International Journal of Business and Development Studies **Vol. 2, No. 1,** (2010) pp. 95-108

Government Size Threshold and Economic Growth in Iran

Esmaiel Abounoori[*] Younes Nademi [**]

Abstract

We apply the two-sector production function developed by Ram (1986) to estimate the threshold regression model for Iran, concerning the effect of government size on economic growth. Three government size indicators are used to find out the different threshold points. The results show a non-linear relationship of the Armey curve in Iran, in which the threshold effects corresponding to total government expenditure share in GDP, government consumption expenditure share in GDP, and government investment expenditure share in GDP of about 34.7%, 23.6% and 8%, respectively.

Keywords: Government size, Economic growth, Threshold regression model

JEL Classification: E62, O40, C22

1. Introduction

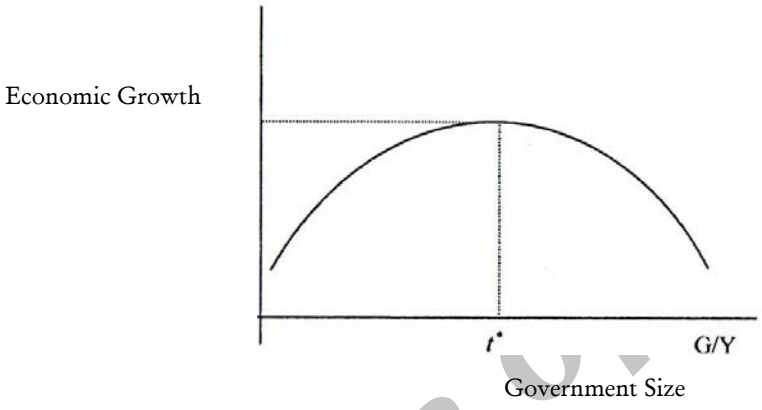
Economic growth is the most important macroeconomic variable reflecting the overall performance of a society. Government role in economics has increased in Iran since the discovery of oil and influx of the revenue. The oil revenue partly has been used to compensate the inefficiency and corruptions created due to the high government intervention and the mismanagement. Among the factors that determine the economic growth in Iran, government spending is of particular interest in this paper.

[*] Professor of Econometrics and Social Statistics - University of Mazandaran, Iran
[**] Ph.D Student, Department of Economics - University of Mazandaran, Iran

.

This paper modifies Ram (1986) two-sector production model in order to estimate the threshold government size. The threshold government size is a point at which any rise in government spending lower than this value will have positive effects, while more than that will have negative effects on economic growth. Figure 1 represents the Armey curve and t* is the threshold value.

Fig.1. Armey Curve



The positive effects may be due to providing substructures, and public goods and the negative effects could be due to the crowding-out effect of government monopolistic activities.

This paper is followed by section 2 that is devoted to a brief literature survey about government size and economic growth. Section 3 presents model specification and data description. Section 4 considers the empirical results and finally the conclusion will be provided in section 5.

2. A Brief Literature Survey

As briefly indicated on Table 1, Landau (1983), Engen and Skinner (1991), Folster and Henrekson (2001), and Dar and Amirkhalkhali (2002) found a negative relationship between government size and economic growth.They believe that expanding government size (government expenditure) has the effect of diminishing returns, and

over-expanding government size will cause a crowded-out effect to private investment.

In addition, government expenditure often turns into inefficient expenditure which will cause a distorted allocation of the resources as well as corruption.While expanding government expenditure, a government needs more taxes to support the expenditure, but expanding taxes will gradually damage the economy.

Table 1. Literature review of the relationships between government size and economic growth

Authors	Relationship of government size and economic growth	Empirical method	subject	Explanation
Landau (1983)	Negative	OLS	96 developed countries	Classify government expenditure
Ram (1986)	Positive	OLS	115 countries	Discuss the difference while the time is divided
Kormendi and Meguire (1986)	Positive	OLS	47 countries	The government size indicator is the average growth rate of total government expenditure/total private consumption expenditure
Engen and Skinner (1991)	Negative	2SLS	107 countries	
Folster and Henrekson (2001)	Negative	OLS	23 OECD countries and 7 developing countries	
Dar and Amirkhalkhali (2002)	Negative	Random coefficient model	19 OECD countries	

There is another opinion which approves that expanding government size will promote economic growth. For instance, Ram (1986) and Kormendi and Meguire (1986) found a positive relationship between government size and economic growth.

They write that expanding government size provides an insurance function to private property, and public expenditure can encourage private investment which will cause economic growth. Government

expenditure provides the investment for public goods that will improve, in general, the investment environment.

Lin (1994), Vedder and Gallaway (1998), and Gwartney, Lawson, and Holcombe (1998) used different government size indicators to discuss the relationship between government size and economic growth.As on Table 2, Vedder and Gallaway (1998) provides five measurements for government size to test the present of the Armey curve: they found that the Armey curve only exists when "total government expenditure/GDP" or "net investment expenditure/GDP" represents the government size variable. Gwartney et al. (1998) indicate that different government size indicators all have negative impacts on economic growth.

Lin (1994) uses "government consumption expenditure/GDP" and "government non production expenditure/GDP" as government size indicators and founds that the two indicators of government size both have a positive impact to economic growth in the short run. However, Lin (1994) indicates that the contribution of government investment expenditure has the encouraging effect on private investment.

Table 2. Literature Review of the relationship between government size and economic growth

Authors	Relationship of government size and economic growth	Government size variable	Empirical method	Subject	Explanation
Hsieh and Lai (1994)	Uncertain	Total government expenditure	VAR	G-7	The relationship will change with time and they did not find the optimum government size
Lin (1994)	Uncertain	(government consumption expenditure/GDP) and (government non-production expenditure/GDP)	OLS 2SLS 3SLS	20 developed countries and 42 developing countries	The government size has a positive impact to economic growth in the short run, but has no impact in the long run
Vedder and Gallaway (1998)	Uncertain	Classify government size into five classification(note 1)	Multi-regression	U.S., Denmark, Italy, Sweden, and U.K.	U.S. optimum total government expenditure size is 17.45% (note 2)
Gwartney et al. (1998)	Negative	Total government expenditure and government non-investment expenditure	Statistical inference	23 OECD countries and 5 fast developing countries	All government size variables have a negative impact to the economy
Chen and Lee (2005)	Before the threshold regime is positive and after the threshold regime is negative.	Three classification(next page in subscript 2)	A threshold regression approach	Taiwan	Before the threshold regime is positive and after than threshold regime is negative.

Note 1: Different government size indicators are : (1) Total expenditure/GDP, (2) Income security expenditure/GDP, (3) Health care expenditure/GDP, (4) National defense expenditure/GDP, and (5) Net investment expenditure/GDP. Note 2: The Armey curve exists while the government size variable is total government expenditure/GDP and net investment expenditure/GDP.

Sheehey (1993), Vedder and Gallaway (1998), and Chen and Lee (2005) point out that the reason of inconsistency concerning the effect of government size on economic growth could be due to a non-linear relationship rather than the linear one.

Armey (1995) implements the Laffer curve to present the relationship between government size and economic growth, from which Sheehey (1993), Vedder and Gallaway (1998), and Chen and Lee (2005) empirically found the nonlinear relationship between the government size and economic growth. Sheehey (1993) used cross countries data and found that government size and economic growth have a positive relationship, when government size (government consumption expenditure/GDP) is smaller than 15%, but the relationship is negative when government size get larger than 15%. Vedder and Gallaway (1998) indicate that this asymmetric relationship is an "Armey curve", which considers that a small government size protect private property and provide public goods, but large government size will cause excessive investment which will create a crowded effect to private investment, overweight taxes and liability interest which will damage the economy.Vedder and Gallaway (1998) infer that government size and economic growth have an inverse U shape as Figure 1. Vedder and Gallaway (1998) used a single square regression function and estimated the optimum government size of the U.S. about 17.45% during 1947-1997.Chen and Lee (2005) used a threshold regression approach for testing a non-linear relationship between government size and economic growth in Taiwan. They found different threshold value for different government size in Taiwan. First of all, the threshold regime is 22.839% for the "total government expenditure divided by GDP".This indicates that there is a non-linear relationship of the Armey curve: when the government size is smaller than the regime, economic growth is promoted under expanding government expenditure, but if the government size is larger than the regime, then the economic growth decreases. Secondly, the threshold regime is 7.302% concerning the "government investment expenditure divided by GDP". Finally, when the variable "government consumption expenditure divided by GDP" is used as the government size, the threshold regime is 14.967%.

3. Model Specification and Data Description

3.1 Model Specification

We have used the Ram (1986) model as following:

$$\dot{Y}_t = \beta_0 + \beta_1\left(\frac{I_t}{Y_t}\right) + \beta_2 g_{L_t} + \beta_3 g_{G_t}\left(\frac{G_t}{Y_t}\right) + e_t \qquad (1)$$

Regression (1) shows that the variables which affect economic growth ($\dot{Y}$) include the investment rate ($\frac{I}{Y}$), growth of labor force (g_L), and the multiplication effects of government expenditure growth (g_G) times government size (G/Y). In addition, we identify the multiplication effects through the sign of β_3. This indicates that the government sector has a reciprocal effect on economic growth through two ways: one is the direct contribution of the government sector and the other is the indirect effect through the non-government sector (externality effect).

Regression (1) is a traditional linear economic growth model, but we alter the linear model into the two regime TAR model of Hansen (1996, 2000). The model can be shown as follows:

$$\begin{cases} \dot{Y}_t = \delta_{10} + \delta_{11}\left(\frac{I_t}{Y_t}\right) + \delta_{12} g_{L_t} + \delta_{13} g_{G_t}\left(\frac{G_t}{Y_t}\right) + e_t & \text{if} \quad q_t \le \gamma \\ \dot{Y}_t = \delta_{20} + \delta_{21}\left(\frac{I_t}{Y_t}\right) + \delta_{22} g_{L_t} + \delta_{23} g_{G_t}\left(\frac{G_t}{Y_t}\right) + e_t & \text{if} \quad q_t > \gamma \end{cases} \qquad (2)$$

Or as one nonlinear regression such as:

$$\dot{Y}_t = \left(\delta_{10} + \delta_{11}\left(\frac{I_t}{Y_t}\right) + \delta_{12} g_{L_t} + \delta_{13} g_{G_t}\left(\frac{G_t}{Y_t}\right)\right) I[q_t \le \gamma] + \left(\delta_{20} + \delta_{21}\left(\frac{I_t}{Y_t}\right) + \delta_{22} g_{L_t} + \delta_{23} g_{G_t}\left(\frac{G_t}{Y_t}\right)\right) I[q_t > \gamma] + e_t \qquad (3)$$

The threshold value γ can be found by estimating the regression (3) through finding the minimum Error Sum of Squared in a re-order threshold variable. The threshold variable can be set by the exogenous variables out of the theoretical model. For example, in this paper we set government size as the threshold variable. We can also apply the statistic

coming from the threshold variable. For instance, we adopt the heteroskedasticity-consistent Lagrange multiplier (LM) of Hansen (1996) to test the null hypothesis of the linear assumption.

Once the estimator can be found, we then start with the statistical test, but the test procedure of Regression (3) is different from the traditional test.Under the null hypothesis of no threshold effect, the threshold parameters will be unidentified. This will cause the traditional test statistic in a large sample distribution to not belong to the χ^2 distribution, but rather to a non-standard and non-similar distribution which is affected by nuisance parameters. This will cause the critical value of the distribution to not be estimated through simulation. In order to overcome the difficulty, Hansen (1996) uses a statistic of his own large sample distribution function to transfer and calculate the asymptotic p-value of a large sample.Under the null hypothesis, the distribution of the p-value statistic is uniform, and this kind of transformation can be calculated through bootstrap.The null hypothesis to test Reg. (3) is as follows:

$$H_0: \delta_{1i} = \delta_{2i}; \quad i = 1, 2, 3. \qquad (4)$$

If H_0 is not rejected then the relationships between economic growth and the government size would be the linear regression as the regression (1).This means there exist no threshold effect. Otherwise, if H_0 hypothesis is rejected, it means that there exist different effects between the two regimes of δ_{1i} and δ_{2i}. The F-test statistics is as follows:

$$F_1 = \frac{RSS_0 - RSS_1(\hat{\gamma})}{\hat{\sigma}^2} \qquad (5)$$

In which RSS_0 and RSS_1 are the residual sum of squares under the null hypothesis and the alternative, respectively.

3.2 Data Description

The resent socio-economic history of Iran has been subject to the past and political-strategic volatility of the region. Iran has not experienced a relatively free market economy due to the share of oil revenue at large. We have intended to use the annual data from 1959 to

2005 available on the Website database of the Central Bank of Iran (CBI).[1] In order to analyze the different government size indicators on economic growth using the notion of Armey curve, we use the share of Government Expenditure in GDP, SGE, and also the share of Government Consumption Expenditure in GDP, SGC, and the share of Government Investment Expenditure in GDP, SGI as the threshold variables. Table 3, illustrates the changes in government size through time

Table 3. Basic Statistic about Government Size during 1959-2006

Year	SGE(%)	SGC(%)	SGI(%)
1960	0.1314	0.0472	0.0877
1965	0.1506	0.0613	0.0893
1970	0.1765	0.0771	0.0994
1975	0.4537	0.1597	0.2940
1980	0.3507	0.0886	0.2621
1985	0.2194	0.0507	0.1687
1990	0.1489	0.0435	0.1054
1995	0.2232	0.0696	0.1537
2000	0.2055	0.0439	0.1616
2005	0.3464	0.0909	0.2556
2006	0.3594	0.0932	0.2662
Mean	0.2303	0.0697	0.1605
Stn. Dev	0.0880	0.0303	0.0630
Min.	0.1172	0.0284	0.0837
Max.	0.4536	0.1632	0.2939

Source: Computed based on the data from CBI.

We find that the respective maximum values of SGE, SGC, and SGI are 0.45 and 0.16, and 0.29, respectively, which all occur in 1975 after the first oil price shock and the oil revenue influx.

4. Empirical Results

This paper uses Hansen (1996, 2000) threshold regression model to study whether a non-linear Armey curve exists in Iran. As Table 4 shows, we adopt Hansen (1996, 2000) advice to use the bootstrapping

[1]. The web site of central bank of Iran is : www.cbi.ir

model. While the threshold variable is "total government expenditure divided by GDP", we find that F-statistic is (33.4), which is significant at 1% level.The threshold value is 34.7%, and this means that one threshold exists. While "government investment expenditure divided by GDP" is the threshold variable, the F- statistic is (4.59), which says that the threshold effect is significant. We find that the threshold regime falls down to (8%). As "government consumption expenditure divided by GDP" is the threshold variable, the F- statistic is (11.78), and we find that the threshold regime falls down to (23.6%). After making sure that the three classifications of government size all have threshold effects and achieve the threshold regimes, we analyze the linear and non-linear government expenditure effects in different government sizes and discuss how the government expenditure affects the economic growth in different threshold regimes.

Table 4. Threshold Tests

Threshold Variables	SGE	P-value	SGI	P-value	SGC	P-value
F value of threshold test	33.40	0.00	4.59	0.00	11.78	0.00
Threshold regime (%)	0.347		0.08		0.236	

Table 5. Economic Growth and Share of Government Expenditure (SGE)

Variables	Linear Model		Government size (SGE)			
Thresholdvalue (%)	Coefficient	prob	≤0.347	prob	>0.347	prob
Interception	0.0088	0.83	-0.030	0.47	-0.699	0.00
I/ Y	0.1288	0.25	0.2757	0.028	0.8354	0.00
g_L	-0.5942	0.46	-0.747	0.28	7.2331	0.00
(g_G)(GS)	0.4539	0.01	0.572	0.005	-1.348	0.00
R^2	0.1792		0.5447			
Ramsey reset (p-value)	0.00		0.72			
Jarque-Bera (p-value)	0.31		0.33			
Breusch-Pagan-Godfrey(p-value)	0.13		0.56			

Table 6. Economic Growth and Share of Government Investment (SGI)

Variables	Linear Model		Government size (SGI)			
Threshold value (%)	Coefficient	prob	≤0.08	prob	>0.08	prob
Interception	0.011	0.80	-0.004	0.93	-0.2188	0.056
I/ Y	0.09	0.43	0.2447	0.17	0.21083	040
g_L	-0.06	0.93	-1.19	0.21	2.8600	0.067
(g_G)(GS)	0.84	0.038	1.81	0.008	-1.2338	0.13
R^2	0.13		0.39			
Ramsey reset (p-value)	0.00		0.68			
Jarque-Bera (p-value)	0.26		0.73			
Breusch-Pagan-Godfrey(p-value)	0.16		0.46			

As table 5 shows, while "total government expenditure divided by GDP" is the threshold variable, total government expenditure has a significantly positive relationship with economic growth in the linear model. Since the government size is small (the threshold value is less than 0.347) in two-regime model, total government expenditure and economic growth have a significantly positive relationship, but when the government size is large (the threshold value is larger than 0.347), total government expenditure and economic growth have a significantly negative relationship. Thus, we can make sure that the non-linear situation of the Armey curve exists in Iran when "total government expenditure divided by GDP" is the threshold variable. Moreover, the labor force growth has a significantly positive impact on economic growth when the government size is large. The investment ratio also has a significantly positive impact on economic growth concerning both of the two regimes. As table 6 shows, we find that when" government investment expenditure divided by GDP" is the threshold variable and government size is small (threshold value is less than 0.08), government investment expenditure has a significantly positive impact to economic growth. By contrast, when government size is large (threshold value is larger than 0.08), government investment expenditure has not a significantly impact to economic growth. In addition, the labor force

growth has not a significantly impact to economic growth in small government size regime but it has a positive impact to economic growth in large government size regime. The investment ratio also has not a significantly impact on economic growth concerning both of the two regimes.

Table 7. Economic Growth and Share of Government Consumption (SGC)

Variables	Linear Model		Government size (SGC)			
Threshold value (%)	Coefficient	prob	≤0.236	prob	>0.236	prob
Interception	0.002	0.95	-0.031	0.39	-0.126	0.42
I/ Y	0.154	0.17	0.31	0.003	-0.05	0.87
g_L	-0.71	0.40	-1.36	0.080	1.94	0.28
(g_G)(GS)	0.65	0.016	1.54	0.001	-0.93	0.09
R^2	0.16		0.51			
Ramsey reset (p-value)	0.00		0.68			
Jarque-Bera (p-value)	0.23		0.16			
Breusch-Pagan-Godfrey(p-value)	0.12		0.60			

As table 7 indicates, when "government consumption expenditure divided by GDP" is the threshold variable, and government size is small (threshold value is less than 0.236), government consumption expenditure has a significantly positive impact to economic growth. By contrast, when government size is large (threshold value is larger than 0.236), government consumption expenditure has a significantly negative impact to economic growth. The investment ratio also has a significantly positive impact on economic growth when the government size is small, but it has not a significantly impact on economic growth in large government size regime. The labor force growth has a negative impact on economic growth in small government size but it has not significantly effect on economic growth in large government size regime. In addition, when we have done the Ramsey reset test for testing the specification error whether it exists or not, we found that all the

linear models have the specification error but in contrast, all of the non-linear models have not been specification error.

According to the above empirical results, we find that when all three classifications of government size are the threshold variables in the model, then they all have a threshold effect and a non-linear relationship of the Armey curve exists in Iran.

5. Conclusion

Following the non-linear theory of Armey (1995) and Vedder and Gallaway (1998), we have tested the presence of a non-linear Armey curve relationship between government size and economic growth in Iran. Doing so, we have modified the Ram (1986) two-sector production model into a threshold regression model and apply Hansen (1996, 2000) method to test the threshold effect.The empirical results indicate that threshold effect exist between government size and economic growth in Iran:

First of all, concerning the "total government expenditure share in GDP" as the threshold variable, the threshold regime is 34.7%.This indicates that when the government size is smaller than the regime, economic growth is promoted under expanding government expenditure, but if the government size is larger than the regime, then the economic growth decreases.

Secondly, when the "government consumption expenditure share in GDP" is the threshold variable, the threshold regime is 23.6%.

Finally, when the "government investment expenditure share in GDP" is the threshold variable, the threshold regime is about 8%.

Comparing these results with those of the observed values during the period 1960-2006 indicates that the government expenditure and government consumption, especially government investment are over-expanding.Therefore, the government in Iran should shrink the government size to increase the efficiency of government expenditures and promote economic growth.

References

1- Armey, R. (1995), the Freedom Revolution, Washington DC: Rognery Publishing Co.

2- Dar, A. & Amirkhalkhali, S. (2002), "Government size, factor accumulation, and economic growth: evidence from OECD countries", Journal of policy modeling, 24, 679-692.

3- Engen,E.,&Skinner, J. (1991).Fiscal policy and economic growth.In paper presented at NBER conference on taxation.

4- Folster, S. & Henrekson, M.(2001).Growth effects of Government Expenditure and Taxation in rich countries. European Economic Review,45(8),1501-1520.

5- Gwartney J., Lawson , R., & Holcombe, R .(1998).The size and functions of government and economic growth. Joint Economic Committee.

6- Hsieh, E. ,& Lai, K. (1994).Government spending and Economic growth; The G-7 experience.Applied Economics,26,535-542.

7-Kormendi, R. C., & Meguire, P. (1986).Government Dept, Government spending, and private sector behavior; Reply .American Economic Review,76(1),191-203.

8- Landau, D. (1983), "Government expenditure and economic growth; A cross-country study", Southern Economic Journal, 49(3),783-792.

9- Lin, S. (1994), "Government spending and economic growth", Applied Economics, 26(1), 83-94.

10- Ram, R. (1996), "Government size and economic growth; A new framework and some evidence from cross section and time-series data", American Economic Review, 76(1),191-203.

11- Sheehey, E. (1993), "The effect of government size on economic growth", Eastern Economic Journal,19(3), 321-328.

12- Sheng Tung Chen, & Chien Chiang Lee (2005), "Government size and economic growth in Taiwan: A threshold regression approach", Journal of Policy Modeling, 27(2005), 1051-1066.

13- Vedder, R. K. & Gallaway, L. E. (1998), Government size and Economic growth, paper prepared for the Joint Economic Committee of the US Congress, pp.1-15.