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The Laffer Curve, the Elasticity of Taxable Income, and the Tax Revenue Elasticity

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Abstract

In this paper, the authors use a simple dynamic general equilibrium model to study the relationship between tax deductions and three elasticities: the elasticity of the Laffer curve (the Laffer elasticity, hereafter), the elasticity of taxable income (ETI), and the income elasticity of tax revenue (the tax revenue elasticity). the authors first show a decomposition of the Laffer elasticity, which consists of the ETI and the tax revenue elasticity. In the case with proportional income tax without deduction and lump-sum social security tax, the tax revenue elasticity is equal to unity, and we obtain a simple relationship between the Laffer elasticity and the ETI. This decomposition indicates that each elasticity, which was investigated independently is closely related each other. The authors then calculate the analytical solutions of these elasticities with respect to labor and capital income under the steady state in the general equilibrium model with exogenous deduction and a social security tax. Since the solution in the model is too complex to analyze its features, the authors conduct a numerical simulation under plausible parameter values that are consistent with the results from Japanese data. The simulation shows that deduction can change these elasticities. Deduction shifts the Laffer curve and decreases the tax rate that maximizes the tax revenue. Further, deduction shifts the ETI upward. Therefore, the authors conclude that the theoretical research on public finance, especially tax analyses, should consider deduction in the model.

1 Introduction

The relationship between tax rate and tax revenue is known as the Laffer curve, and there are many previous studies. For example, Trabandt and Uhlig (2011) and Nutahara (2015) analyze the Laffer curve using the general equilibrium model based on data of industrial countries. As long as income is constant, rising tax rates will increase tax revenue. However, since income actually depends on the tax rate, a rise in the tax rate does not always lead to an increase in tax revenue. In other words, the Laffer curve is a combination of the effect of the tax rate when income is given and the effect of the tax rate when income changes. Furthermore, the latter can be broken down into the effect of tax rate on income and the effect of income on tax revenue. Therefore, the Laffer curve should be decomposed into three indices: the effect of tax rate on tax revenue when income is given, the effect of tax rate on income, and the effect of income on tax revenue.

The effect of tax rate on income has been actively discussed in research on its elasticity, the elasticity of taxable income (ETI). Feldstein (1995) uses the panel data of the self-assessment income and finds that the ETI is 1 to 3. Also, Carroll (1998) and Gruber and Saez (2002) point out that there is a problem of mean regression that a significant proportion of high-income earners temporarily earn large income and then suddenly the income decreases, and suggest that previous estimates on ETI have upward bias. Furthermore, they perform an estimation that takes into consideration the problem of average regression and show that the ETI is about 0.12 to 0.4.

On the other hand, the effect of income on tax revenue is called tax revenue elasticity, and since the pioneering research of Groves and Kahn (1952), it has been analyzed for a long time. Recently, Girouard and André (2005) estimates household's tax revenue elasticity from the average marginal tax rate using OECD Taxing Wages. Their estimation shows that the tax revenue elasticity tends to deviate from one.

These previous studies suggest that the above indicators depend on the tax system. Therefore, in this paper, we carry out this decomposition and theoretically derive the influence from the tax system. First of all, we derive this proposition in a general form.[1] Saez et al. (2012) and

[1] Our research is relevant to the discussion of the feedback effect; i.e. Dynamic Scoring. For example, Mankiw and Weinzierl (2006) showed that the feedback effect of tax reduction financed by reduction of lump-sum transfer is large. On the other hand, Leeper and Yang (2008) showed that the feedback effect of tax reduction financed by reduction of government consumption is small.

Creedy and Gemmell (2015) also derive almost the same equations as we derive. However, they do not mention that this formula represents the relationship between the three topics that have been independently studied. Next, to numerically express these equations and the influence from the tax system, we analytically derive the corresponding equation in a general equilibrium model. Under plausible parameters, we show that the above three indicators vary depending on deduction and social security tax. In particular, we found that the peak of the Laffer curve with deduction and social security tax has a lower tax rate than the peak without them.

2 The Elasticity of the Laffer Curve

Suppose that tax revenue R is a function of tax rate τ and income Y, $R = R(\tau, Y)$, and income Y is a function of τ and other factors A, $Y = Y(\tau, A)$. In this setting, the elasticity of Laffer curve ε^L is

$$\varepsilon^L \equiv \frac{\partial \log R}{\partial \log \tau} = \left.\frac{\partial \log R}{\partial \log \tau}\right|_{Y=\bar{Y}} + \frac{\partial \log R}{\partial \log Y}\frac{\partial \log Y}{\partial \log \tau}. \tag{1}$$

Put differently, the Laffer elasticity is divided into (i) the effect of the tax rate itself given income (the first term on the right hand side), and (ii) the effect that the tax rate changes income, which changes the tax revenue (the second term).

The elasticity of taxable income against net-of-tax rate is the ETI. From (1), we can derive the proposition on the Laffer elasticity, the ETI, and the tax revenue elasticity.

Proposition 2.1 *For the Laffer elasticity ε^L, the ETI ε^{TI}, and the tax revenue elasticity ε^R, the following relationship holds:*

$$\varepsilon^L = \left.\frac{\partial \log R}{\partial \log \tau}\right|_{Y=\bar{Y}} - \frac{\tau}{1-\tau}\varepsilon^{TI}\varepsilon^R. \tag{2}$$

In particular, if tax revenues consist only of proportional tax, then

$$\varepsilon^L = 1 - \frac{\tau}{1-\tau}\varepsilon^{TI}. \tag{3}$$

Proof. From the second term on the right side of (1), we obtain

$$\begin{aligned}\frac{\partial \log Y}{\partial \log \tau} &= \frac{\partial \log Y}{\partial \log(1-\tau)} \frac{d\log(1-\tau)}{d(1-\tau)} \frac{d(1-\tau)}{d\tau} \frac{d\tau}{d\log \tau} \\ &= -\frac{\tau}{1-\tau} \frac{\partial \log Y}{\partial \log(1-\tau)}.\end{aligned}$$

$\partial \log Y / \partial \log(1-\tau)$ is the elasticity of taxable income against net-of-tax rate $(1-\tau)$, that is, the ETI. Therefore. we have (2).

Next, if the tax revenue consists of a proportional tax, i.e., $R = \tau Y$, the first term on the right side of (2) is

$$\begin{aligned}\left.\frac{\partial \log R}{\partial \log \tau}\right|_{Y=\bar{Y}} &= \frac{d\log R}{dR} \left.\frac{\partial R}{\partial \tau}\right|_{Y=\bar{Y}} \frac{d\tau}{d\log \tau} \\ &= \frac{1}{R} Y \tau \\ &= 1.\end{aligned}$$

Moreover, it is straightforward to show that the tax revenue elasticity is one when tax revenue consists of proportional tax, so (3) is obtained. □

However, if there are tax deduction, tax credit, and social security tax, then the formulas change. As an example, we consider the tax system including income deduction D_1, tax credit D_2, and fixed social security tax $\bar{R}^{SS}$:

$$R = \tau(Y - D_1 - \bar{R}^{SS}) - D_2 + \bar{R}^{SS}. \tag{4}$$

Proposition 2.2 *If the tax revenue is (4), the Laffer elasticity is*

$$\varepsilon^L = \frac{\tau(Y - D_1 - \bar{R}^{SS})}{\tau(Y - D_1 - \bar{R}^{SS}) - D_2 + \bar{R}^{SS}} - \frac{\tau}{1-\tau} \frac{Y - D_1 - \bar{R}^{SS}}{Y} \varepsilon^R \varepsilon^{TI}. \tag{5}$$

Proof. The first term in (1) is

$$\begin{aligned}\left.\frac{\partial \log R}{\partial \log \tau}\right|_{Y=\bar{Y}} &= \frac{\partial \log R}{\partial R} \left.\frac{\partial T}{\partial \tau}\right|_{Y=\bar{Y}} \frac{\partial \tau}{\partial \log \tau} \\ &= \frac{\tau}{R}(Y - D_1 - \bar{R}^{SS}) \\ &= \frac{\tau(Y - D_1 - \bar{R}^{SS})}{\tau(Y - D_1 - \bar{R}^{SS}) - D_2 + \bar{R}^{SS}}.\end{aligned}$$

Also, the second term in (1) is

$$\begin{aligned}
\frac{\partial \log R}{\partial \log Y}\frac{\partial \log Y}{\partial \log \tau} &= \frac{\partial \log R}{\partial \log Y}\frac{\partial \log Y}{\partial \log(Y - D_1 - \bar{R}^{SS})}\frac{\partial \log(Y - D_1 - \bar{R}^{SS})}{\partial \log(1-\tau)}\frac{\partial \log(1-\tau)}{\partial \log \tau} \\
&= -\varepsilon^R \frac{\tau}{1-\tau}\frac{Y - D_1 - \bar{R}^{SS}}{Y}\varepsilon^{TI} \\
&= -\frac{\tau}{1-\tau}\frac{Y - D_1 - \bar{R}^{SS}}{Y}\varepsilon^R \varepsilon^{TI}.
\end{aligned}$$

Hence, we obtain (5). □

3 The Elasticities in the Dynamic General Equilibrium

3.1 The Model

In the previous section, we found that tax revenue elasticity and the ETI are related to the shape of the Laffer curve. A theoretical analysis of the Laffer curve already considering the tax system already exists. For example, Holter et al. (2015) analyzes the Laffer curve considering the progressive taxation. However, in view of deductions and social insurance premiums, analyzes that unified analytically the Laffer curve, the ETI, and the tax revenue elasticity have not been conducted until now. Therefore, in this section we consider the general equilibrium model including them.

Households maximize their lifetime utility

$$\max_{\{c_t, n_t, k_{t+1}\}_0^\infty} \sum_{t=0}^{\infty} \beta^t \left(\frac{c_t^{1-\sigma}}{1-\sigma} - \mu \frac{n_t^{1+\lambda}}{1+\lambda} \right), \tag{6}$$

subject to

$$c_t + k_{t+1} = w_t n_t - \underbrace{\tau_{nt}(w_t n_t - d_{nt} - \phi s_t) - s_t}_{\text{labor income tax}} + r_t k_t + (1-\delta)k_t - \underbrace{\tau_{kt}[(r_t - \delta)k_t - d_{kt}]}_{\text{capital income tax}} + T_t, \tag{7}$$

where c_t is consumption expenditure, n_t is labor supply, σ is the parameter of relative risk aversion, μ is the parameter of labor disutility, λ is the inverse of the Frisch elasticity, k_{t+1} is capital stock, w_t is the wage rate, r_t is the rental rate of capital, δ is the rate of capital depreciation, d_{nt} is the deduction of labor income, d_{kt} is the deduction of capital income, s_t is the social security tax, and T_t is lump-sum government transfer. We assume that $0 < \tau_n, \tau_k < 1$

and $\sigma, \mu, \lambda > 0$. The second and fourth terms of the right hand side in (7) are the labor and capital income taxes, respectively. s_t is a part of the labor income taxes. From (7), we obtain

$$c_t + k_{t+1} = (1-\tau_{nt})w_t n_t + \tau_{nt}d_{nt} - s_t + [1 + (1-\tau_{kt})(r_t - \delta)]k_t + \tau_{kt}d_{kt} + T_t.$$

In other words, the deductions, $\tau_{nt}d_{nt}$ and $\tau_{kt}d_{kt}$, are like a subsidy which changes proportionally according to the tax rate.

Firms maximize their profit

$$\pi_t = A_t k_t^{\alpha} n_t^{1-\alpha} - w_t n_t - r_t k_t$$

where A_t is the total factor productivity (TFP) and α is the share of capital income.

The government imposes taxes and transfers them subject to the budget constraint

$$T_t = \tau_{nt}(w_t n_t - d_{nt} - \phi s_t) + s_t + \tau_{kt}[(r_t - \delta)k_t - d_{kt}].$$

The equilibrium conditions of this economy are

$$\left(\frac{c_{t+1}}{c_t}\right)^{\sigma} = \beta[1 + (1-\tau_{k,t+1})(r_{t+1} - \delta)], \tag{8}$$

$$\frac{(1-\tau_{nt})w_t}{c_t^{\sigma}} = \mu n_t^{\lambda}, \tag{9}$$

$$\tau_{nt}w_t n_t + \tau_{kt}(r_t - \delta)k_t + s_t - \tau_{nt}d_{nt} - \tau_{kt}d_{kt} = T_t, \tag{10}$$

$$c_t + k_{t+1} = A_t k_t^{\alpha} n_t^{1-\alpha} + (1-\delta)k_t, \tag{11}$$

$$w_t = (1-\alpha)A_t\left(\frac{k_t}{n_t}\right)^{\alpha}, \tag{12}$$

$$r_t = \alpha A_t\left(\frac{k_t}{n_t}\right)^{\alpha-1}. \tag{13}$$

These conditions suggest that d_{nt}, d_{kt}, and T_t do not affect the Euler equation (8) and the intratemporal equilibrium condition (9). That is, the deductions do not cause distortions in household behavior.

In the steady state, the capital stock and the labor supply are

$$\frac{k}{n} = (\alpha A)^{\frac{1}{1-\alpha}} \left[\left(\frac{1}{\beta} - 1 \right) (1 - \tau_k)^{-1} + \delta \right]^{\frac{1}{\alpha - 1}},$$

$$n = \left\{ \frac{(1-\tau_n)(1-\alpha)A}{\mu} \left(\frac{k}{n} \right)^{\alpha} \left[A \left(\frac{k}{n} \right)^{\alpha} - \delta \frac{k}{n} \right]^{-\sigma} \right\}^{\frac{1}{\lambda + \sigma}}.$$

Also, the tax revenue from labor income R_n, the tax revenue from capital income R_k, and the total revenue are

$$R_n = \tau_n (wn - d_n - \phi s) + s = (1-\alpha)\tau_n \left(\frac{k}{n} \right)^{\alpha} n - \tau_n d_n + (1 - \phi \tau_n) s, \tag{14}$$

$$R_k = \tau_k [(r - \delta)k - d_k] = \tau_k \left[\alpha \left(\frac{k}{n} \right)^{\alpha} n - \delta \frac{k}{n} n - d_k \right], \tag{15}$$

$$R = R_n + R_k. \tag{16}$$

These are the Laffer curves.

On the other hand, the ETIs in the steady state are

$$\varepsilon_n^{TI} = \frac{\partial \log(wn - d_n - \phi s)}{\partial \log(1 - \tau_n)} = \frac{(1-\alpha)A\left(\frac{k}{n}\right)^{\alpha} n}{(1-\alpha)A\left(\frac{k}{n}\right)^{\alpha} n - d_n - \phi s} \frac{1}{\sigma + \lambda}, \tag{17}$$

$$\begin{aligned} \varepsilon_k^{TI} &= \frac{\partial \log[(r-\delta)k - d_k]}{\partial (1 - \tau_k)} \\ &= \frac{\alpha A \left(\frac{k}{n}\right)^{\alpha} n - \delta \frac{k}{n} n}{\alpha A \left(\frac{k}{n}\right)^{\alpha} n - \delta \frac{k}{n} n - d_k} \left\{ \frac{\alpha}{1-\alpha} + \frac{1-\sigma}{(\sigma+\lambda)(1-\alpha)} + \frac{\sigma}{\sigma+\lambda} \left[1 - \frac{1 - \beta(1-\delta)}{A\alpha\beta(1-\tau_k)} \delta \right]^{-1} \right\}. \end{aligned} \tag{18}$$

Note that the ETI of capital income depends on the capital income tax rate τ_k, whereas the ETI of labor income does not depend on tax rate of labor income or capital income. The tax revenue elasticity of labor income in the steady state is

$$\varepsilon_n^{R} = \frac{\partial \log(\tau_n (wn - d_n - \phi s) + s)}{\partial \log(wn)} = \frac{\tau_n (1-\alpha) A \left(\frac{k}{n}\right)^{\alpha} n}{\tau_n \left[(1-\alpha) A \left(\frac{k}{n}\right)^{\alpha} n - d_n - \phi s \right] + s}. \tag{19}$$

Whether this elasticity is greater than one depends on d_n and s. On the other hand, the tax revenue elasticity of labor income in the steady state is

$$\varepsilon_k^R = \frac{\partial \log(\tau_k[(r-\delta)k - d_k])}{\partial \log(rk)} = \frac{\alpha A \left(\frac{k}{n}\right)^\alpha n}{\alpha A \left(\frac{k}{n}\right)^\alpha n - \delta \left(\frac{k}{n}\right) n - d_k}. \tag{20}$$

Even if there is no deduction on capital income, $d_k = 0$, the capital income elasticity of tax revenue is greater than one, $\varepsilon_k > 1$, as long as $\delta > 0$. Eqs. (14)–(20) can be explicitly presented by substituting k/n and n.

Finally, from (5) and (17)–(20), we obtain the elasticity of the Laffer curve

$$\varepsilon_n^L = \frac{\tau_n(1-\alpha)A\left(\frac{k}{n}\right)^\alpha n}{\tau_n((1-\alpha)A\left(\frac{k}{n}\right)^\alpha n - d_n - \phi s) + s} - \frac{\tau_n}{1-\tau_n}\frac{(1-\alpha)A\left(\frac{k}{n}\right)^\alpha n - d_n - \phi s}{(1-\alpha)A\left(\frac{k}{n}\right)^\alpha n}\varepsilon_n^{TI}\varepsilon_n^R, \tag{21}$$

$$\varepsilon_k^L = 1 - \frac{\tau_k}{1-\tau_k}\frac{(r-\delta)k - d_k}{rk}\varepsilon_k^{TI}\varepsilon_k^R. \tag{22}$$

3.2 The Numerical Exercises

Using the above model, we conduct a numerical simulation. We set $\alpha = 1/3$, $\beta = 0.96$, $\delta = 0.025$, $A = 1$, $\sigma = 1.5$, $\lambda = 1/4$, $\mu = 3$, and $d_n = d_k = s = 0.04$. Deductions and social insurance premiums were set to values that would reduce the case where the total tax revenue would be zero. These parameter values are consistent with earlier studies on Japanese economy. Figure 1 depicts the Laffer curves, the ETIs, and the tax revenue elasticities for labor income and capital income. The solid line is the case with deductions and social security tax, and the dotted line is the case without them.

The two panels of the left hand side in Figure 1 shows the Laffer curves. The upper one is of labor income tax when the tax rate of capital income is zero, and the lower one is of capital income tax when the tax rate of labor income is zero. The solid line shows the case without deduction, the dotted line shows the case with income deduction and social security tax deduction ($\phi = 1$, like Japan), and the broken line shows the case with income deduction and no social security tax deduction ($\phi = 0$, like US). Even if the labor income tax rate is zero, the labor tax revenue of labor is not zero at the zero labor tax rate because there is a social security tax for both $\phi = 1$ and $\phi = 0$. Moreover, The peak of $\phi = 1$ is located at the upper left of the peak in the case of no deduction, whereas the peak of $\phi = 0$ is located at the lower left. As a result, the peak of the curve with deduction shifts to the left. The Laffer curve of capital income tax is pushed down to the lower left when deductions are included, and the top also shifts to the lower left. In both cases, the tops of the curves move to the left, so the tax rate with the maximum tax revenue is lower than in the absence of deductions and social security tax.

From Proposition 2.1, this factor can be broken down into the ETI and the tax revenue elasticity. The upper and lower panels in the center of Figure 1 represent the ETIs. For both labor income and capital income, the ETIs do not change much for relatively low tax rates, but as the tax rate approaches one, the ETIs rise sharply. Also, in the absence of deductions and social insurance premiums, the ETI of labor income is not affected by the tax rate, so the effect of ETI on the Laffer curve depends on the deduction and the existence of social security tax.

The two panels on the right of Figure 1 are tax revenue elasticity values. In the absence of tax deductions and social security taxes, the labor income elasticity of tax revenue is always one while the capital income elasticity of tax revenue is larger than one due to the deduction of depreciation expense. Since Girouard and André (2005) estimate the tax revenue elasticity in Japan as 0.9 for labor income and 1.6 for corporate income, as long as the parameters do not deviate significantly from the benchmark, our general equilibrium model seems to capture real values well. However, excluding the deduction of depreciation expenses, the capital income elasticity of tax revenue is also always one. The labor income elasticity shown in the upper right panel approaches 1 as the tax rate rises. On the other hand, although the capital income elasticity shown in the lower right panel falls down as the tax rate rises, it rises sharply from around 0.8. This is because the capital income decreases with the rise in capital income tax and approaches the deduction amount, so the denominator of capital income elasticity approaches zero.

Even tax revenue by factor income may be affected by another factor income. For example, if the labor income tax rate changes, the capital income tax revenue also change. Therefore, Figure 2 depicts the Laffer curve for the tax revenue for two factor incomes. Labor income tax revenue is inverse U shape for the labor income tax rate, while monotonically decreasing for the capital income tax rate. The same is true for capital income tax revenue. Furthermore, each tax revenue sinks if there is deduction.

Figures 3 to 5 are the contours of the Laffer curve for the total tax revenue. The darker the color, the lower the total tax revenue. At the top of the Laffer curve in the absence of deduction (Figure 3), the labor income tax rate is 0.57 and the capital income tax rate is 0.47. In the case of income deduction and social insurance premium deduction as in Japan (Figure 4), the labor income tax rate is 0.53 and the capital income tax rate is 0.26 at the top of the Laffer curve, both tax rates of which are lower than Figure 3. If there is income deduction but no social security tax deduction like in the United States (Figure 5), the labor income tax rate is 0.59 and capital income tax rate is 0.12 at the top of Laffer curve. In other words, if there is an income deduction and there is no social security tax deduction, the labor income tax rate and the capital income tax rate at the top of the Laffer curve change inversely.

Next, we check whether these results depend on parameters. Table 1 shows the tax rates at the top of the Laffer curve. As the labor income tax income deduction d_n is smaller, the labor tax rates of $\phi = 1$ and $\phi = 0$ at the top of the Laffer curve are higher, whereas the capital tax rates are lower. Similarly, the smaller the capital income tax income deduction d_k, the higher the capital tax rates and the smaller the labor tax rates at the top.

These results suggest that consistency between ETI and tax revenue elasticity and the tax system, especially the existence of deduction, must be considered when estimating and modeling the Laffer curve. From a policy point of view, when changing the tax rate with the goal of tax revenue, it is necessary to consider the channel where the tax rate changes income and further the changed income changes tax revenue. Furthermore, because deductions and social security taxes are involved in that channel, detailed consideration of taxation is also indispensable for quantitative analysis.

4 Conclusions

This paper showed that the income elasticity of tax revenue and the ETI are related to the elasticity of the Laffer curve and analytically derived them from a dynamic general equilibrium model including deduction and fixed payment of social security. Furthermore, if the deduction and social security tax are present from the simulation under the value of the plausible parameters, we found that if deduction and social security tax exist, then the tax revenue elasticity deviates from 1, the ETI responds strongly to the tax rate, and the tax rate at the peak of the Laffer curve also changes.

There are several points to be improved in the future. First, it is necessary to consider the influence of policy on welfare. For example, we would like to analyze which tax rate and deduction combination is desirable for social welfare. Second, the assumption about full employment of capital stock and labor may be relaxed. That is, changing tax rate affects both short and long run the capital utilization and unemployment rate which amplify the change in output. By taking these into account, the analysis of the tax system and its impact on the economy will be more realistic.

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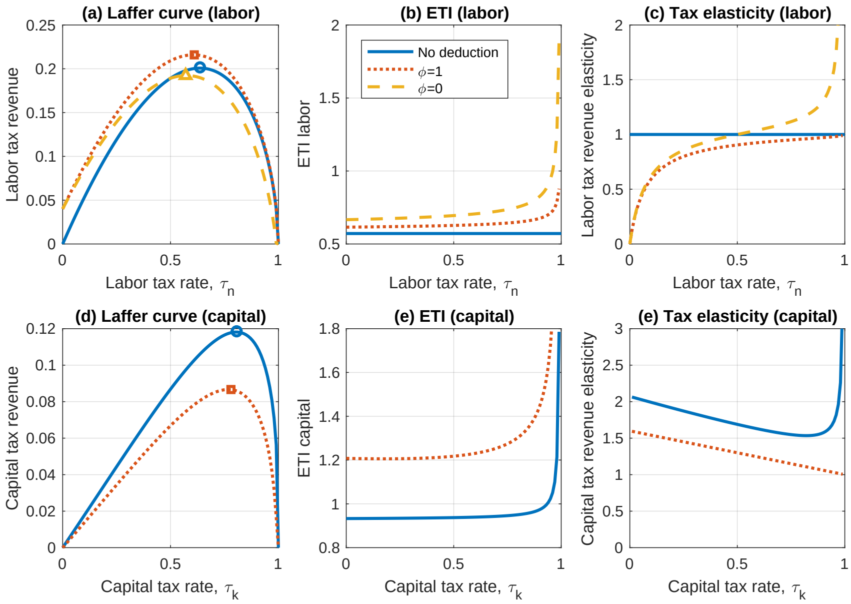

Figure 1: Laffer curve, ETI, and the tax revenue elasticity

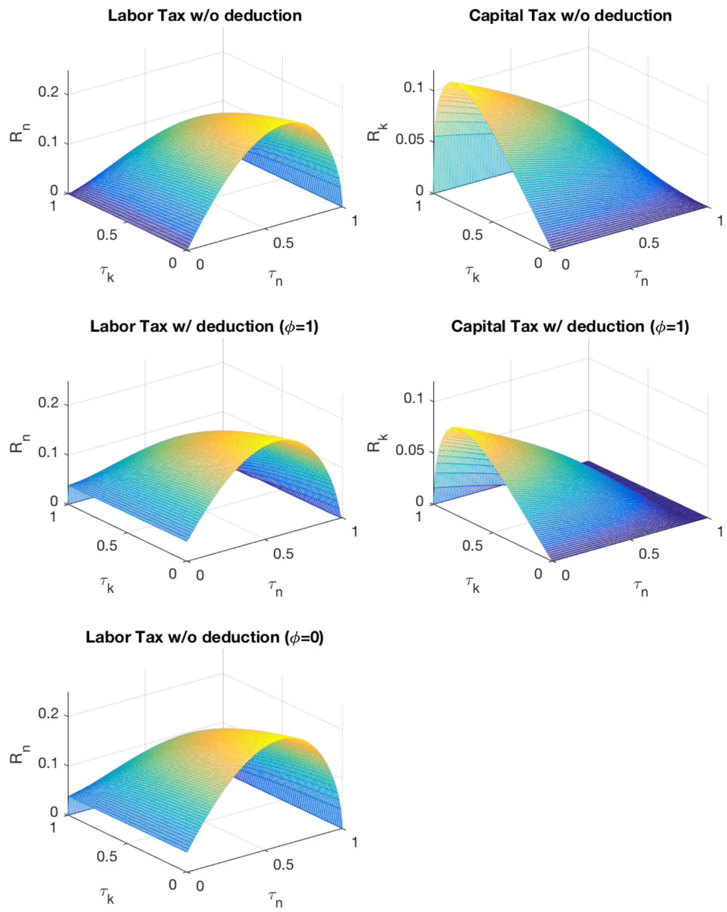

Figure 2: The Laffer curves by factor incomes

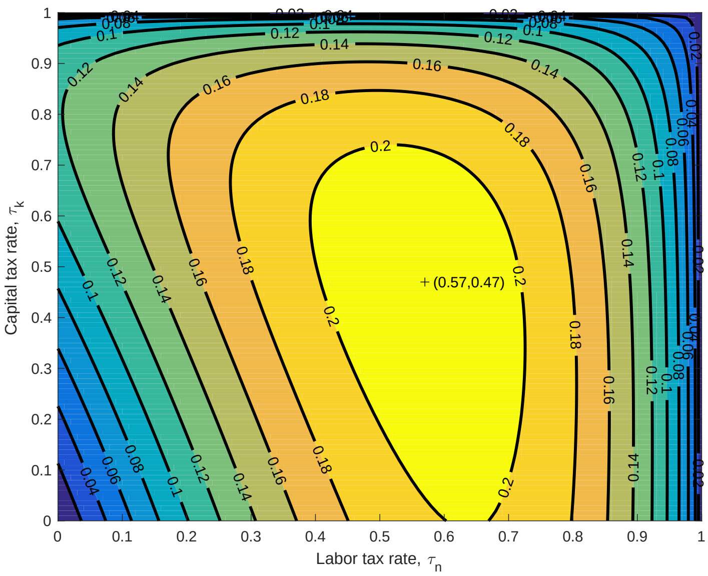

Figure 3: The Laffer curve of total tax revenue without deduction

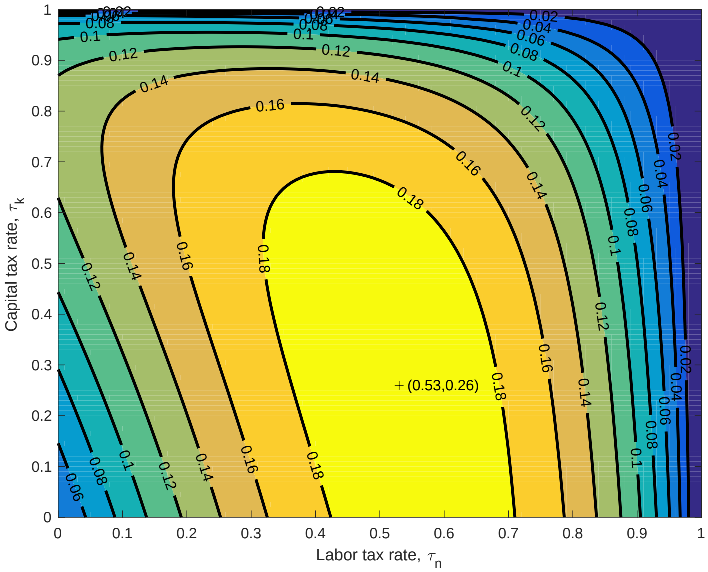

Figure 4: The Laffer curve of total tax revenue with income tax deduction and social security tax deduction ($\phi = 1$)

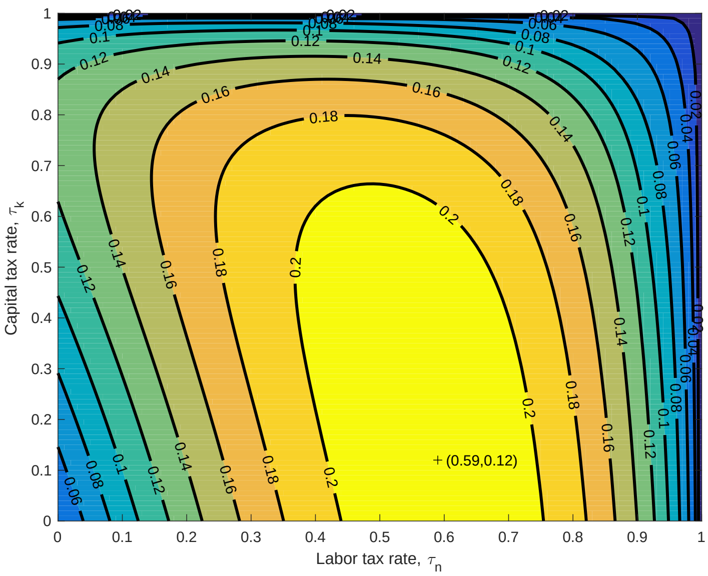

Figure 5: The Laffer curve of total tax revenue with income tax deduction and no social security tax deduction ($\phi = 0$)

Table 1: Tax rates at the top of the Laffer curve

	w/o tax deduction and SST deduction ($d_n = d_k = s = 0$)		w/ tax deduction and SST deduction ($\phi = 1$)		w/ tax deduction w/o SST deduction ($\phi = 0$)	
Parameter	Labor	Capital	Labor	Capital	Labor	Capital
d_n						
0.00	0.57	0.47	0.59	0.12	0.64	0.00
0.02	0.57	0.47	0.56	0.20	0.62	0.02
0.04	0.57	0.47	0.53	0.26	0.59	0.12
0.06	0.57	0.47	0.50	0.31	0.56	0.20
0.08	0.57	0.47	0.47	0.36	0.53	0.26
d_k						
0.00	0.57	0.47	0.47	0.54	0.53	0.50
0.02	0.57	0.47	0.50	0.44	0.57	0.38
0.04	0.57	0.47	0.53	0.26	0.59	0.12
0.06	0.57	0.47	0.57	0.00	0.61	0.00
0.08	0.57	0.47	0.57	0.00	0.61	0.00
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0.00	0.57	0.47	0.59	0.12	0.59	0.12
0.02	0.57	0.47	0.56	0.20	0.59	0.12
0.04	0.57	0.47	0.53	0.26	0.59	0.12
0.06	0.57	0.47	0.50	0.31	0.59	0.12
0.08	0.57	0.47	0.47	0.36	0.59	0.12