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Abstract

This paper discusses the impact of Estonia's 2000 income tax law using Tobin's *q* theory of investment. The results indicate a net increase in the capital stock of 6.1 % over the long run.

Keywords: Investment, Taxation, Tax Reform, Estonia
JEL Classification: E22, E62, H25, O52

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1 Introduction

In mid-1991, after five decades of Soviet rule, Estonia regained independence. The country inherited an inefficient planned economy and large macroeconomic imbalances, yet within a decade Estonia had established a well-functioning market economy and had become a leading EU accession candidate. The foundations of this transition were built on rapid privatization of state companies, a currency board system introduced in 1992, liberal labor market policy, a free trade regime, and a new legal framework for private activity.[1] Estonian authorities further streamlined the tax system, keeping the number of tiers to a minimum to make tax declaration easy and collection efficient. Income and corporate tax rates were levied at a flat rate of 26 %, non-wage labor costs (to finance health and pensions) at 33 %. With this positive environment, Estonia soon topped several competitiveness surveys of transition countries.

The promotion of investment and economic growth through generous tax allowances at the corporate level is an important policy objective for many countries. Moreover, free capital movements, the advent of the EU's single currency, and the advancement of information and communication technologies, all increase the mobility of tax bases. Greater exposure to international tax competition puts pressure on governments to lower their taxes on mobile capital and to shift the tax burden to immobile factors such as labor or consumption taxes.[2] While Estonia was considered to have a relatively low tax burden on companies, it nevertheless modified its corporate income tax codes in 2000. The goal was to shield corporate income from taxes altogether. Proponents of the change argued that taxes on company profits are taxes on essentially shareholder income, i.e. a form of personal income. Following this argument, one might well abolish the corporate income tax and instead tax profits when they turn up as dividend income of individual taxpayers. The benefits of this approach are simplified taxation and a reduced possibility of inadvertent effects on investment decisions. Because of the wider implications for other nations, the impact of Estonia's 2000 corporate tax reform on investment decisions deserves scrutiny.

The paper is divided into five sections. Section 2 briefly describes the 2000 corporate tax reform in Estonia. Section 3 presents a continuous time version of the q investment theory that includes corporate and personal taxation. Section 4 details calibration of the model and discusses how the changing tax environment might influence investment decisions. A concluding section summarizes the findings and proposes directions for future research.

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[1] Estonia adopted the German model for the privatization of state companies, selling larger enterprises through a privatization agency, Eesti Erasmus, and using the State Property Department to dispose of smaller companies. The two were merged in 1993 to form the Estonian Privatization Agency (EPA). By the end of 1994, the agency had privatized over 50 % of all large public companies.

[2] Joumard (2001) provides an excellent overview of current EU tax systems. While there has been a persistent fear that countries would undercut each other's capital income tax to attract international footloose business activity, this tax-race-to-the-bottom hypothesis is unsupported by the data. True, many countries have decreased their statutory capital income rates, but they have done so while simultaneously broadening their tax bases. Moreover, by putting downward pressure on tax rates, the threat of tax competition may discipline governments that would otherwise waste tax revenue [see Edwards and Keen (1996)].

2 Estonia's 2000 Income Tax Law

For most of the 1990s, Estonia's tax system was stunningly simple. Introduced in 1993, Estonia's original tax code applied a flat tax rate of 26% to businesses, personal earnings, and capital gains.[3] There were depreciation allowances up to 40% for equipment and up to 8% for buildings. Additionally, there was a loss-carry-forward possibility over a period of five years. The personal income tax rate was 26%. When companies paid dividends, they had to pay an additional tax of 26/74 on *net* dividends and shareholders received a dividend tax credit.[4] The effect of this dividend credit system was that distributed profits were only taxed at the shareholder's personal rate of income tax, and not under a corporation tax. In other words, the system worked as if it were an imputation system where the rate of imputation was the corporation tax rate.

On January 1, 2000, Estonia turned this income tax approach upside down. Under the Income Tax Act of 2000, companies became subject to income tax solely with respect to *distributions* (which combined dividends and such hidden profit distributions as fringe benefits, gifts, donations and other expenses unrelated to business activities). The tax rate is 26/74 of *net* dividends. In other words, under the new income tax legislation, the corporate entities are exempt from income tax on undistributed profits, regardless whether they are reinvested or retained.[5] Since there are no taxes on corporate income per se, there is also no need for depreciation allowances. Capital gains remain untaxed as long as the receiver is an incorporated Estonian firm. When the receiver of capital gains is a natural person, the tax rate on capital gains is 26 %.[6]

3 The Investment Function

The analysis of tax incentives for corporate investment decisions requires a consistent and rigorous framework for treating changes in both tax rates and tax systems. In the following, we analyze the dynamic effects of tax policies in a q model based on the decisions of value-maximizing firms facing convex adjustment costs. The model of optimal investment spending considers taxes levied at both the corporate and personal levels.[7] We begin by considering a representative firm.[8] The gross dividend payouts at time t are given as

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[3] The tax-free income of a resident natural person is 12,000 kroons. This implies that the marginal income tax rate is either 0 % or 26 %, and the average income tax rate is somewhere between 0% and 26%. Despite heated debate, repeated attempts to introduce a progressive income tax have failed.

[4] If the after-tax dividend was 74 kroons, then the corporation had to pay 26 kroons in taxes on the dividend. The tax rate of 26/74 is thus equal to a 26 % personal income tax rate. Summaries of the Estonian tax system are available in IMF (2000), pp. 35-48 and Kesti (1995).

5 The Estonian government is constitutionally obliged to maintain a balanced central budget. To plug any revenue gaps, the government plans to introduce protective tariffs against non-EU countries and the US. The goal is to confront possible budget deficits without raising interest rates or dampening investment and growth.

[6] In the case of nonresidents, capital gains taxation depends upon the type of asset. For real estate, the tax is 26 %. There is no capital gains taxation on financial assets (e.g. stocks and bonds).

[7] Our approach to modeling investment decisions draws on the work of Abel (1982) and Auerbach (1989). Funke and Willenbockel (1992) use a similar approach to analyze the impact of temporary and permanent tax incentives in eastern Germany.

[8] We assume that the firm finances its marginal investment expenditures entirely from retained earnings. This is consistent with the existing preferential tax treatment of capital gains in Estonia.

(1) $$\pi_t = (1-\tau_t)F(K_t) + \tau_t D_t - f\left(\frac{I_t}{K_t}\right) I_t$$

where π are the gross dividends, τ is the corporate tax rate for retained earnings, $F(\cdot)$ is the production function, K is the capital stock, D are the depreciation allowances, I is gross investment and $f(\cdot)$ is the adjustment cost function with $f(0) = 0$, $f'(I_t) > 0$, $f''(I_t) > 0$ and $f'(K_t) < 0$.[9] These assumptions imply that the marginal adjustment cost is increasing in the size of the adjustment and decreasing in the size of the existing capital stock. The price of investment goods is normalized to one.

The optimal behavior of the firm depends upon both the personal tax system and the corporate tax system. We define the tax system in terms of two variables. The first, defined above, is the corporate tax rate for retained earnings (τ). The second measures the degree of discrimination between earnings retention and dividend payments. This "tax discrimination variable" is denoted by θ and is defined as the opportunity cost of retained earnings in terms of *net* dividends forgone.[10] Thus, if the firm distributes one kroon, the shareholder receives θ kroons in after-tax dividends. For an imputation system, this tax discrimination variable is given as

(2) $$\theta_t = \frac{1 - m_t}{1 - \tau_t}$$

where m is the personal tax rate on dividend income. Equation (3) allows a straightforward taxonomy of corporate tax systems. Dividends are tax-favored when $\theta > 1$, while for $\theta < 1$ a preferential tax treatment of retained earnings exists. When $\theta = 1$, the corporate tax system is neutral with respect to retentions and distributions.

We next examine the asset market arbitrage condition governing shareholders' portfolio decisions. If investors seek to maximize their expected after-tax real return, they will hold shares only if the return on equity (i.e. the combination of the dividend yield and capital appreciation) equals the return on comparably risky assets

(3) $$rV_t = \theta_t \pi_t + \dot{V}_t \,.$$

The representative firm is assumed to maximize the discounted after-tax dividends over an infinite horizon

(4)
$$V(0) = \int_0^\infty \theta_t \pi_t e^{-rt}\, dt$$

$$\Leftrightarrow \; V(0) = \int_0^\infty \left[\theta_t (1-\tau_t) F(\cdot) - (\theta_t - z_t) f(\cdot) I_t\right] e^{-rt}\, dt + A(0)$$

[9] Equation (1) implicitly assumes that the firm has profits on old assets that are either sufficiently large or loss-carry-forward provisions exist which allow the firm to take advantage of depreciation allowances.

[10] For a detailed discussion, see King (1977), pp. 47-56, and King and Fullerton (1984), pp. 21-22.

where r is the constant discount rate. The terms $A(0)$ and z_t are determined by

$$(5) \qquad A(0) = \int_0^{\infty} \theta_t \tau_t \left[\int_{-\infty}^{0} d_{t-v,t} \, f(\cdot) \, I_v \, dv \right] e^{-rt} \, dt$$

and

$$(6) \qquad z_t = \int_0^{\infty} \theta_{t+s} \tau_{t+s} \, d_{s,t} \, e^{-rs} \, ds$$

where d measures fiscal depreciation. The term $A(0)$ in equation (5) represents the tax bill savings due to fiscal depreciation allowances on existing capital installed *before* time $t = 0$. In other words, this term is irrelevant for investment decisions from time t = 0 onward. The term z_t in equation (6) is the present discounted value of the entire stream of depreciation allowances per kroon of original cost. The law of motion on capital accumulation is given as

$$(7) \qquad \dot{K}_t = I_t - \delta K_t \, .$$

where δ is the economic depreciation rate which is a constant.[11] The present value Hamiltonian for this programming problem is

$$(8) \qquad H = e^{-rt} \left[\theta_t (1-\tau_t) F(\cdot) - (\theta_t - z_t) f(\cdot) I_t \right] + \lambda \left[I_t - \delta K_t \right]$$

where λ is a costate multiplier. We define

$$(9) \qquad q \equiv \lambda e^{rt} \, .$$

Thus, q_t is the present value of after-tax marginal products accruing to one kroon of capital installed at time t.[12] Thus, the first order conditions for the optimization are

$$(10) \qquad q_t = (\theta_t - z_t) \left(f(\cdot) + \frac{\partial f}{\partial I} I_t \right)$$

and

$$(11) \qquad \dot{q}_t = (\theta_t - z_t) \frac{\partial f}{\partial K} I_t - \theta_t (1-\tau_t) \frac{\partial F}{\partial K} + (r+\delta) q_t$$

[11] We carefully distinguish in the model between economic depreciation and depreciation for tax purposes.

[12] Absent taxes, the capital goods market is in equilibrium only if $q = 1$. This need not be true, however, with taxes. Differential tax treatment of different sources of finance can cause equilibrium q to diverge from unity. See Romer (1996), p. 352.

and the transversality condition

(12) $$\lim_{t\to\infty} q_t K_t e^{-rt} = 0 \ .$$

To obtain economically meaningful solutions, it is assumed that this condition holds. Since $f(I_t)$ is an increasing function, $f'^{-1}(I_t)$ is also an increasing function. Thus, desired gross investment spending in (10) is an increasing function of q_t. The transversality condition prevents the firm's value from becoming infinite during a finite period. To pin down the optimal response of the firm to a change in corporate taxation, we parameterize the internal adjustment cost function as

(13) $$f(\cdot) = 1 + \alpha \frac{\left[(I_t/K_t) - \delta \right]^2}{2I_t/K_t} \qquad \alpha > 0.$$

The functional form given in (13) leads to the tax-adjusted q-type investment equation

(14) $$\frac{I_t}{K_t} = \alpha^{-1}\left(\frac{q_t}{\theta_t - z_t} - 1 \right) + \delta \ .$$

We assume for tax purposes that the firm can deduct a fraction d of the accounting value of its assets defined on a declining balance basis, i.e. $d(s,t) = d'e^{-d's}$. The steady state of the model is characterized by constant levels of q and K, i.e.

(15) $$\frac{\partial F}{\partial K}\left(K^*\right) \equiv \frac{\left(r + \delta\right)\left(1 - r^* z'^*\right)}{\left(1 - \tau^*\right)}$$

and

(16) $$q^* = \theta^* - z'^*$$

where the asterisk superscript indicates a steady state value and $z^* = \theta^* r^* z'^*$ with $z'^* \equiv d'e^{-d's}$. The production function $F(\cdot)$ is parametrized as a Cobb-Douglas function

(17) $$F(K) = aK^{1-\beta}$$

We next consider linearizing the bivariate system around the steady state with respect to K and q using a Taylor-series expansion. This gives

(18) $$\begin{pmatrix} \dot{K} \\ \dot{q} \end{pmatrix} = \begin{pmatrix} 0 & \frac{K^*}{\alpha g^*} \\ \frac{\beta(r+\delta)g^*}{K^*} & r \end{pmatrix} \begin{pmatrix} \Delta K_t \\ \Delta q_t \end{pmatrix} + \begin{pmatrix} \frac{-K^*}{\alpha g^*} & 0 \\ \delta & \frac{-(r+\delta)g^*}{\theta^*(1-\tau^*)} \end{pmatrix} \begin{pmatrix} \Delta g_t \\ \Delta(\theta_t(1-\tau_t)) \end{pmatrix}$$

$$\Leftrightarrow \dot{y}_t = Ay_t + Bu_t$$

where $g_t \equiv \theta_t - z_t$ and $\Delta x_t \equiv x_t - x^*$. The eigenvalues of A are given by:

(19) $$\mu_{1,2} = \frac{r \pm \sqrt{r^2 + 4\alpha^{-1}\beta(r+\delta)}}{2}$$

Finally, the optimal time paths for the capital stock and Tobin's q are easily derived:

(20) $$K_t - K^* = (K(0) - K^*)e^{\mu_2 t}$$

(21) $$q_t - q^* = \left(\frac{\mu_2 \alpha g^*}{K^*}\right)(K_t - K^*)$$

Equation (20) implies that K converges to the steady state and that the "speed of convergence" is determined by stable eigenvalue of the transition matrix A.[13]

4 Calibration Results

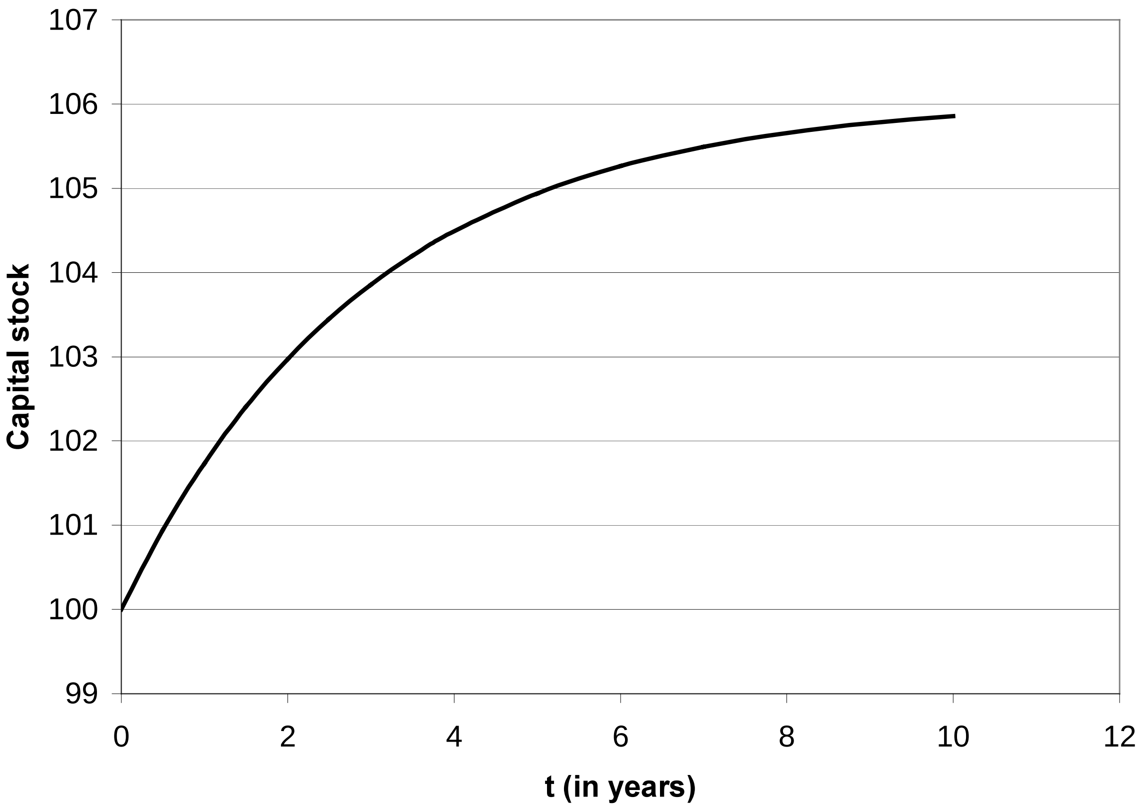
In this section we take a "bottom-up" approach and calibrate the effects of the zero tax on undistributed profits of an incorporated firm on *equipment* investment spending. Our purpose here is to determine whether the 2000 enterprise income tax reform spurs or discourages investment and growth. The analysis is carried out through calibrations and numerical solutions that account for the effects of government policy, but without estimating real-economy parameters for the model. Instead, we borrow reasonable parameters estimated by other researchers.

In addition to tax estimates, the calibrations require information on technology and preference parameters. Among the technology parameters, we take $\beta = 0.65$, as employed in Auerbach's (1989) tax study. The parameter of the adjustment cost function α is set to

[13] We have not included any mechanism through which anticipated tax changes influence investment spending. Funke and Willenbockel (1992) use an extended framework to model anticipated permanent and temporary corporate tax changes in eastern Germany.

7.5.[14] The efficiency parameter of the production function a is chosen such that the initial steady state capital stock equals 100. For the underlying economic depreciation parameters we set $\delta = 0.15$.[15] Fiscal depreciation prior to the 2000 reform equals $\delta' = 0.40$ and $\delta' = 1.00$ afterwards.[16] The tax discrimination variable prior to the reform is given by $\theta = (1-0.26)/(1-0.26) = 1.0$, and $\theta = (1-0.26)/(1-0.0) = 0.74$ effective January 1, 2000. Finally, the discount rate r is assumed to be equal to 0.05. These parameters lead to $\partial F/\partial K(K^*) = 0.2$ and $\mu_2 = -0.336$. The simulation results for the steady state equipment capital stock K^* are presented in Figure 1 below.

Figure 1. Effects of Enterprise Income Tax Reform of 2000



The results in Figure 1 strongly indicate companies will change their behavior in response to the enterprise income tax law reform of 2000. Eventually, the equipment capital stock increases by 6.07 %. This should both stimulate growth and raise corporate productivity. The result also implies that inflows of foreign direct investment should remain quite

[14] Please note that the size of α has no impact on the new steady state. It only determines the speed of adjustment.

[15] The actual rate of depreciation of the equipment capital stock is not readily gleaned from Estonian statistics. Here, we resort to estimates by King and Fullerton (1984).

[16] As there are no taxes on corporate income per se, there is also no need for depreciation allowances.

favorable. This numerical calibration result is consistent with econometric evidence showing that investment responds significantly to tax changes.[17]

5 Conclusions

Academic economists are legendarily cautious about economic data. In one old chestnut, the professor quips, "That may be so in practice, but is it true in theory?" In the case of Estonian tax reform, at least, the answer to the professor's query seems clear. The modeling and calibration results herein strongly support the view that Estonia's 2000 corporate tax reform should encourage investment spending.[18] This research could also be usefully extended in several directions. One possibility is to consider the long-run growth effects of taxes in an endogenous growth model. Economists have long speculated that government tax policy can affect economic growth. Kim (1998) has recently built and calibrated an endogenous growth model comprising financial, human, and physical capital and incorporating major features of tax systems. The major result of the paper is that the difference in tax systems across countries explains a significant proportion (around 30 %) of the differences in growth rates. Recent growth models should also provide valuable complements to this paper.

[17] Cummins et al. (1996) showed that, in a *q*-type framework, there were statistically and economically significant investment responses to tax changes in 12 of the 14 countries in their sample.

[18] It is interesting to note that Latvia is planning to reduce corporate income tax rates from 25 percent in 2000 to 22 percent in 2002 and 19 percent in 2003. This move has probably been made in response to Estonia´s tax reform described above, which as led to the concern that Latvian companies would move their headquarters to Estonia.

References

Abel, A.B. (1982) "Dynamic Effects of Permanent and Temporary Tax Policies in a *q* Model of Investment," *Journal of Monetary Economics* 9, 353-373.

Auerbach, A.J. (1989) "Tax Reform and Adjustment Costs: The Impact on Investment and Market Value," *International Economic Review* 30, 939-962.

Cummins, J.G., Hassett, K.A. and R.G. Hubbard (1996) "Tax Reforms and Investment: A Cross-Country Comparison," *Journal of Public Economics* 62, 237-273.

Edwards, J. and M. Keen (1996) "Tax Competition and Leviathan," *European Economic Review* 40, 113-134.

Funke, M. and D. Willenbockel (1992) "Steuerliche Investitionsförderung in den neuen Bundesländern - Maβnahmen und Auswirkungen," *FinanzArchiv* 49, 457-480.

IMF (2000) "Republic of Estonia: Statistical Appendix," IMF Staff Country Report No. 00/102, Washington.

Joumard, I. (2001) "Tax Systems in European Union Countries," *OECD Economics Department Working Paper No. 301*, Paris.

Kesti, J. (1995) "Estonia: Taxation of Companies and Individuals," *European Taxation* 35, 193-197.

Kim, S.-J. (1998) "Growth Effect of Taxes in an Endogenous Growth Model: To What Extent Do Taxes Affect Growth?," *Journal of Economic Dynamics and Control* 23, 125-158.

King, M.A. (1977) *Public Policy and the Corporation*, London (Chapman and Hall).

King, M.A. and D. Fullerton (1984) *The Taxation of Income from Capital – A Comparative Study of the United States, the United Kingdom, Sweden, and West Germany*, Chicago (The University of Chicago Press).

Romer, D.H. (1996) *Advanced Macroeconomics*, New York (McGraw-Hill).

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