Tax Ratio Threshold and Economic Growth in Iran

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Abstract: The purpose of this article is to estimate the rate and effect of threshold tax on economic growth in Iran during 1980 - 2008. To do so, first we divide Iran’s economy into two sectors namely, public and non-public sector based on Ram (1986) model. Then we estimate a linear model. Due to poor results of the estimated linear model we specified a nonlinear model on explain the role of tax on economic growth in Iran. The results indicate that there exists a threshold tax rate of 22%. In other words, when tax rate is less than 22%, then as a result of an increase in tax revenue rate of economic growth will increase and beyond a tax rate of 22%. It will have a detrimental effect on economic growth of the country.

Key words: Tax Rate; Economic Growth; Threshold Model; Nonlinear Model.

INTRODUCTION

Economic growth and its determinants have been a critical issue especially for developing countries after the world war II. Tax rate is one of the variables which may have both positive and negative effect on economic growth. The negative effect is due to behavior and choice of individuals and firms. In fact when tax rate increases, investing returns (both physical and human) decreases which in turn leads to decrease investing intensives and reduction of economic growth. The positive effect is due to increase government revenue. When tax rate increases the government ability to spend on health, education, infrastructures and so on increase and as a result boost the rate of economic growth.

The ratio of tax revenue to gross domestic production has increased remarkably in many countries through twentieth century. This ratio was 5 to 10 percent in beginning of twentieth century but it reach to 30 to 40 percent in the end of twentieth century.

According to managing and planning institution reports, in 2006 Iran tax revenue become 20 times as much to 1979. Now the question is the effect of this excessive tax revenue on economic growth during last 40 years.

After the introduction, section 2 is devoted to literature reviews. Section 3 introduces the model specification. Then Sections 4 provide empirical results and finally section 5 presents a summary of main conclusion.

Review of Literature:

Tax rate affect economic growth through individuals and firms decisions. Several models have tried to identify this relationship between tax rate and economic growth. Apart from details, all of them investigate this process with two different parts (Myles 2009).this two parts are as follows:

\[ g_y = g_y (a_1(t_1,t_2), a_2(t_1,t_2)) \]  

In which \( a_1 \) and \( a_2 \) represents two sort economic activities such as education and research. \( t_1 \) and \( t_2 \) are tax rates. \( g_y(.) \) is equilibrium growth rate as a function of economic activity.

Using (1) the effect of tax rate change on economic growth is equal to:

\[ \frac{g_y}{dt} = (\frac{dg_y}{da_1})(\frac{da_1}{dt_1}) \]  

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In which $d_a / dt$ is represent effect of tax rate on economic activity, $d_g / da$ is represents effect of economic activity on economic growth. The effect of tax rate on economic growth is equal to effect of tax rate on economic activity plus effect of economic activity on economic growth. Now if the $d_a / dt_i$ is large, but $d_g / da$ is little, the result is tax rate is not influence economic growth effectively.

In contrary if $d_a / dt$ is small but $d_g / da$ is large, then tax rate is important factor of economic growth. Therefore the effect of tax on economic growth is not clear in theoric analysis.

Several studies have tried to investigate the effect of tax rate on economic growth which most of them (not all of them) conclude that increase of tax rate have negative effect on economic growth.

Some of these studies are pointed out as follows:

Mofidi and Stone (1990) investigated the effect of tax on economic growth of 50 developing countries during 1962-1982. Their purpose was analyse the effect of tax on microeconomic level in order to remove the business cycles. They results indicated that tax increase had negative effect on private investment and economic growth. Hanson (2002) examined the effect of tax on wealth and economic growth in 20 of OECD countries and have made same results. Holcombe and Lacombe (2004) studied the effect of marginal tax rate change on per capita income in 20 developing countries through sectional analysis. They compared countries which have increased tax rate with other countries which had lower tax rate during 1960-1990. They concluded that the countries with larger tax rate have had lower capita income relatively. Furceri and Karras (2008) investigated the effect of tax rate changes on economic growth of 26 OECD countries empirically. Their results indicated that 1 percent increase in tax rate lead to 0.5 to 1 percent decrease in capita GDP. They also come to the conclusion that increase goods and services tax rate have more negative effect as compared with increase income tax rate. Jafari Samimi and Hasanzadeh (2001) argued the effect of tax on economic growth with regard to endogenous growth models. Their findings indicate that the effect of tax on economic growth is not clear. Furthermore the results are sensetives to parameters and type of data (time series or sectional) that used in the model. In sum they conclude that the effect of tax on economic growth is weak. Samadi, Zahedfar and Faramarzi (2008) showed that if income distribution be right which means captured tax from wealth people and paid to poor people, then increase tax revenue lead to increase economic growth. Increase tax revenue in Iran based on empirical results during 1959-2007, cause to decrease economic growth. Because in Iran most of taxes gatherd from low income people and most expenditures do for high income people.

Model Specification:

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

$$\dot{Y}_t = \beta_0 + \beta_1 \left( \frac{I}{Y_t} \right) + \beta_2 g_t + \beta_3 g_t \left( \frac{G_t}{Y_t} \right) + e_t.$$  \hspace{1cm} (1)

Regression (1) shows that the variables which affect economic growth ($\dot{Y}_t$) include the investment rate ($I/Y_t$), growth of labor force ($g_t$), and the multiplication effects of government expenditure growth ($g_t$) times government size ($G_t/Y_t$).

Now, we assume that budget is balance. Therefore $G=T$, $\dot{G} = \dot{T}$ and $G_t/T = T_t/Y_t$, .

So we modify Eq.(1) as following:

$$\dot{Y}_t = \beta_0 + \beta_1 \left( \frac{I}{Y_t} \right) + \beta_2 g_t + \beta_3 g_t \left( \frac{T}{Y_t} \right) + e_t.$$  \hspace{1cm} (2)

In Eq.(2), we identify the multiplication effects through the sign of $\beta_3$. 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 (2) 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:

$$\begin{cases}
\dot{Y}_t = \delta_{10} + \delta_{11} \left( \frac{I}{Y_t} \right) + \delta_{12} g_t + \delta_{13} g_t \left( \frac{T}{Y_t} \right) + e_t, & \text{if } q_t \leq \gamma \\
\dot{Y}_t = \delta_{00} + \delta_{21} \left( \frac{I}{Y_t} \right) + \delta_{22} g_t + \delta_{23} g_t \left( \frac{T}{Y_t} \right) + e_t, & \text{if } q_t > \gamma
\end{cases}$$  \hspace{1cm} (3)
Or as one nonlinear regression such as:

\[
\hat{Y}_i = \left( \delta_{10} + \delta_{11} \frac{L_i}{Y_i} \right) + \delta_{12} g_{L_i} + \delta_{13} \frac{T_i}{Y_i} + \left[ q_i \leq \gamma \right]
\]

\[
\left( \delta_{20} + \delta_{21} \frac{L_i}{Y_i} \right) + \delta_{22} g_{L_i} + \delta_{23} \frac{T_i}{Y_i} + \left[ q_i > \gamma \right] + e_i
\]

(4)

The threshold value \( \gamma \) can be found by estimating the regression (4) 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 \( \frac{T_i}{Y_i} \) 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 Eq. (4) 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 \( \chi^2 \) 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 Eq. (4) is as follows:

\[
H_0: \delta_{u} = \delta_{u} \quad :i = 1, 2, 3, \ldots
\]

If \( H_0 \) is not rejected then the relationships between economic growth and the tax ratio \( \frac{T_i}{Y_i} \) would be the linear regression as the regression (2). This means there exists no threshold effect. Otherwise, if \( H_0 \) hypothesis is rejected, it means that there exist different effects between the two regimes of \( \delta_{u} \) and \( \delta_{u} \). The F-test statistics is as follows:

\[
F_1 = \frac{RSS_0 - RSS_1}{\tilde{\sigma}^2}
\]

(6)

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

**Empirical Results:**

This paper uses Hansen (1996, 2000) threshold regression model to study whether a non-linear relationship between tax ratio and economic growth exists in Iran. As Table 1 shows, we adopt Hansen (1996, 2000) advice to use the bootstrapping model. While the threshold variable is “Tax revenue divided by GDP”, we find that F-statistic is (-4.62), which is significant at 1% level. The threshold value is 22%, and this means that one threshold exists.

As table 1 show, only the investment rate (I/Y) has a significant and positive effect on economic growth in the linear model, but the other variables haven’t a significant effect on economic growth in the linear model. In the nonlinear model, while “Tax revenue divided by GDP” is the threshold variable, since the tax ratio is small (the threshold value is less than 0.22), the investment rate and the multiplication effects of tax revenue growth \( g_{T_i} \) times tax ratio \( T/Y \) have a significantly positive effect on economic growth in Iran. But when the tax ratio is large (the threshold value is larger than 0.22), the multiplication effects of tax revenue growth \( g_{T_i} \) times tax ratio \( T/Y \) has a significantly negative effect on economic growth, and the other variables...
haven’t a significantly effect on economic growth in Iran. Thus, we can make sure that the non-linear relationship between tax ratio and economic growth as the shape of inversion U exists in Iran when “tax revenue divided by GDP” is the threshold variable. Moreover, the labor force growth has not a significantly impact on economic growth in both of two regimes taxes.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Linear Model</th>
<th>Tax Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold value (%)</td>
<td>Coefficient</td>
<td>t-statistics</td>
</tr>
<tr>
<td>Interception</td>
<td>-0.09***</td>
<td>-3.49</td>
</tr>
<tr>
<td>I/ Y</td>
<td>0.98***</td>
<td>3.85</td>
</tr>
<tr>
<td>gL</td>
<td>0.90</td>
<td>0.92</td>
</tr>
<tr>
<td>( gT) / Y</td>
<td>0.290</td>
<td>1.37</td>
</tr>
</tbody>
</table>

R² 0.49 0.75
Ramsey reset (F) 0.695 0.189
Jarque-Bera (Normality) 14.49*** 1.71
Het(Breusch-Pagan-Godfrey) 0.85 1.20
F value of threshold test -4.62****

Indicates significance at 10% level.
** Indicates significance at 5% level.
***Indicates significance at 1% level.

Conclusion:
In this paper, 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 tax ratio and economic growth in Iran.

While “tax revenue divided by GDP” as the threshold variable, the threshold regime is 22%. This indicates that when the tax ratio is smaller than the regime, economic growth is promoted under expanding government expenditure, but if the tax ratio is larger than the regime, then the economic growth decreases.

REFERENCES


