CAPITAL TAXATION MAY SURVIVE IN OPEN ECONOMIES

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Abstract

When capital is perfectly mobile across countries and labour is fixed, a source-based tax on capital both reduces and redistributes world income. We show that under plausible circumstances there always exists a country that benefits from introducing such a tax.

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1 Introduction

It is often maintained that a tax on a completely mobile factor has eventually to be borne by the less mobile factors if the country introducing the tax is small. The underlying argument is simple enough: Consider a country too small to have an influence on world equilibrium prices, and assume that capital is the mobile factor and labor is the fixed one. The introduction of a source-based tax τ on capital in such a country will then not affect the world equilibrium rate of return on capital, r^w. And as capital is assumed to be perfectly mobile across borders, investors in the country with the tax will have to realize the same net return they may obtain abroad. Hence their gross return must equal $r^w + \tau$, and the domestic market-clearing wage has to fall. This is at times interpreted to mean (a) that the tax is borne by labor and (b) that capital owners remain spared.

While taxing labour would also reduce the net wage rate, it would not distort the decision to invest at home vs. abroad. Hence a labour income tax is thought to dominate a corporate income tax, even from the perspective of labour [Diamond and Mirrlees (1971)]. As a result, it is concluded (c) that a source-based tax on capital should never be used. Of course, this theoretical forecast is not in line with observation: virtually all countries in the world tax the capital income earned by corporations located within their borders.[1]

It is the purpose of this note to demonstrate on the basis of a simple general equilibrium model that conclusion (a) is misleading and that both (b) and (c) are false. We thus provide a theoretical explanation for the survival of capital taxation in spite of the integration of world capital markets.

2 The model

2.1 Assumptions

Consider the following extension of Bradford's (1978) two-factor model in which countries are allowed to have different shares in the world's labour. The world consists of countries $i = 1, 2, ..., I$ that produce a single output with an identical linear-homogeneous technology $F(K^i, L_i)$. Factor markets are competitive so that factors earn their respective marginal product. Total world capital, denoted by $K = \sum_{i=1}^{I} K^i$, is perfectly mobile across borders. Labor is measured in skill units, denoted by $L = \sum_{i=1}^{I} L_i$, and completely immobile. Let $\lambda_i = L_i/L$ denote the share of country i's labour in total labour.

In the status-quo there is no taxation and the entire world is a laissez-faire economy.

[1] For an overview of current systems of international taxation, see e.g. Cnossen (2000). The recent evidence on the impact of company taxes on foreign direct investment is discussed by Hines (1999).

Then, country 1 introduces a small tax τ on capital invested within the country. The proceeds of taxation are uniformly redistributed to country 1's residents, denoted by $j = 1, 2, ...J$. The labour endowment of a country 1's resident is denoted by l_j, while his endowment of financial assets - representing claims on the capital used by firms - is denoted by a_j.

2.2 Factor Returns

Given the linear homogeneity of the production functions we have the well-known identity $F(K^i, L_i) = L_i f(k^i)$ and the equally well-known relations $F_K(K^i, L_i) = f'(k^i)$ and $F_L(K^i, L_i) = f(k^i) - k^i f'(k^i)$. Thus, the marginal products of capital and labour only depend on the country's capital intensity k^i. Now, assume that country 1 introduces a source-based tax τ on capital. Since this factor is perfectly mobile by assumption, its net return must be equal in all countries irrespective of where it is invested. Hence,

$$r^w(\tau) + \tau = f'(k^1(\tau)) \tag{1}$$

and

$$r^w(\tau) = f'(k^i(\tau)) \quad , \quad i = 2, ..., I \tag{2}$$

must hold. Differentiating (1) and (2) with respect to τ yields

$$r^w_\tau(\tau) + 1 = f''(k^1(\tau))K^1_\tau(\tau)/L_1 \tag{3}$$

and

$$r^w_\tau(\tau) = f''(k^i(\tau))K^i_\tau(\tau)/L_i \quad , \quad i = 2, ..., I. \tag{4}$$

Now, multiply (3) by $\lambda_1 = L_1/L$ and (4) by $\lambda_i = L_i/L$ and sum the results to get $r^w_\tau(\tau) + \lambda_1 = \sum_i f''(k^i(\tau))K^i_\tau/L$ which, at the point $\tau = 0$, simplifies to

$$r^w_\tau(0) + \lambda_1 = f''(k) \sum_i K^i_\tau(0)/L$$

because at $\tau = 0$ all countries still operate at identical capital intensities: $k^i(0) = k = K/L$. As a result,

$$r^w_\tau(0) = -\lambda_1, \tag{5}$$

since the changes in the countries' capital stocks, K^i_τ, must sum to zero.

Before we proceed to interpret this key result, it is useful to derive the changes in tax revenue, world capital income and world wage income first.

Differentiating the tax revenue $T(\tau) = \tau K^1(\tau)$ with respect to τ one has $T_\tau(\tau) = K^1(\tau) + \tau K^1_\tau(\tau)$, which gives

$$T_\tau(0) = K^1(0). \tag{6}$$

For world capital income $C(\tau) = r^w(\tau)K$ one finds accordingly $C_\tau(\tau) = r^w_\tau(\tau)K$ and

$$C_\tau(0) = r^w_\tau(0)K = -\lambda_1 K = -K^1(0), \tag{7}$$

where use was made of (5) and the fact that $\lambda_1 K = L_1 K/L = K^1(0)$ must hold. And finally, for world wage income $W(\tau) = \sum_i [f(k^i(\tau)) - k^i(\tau)f'(k^i(\tau))]L_i$ we have

$$W_\tau(\tau) = -\sum_i k^i(\tau)f''(k^i(\tau))K^i_\tau(\tau).$$

Evaluating this expression at $\tau = 0$ yields

$$W_\tau(0) = -kf''(k)\sum_i K^i_\tau(0) = 0. \tag{8}$$

2.3 Personal incomes

Disposable income of a resident j in country 1 amounts to

$$y^j(\tau) = l_j\frac{W^1(\tau)}{L_1} + a_j r^w(\tau) + \frac{T(\tau)}{J} \quad , \quad j = 1, 2, ..., J,$$

where $W^1(\tau)$ is the country's wage bill. The effect from taxing capital and distributing the proceeds is given by

$$y^j_\tau(0) = l_j\frac{W^1_\tau(0)}{L_1} + a_j r^w_\tau(0) + \frac{T_\tau(0)}{J}, \tag{9}$$

where

$$W^1_\tau(\tau) = -k^1(\tau)f''(k^1(\tau))K^1_\tau(\tau).$$

By (3) and (5) one obtains

$$W^1_\tau(0) = -(1-\lambda_1)K^1(0). \tag{10}$$

Inserting equations (10), (5) and (6) into (9) yields

$$y^j_\tau(0) = -l_j(1-\lambda_1)k - a_j\lambda_1 + k\bar{l} \quad , \quad j = 1, 2, ..., J, \tag{11}$$

where $\bar{l} = L_1/J$ denotes the average endowment of skill units in country 1. It follows that individual j benefits from the redistributive program if and only if $k\bar{l} > l_j(1-\lambda_1)k + a_j\lambda_1$ or

$$\frac{l_j}{\bar{l}}(1-\lambda_1) + \frac{a_j}{\overline{a}}\alpha_1 < 1, \tag{12}$$

where $\overline{a} = \sum_{j=1}^J a_j/J$ denotes average financial wealth in the country and $\alpha_1 = \sum_{j=1}^J a_j/K$ is the share of world capital owned by domestic residents.

By (11) the effect of the tax on national income is given by

$$\sum_{j=1}^{J} y_\tau^j(0) = \lambda_1 \left(K^1(0) - \sum_{j=1}^{J} a_j \right).$$

Hence, the condition for national income to rise is

$$\sum_{j=1}^{J} y_\tau^j(0) > 0 \quad \Leftrightarrow \quad \lambda_1 > \alpha_1. \tag{13}$$

2.4 Income inequality

Consider the benchmark case where $l_j/\overline{l} = a_j/\overline{a} = \theta_j$ and the individuals are ordered in such a way that θ_j is weakly increasing in j. Disposable income then reads

$$y^j(0) = \theta_j \left(\frac{W^1(0)}{J} + r^w(0)\overline{a} \right) + \frac{T(0)}{J} \quad , \quad j = 1, 2, ..., J. \tag{14}$$

Denote the Lorenz curve of disposable income in country 1 as

$$\mathcal{L}\left(\frac{h}{J}\right) = \frac{\sum_{j=1}^{h} y^j}{\sum_{j=1}^{J} y^j} \quad , \quad h = 1, 2, ..., J.$$

The effect of the capital tax on the distribution of income in country 1 is

$$\frac{\partial \mathcal{L}(h/J)|_{\tau=0}}{\partial \tau} \geq 0 \quad \Leftrightarrow \quad \frac{\sum_{j=1}^{h} y_\tau^j(0)}{\sum_{j=1}^{h} y^j(0)} \geq \frac{\sum_{j=1}^{J} y_\tau^j(0)}{\sum_{j=1}^{J} y^j(0)}. \tag{15}$$

Since we may write $y_\tau^j(0) = k\overline{l} - \theta_j[(1-\lambda_1)k\overline{l} + \lambda_1\overline{a}]$, it is obvious that $y_\tau^j(0)$ decreases with j while, according to (14), $y^j(0)$ increases with j. Therefore,

$$\frac{\sum_{j=1}^{h} y_\tau^j(0)}{\sum_{j=1}^{h} y^j(0)} \quad , \quad h = 1, 2, ..., J$$

is decreasing in h. In conjunction with (15), this implies that the capital tax shifts the Lorenz curve upwards unless θ_j is constant for all j.

3 Implications

1. Equation (5) says that the introduction of a tax on capital in country 1 reduces the world market rate of interest r^w by exactly λ_1, its share in world capital[2]. If country 1 is small, the world interest rate will fall by correspondingly little or, in the borderline case $\lambda_1 \to 0$, not at all.

[2] At $\tau = 0$ all countries operate at an identical capital intensity. Hence, their share in world labour, measured in skill units, is also their share in world capital.

2. The capital owners carry the full tax, as can be seen from (7) in conjunction with (6). Irrespective of how small country 1 and thus λ_1 is, world capital income declines by exactly the amount of the tax revenue. From a global point of view it is thus the capital owners who pay the entire tax.

3. From a purely national point of view the outcome is somewhat different. When looking at country 1, equation (10) states that a share $1 - \lambda_1$ of the tax has to be borne by country 1's wage earners through a fall of the domestic market-clearing wage rate.

4. From a global point of view, however, world wage income remains untouched. This is what (8) says, and that means that workers in the rest of the world gain exactly what the workers in country 1 loose. The reason is, of course, the outbound capital migration induced by the tax.

5. From the point of view of country 1's residents, redistribution via a source-based tax increases consumption if condition (12) is met. This is the more likely when a resident's skill or financial wealth is low relative to the corresponding domestic average, and when he lives in a country that is comparatively rich in terms of human capital and poor in terms of financial wealth. If $l_j/\overline{l} = a_j/\overline{a}$ and $\lambda_1 = \alpha_1$, the individual benefits from the program if and only if his market income is below domestic average.

6. Having a uniform social transfer financed by a source-based tax on capital may fuel domestic welfare even if the country with this program has an egalitarian income distribution. In case of $l_j = \overline{l}$ and $a_j = \overline{a}$ for all j, condition (12) shows that a Pareto-improvement occurs in country 1 if $\lambda_1 > \alpha_1$, i.e. if nationals are relatively richer in terms of human rather than in terms of financial capital.

7. An egalitarian world economy has $l_j = \overline{l}$, $a_j = \overline{a}$ and $\lambda_1 = \alpha_1$. As implied by (12), in an egalitarian world economy no country would ever use a tax on capital.

8. If $l_j/\overline{l} = a_j/\overline{a} \neq 1$ for all j, condition (15) shows that introducing the capital tax promotes equality in terms of Lorenz dominance. Assume that residents in country 1 are endowed with a common utility function, strictly increasing and concave in consumption. If $\lambda_1 \geq \alpha_1$, average income does not decrease in the country - see condition (13). In this case, the theorem of Atkinson (1970) applies to show that social welfare in country 1 is raised by the tax on capital.

9. Consider an unequal world economy with the features of the point above and in which utilitarian national planners noncooperatively set source-based capital taxes. In any Nash-equilibrium of that game, capital taxes exist with strictly positive probability.

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