A Note on the Impact of Progressive Dividend Taxation on Investment Decisions*

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Abstract

This paper studies the distortionary impact of progressive dividend taxation on investment decisions under the premise of the "new view". According to the "new view", proportional dividend taxation does not distort firms' investment decisions. We find that progressive dividend taxation distorts investment decisions due to endogenous variations in the marginal tax rate caused by stochastic taxable income over the business cycle. The magnitude of this distortion critically depends upon the marginal tax rate and the progressivity of the tax system.

Key words: new view, dividend tax, investment, marginal tax rate

1 Introduction

In the United States, traditionally all the dividends received by an individual are taxed as ordinary income with a progressive schedule[1]. In this paper we examine whether the progressivity of dividend taxes *per se* matters for dynamic corporate investment decisions.

Virtually all of the literature on the impact of dividend taxation has confined itself to the analysis of proportional taxes. There have been two prevalent competing views. Under the "traditional" view, the marginal source of investment finance is new equity and the return to investment is used to pay dividends. Thus, a positive dividend tax increases the pre-tax return which firms are required to earn and hence lowers investment. Under the "new" view, firms finance investment using retained earnings and do not issue new equity or conduct share repurchases. Because future taxes are capitalized into share values, share-holders are indifferent between paying dividend taxes now or later. Thus, dividend taxes have no impact on a firm's marginal incentive to invest.[2]

Our model is constructed under the premise of the "new view". We introduce progressive dividend taxation into a representative-agent model with aggregate uncertainty, which takes the form of stochastic aggregate productivity across business cycles. In our tax system, the marginal dividend tax rate increases with taxable income. In presence of uncertainty, the taxable income, and consequently the marginal dividend tax rate, become stochastic variables. As a result, the firm in our model makes investment decisions under stochastic taxation.

We find that although proportional dividend taxation has no impact on investment decisions under the new view, progressive dividend taxation matters for dynamic investment decisions under the same premise. Progressivity introduces a wedge between the effect of dividend taxes on the marginal cost and marginal benefit of investment due to stochastic taxation, thus creating distortions in dynamic investment decisions. This wedge is absent in a proportional dividend tax environment.

We then evaluate the quantitative importance of progressive dividend taxation using our model. The quantitative importance of dividend taxation crucially depends upon the progressivity of the tax code, which is indexed by the derivative of the marginal tax rate with respect to the taxable income. We find that the U.S. income tax code is not progressive enough for dividend taxation to be quantitatively important for marginal investment decisions.

Our results contrast with the new view in that the progressivity of dividend taxation is theoretically relevant for dynamic investment decisions[3]. Despite the theoretical relevance, the quantitative magnitude of the distortion is small in a stochastic representative-agent model under the premise of the "new view".

Gourio and Miao (2008a, b) study the dynamic effects of dividend tax policies on investment decisions of heterogeneous firms. They demonstrate that the dynamic effects of dividend tax policies depend on whether the firm issues new equity (traditional view) or use retained earnings to finance its investment (new view). In our model, the representative firm finances its capital stock solely through retained earnings. This type of financing is typical among mature firms. Thus the only distortion of dividend taxation comes from its progressivity.

The impact of a progressive tax system has been studied in heterogeneous-agent models.[4] A progressive tax system has both distributional and dynamic implications. The dynamic implications capture how the agent's intertemporal investment decisions are altered due to the different marginal tax rates a given individual might be facing over time, due to uncertainty. In a heterogenous-agents model, distributional and dynamic effects are bundled, making it difficult to disentangle their respective implications. We examine this issue in a representative-agent model to isolate the dynamic implications from distributional issues.

The organization of the paper is as follows. Section 2 describes the model. Section 3 presents results and discusses intuition. Section 4 concludes.

2 The Model

There are a large number of identical and infinitely-lived firms and households. There is a single consumption-investment good. The households' personal income is subject to progressive taxation. The economy grows at a constant trend g on the balanced growth path.

2.1 Households

Each household maximizes a lifetime utility function:

$$\max_{\{a_{t+1}, f_{t+1}, c_t\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \beta^t \frac{C_t{}^{1-\gamma}}{1-\gamma} \tag{1}$$

subject to the following budget constraint:

$$c_t + a_{t+1}V_t + f_{t+1}V_t^f = a_t(V_t + D_t) + f_t(V_t^f + D_t^f) + W_tL_t - T(S_t) + \psi_t. \tag{2}$$

Here β is the subjective discount factor and C_t is real consumption at time t. The coefficient γ measures the curvature of the representative agent's utility function with respect to its argument C_t.

In the budget constraint, a_t represents shares of the representative firm held from period $t-1$ to t. V_t and D_t are the value per share and pre-income-tax dividends per share, respectively. The vector f_t represents the vector of other financial assets held at period t and chosen at $t-1$, including private bonds and possibly other assets. The vectors V_t^f and D_t^f are corresponding vectors of asset prices and current period real payouts; W_t represents the real wage, L_t is the labor supply at time t. Each household faces a (normalized) time constraint 1. Given that leisure does not enter the utility function, agents will allocate their entire time endowment to productive work. ψ_t is a lump-sum transfer of all the tax revenues from the government[5]. The tax function $T(\bullet)$ represents the income tax based on taxable income, S_t, which is a combination of dividends and labor income. According to the tax function, labor income and dividends are taxed jointly and progressively[6]:

$$S_t = D_t a_t + W_t L_t. \tag{3}$$

2.2 Production

Output Y_t is produced using the Cobb-Douglas production technology:

$$Y_t = Z_t K_t^{\alpha} L_t^{(1-\alpha)}. \tag{4}$$

where K is the capital stock, and the logarithm of the stochastic productivity level, Z_t, follows a first-order auto-regressive process given by

$$z_t = \rho z_{t-1} + \sigma \xi_t. \tag{5}$$

We assume convex capital adjustment costs in the capital accumulation process, similar to Jermann (1998) and Boldrin, Christiano and Fisher (2001):

$$K_{t+1} = (1-\delta) K_t + \Phi \left(\frac{I_t}{K_t} \right) K_t, \tag{6}$$

where δ is the depreciation rate and $\Phi(\bullet)$ is a positive, concave function. Concavity of the function, $\Phi(\bullet)$, captures convex costs of adjustment.

We assume that the representative firm does not issue new shares or conduct share repurchases, and finances its capital stock solely through retained earnings. The dividends to shareholders are then equal to:

$$D_t = Y_t - W_t L_t - I_t. \tag{7}$$

where I_t represents investment.

Taking the representative agent's (the owner's) marginal tax rate as given, the representative firm maximizes the present value of a stream of after-tax dividends:

$$\max_{\{I_t\}_{t=0}^{\infty}} E_0 \sum_{t=0}^{\infty} \left\{ \beta^t \frac{\Lambda_t}{\Lambda_0} [(1-\tau_t) D_t] \right\}, \tau_t = \frac{\partial T_t}{\partial S_t} \tag{8}$$

subject to equation (6). Here Λ_t is the Lagrange multiplier of the budget constraint (2), and τ_t denotes the marginal tax rate at time t.

The first order condition with respect to investment is:

$$\frac{1-\tau_t}{\Phi'\left(\frac{I_t}{K_t}\right)} = \beta E_t \left\{ \frac{\Lambda_{t+1}}{\Lambda_t} (1-\tau_{t+1}) \left[\alpha \frac{Y_{t+1}}{K_{t+1}} + \frac{(1-\delta) + \Phi\left(\frac{I_{t+1}}{K_{t+1}}\right) - \Phi'\left(\frac{I_{t+1}}{K_{t+1}}\right) \frac{I_{t+1}}{K_{t+1}}}{\Phi'\left(\frac{I_{t+1}}{K_{t+1}}\right)} \right] \right\}. \tag{9}$$

The left hand side is the shadow price of the installed capital in terms of the consumption good, or the marginal q. A positive marginal tax rate means that by investing the marginal unit of the good, the representative household avoids paying dividend taxes at τ_t. This effect is present even when the dividend tax is proportional. Investment provides an additional benefit in avoiding dividend taxes. As a result, the marginal q is lower.

The right hand side, which is the marginal benefit of investing an extra unit of the good, is affected by dividend taxes as well. The marginal gain from investment is subject to the marginal income tax rate τ_{t+1}, which vary endogenously over the business cycle. The marginal tax rate is time-varying because dividend taxes are progressive and depend upon the time-varying taxable income. The firm makes investment decisions under stochastic dividend taxation.

There is a wedge between the effect of progressive dividend taxes on the marginal cost and benefit of investment due to the time-varying nature of the marginal tax rate. The wedge, denoted as $\zeta_{t,t+1}$,

$$\zeta_{t,t+1} = \frac{1-\tau_{t+1}}{1-\tau_t}, \tag{10}$$

augments the stochastic discount factor and alters the marginal investment decision.[7] The farther $\zeta_{t,t+1}$ is from 1, the larger the distortion of the progressive dividend tax. Under a proportional dividend tax regime, τ_t is constant. As a result, $\zeta_{t,t+1}$is equal to 1. Thus, under a proportional tax schedule, dividend taxation has no impact on the firms' investment decisions. This is the essence of the "new view".

2.3 Equilibrium

In equilibrium, all produced goods are either consumed or invested:

$$Y_t = C_t + I_t. \tag{11}$$

Labor is supplied inelastically at 1. Financial markets equilibrium requires that a_t equals 1 for all t, and that all other assets are in zero net supply. In our model, the representative household cannot vary its labor supply or share-holding to avoid income taxes. This allows us to isolate the impact of progressive dividend taxation on dynamic investment decisions.

3 Quantitative Analysis

The objective of the section is to quantify the impact of progressive dividend taxation on investment and other aggregate variables. In order to do that, we compare the dynamic decisions rules in an economy with progressive dividend taxation with the ones of an economy with proportional dividend taxation (i.e. an economy without dividend taxation).

3.1 Parameterization

We set the quarterly trend growth rate, $1+g$, to 1.005, the capital depreciation rate, δ, to 0.025, and the constant labor share in a Cobb-Douglas production function, $1-\alpha$, to 0.64. We assume that the capital adjustment cost function $\Phi(\bullet)$ takes the following form[8]:

$$\Phi\left(\frac{I_t}{K_t}\right) = \frac{(g+\delta)^{\eta}}{1-\eta}\left(\frac{I_t}{K_t}\right)^{1-\eta} + \frac{\eta(g+\delta)}{\eta-1}. \qquad (12)$$

The capital supply becomes inelastic as η approaches infinity. We follow Jermann (1998) in setting η to 4.3.

We set the trend-adjusted subjective time preference, $\beta(1+g)^{1-\gamma}$, to 0.99. We will fix the risk aversion parameter, γ, at 3 for our benchmark parameterization.

Estimates of the Solow residual, z_t, typically yield a highly persistent AR(1) process in levels. We calibrate the standard deviation of the shock innovation to replicate U.S. postwar quarterly output growth volatility of 1%. We set ρ to 0.97 in our benchmark case, as is standard in the real business cycle models.

The progressive tax schedule in the model is based on a relationship between individual effective federal income tax rates and income for the U.S. tax return estimated by Gouveia and Strauss (1994). The tax function is given by:

$$T(S_t) = \phi_0\{S_t - [S_t^{-\phi_1} + \phi_2]^{-\frac{1}{\phi_1}}\}, \phi_0, \phi_1 > 0. \tag{13}$$

We use the values of $\phi_0 = 0.258, \phi_1 = 0.768$ to approximate the U.S. tax system prior to the tax reform in 2003, as estimated by Gouveia and Strauss (1994). The parameter ϕ_2 is not unit free. We set ϕ_2 to 0.3045 so that the average tax rates in the U.S. economy and in the model are the same[9].

Given the estimates of ϕ_0, ϕ_1 and ϕ_2, the marginal tax rate, τ_t, which is the first-order derivative of the tax function with respect to taxable income, is 17% in the steady state. This figure is close to the marginal dividend tax rate estimated by McGrattan and Prescott (2005) for the period from 1990 to 2001.

3.2 The Quantitative Importance of Progressive Taxation

We compute the nonlinear solutions to the model to take into account possible higher order effects of progressive dividend taxation[10]. In equilibrium all the decision variables, such as consumption and investment, can be approximated by a second-order Taylor expansion around the steady state values of the capital stock and productivity. We compute these decision rules for an economy with either proportional or progressive dividend taxes.

Table 1 contains the Taylor coefficients of consumption and investment in an economy with either proportional or progressive dividend taxes for the benchmark case. The coefficients, including those on the second order terms, are very similar in an economy with proportional dividend taxation as compared to an economy with progressive dividend taxation. These results indicate that the distortionary impact on investment decisions arising from progressive dividend taxation is quantitatively very small.

[Table 1 should appear here.]

3.2.1 Intuition: Why is the quantitative effect so small?

Additional insight into why the quantitative effect of progressive dividend taxation is so small can be obtained from a log-linear approximation of $\zeta_{t,t+1}$, which summarizes the distortionary effect of progressive dividend taxes on corporate investment decisions. The log-linear approximation of $E_t \log\left(\zeta_{t,t+1}\right)$ can be represented as:

$$\begin{aligned} E_t \log\left(\zeta_{t,t+1}\right) &\approx -\frac{\mu}{1-\tau}\left(E_t \triangle S_{t+1}\right), \\ \text{where } \mu &= \left.\frac{\partial^2 T}{\partial S^2}\right|_{s.s.} \end{aligned} \tag{14}$$

There are two factors which determine the size of the distortion. The first factor is the expected change in taxable income. For a given level of progressivity of the tax system indexed by μ, the larger the expected change of taxable income S_{t+1}, the larger the possible differences between the marginal tax rates facing the agent in period t and $t+1$. The second factor, $\frac{\mu}{1-\tau}$, measures the amount of distortion from expected changes in taxable income. The term μ represents the marginal change in the marginal tax rate due to the marginal change in the taxable income. The higher μ, the larger the distortion brought by the tax wedge on both sides of the investment equation.

Holding μ fixed, the distortion is higher for a higher marginal tax rate τ. According to our benchmark calibration using the tax function estimated to match the U.S. income code, $\frac{\mu}{1-\tau}$ takes the value of 0.0272 in the steady state. Even with more volatile taxable income, the small value of $\frac{\mu}{1-\tau}$ limits the distortionary impact of progressive dividend taxation. The distortion turns out to be too small to have any impact on dynamic investment decisions.

Panel A of Figure 1 shows the dynamic path of τ_t after a one-unit standard deviation in the technology shock in an economy with progressive taxes. The largest absolute deviation of the marginal tax rate is merely 0.06 percent above the steady state rate of 17 percent. Since the variations of the marginal tax rate are determined by both the variations in the taxable income and the progressivity of the tax system indexed by the second-order derivative of the tax function, the latter is too small for the distortionary term $\zeta_{t,t+1}$ to deviate from 1.

[Figure 1 should appear here.]

3.2.2 Robustness of the Results

We proceed to examine whether our results are robust under more progressive tax codes around the 1960s in the United States. Figure 2 compares the plots of the marginal tax rates and the second order derivatives of the tax functions as a function of taxable income in 1957, 1967 and our benchmark case[11]. The tax system in 1957 is the most progressive of the three with τ and μ being respectively 33.37 percent and 0.0599 when evaluated at our model's steady state. Consequently, the term $\frac{\mu}{1-\tau}$ takes the value of 0.0899 in the steady state, nearly four times higher than the corresponding value in our benchmark model. Table 1 also reports the Taylor coefficients of key economic variables when the tax system is that of 1957. The coefficients are still very similar in an economy with either proportional or progressive dividend taxes. Panel B of Figures 1 plots the dynamic path of the marginal tax rate following a one-unit standard deviation positive technology shock. The largest absolute deviation of the marginal tax rate τ_t is 0.18 percent above the corresponding steady state value. Even under such a highly progressive tax system, the distortionary effect of progressive dividend taxation is still too small to affect dynamic investment decisions.[12]

[Figure 2 should appear here.]

4 Conclusion

In this paper, we study the distortionary impact of progressive dividend taxation on dynamic investment decisions under the premise of the new view. We find that, theoretically, progressive dividend taxation distorts dynamic investment decisions by creating a wedge between the marginal cost and benefit of investment. Quantitatively, the progressivity of the U.S. tax code is too weak for the distortion caused by progressive dividend taxation to be important for dynamic investment decisions.

Notes

[1]In 2003, the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) was enacted as a temporary tax relief. The reform involves a transition from a progressive to a de facto proportional dividend tax schedule. The Act is set to expire in 2010.

[2]The traditional view is examined by Poterba and Summers (1983, 1985). Auerbach (2002) and Hasset and Hubbard (2002) have a comprehensive survey of the literature on the new view.

[3]Following the new view, we assume that dividends are the only form of distribution to the households. Our results can also apply to an economy with share repurchases as a form of distribution if the dividend tax rate is equal to the capital gains tax rate (Modigliani and Miller Dividend Irrelevance Theorem holds).

[4]Erosa and Koreshkova (2007) and Conesa and Krueger (2006) study welfare implications of progressive income taxes in a heterogeneous-agent model.

[5]We assume that the government rebates all the tax revenues to the household in a lump sum fashion. By doing this we abstract from the income effect of the taxation system, and focus on the distortionary aspect of the progressive taxation.

[6]In equilibrium, the representative household holds zero real bonds. As a result, interest payment is not included in taxable income.

[7]In the special case where the firm takes into account the impact of its investment decisions on the marginal tax rate of its shareholders, the wedge, $\varsigma_{t,t+1}$, is defined as

$$\zeta_{t,t+1} = \frac{1 - \tau_{t+1} - D_{t+1} \frac{\partial^2 T_{t+1}}{\partial S_{t+1}^2}}{1 - \tau_t - D_t \frac{\partial^2 T_t}{\partial S_t^2}}.$$

Details of this special case are available from the authors upon request.

[8]The functional form implies that $\phi\left(\frac{I}{k}\right) = g + \delta$ and $\phi'\left(\frac{I}{K}\right) = 1$ when evaluated at the steady state. As a result, incorporation of capital adjustment costs does not change the steady state of the model.

[9]This normalization amounts to choosing ϕ_2 in the model so that, $\phi_2^{\text{model}} = \phi_2 \left(\frac{AHI\text{model}}{AHI_{\text{U.S. 1990}}}\right)^{-\phi_1}$ where AHI is the average household income (about \$50 thousand for the U.S.)

[10]We use Dynare to compute the model solutions.

[11]The tax parameters ϕ_0, ϕ_1 and ϕ_2 for the effecitve tax functions in 1957 and 1967 are estimated by Young (1990).

[12]In reality, the households who would most likely hold on to stocks are typically those in the middle to top income tax brackets. The second order derivative of the tax function for this group of individuals is very small. Thus the distortionary impact of progressive dividend taxes is very small as well.

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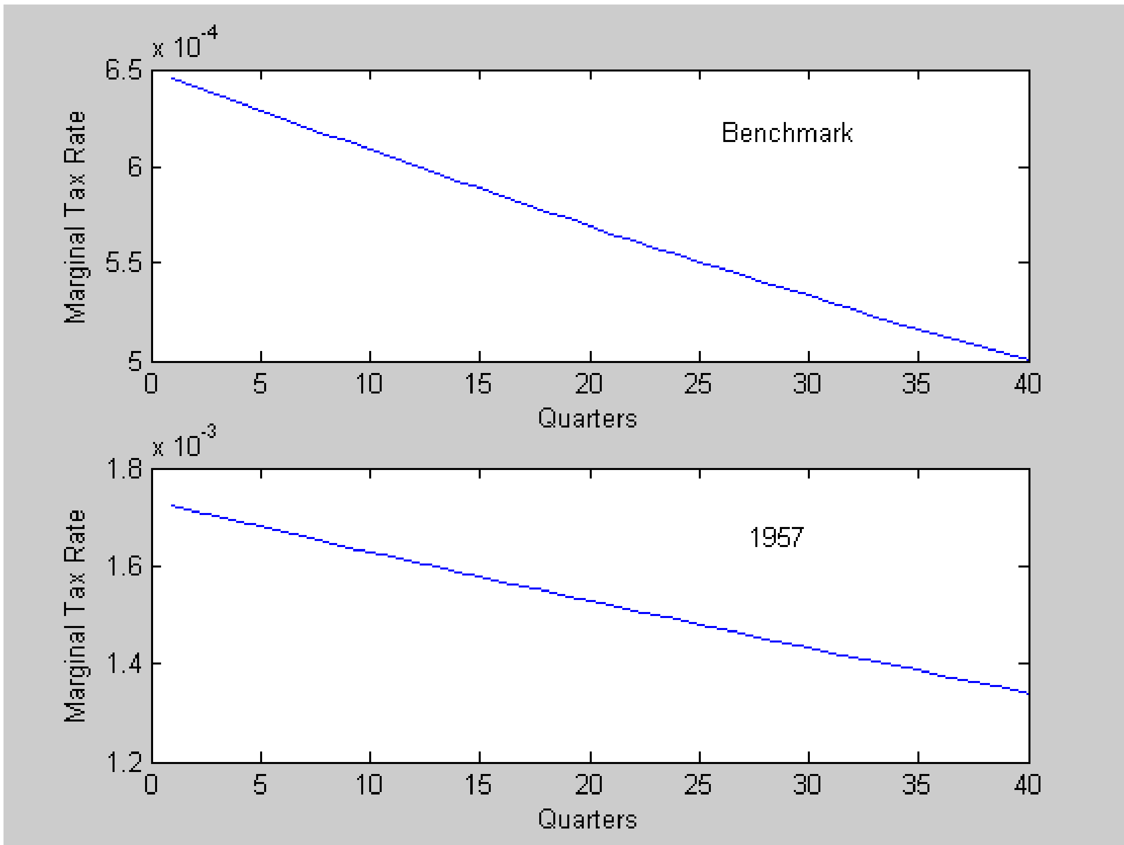
Table 1: Comparison of the Model Results

	The Benchmark Case				The Case of 1957			
	C_t		I_t		C_t		I_t	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
constant	2.547	2.547	1.083	1.083	2.547	2.547	1.083	1.083
$\widehat{K}_t$	0.014	0.014	0.022	0.022	0.014	0.014	0.022	0.022
$\widehat{z}_{t-1}$	2.850	2.854	0.744	0.740	2.840	2.854	0.754	0.740
$\widehat{\xi}_t$	0.029	0.029	0.008	0.007	0.029	0.029	0.008	0.007
$\widehat{K}_t^2$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
$\widehat{z}_{t-1}\widehat{K}_t$	0.020	0.020	0.016	0.016	0.019	0.020	0.017	0.016
$\widehat{z}_{t-1}^2$	1.383	1.387	0.396	0.392	1.365	1.387	0.414	0.392
$\widehat{\xi}_t^2$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$\widehat{K}_t\widehat{\xi}_t$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
$\widehat{z}_{t-1}\widehat{\xi}_t$	0.028	0.028	0.008	0.007	0.028	0.028	0.008	0.007

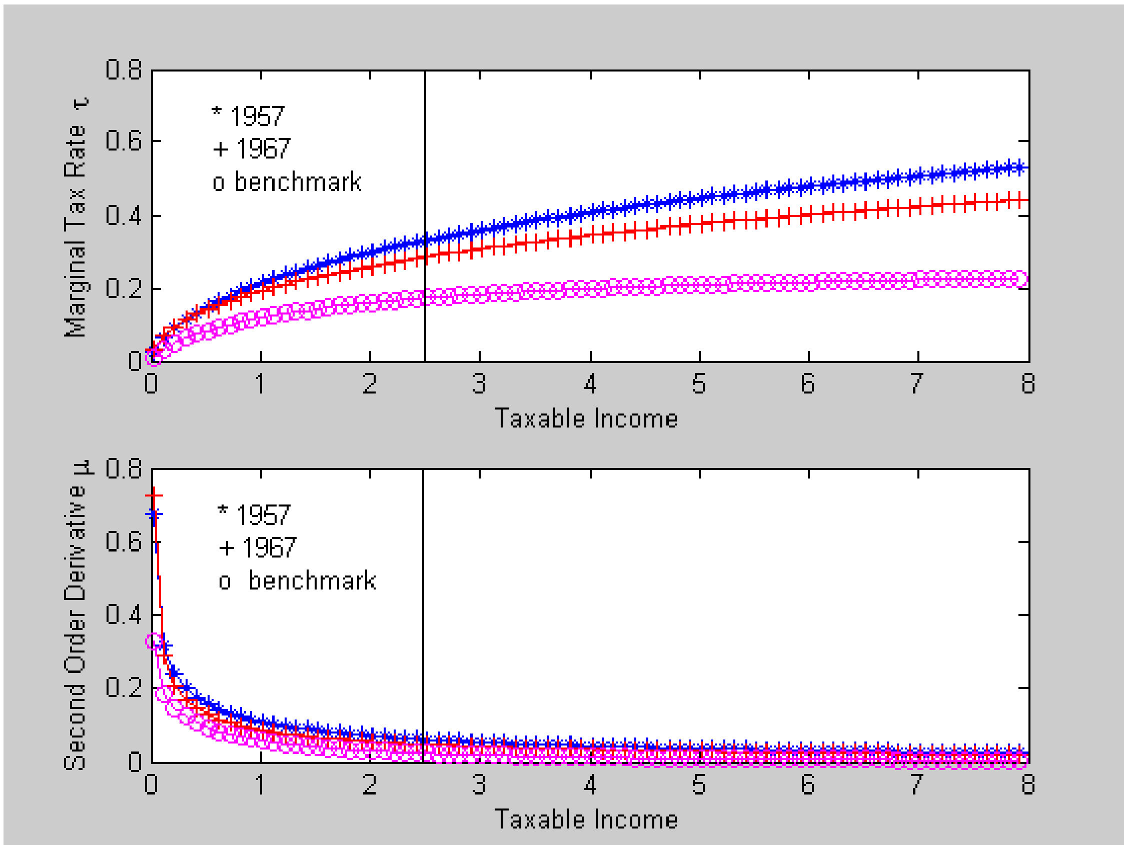
The first column lists the first- and second-order terms of Taylor expansion for consumption and investment functions. The first row contains the constant term, which is the sum of the steady state value and the additional effect of the variance of future shocks. The $\widehat{\cdot}$ variables in the rows represent deviations from their respective steady state values. Column (a) contains the coefficients of policy and transition functions for consumption and investment in an economy with progressive taxation for both the benchmark and the 1957 cases. Column (b) contains the coefficients in an economy with proportional taxation for the same two cases.

Figure 1: Dynamic Path of the Marginal Tax Rate



The two panels show the absolute deviations of τ from steady state values after a one-unit standard deviation in z.

Figure 2: Comparison of the Tax Functions



The vertical line represents taxable income in the steady state.