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The Optimal Tax Rate in Middle East

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ABSTRACT

Background: Tax rate affect economic growth through individuals and firms decisions. Several models have tried to identify this relationship between tax rate and economic growth. **Objective:** The purpose of this article is to estimate the rate and effect of tax rate on economic growth in Iran, Turkey and Pakistan during 1979- 2009. To do so, first we divide these economies into two sectors namely, public and non-public sector based on Ram model. **Results:** Then we specified a nonlinear model on explain the role of tax rate on economic growth in these countries. While "tax revenue divided by GDP" as the threshold variable, the threshold tax rate is 22%, 14% and 12% for Iran, Turkey and Pakistan respectively. **Conclusion:** This indicates that when the tax rate is smaller than the threshold tax rate, economic growth is promoted under increasing tax rate, but if the tax rate is larger than the threshold tax rate, then the economic growth decreases.

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INTRODUCTION

In economics, the Laffer curve is a theoretical representation of the relationship between government revenue raised by taxation and all possible rates of taxation. It is used to illustrate the concept of Taxable Income Elasticity (that taxable income will change in response to changes in the rate of taxation).

One potential result of the Laffer curve is that increasing tax rates beyond a certain point will become counterproductive for raising further tax revenue because of diminishing returns.

Tax rate affect economic growth through individuals and firms decisions. Several models have tried to identify this relationship between tax rate and economic growth.

Dharmapala *et al* (2011) have analyzed the optimal taxation of firms when the government faces fixed (per-firm) administrative costs of tax collection. The tax instruments at the government's disposal are a fixed (per-firm) fee and a linear tax on output Dharmapala *et al* (2011). If all firms in an industry are taxed, we show that it is optimal to impose a positive fee to internalize administrative costs. The output taxes satisfy the inverse elasticity rule for taxed industries, but industries with sufficiently high administrative costs should be exempted from taxation Dharmapala *et al* (2011). They also investigated the case where firms with outputs below a cutoff level can be exempted from taxation. It may be optimal to set the cutoff high enough to exempt a sizable number of firms, even though some firms reduce their outputs to the cutoff level, creating a "missing middle": small and large firms – but not those of intermediate size-exist Dharmapala *et al* (2011). Thus, this common phenomenon in developing countries may result from optimal policies. Their paper also presented a modified inverse-elasticity rule when output cutoffs are used, and it extended the analysis to include optimal nonlinear taxes on output, Dharmapala *et al* (2011).

Immervoll *et al* (2011) analyzed the optimal design of general nonlinear tax-transfer schedules for couples under unitary and collective approaches to family decision making. They considered a double-extensive model of labor supply where each spouse makes a labor force participation choice for given hours of work. They presented simple and intuitive optimal tax rules that generalize existing findings on the optimal taxation of single-person households with extensive responses to the case of two-person households with double-extensive responses. Without income effects on labor supply, optimal tax rules as a function of sufficient statistics are the same under the unitary and collective approaches. With income effects on labor supply, optimal tax rules under the two approaches continue to depend on the same sufficient statistics, but the collective model features an additional Pigouvian term arising from a within-family participation externality. Finally, they presented

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microsimulations of tax reform for 15 European countries suggesting that a reduction of tax rates on secondary earners relative to primary earners is associated with strong welfare gains in all countries.

Becker and Fuest (2011) analyzed the optimal tax policy in a model where firms are internationally mobile. They showed that the optimal policy response to increasing firm mobility may be taxation, subsidization, or non-distortion of the marginal investment, depending on whether the mobile firms are more or less profitable than the average firm in the economy. Their findings may contribute to understanding recent tax policy developments in many OECD countries Becker and Fuest (2011).

Marekwica (2012) studied the portfolio problem with realization-based capital gain taxation when limited amounts of losses qualify for tax rebate payments, as is the case under current US tax law Marekwica (2012). When the tax rate applicable to realized losses exceeds that on realized capital gains, it can be optimal to realize capital gains immediately and pay capital gain taxes to regain the option to use potential future losses against a higher tax rate Marekwica (2012). This incentive adds an entirely new and as yet unstudied dimension to the portfolio problem. It causes risk averse investors to hold more equity and attain higher welfare levels than is the case when trading under a tax system that seeks to collect the same amount of taxes, but does not allow for tax rebate payments Marekwica (2012). This is because the benefit to these investors from having their losses subsidized is greater than the suffering from having profits taxed at a higher rate Marekwica (2012).

Levaggi and Menoncin (2012) model capital tax evasion in a dynamic framework. In their paper, The optimal dynamic tax evasion and consumption path are determined. They studied the effect of fine and audit on the accumulation path. Results indicate that optimal evasion may be either increasing or decreasing in the tax rate. Also, the form of the penalty determines the sign of the above relationship Levaggi and Menoncin (2012).

Simula and Trannoy (2010) examined how allowing individuals to emigrate to pay lower taxes changes the optimal nonlinear income tax scheme in a Mirrleesian economy. An individual emigrates if his domestic utility is less than his utility abroad, net of migration costs-utilities and costs both depending on productivity. A simple formula, that complements Saez's formula obtained in closed economy, is derived for the marginal tax rates faced by top-income earners. It depends on the labour elasticity, the tax rate abroad and the migration costs expressed as a fraction of the utility obtained abroad. The Rawlsian marginal tax rates, obtained for the whole population, illustrate a curse of the middle-skilled. Simulations are provided for the French economy.

Abounoori and Nademi (2010) applied 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. Their 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 Abounoori and Nademi (2010).

In this paper we have estimated the threshold tax rate based on the modified Ram (1986) model for Iran, Turkey and Pakistan during 1979- 2009. The threshold tax rate is the tax rate that maximizes economic growth.

Nademi *et al* (2010) have estimated the threshold regression model for OECD countries, concerning the effect of government size on economic growth. Their results showed a non-linear relationship of the Armey curve in OECD countries, in which the threshold effect corresponding to final government expenditure share in GDP of about 20%.

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

2. Model Specification:

We have used the Ram (1986) model that developed by Abounoori and Nademi (2010) as following:

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

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).

Now, we assume that budget is balance. Therefore G=T, $\dot{G} = \dot{T}$ and $\frac{G_t}{Y_t} = \frac{T_t}{Y_t}$.
So we modify Eq.(1) as following:

$$\dot{Y}_t = \beta_0 + \beta_1(\frac{I_t}{Y_t}) + \beta_2 g_{L_t} + \beta_3 g_{T_t}(\frac{T_t}{Y_t}) + e_t \quad (2)$$

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In Eq.(2), 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 (2) is a traditional linear economic growth model, but we alter the linear model into the two regime TAR model of Hansen (2000). The model can be shown as follows:

$$\begin{cases} \dot{Y}_t = \delta_{10} + \delta_{11}(\frac{I_t}{Y_t}) + \delta_{12} g_{L_t} + \delta_{13} g_{T_t}(\frac{T_t}{Y_t}) + e_t & if \quad q_t \le \gamma \\ \dot{Y}_t = \delta_{20} + \delta_{21}(\frac{I_t}{Y_t}) + \delta_{22} g_{L_t} + \delta_{23} g_{T_t}(\frac{T_t}{Y_t}) + e_t & if \quad q_t > \gamma \end{cases} \tag{5}$$

Or as one nonlinear regression such as:

$$\begin{aligned} \dot{Y}_t = & \left(\delta_{10} + \delta_{11}(\frac{I_t}{Y_t}) + \delta_{12} g_{L_t} + \delta_{13} g_{T_t}(\frac{T_t}{Y_t}) \right) I\left[q_t \le \gamma \right] \\ & + \left(\delta_{20} + \delta_{21}(\frac{I_t}{Y_t}) + \delta_{22} g_{L_t} + \delta_{23} g_{T_t}(\frac{T_t}{Y_t}) \right) I\left[q_t > \gamma \right] + e_t \end{aligned} \tag{4}$$

The threshold value γ 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 $(\frac{T_t}{Y_t})$ out of the theoretical model. For example, in this paper we set $(\frac{T_t}{Y_t})$ 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 (2000) 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 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 (2000) 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:

$$H_0 : \delta_{1i} = \delta_{2i} \quad ; i = 1, 2, 3, \ldots \tag{5}$$

If H_0 is not rejected then the relationships between economic growth and the tax rate $(\frac{T_t}{Y_t})$ 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 δ_{1i} and δ_{2i}. The F-test statistics is as follows:

$$F = \frac{RSS_0 - RSS_1}{\hat{\sigma}^2} \tag{6}$$

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

3. Empirical Results:

This paper uses Hansen (2000) threshold regression model to study whether a non-linear relationship between tax rate and economic growth exists in Iran, Turkey and Pakistan. As Table 1 shows, we adopt Hansen (2000) advice to use the bootstrapping model. While the threshold variable is "Tax revenue divided by GDP", we find that one threshold exists.

As table 1,2 and 3 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 rate is small (the threshold value is less than 0.22, 0.14 and 0.12 for Iran, Turkey and Pakistan respectively), the

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investment rate and the multiplication effects of tax revenue growth (g_{T_t}) times tax rate (T/Y) have a significantly positive effect on economic growth in these countries, But when the tax rate is large (the threshold value is larger than 0.22, 0.14 and 0.12 for Iran, Turkey and Pakistan respectively), the multiplication effects of tax revenue growth (g_{T_t}) times tax rate (T/Y) has a significantly negative effect on economic growth, and the other variables haven't a significantly effect on economic growth in these countries. Thus, we can make sure that the non-linear relationship between tax rate and economic growth as the shape of inversion U exists in these countries when "tax revenue divided by GDP" is the threshold variable.

Table 1: Economic Growth and Tax Rate in Iran.

Variables	*Linear Model*		*Tax rate*			
Threshold value (%)	Coefficient	t-statistics	≤0.22	t-statistics	>0.22	t-statistics
Interception	-0.18***	-3.22	-0.208**	-2.82	0.16	1.43
I/ Y	0.449***	3.05	0.52***	2.63	0.36	1.15
g_L	0.90	0.92	0.24	0.106	0.96	0.35
$(\frac{T_t}{Y_t})$ (g_T)	0.290	1.37	4.92**	1.99	-4.87*	-1.96
R^2	0.38		0.68			
F value of threshold test	10.56***					

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

Table 2: Economic Growth and Tax Rate in Turkey.

Variables	*Linear Model*		*Tax rate*			
Threshold value (%)	Coefficient	t-statistics	≤0.14	t-statistics	>0.14	t-statistics
Interception	-0.38***	-4.42	-0.23**	-2.82	0.16***	4.43
I/ Y	0.27***	3.85	0.49***	2.63	0.36	1.15
g_L	0.39	0.62	0.64	0.106	0.96	0.25
$(\frac{T_t}{Y_t})$ (g_T)	0.290	1.33	3.52**	2.06	-4.37*	-1.89
R^2	0.41		0.72			
F value of threshold test	14.32***					

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

Table 3: Economic Growth and Tax Rate in Pakistan.

Variables	*Linear Model*		*Tax rate*			
Threshold value (%)	Coefficient	t-statistics	≤0.12	t-statistics	>0.12	t-statistics
Interception	-0.36***	-3.22	-0.208**	-3.82	0.16***	3.13
I/ Y	0.614***	3.05	0.52***	4.33	0.36	1.25
g_L	0.70	0.92	0.24**	2.15	0.96	0.65
$(\frac{T_t}{Y_t})$ (g_T)	0.17	1.37	2.72**	2.11	-4.87**	-1.99
R^2	0.40		0.76			
F value of threshold test	16.33***					

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

4. Conclusion:

In this paper, we have modified the Ram (1986) two-sector production model into a threshold regression model and apply Hansen (2000) method to test the threshold effect. The empirical results indicate that threshold effect exist between tax rate and economic growth in Iran, Turkey and Pakistan.

While "tax revenue divided by GDP" as the threshold variable, the threshold tax rate is 22%, 14% and 12% for Iran, Turkey and Pakistan respectively. This indicates that when the tax rate is smaller than the threshold tax rate, economic growth is promoted under increasing tax rate, but if the tax rate is larger than the threshold tax rate, then the economic growth decreases.

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