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The optimal taxation of savings and investment in an open economy

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Abstract

While the taxation of savings and of investment are equivalent in a closed economy, there is a real choice between the two in an open economy setting. A tax authority can, specifically, tax the return to domestic capital following the source principle, or it can tax the return to domestic savings following the residence principle. This paper examines the optimal joint taxation of savings and investment for a country that has access to the international capital market. Conditions under which such a country should tax only savings or investment are identified. Generally, however, countries optimally tax both savings and investment. Most countries' tax systems, indeed, are a mixture of the source and residence systems of taxation.

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1. Introduction

In a closed economy, the taxation of savings and of investment are potentially equivalent. In this case, savings equal investment and their common volume is determined by the tax wedge between the gross return to investment and the net return to savings. In the open economy, instead, the taxation of savings and of investment are not equivalent. The pre-tax return to investment in this instance is determined by the tax on investment and the world rate of return, while the net return to savings follows from the tax on savings and the world rate of return. In open economies, a distinction can be made between the source and the residence principles of taxation (see Frenkel et al., 1991, ch. 2). Under a pure source system of taxation, the return to domestic investment is subject to taxation, regardless of its ownership. Under a pure residence system, instead, the return to domestic savings is taxed, regardless of its international allocation.

This paper considers how the pure source and residence principles of taxation are optimally combined in a simple two-period model of an open economy that is a price-taker in the international capital market. The government is generally shown to optimally use its savings as

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well as its investment tax instruments. This corresponds to the reality that most countries tax the return to domestic capital and the capital income of domestic residents separately. Conditions under which only savings or investment should be taxed, however, are identified. Section 2 outlines the model, while Section 3 concludes.

2. The model

Let us consider an economy that exists for two periods and that takes the international interest rate, r, as given. Capital is the only variable factor of production. First-period output is denoted by a standard production function $f(K_1)$, where K_1 is the given first-period capital stock. Capital depreciates fully each period so that the second-period capital stock, K_2, equals first-period investment. First-period output is allocated between first-period consumption, C_1, and first-period savings, S_1. The tax authorities generally tax the returns to savings as well as to domestic investment. Let τ_s (τ_k) be the tax applied per unit of savings (domestic investment). There are no consumption taxes. Second-period tax revenues, R, are the sum of savings and investment taxes as follows:

$$R = \tau_s S_1 + \tau_k K_2 . \tag{1}$$

The consumer's lifetime welfare, which depends on consumption in both periods, is represented by a standard utility index, $U(C_1, C_2)$. The representative agent maximizes the utility index subject to the following budget constraint:

$$f(K_1) + \frac{f(K_2)}{1+r-\tau_s} \geq C_1 + \frac{C_2}{1+r-\tau_s} + \frac{1+r+\tau_k}{1+r-\tau_s} K_2 . \tag{2}$$

The budget constraint reflects that the tax-inclusive cost of capital is $r+\tau_k$, while the net rate of return to savings is $r-\tau_s$. The optimality conditions to the agent's problem with respect to first-period savings and investment are as follows:

$$U_1 = (1+r-\tau_s)U_2 , \tag{3}$$

$$f_2 = 1+r+\tau_k , \tag{4}$$

where U_i and f_2 are the marginal utility of consumption in period i ($i = 1, 2$), and the marginal productivity of capital in period 2, respectively.

The government's optimal tax problem is to set the two tax rates, τ_s and τ_k, so as to maximize the agent's welfare subject to a minimum revenue constraint, $\bar{R}$, for purposes of, say, national defense. The optimality conditions to the government's problem with respect to τ_s and τ_k are as follows:

$$U_2[-S_1] + \lambda\left[S_1 + \tau_s \frac{dS_1}{d\tau_s}\right] = 0 , \tag{5}$$

$$U_2[-K_2] + \lambda\left[K_2 + \tau_k \frac{dK_2}{d\tau_k} + \tau_s \frac{dS_1}{d\tau_k}\right] = 0\,, \tag{6}$$

where λ is the shadow price of public revenues in terms of lifetime utility.

Using (1), (5) and (6), we can solve for the optimal values of the tax rates, τ_s and τ_k, as follows:

$$\tau_s = \frac{\epsilon_k}{\epsilon_k S_1 + (\epsilon_s + \mu)K_2}\hat{R}\,, \tag{7}$$

$$\tau_k = \frac{\epsilon_s + \mu}{\epsilon_k S_1 + (\epsilon_s + \mu)K_2}\hat{R}\,, \tag{8}$$

where $\epsilon_s = -(dS_1/d\tau_s)/S_1 \gtrless 0$ and $\epsilon_k = -(dK_2/d\tau_k)/K_2 > 0$, and where μ is the marginal propensity to save in the first period out of second-period income.[1] The parameter μ features in expressions (7) and (8), as a higher tax on investment reduces second-period after-tax investment income, thereby increasing first-period savings. With $\mu + \epsilon_s > 0$, we can see that a lower μ, ceteris paribus, increases the optimal value of τ_s, while it reduces the optimal value of τ_k. The tax on savings is thus relatively desirable if a higher tax on domestic investment increases first-period savings relatively strongly.

The optimal values of τ_s and τ_k in (7) and (8) generally are both different from zero. It follows that tax authorities generally should combine the source and the residence systems of taxation.[2] We can see immediately from (7) and (8), however, under what conditions the optimal tax system collapses to either a pure source or to a pure residence system of taxation. A residence system of taxation only, characterized by $\tau_s > 0$ and $\tau_k = 0$, is optimal if $\epsilon_s + \mu = 0$ or, approximately, if ϵ_k approaches infinity. A source system only, with $\tau_s = 0$ and $\tau_k > 0$, instead, materializes if $\epsilon_k = 0$ or, approximately, if $|\epsilon_s + \mu|$ approaches infinity.

From (7) and (8) we can calculate the total tax wedge between the gross return to domestic investment and the net return to domestic savings as follows:

$$\tau_s + \tau_k = \frac{\epsilon_k + \epsilon_s + \mu}{\epsilon_k S_1 + (\epsilon_s + \mu)K_2}\hat{R}\,. \tag{9}$$

This open economy tax wage generally can be smaller than, equal to, or larger than the autarky tax wedge where the country does not participate in the international capital market. If the open economy tax wedge equals the autarky tax wedge, then the country does not benefit from the possibility of entering the international capital market. In that instance, first-period savings equal first-period investment, or $S_1 = K_2$, regardless of whether it has access to the international capital market. Note that savings and investment taxes can always

[1] If γ is the marginal propensity to consume in the first period out of first-period income, then we can write μ as follows:

$$\mu = \frac{-\gamma}{1 + r - \tau_s} < 0\,.$$

[2] As shown by Frenkel et al. (1991, ch. 5), the investment tax instrument is optimally not used if the government has first- and second-period consumption taxes at its disposal. In that instance, the economy attains aggregate production efficiency, as defined by Diamond and Mirrlees (1971).

be chosen in an open economy setting such that savings, investment and welfare are equal to their autarky values. To see this, let K_2^a and τ^a stand for the second-period capital stock and the total tax wedge in autarky, which implies that $K_2^a\tau^a = \hat{R}$. If the open economy values of τ_k and τ_s are chosen such that

$$\tau_k = 1 + r - f_2(K_2^a) \tag{10}$$

and

$$\tau_s = \tau^a - \tau_k\,, \tag{11}$$

then the open economy and autarky values of savings, investment and overall welfare are in fact equal.

It is interesting to compare the autarky and open economy tax systems and savings and investment choices for the special case of a closely linear production function, with ϵ_k close to infinity, and a loglinear utility index. In this instance, the open economy value of τ_k is optimally chosen to be zero according to (8). The total open economy tax wedge in (9) is now simply equal to τ_s. If, for such an economy, we vary first-period output, $f(K_1)$, then first-period savings and the current account change as follows:

$$\mathrm{d}S_1 = \mathrm{d}CA_1 = (1-\gamma)\,\mathrm{d}(f(K_1)) > 0\,, \tag{12}$$

where γ is the marginal propensity to consume in the first period out of first-period income.

Clearly, for some value of $f(K_1)$ we have exactly $CA_1 = 0$ in the open economy so that welfare levels in autarky and in the open economy are equal. For first-period output lower (higher) than this benchmark value, the economy experiences a first-period current account surplus (deficit). In the surplus (deficit) case, the tax wedge in the open economy is smaller (larger) than in autarky. In either case, welfare is higher in the open economy case than in autarky.

3. Conclusion

This paper has examined the optimal combination of savings and investment taxes in a small open economy. Savings and investment generally should both be taxed, as they are in most countries. The optimal tax rates are derived for a small open economy that takes the world rate of interest as given. An extended model would allow the country's savings and investment choices to affect the world rate of interest, as in Bovenberg (1989). In such a setting, it would be interesting to consider international tax competition if more than a single country faces savings and investment taxation choices.

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