Broadening the Tax Base of Neutral Business Taxes

by

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Abstract. The Samuelson tax is a neutral business income tax on the normal return on capital only. I discuss two modifications of the Samuelson tax in order to include pure profits in its tax base, but still achieve neutral business taxation.

Keywords. Neutral taxation, pure profit, optimal taxation, business taxation

JEL Classification. H25; H21

1. Introduction

A business income tax is neutral if the posttax net present value has the same sign as the pretax net present value (see Bond and Devereux, 2003, and Sinn, 1987, p. 117). Consequently, a neutral tax does not affect investment decisions. If the laissez-faire allocation of market economies is optimal, it is still – at least from a partial equilibrium perspective – optimal after the introduction of a neutral tax (see Sinn, 1987, p. 5). There are two well-known ways to achieve neutral business taxation: A cash flow tax and the Samuelson tax. Under a cash flow tax, solely the pure profit of all kinds of investments is taxed at a uniform and time-invariant tax rate. On the contrary, under the Samuelson tax, the pure profit is tax free, whereas the normal return on capital of all kinds of investments – including the capital market investment – is taxed at a uniform rate. This is an unsatisfactory result, since there is no neutral business tax available taxing both the normal return on capital *and* pure profits at the same time. This paper presents two modifications of the Samuelson tax allowing the achievement of this goal. Such modifications broaden the tax base in order to raise additional tax revenue without distorting investment decisions.

2. Samuelson Tax

Samuelson (1964) considers an investment generating a cash receipt stream resulting in value $V(t) = \int_t^T \epsilon N(x)e^{-r(x-t)}dx$ at t with acquisitions cost A_0 in period 0, resulting in the net present value $NPV_0 = \int_0^T \epsilon N(x)e^{-rx}dx - A_0$, where $N(x)$ is the net cash receipt as a function of time in the finite interval $(0, T)$, ϵ is a productivity parameter, and r is the interest rate. If, at any point of time $t \in (0, T)$,

(1) economic depreciations $\delta(t)$, defined as $\delta(t) \equiv -\frac{dV(t)}{dt} = \epsilon N(t) - rV(t)$, are permitted as a tax-deductible depreciation expense resulting in taxable business income $I(t) = \epsilon N(t) - \delta(t) = \epsilon N(t) + \frac{dV(t)}{dt} = rV(t)$, and
(2) business income $I(t)$ as well as interest is subject to a uniform income tax rate τ,

then the pretax net present value NPV_0 is equal to the posttax net present value NPV_0^τ ($NPV_0 = \int_0^T \epsilon N(x)e^{-rx}dx - A_0 = NPV_0^\tau = \int_0^T [\epsilon N(x) - \tau I(x)]e^{-(1-\tau)rx}dx - A_0$), and the tax is neutral. Since taxable business income is $I(t) = rV(t)$, the Samuelson tax is a tax on the normal return on capital only.

3. Samuelson Tax and Pure Profits

3.1. **Tax on the Net Present Value.** If an investment generates pure profits, its net present value is positive. Taxing the net present value of an investment upon occurrence implies the taxation of pure profits. Taxing the pure profit in such a way, and taxing equally the normal return on capital (as described in section 2) of all kind of investments, results in a neutral taxation of business income.

Formally under the first modification m_1 a taxation of eventual pure profits is achieved taxing the net present value NPV_0^τ in $t = 0$ at the uniform tax rate τ. The resulting net present value is $NPV_0^{\tau,m_1} = (1-\tau)NPV_0^\tau = (1-\tau)\left\{\int_0^T \left[\epsilon N(x) - \tau(\epsilon N(x) + \frac{dV(x)}{dx})\right] e^{-(1-\tau)rx}dx - A_0\right\}$. Using $NPV_0^\tau = NPV_0$ from section 2, the posttax net present value has the same sign as the pretax net present value, and such a tax is neutral.

3.2. **Limiting Economic Depreciations to the Level of the Marginal Investment.** Pure profits are realized as soon as the net cash receipt level of an investment exceeds the net cash receipt level of the marginal investment. Taxing the difference between the net cash receipts of profitable investments and the net cash receipts of marginal investments ensures the taxation of pure profits. In section 2 economic depreciations increase with the profitability of investments. Thus any positive difference between the net cash receipts of profitable investments and the net cash receipts of marginal investments (pure profit) is tax free except for the tax on the normal return on capital. Limiting economic depreciations instead to the level granted for marginal investments allows one to tax pure profits upon realization (see Sinn, 1987, p. 122). Again, such equal taxation of pure profits as well as the normal return on capital for all investments ensures neutral taxation.

Formally, under the second modification m_2, economic depreciations are limited to the level granted for marginal investments ($NPV_0^c = \int_0^T \epsilon^c N(x) e^{-rx} dx - A_0 \equiv 0$, with $V^c(t) = \int_t^T \epsilon^c N(x) e^{-r(x-t)} dx$; here ϵ^c is the productivity and $V^c(t)$ the value at t of the pretax marginal investment). If at any point of time $t \in (0, T)$

(1) economic depreciations of the marginal investment $\delta^c(t) \equiv -\frac{dV^c(t)}{dt}$ are permitted as a tax-deductible depreciation expense resulting in taxable income $I(t) = \epsilon N(t) + \frac{dV^c(t)}{dt}$ for all investments – including investments generating pure profits – and
(2) income $I(t)$ as well as interest is subject to a uniform income tax at rate τ,

then a positive pretax net present value $NPV_0 = \int_t^T \epsilon N(x) e^{-rx} dx - A_0$ implies a positive posttax net present value $NPV_0^{\tau,m_2} = \int_0^T \left[(1-\tau)\epsilon N(x) - \tau \frac{dV^c(x)}{dx}\right] e^{-(1-\tau)rx} dx - A_0$ ($NPV_0 \geq 0 \Rightarrow NPV_0^{\tau,m_2} \geq 0$), and the tax is neutral.

Proof. For the marginal investment the Samuelson theorem of section 2 applies, and thus a zero pretax net present value implies a zero posttax net present value ($NPV_0^c = \int_0^T \epsilon^c N(x) e^{-rx} dx - A_0 = 0 \Rightarrow NPV_0^{\tau,m_2,c} = \int_0^T \left[(1-\tau)\epsilon^c N(x) - \tau \frac{dV^c(x)}{dx}\right] e^{-(1-\tau)rx} dx - A_0 = 0$). If $NPV_0 = \int_0^T \epsilon N(x) e^{-rx} dx - A_0 > 0$, then $\epsilon > \epsilon^c$. If $\epsilon > \epsilon^c$, then $NPV_0^{\tau,m_2} = \int_0^T \left[(1-\tau)\epsilon N(x) - \tau \frac{dV^c(x)}{dx}\right] e^{-(1-\tau)rx} dx - A_0 > NPV_0^{\tau,m_2,c} = \int_0^T \left[(1-\tau)\epsilon^c N(x) - \tau \frac{dV^c(x)}{dx}\right] e^{-(1-\tau)rx} dx - A_0 = 0$, since $\int_0^T (1-\tau)\epsilon N(x) dx > \int_0^T (1-\tau)\epsilon^c N(x) dx$ and all other terms remain unchanged. A positive pretax net present value NPV_0 implies a positive posttax net present value NPV_0^{τ,m_2} under modification m_2. □

Summing the economic depreciations granted over the investment's lifetime gives $\int_0^T \frac{dV^c(x)}{dx} dx = V^c(0)$. Since $NPV_0^c = \int_0^T \epsilon^c N(x) e^{-rx} dx - A_0 \equiv 0$ and $V^c(0) = \int_0^T \epsilon^c N(x) e^{-rx} dx$, the amount of economic depreciations granted under modification 2 is equal to the investment's acquisition cost A_0 ($\int_0^T \frac{dV^c(x)}{dx} dx = V^c(0) = A_0$). Limiting depreciations granted to the acquisition cost observed at the time of investment is practically feasible and is indeed the standard practice of most tax codes.

3.3. **Mutually Exclusive Investments with Pure Profits.** Devereux and Griffith (2003) for FDI in general, and Becker and Fuest (2010) specifically for mergers and acquisitions, argue that investments generating pure profits may be mutually exclusive. The investor has the choice to realize either investment A or investment B, and both investments offer a positive pretax as well as posttax net present value.

Then the same sign of the posttax and the pretax net present value no longer guarantees that the investors' posttax and pretax decisions are identical. While all net present values are positive ($NPV_0^A, NPV_0^B, NPV_0^{\tau,A}, NPV_0^{\tau,B} > 0$), investment A may be more attractive than investment B before taxes, whereas after taxes investment B is more attractive than investment A. In order to ensure identical posttax and pretax decisions, as a stronger requirement for neutral tax systems, a larger pretax net present value of investment A than of investment B has to imply also a larger posttax net present value ($NPV_0^A > NPV_0^B \Rightarrow NPV_0^{\tau,A} > NPV_0^{\tau,B}$). The Samuelson tax (since $NPV_0 = NPV_0^{\tau}$) and modification 1 (since $NPV_0 = (1-\tau)NPV_0^{\tau,m_1}$) fulfill this stronger criterion for neutrality.

On the contrary, the practically important second modification does not fulfill this stronger criterion for neutrality, since it may happen that investors prefer investment A to investment B before taxes, but B to A after taxes.

Proof. Consider $NPV_0^A = \int_0^T \epsilon^A N^A(x)e^{-rx}dx - A_0^A$ and $NPV_0^B = \int_0^T \epsilon^B N^B(x)e^{-rx}dx - A_0^B$. I define $\epsilon = \epsilon^c + \epsilon^e$, where ϵ^c is the productivity of the marginal investment ($NPV_0^c = \int_0^T \epsilon^c N(x)e^{-rx}dx - A_0 = 0$). Then $NPV_0^A = \int_0^T \epsilon^{A,e} N^A(x)e^{-rx}dx$ and equivalently $NPV_0^B = \int_0^T \epsilon^{B,e} N^B(x)e^{-rx}dx$. Using $NPV_0^c = 0 \Rightarrow NPV_0^{\tau,m_2,c} = \int_0^T [(1-\tau)\epsilon^c N(x) - \tau \frac{dV^c(x)}{dx}]e^{-(1-\tau)rx}dx - A_0 = 0$, I transform $NPV_0^{\tau,m_2,A}$ to $NPV_0^{\tau,m_2,A} = \int_0^T (1-\tau)\epsilon^{A,e} N^A(x)e^{-(1-\tau)rx}dx$ and equivalently $NPV_0^{\tau,m_2,B} = \int_0^T (1-\tau)\epsilon^{B,e} N^B(x)e^{-(1-\tau)rx}dx$. The net present values to be compared are thus $NPV_0^A = \int_0^T \epsilon^{A,e} N^A(x)e^{-rx}dx$ versus $NPV_0^B = \int_0^T \epsilon^{B,e} N^B(x)e^{-rx}dx$ before taxes and $NPV_0^{\tau,m_2,A} = \int_0^T (1-\tau)\epsilon^{A,e} N^A(x)e^{-(1-\tau)rx}dx$ versus $NPV_0^{\tau,m_2,B} = \int_0^T (1-\tau)\epsilon^{B,e} N^B(x)e^{-(1-\tau)rx}dx$ after taxes. Since the discount factor is e^{-rx} before taxes but $e^{-(1-\tau)rx}$ after taxes, it may happen that $NPV_0^A > NPV_0^B$, but $NPV_0^{\tau,m_2,A} < NPV_0^{\tau,m_2,B}$. □

4. Conclusion

There are two well-known ways to achieve neutral business income taxation: A cash flow tax and the Samuelson income tax. Under a cash flow tax only the pure profit, not the normal return on capital, is subject to tax. On the contrary, under the Samuelson income tax only the normal return on capital, not the pure profit, is subject to tax. I present two modifications of the Samuelson tax in order to achieve the simultaneous neutral taxation of the normal return on capital *and* pure profits within an income tax. This allows one to broaden the neutral tax base in order to raise tax revenue in a nondistorting manner. Under the first modification, any net present value is subject to tax upon occurrence. Under the second modification economic depreciations are limited to the acquisition cost of assets. The latter modification is in line with the standard practice of most tax codes, which also limit depreciations to the acquisition cost of assets. Such tax codes may violate the condition for neutral taxation only to the extent that they do not mimic the exact economic depreciation structure over time. This should however cause only minor interest effects. This conclusion is practically important, since as a result the business taxation of most tax codes is nearly neutral.

There are two important limitations of these results. Firstly, the second modification is not neutral if investments generating pure profits are mutually exclusive.

Secondly, neutral taxation is a partial equilibrium concept. Even if a tax is neutral in a partial equilibrium, it may nevertheless affect economic behavior in a general equilibrium. Still, given the complexity of general equilibrium concepts, neutral taxation is a good starting point for evaluating tax systems.

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