskin (2016) 's research for the Turkish

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economy have shown that government expenditures and revenues have limited impact on the macroeconomic variables set which includes GDP, inflation, stock market index, external debt and interest rate. In Another way, the study by Panizza and Presbitero (2014) For the OECD, show that fiscal consolidation promotes growth; and higher debt ratios are beneficial to TFP growth.

Introduction of model

The proposed model of this paper, which has been reconstructed from Devarajan's model, seeks to solve three indigenous variables: contribution of the optimal government spending to current and capital expenditures, optimal tax rate and optimal economic growth and its impact on economic growth. We first explain Devarajan's model in the following and then analyze optimal fiscal policy (OFP) using CES production function where y, k, g1 and g2 stand for production, private investment, current expenditures and capital expenditures, respectively.

$$y = \left[\sim k_{-¸} + \quad g_1^{-¸} + ¥ g_2^{-¸} \right]^{-1/¸} \qquad (1)$$

$$\sim > 0, \quad \geq 0, ¥ \geq 0, \sim + \quad + ¥ = 1, ¸ \geq -1.$$

Government budget limitation is defined as follows:

$$ty + oily = g_1 + g_2 \qquad (2)$$

Where t is fixed income tax over time and oily is oil revenue. The contribution of $g_1(¨)$, $g_2\ (1-¨)$ to the total government spending out of revenue is derived from the following relations:

$$g_1 = ¨\ (ty + oily), \qquad g_2 = (1 - ¨)(ty + oily) \qquad (3)$$

Consumer utility function derived from the expenditures of the private sector is written as follows:

$$U = \int_0^{\infty} \frac{C^{1-±} - 1}{1 - ±} e^{-°t}\, dt \qquad (4)$$

Where $° > 0$ shows the rate of time preference

Consumer limitation is shown as follows:

$$k^{\circ} = (1 - {}^{2})\, y - c \qquad (5)$$

Indigenous economic growth rate is derived as follows:

$$a = \frac{\sim (1 - {}^{2})\left\{\sim^{2} \cdot / \left[{}^{2} \cdot - ¤^{-\cdot} - ¥\,(1 - ¤)^{-\cdot}\right]\right\}^{-(1+s)/s} - {}^{\circ}}{\pm} \qquad (6)$$

This section analyzes government OFP in Devarajan's model. Equations (1) to (5) are exactly based on Devarajan's 1996 model. The current problem is to calculate c and k° in order to maximize utility, U, in equation (4) considering its limitation and given values of t, g_1, g_2 and k°. The first order condition of Euler equation is given as follows:

$${}^{\circ} + \frac{\dot{c}}{c} = (1 - {}^{2})\frac{\partial y}{\partial k} \qquad (7)$$

The problem of government is to select optimal values for t, g_1 and g_2 in order to maximize utility function considering the limitations of equations (2), (5) and (7) and given value of k°. The first order condition corresponding to t, g_1 and g_2 is written as follows:

$$« = X \qquad (8)$$

$$« \,(1 - {}^{2})\frac{\partial y}{\partial g_1} + X\, {}^{2}\, \frac{\partial y}{\partial g_1} - X = 0 \qquad (9)$$

$$« \,(1 - {}^{2})\frac{\partial y}{\partial g_2} + X\, {}^{2}\, \frac{\partial y}{\partial g_2} - X = 0 \qquad (10)$$

Where μ and X are two corresponding variables associated with the restrictions of the private sector and public budget, respectively indicated in equations 2 and 5. It can be concluded from equations 9 and 10 that the condition of $\frac{\partial y}{\partial g_1} = \frac{\partial y}{\partial g_2} = 1$ should be satisfied in order to optimize the impact of government spending and to have an optimal government so that:

$$\left(\frac{g_1}{g_2}\right)^{*} = \left(\frac{\;}{\text{¥}}\right)^{\frac{1}{\text{¸}+1}} \qquad (11)$$

The value of $\frac{g}{k}$ is derived differentially using relation 11 as follows:

$$\frac{g_1}{k} = \left[\frac{(\;/\text{¥})^{(1/(\text{¸}+1))}}{(\;/\text{¥})^{(1/(\text{¸}+1))}+1}\right].\left[\frac{2\text{¸} - \text{¤}^{-\text{¸}} - \text{¥}(1-\text{¤})^{-\text{¸}}}{\sim}\right]^{1/\text{¸}} \qquad (12)$$

$$\frac{g_2}{k} = \left[\frac{1}{(\;/\text{¥})^{(1/(\text{¸}+1))}+1}\right].\left[\frac{2\text{¸} - \text{¤}^{-\text{¸}} - \text{¥}(1-\text{¤})^{-\text{¸}}}{\sim}\right]^{1/\text{¸}} \qquad (13)$$

Establishing relation $\frac{\partial y}{\partial g_1} = 1$ (14) we have $g_1^{*} = \;^{\frac{1}{1+\text{¸}}}.y$ (15)
and establishing relation $\frac{\partial y}{\partial g_2} = 1$ we have $g_2^{*} = \text{¥}^{\frac{1}{1+\text{¸}}}.y$

At this step, optimal tax rate is derived considering government compassionate behavior. Taking budget restriction and optimal values of equations 14 and 15 into account, optimal tax rate can be calculated as follows:

$$2^{*} = \;^{\frac{1}{1+\text{¸}}} + \text{¥}^{\frac{1}{\text{¸}+1}} \qquad (16)$$

Finally, the optimal rate of current expenditures out of government revenue (first part of public services) can be derived as follows considering the maximization of welfare and combining relations 3, 14 and 16:

$$\text{¤}^{*} = \frac{\;^{1/(\text{¸}+1)}}{\;^{1/(\text{¸}+1)} + \text{¥}^{1/(\text{¸}+1)}} \qquad (17)$$

Similarly, the optimal rate of capital expenditures out of government revenue (part 2 of public services) is derived by combining relations 16, 3 and 16.

$$1-\text{¤}^{*} = \frac{\text{¥}^{1/(\text{¸}+1)}}{\;^{1/(\text{¸}+1)} + \text{¥}^{1/(\text{¸}+1)}} \qquad (18)$$

By combining relations 18, 12 and 19 we have:

$$\left(\frac{g_1}{g_2}\right)^{*} = \frac{¤^{*}}{1-¤^{*}} = \left(\frac{\quad}{¥}\right)^{\frac{1}{¸+1}} \qquad (19)$$

The term of growth rate can be derived using fiscal tools of t, g_1 and g_2, and via maximizing welfare level so that combining equations 16, 6 and 17 we have:

$$a^{*} = \frac{\sim(1-2^{*})\left\{\sim 2^{*¸} / \left[2^{*¸} - ¤^{*-¸} - ¥(1-¤^{*})^{-¸}\right]\right\}^{-(1+¸)/¸} - °}{±} \qquad (20)$$

$$= \frac{\sim^{-1/¸}\left[1 - {}^{1/(¸+1)} - ¥^{1/(¸+1)}\right]^{-(1+2¸)/¸} - °}{±}$$

In above, we extracted OFP from Devarajan’s model. Instead of replacing given values of tax rate and the contribution of government expenditures to the aforementioned two main sectors in the model, we extended this model and considered maximizing welfare level index as the basis of achieving OFP. Here we discuss that how making change in factor, as the factor of current expenditures in the production function, changes optimal economic growth rate, optimal tax rate and contribution of government spending. Beta ( ) shows the productivity of the production factor of current expenditures. The value of $\frac{da^{*}}{d}$ is first obtained from equation 20.

$$\frac{da^{*}}{d} = A.B, \quad A \equiv \frac{1}{±}.\frac{\sim^{-1/¸}}{1+¸}.\left(\frac{1+2¸}{¸}\right)\left[1 - {}^{1/(1+¸)} - ¥^{1/(1+¸)}\right]^{(1+¸)/¸}, \qquad (21)$$

$$B \equiv ¥^{-¸/(1+¸)} - {}^{-¸/(1+¸)}. \qquad \frac{da^{*}}{d} > 0 \quad if \quad > ¥.$$

If $=¥$ i.e. the productivity of both current and capital expenditure factors are equal, any change in will not affect optimal economic growth. If production factor of current expenditures is more productive than the production factor of capital expenditures, it can be argued that making change in can increase optimal economic growth. In contrast, if the contribution of capital expenditures to the production factor is more productive i.e. $¥ >$, any increase in the coefficient of capital expenditures in the production factor will increase optimal economic growth. In addition, the increase of low productive production factor of government spending decreases optimal economic growth. It can be argued, therefore, that it is important to investigate which one is more productive in the production function: current expenditures factor or capital expenditures factor?

The influence of or the productivity of current expenditures on optimal tax rate is measured using equation 16 as follows:

$$\frac{d\,2^{*}}{d} = \frac{1}{1+¸}\left[\frac{1}{¸/(1+¸)} - \frac{1}{¥¸/(1+¸)}\right]. \qquad (22)$$

$$\frac{d2^{*}}{d} < 0 \quad if \quad > ¥.$$

In the above model, if $> ¥$, any increase in the contribution of a high productive input to the production function decreases optimal utility rate. The reason is that higher productivity rates result in higher production in economy and in turn result in higher tax revenue. In order to establish a balanced budget in the model, the optimal tax rate should decrease. From maximizing welfare function point of view, however, any increase in the productivity of productive products enables the decrease of optimal tax rate.

Finally, it is possible to measure the influence of current expenditure in the production function, , on its optimal contribution to total government spending using equation 19:

$$\frac{d(¤^{*}/(1-¤^{*}))}{d} = \frac{C}{D}, \quad C \equiv \frac{1}{1+¸}\left[(\;^{-¸}¥)^{1/(1+¸)} + (\;¥^{-¸})^{1/(1+¸)}\right], D \equiv ¥^{\;2/(1+¸)} \qquad (23)$$

$$\frac{d(¤^{*}/(1-¤^{*}))}{d} \succ 0 if \quad +¥ \succ 0$$

As we know, $\sim + \; +¥ = 1$ is satisfied and the value of $\sim$ ranges from zero to 1. Therefore, $+¥ \succ 0$ will be satisfied. Thus, the influence of current expenditure in the production function on its optimal contribution to total government spending will be positive.

Experimental results

The proposed theoretical model used the following variables to give estimations:

GDP: gross domestic product at market price

RGDP: gross domestic product at a fixed price (base year=2004)

RRGDPP: gross domestic product growth per capita at a fixed price (base year=2004)

K: net capital stock at a fixed price (base year=2004)

g_1: current expenditures at market price

g_2 : capital expenditures at market price

BMP: exchange rate at free market price

Estimation variables are named as follows:

$$\cdot KG = \frac{(K/RGDP)}{(g_1+g_2)/GDP} \text{ و } STEE = \frac{g_2}{g_1+g_2} \quad STJE = \frac{g_1}{g_1+g_2}$$

The econometrics model for explaining the impacts of fiscal policies on optimal economic growth rate, optimal tax rate and optimal contribution of capital and current expenditures is proposed based on theoretical fundamentals. On this basis, the following two models are estimated:

Model 1: $$RRGDPP = C + F\left(\frac{g_1}{g_1+g_2}\right) + h\left(\frac{g_1+g_2}{GDP}\right) + j\left(\frac{K_1/RGDP}{(g_1+g_2)/GDP}\right) + l(bmp)$$

Model2: $$RRGDPP = C + F\left(\frac{g_2}{g_1+g_2}\right) + h\left(\frac{g_1+g_2}{GDP}\right) + j\left(\frac{K_1/RGDP}{(g_1+g_2)/GDP}\right) + l(bmp)$$

The variable of BMP, which is accompanied with the variables of current expenditures (g_1), capital expenditures (g_2), net capital stock (k) and GDP at market price (GDP), is the exchange rate at market price. This variable was proposed by Devarajan in his model. It was introduced

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to the model in order to evaluate the impacts of other domestic policies, except government spending productivity.

Unit root test results

Examining the unit root test of variables is the first step in primary econometrics models so that in the event of non-stationary variables, it is not permissible to use conventional econometrics methods without conducting co integration tests and such a use may lead to false results. This study uses augmented Dickey-Fuller test to conduct unit root tests. This test was conducted based on Schwartz Bayesian Criterion (SBC) on 1978-2012 data.

Table 1: Augmented Dickey-Fuller stationary test results

variable	Data level		The first difference of data	
	SBC-based ADF	stationary status	SBC-based ADF	stationary status
RRGDPP	**-4.24**	stationary	-4.7	stationary
$\frac{g_1}{g_1 + g_2}$	-2.54	Non-stationary	-5.55(0)	stationary
$\frac{g_1}{g_1 + g_2}$	-2.54	Non-stationary	-5.55	stationary
$\frac{g_1 + g_c}{GDP}$	-3.15	Non-stationary	-5.6(0)	stationary
$\frac{(K / RGDP)}{(g_1 + g_2) / GDP}$	-2.65	Non-stationary	-5.38(0)	stationary
BMP	-3.54	Non-stationary	-3.15	stationary

Source: PC output (Figures inside parentheses show optimal lagged)

The examination of the stationary of variables in data level shows that not all variables, except RRGDPP, are stationary in their level. However, in the first difference, the absolute value of ADF statistic is higher than its critical value in a confidence level of 95%based on SBC criterion. Therefore, the first difference of data is stationary (table 1). Since all studied variables in both models are integrated of order one, the next step determines fit model using Johansen co integration test.

Johansen co integration test

The results of this study can help us to realize that whether there are co integration vectors. In the process of performing this test it is first necessary to obtain the optimal order of long-term relations in models (1) and (2). To do this, the maximum number of intervals to be introduced to the model is selected based on sample size ( ). Applying this rule resulted in three intervals. SBC was used to determine the optimal order of the model (table 2).

Table 2: test for determining optimal order of VAR

Optimal order	**Model 1**		Model 2	
	SBC	LR statistics	SBC	LR statistics
1	10.95(*)	183.8	10.95(*)	183.8
2	12.27	29	12.27	29
3	13.23	27.1	13.23	27.1

Source: estimation outputs (* optimal order of VAR)

According to table 2, the optimal order of VAR is determined to be 1 based on SBC criterion where the minimum value of this criterion is considered as the optimal order.

Following the determination of the optimal order of VAR, Johansen test was performed by two approaches i.e. maximum Eigen values and effect matrix in order to determine the number of co integrated vectors and long-term relations. Since Johansen test covers 5 states from the maximum constraint state to no-constraint state, the relevant SBC-based test is first performed to determine the optimal state of both models. The assumptions of “no trend in long-term and short-term and intercept in short-term” and “no intercept and trend in long-term and short-term” are considered as the presumptions of models 1 and 2, respectively in Johansen test.

Table 3: Johansen co integration test

Variables	Null hypothesis	Effect matrix statistics	Maximum Eigen value statistics	Number of co integration vectors
RRGDPP, STE, STJE, KG, BMP	r≤ 1	40.6	17.8	1
RRGDPP, STE STEE, KG, BMP	r≤ 1	28.3	17.4	1

Source: estimation outputs

Table 3 shows the number of co integration vectors based on effect matrix and maximum Eigen value approaches for models 1 and 2. The null hypothesis stating that r≤1 is not rejected for the variables of both models in the confidence level of 95%. Therefore, according to Johansen test results, only one co integration vector is identified for the variables of both models.

Relying on optimal order and the number of co integration vector tests (r=1, VAR (1)), normalized coefficients of long-term variables are written as follows:

RRGDPP = -.45 + .4STJE + .29STE + .003KG + 7E-6BMP

RRGDPP= - .44STEE + .2 STE + .002KG – 6.3 E-6BMP

According to the results of the long-term relationships between variables, the impact of government spending on actual growth per capita is positive. On the other hand, the impact of current expenditures on actual growth per capita in long-term is positive and the impact of capital expenditures on actual growth per capita in long-term is negative.

Estimating short-term relationships and adjustment speed using VECM

Relying on Johansen co integration test results as well as the estimations of long-term relationships of both models, this section evaluates short-term dynamisms. In addition, it evaluates error correction coefficient used to assess the speed of short-term to long-term adjustment. To do this, VECM (Vector Error Correction Model) is used as per table 4.

Table 4: VECM estimations

Dependent variable	Independent variable						
D(RGDPP) (model 1)		ECM	D (RGDPP (-1))	D(STE(-1))	D(STJE(-1))	D(KG(-1))	D(BMA(-1))
	coefficient	-0.94	0.04	1.4	0.86	0.01	-1.7
	t-statistic	-2	0.025	0.96	-1.26	0.79	0.69
D(RGDPP) (model 2)		ECM	D (RGDPP (-1))	D(STE(-1))	D(STEE(-1))	D(KG(-1))	D(BMA(-1))
	coefficient	-0.88	0.03	1.6	0.87	0.018	1.6
	t-statistic	-1.89	0.22	0.77	1.2	0.89	-0.64

Source: estimation outputs

In above estimations, ECM is error correction term and D stands for difference where: Dx = x – x (-1)

To examine the classic assumptions of both models and to evaluate the estimations from statistical point of view, residual term tests, such as serial auto-regression, heteroskedasticity and normalized distribution of terms, are performed in both models. Table 5 shows the obtained results for both models. According to results, the null hypothesis of all the three mentioned tests, i.e. serial auto-regression, hetroskedasticity and normalized residual terms, respectively stating that there is no serial auto-regression, there is no hetroskedasticity and the residual terms are normal, is not rejected in the confidence level of 95%. This implies that both models have no estimation problem.

Table 5: Values of The Statistics of Models Estimations

model	Serial auto-regression test		Hetroskedasticity test		Time test for residual terms	
	LM	Likelihood percent	X^2	Likelihood percent	X^2	Likelihood percent
Model1	33.06	0.13	191	0.27	8.07	0.12

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Model 2	32	0.16	190	0.27	7.9	0.15

Source: estimation outputs

The estimations derived from the models show that the coefficient of error correction term is significant in both models. In addition, the impact of the contribution of current expenditures, contribution of capital expenditures and contribution of total expenditures to actual economic growth is significant in long term but in short term, they are not acceptable considering low t-statistics. Model 1 results show that with a coefficient of 0.4, current expenditures have a positive and significant impact on actual production per capita in long term. On the other hand, the impact of total expenditure to actual production per capita ratio is 0.29. This implies that an increase in government spending in long term by 1% will result in the increase of actual production per capita by 0.4%. In short term, however, the impact of current expenditures on actual production per capita is not significant. On the other hand, error correction model coefficient (ECM) stating the speed of short term to long term adjustment is 0.94 and is significant. This means that if actual production per capita is deviated from its long term balanced state, due to changes in current expenditures and other factors (e.g. contribution of total expenditures, contribution of private to public expenditures and market exchange rate), it will be switched towards its long term values with a speed of 0.94 and this adjustment will occur slightly more than one year. In long term, however, the impact of free exchange rate, as a no political factor, on constant production per capita is negligible and is not significant in long term. This disagrees with the results of Devarajan et al (1996). Model 2 measures the impact of the contribution of capital expenditures, total expenditures, private to public expenditures as well as the impact of black market variable on actual production per capita. According to results, with a coefficient of -0.44, the impact of capital expenditures on actual production per capita is negative in long term. This completely disagrees with conventional theories about the positive influence of capital expenditures and its impact on investment and development growth. The review of the short term impact of capital expenditures on actual production per capita shows that the relevant coefficient is not significant, but the coefficient of short term to long term adjustment which is displayed as ECM is significant and equals to -0.88.

This implies that in the event of any change in the indigenous variables of the model, if there is any deviation from long term values of actual production per capita, the speed of adjustment will be 0.88 per year towards long term values. This means that adjustment will occur slightly more than one year which is considered as a high speed adjustment. In model 2, the impact of total expenditure to actual production per capita ratio is 0.2. In addition, the impact of private to public expenditures and black market index on actual production per capita is negligible in long term. The negligible value of BMP implies the no significant impact of other internal variable, except those defined in the model.

Conclusion and suggestions

The theoretical model proposed in previous articles considered current and capital expenditures as two inputs of production function. According to the theoretical model, if the impact of current expenditures on economic growth is positive, i.e. $>$¥ or the coefficient of current expenditures is higher than the coefficient of capital expenditures in the production function, then we will have: $\frac{¢ª*}{¢} > 0$.

The obtained results show that with a coefficient of 0.4, current expenditures have a positive impact on the production function while the coefficient of capital expenditures is -0.44. This indicates that $>$ª is satisfied. Therefore, in Iranian economy, current expenditures have a more impact on optimal economic growth. In other words, current expenditures are more productive in the production function and the growth of current expenditures can have a positive impact on optimal economic growth. This is due to the combination of current and capital expenditures as well as the economic structure of Iran. The inefficiency of capital expenditures is originated from the fact that despite its classification in terms of accounting categories, the nature of such expenditures are non-capital expenditures and they are not used in production infrastructures and creating economic boom. According to 2015 data, only 42% of capital expenditures have been used in economic activities and the industry sector accounts for less than 2% of capital expenditures. In addition, a major part of capital expenditures has been used in water season where despite the strategic importance of water,

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they have failed to affect optimal economic growth. the other reason for the inefficiency of capital spending is the existence of large number of semi-finished government projects in the Iranian economy. lack of allocate adequate funds from the government to complete construction projects has caused the allocated resources to be spent only on project maintenance . because much of government current expenditure is spent on salaries for government employees, current expenditures are more productive than capital expenditures in the market due to creating consumption demand .There for results obtained from this study correspond to the results of the Bashar, Bhattacharya and Wohar (2017) investigation.

Moreover, the realization of current and capital expenditures in Iranian economy is between 70 to 90%, and 10 to 30%, respectively. This suggests that the government compensated its budget deficit by reducing development expenditures resulted in inefficiency of capital expenditures. So that to reduce capital expenditures, the priorities that are less important from the perspective of policy makers, e.g. development of the railway network and highways, were excluded from the list of capital expenditures. Whereas, some of the excluded items play an important role in development.

If the second condition stating the impact of the growth of the factor producing current expenditures on optimal tax rate is measured, it will be found that since >¥ is met, any increase in decreases optimal tax rate. This in turn increases consuming expenditures and production. For capital expenditures, the inverse situation is held. In other words, any increase in the coefficient of capital expenditures increases optimal tax rate due to negative productivity. In addition, experimental results show that +¥<0. Therefore, the growth of the coefficient of current expenditures (the productive variable in the production function) will decrease the optimal contribution of current expenditures compared with capital expenditures.

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