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THE INCIDENCE OF CAPITAL INCOME TAXES:
DOES CAPITAL BENEFIT FROM INCREASED
FACTOR MOBILITY?



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Abstract

We characterize the role of capital and labor mobility in the shifting of capital taxes in a 2×2 general-equilibrium model with partially-mobile factors. This is done by means of an intuitive decomposition of the incidence of a selective capital tax into a "specificity effect" and a "mobility effect".

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1. CAPITAL INCOME TAXATION AND MOBILITY

Formal general-equilibrium analysis of the effects of a selective capital income tax (SCIT) within the standard two-sector, two-factor model of tax incidence was first carried out by Harberger (1962). In the Harberger model factors of production are assumed perfectly mobile across industries. The introduction of a SCIT in one sector initially drives a wedge between the returns to capital in the two industries, thus initiating a chain of reactions throughout the economy. The taxed sector will tend to substitute relatively cheap labor for relatively expensive capital, thus making capital owners worse-off. At the same time, however, as production of the taxed industry falls, the wage-rental ratio rises (falls) if the taxed industry is capital-(labor) intensive. The overall effect of SCIT upon the wage-rental ratio is "a priori" ambiguous.

In recent years, Harberger's analysis has been extended in many directions. The assumption of perfect factor mobility has been relaxed in a number of papers (for example, McLure, 1971; Ratti and Shome, 1977; Bhatia, 1989). These extensions posit the existence of a fixed factor. In this context, a SCIT will be borne by the owners of the taxed capital, regardless factor substitution and factor intensities.

The use of extreme assumptions on factor mobility has precluded a formal explanation of systematic relationships between mobility and shifting. The purpose of this paper is to characterize the role of mobility in the shifting process in a Harberger-type model with partially-mobile factors. This is done by means of a meaningful decomposition of the incidence of the SCIT into a "specificity effect" and a "mobility effect".

2. THE MODEL

A closed economy is assumed to produce two final outputs, X and Y, using capital, K, and labor, L. Technologies are CRS. Under competition, the behavior of producers is completely described by the equality of price and average cost:

$$p = c_X(r_X \tau_{KX}, w_X) \quad (1)$$

$$1 = c_Y(r_Y, w_Y) \quad (2)$$

where p is the relative price of X in terms of Y (numéraire), c_i ($i = X, Y$) is the unit-cost function with the standard properties, r_i and w_i are the net rewards of capital and labor, and $\tau_{KX} = 1 + t_{KX}$, where t_{KX} is a selective "ad valorem" tax on capital used in sector X. Full employment of factors is ensured by perfect flexibility of factor returns:

$$L_X(r_X \tau_{KX}, w_X, X) + L_Y(r_Y, w_Y, Y) = L \quad (3)$$

$$K_X(r_X \tau_{KX}, w_X, X) + K_Y(r_Y, w_Y, Y) = K \quad (4)$$

where the terms in the left-hand side are factor demands. Total supplies of labor and capital are fixed.

Factor preference, moving costs or other unspecified causes make labor and capital imperfectly mobile. A parametric formulation of this mobility condition is:

$$\hat{L}_X = \mu_L(\hat{w}_X - \hat{w}_Y), \quad 0 \leq \mu_L < \infty \quad (5)$$

$$\hat{K}_X = \mu_K(\hat{r}_X - \hat{r}_Y), \quad 0 \leq \mu_K < \infty \quad (6)$$

where μ_j ($j: K, L$) is the supply elasticity of the j -th factor to sector X with respect to the net earnings differential, and a hat denotes rate of change of the

corresponding variable in a neighborhood of its equilibrium value. The microeconomic foundations of equations (5) and (6) can be found elsewhere (for example, see Manning and Sgro, 1975, Mussa, 1982, Grossman, 1983, and Casas, 1984).

Preferences over goods are represented by a single homothetic utility function. Aggregate demand for X is:

$$X = X(p, Z) \quad (7)$$

where $Z = pX + Y$. This definition of income is valid when the SCIT is "small" and revenues are returned back to consumers in a lump-sum fashion. In equilibrium, Walras' Law allows to ignore the demand function for Y.

The general-equilibrium system (1)-(7) can be solved for the change in factor prices using the convenient properties of Jones' algebra (see Jones, 1965, and Atkinson and Stiglitz, 1980). After some manipulation, the incidence of a SCIT in sector X upon r_X can be expressed as:

$$p_X = |\Sigma|^{-1} [\sigma_L \sigma_K \theta_{LY} \Omega - \sigma_L \Sigma_2 - \sigma_K \lambda_{KX} \theta_{LY} \sigma_X \sigma_D - \sigma_X \sigma_Y \sigma_D] \hat{r}_{KX} \quad (8)$$

where

$$|\Sigma| = \sigma_L \sigma_K \Sigma_1 + \sigma_L \Sigma_2 + \sigma_K \Sigma_3 + \sigma_X \sigma_Y \sigma_D$$

$$\Omega = |\lambda| \theta_{KX} \sigma_D - \delta_X \sigma_X$$

$$\Sigma_1 = \sigma_D |\theta| |\lambda| + \delta_X \sigma_X + \delta_Y \sigma_Y$$

$$\Sigma_2 = \lambda_{LX} \theta_{KY} \sigma_X \sigma_D + \lambda_{LY} \sigma_Y (\theta_{LX} \sigma_X + \theta_{KX} \sigma_D)$$

$$\Sigma_3 = \lambda_{KX} \theta_{LY} \sigma_X \sigma_D + \lambda_{KY} \sigma_Y (\theta_{KX} \sigma_X + \theta_{LX} \sigma_D).$$

σ_D is (minus) the compensated elasticity of the demand for X. λ_{ji} is the share in the total supply of factor j of the amount of this factor employed in sector i. θ_{ji} is the share of the j-th factor in the value of the i-th product. The remaining short-hand

expressions used above are: $|\lambda| = \lambda_{LX} - \lambda_{KX} = \lambda_{KY} - \lambda_{LY}$, $|\theta| = \theta_{LX} - \theta_{LY} = \theta_{KY} - \theta_{LY}$, $\delta_X = \lambda_{KY} \lambda_{LX} \theta_{KX} + \lambda_{KX} \lambda_{LY} \theta_{LX}$, $\delta_Y = \lambda_{KY} \lambda_{LY}$, $\sigma_K = \mu_K / \lambda_{KY}$ y $\sigma_L = \mu_L / \lambda_{LY}$. Sector X is said to be relatively labor-intensive in the physical (the value) sense if $|\lambda| (|\theta|) > 0$. At an initial undistorted equilibrium, $|\lambda| |\theta| > 0$ (see Neary, 1978).

3. THE SPECIFICITY AND THE MOBILITY EFFECTS OF A SCIT

Here we aim at an expression that separates the incidence of the tax upon impact from the general equilibrium effects that take place once factors are allowed to move in response to the tax. To do this, we can reexpress (8) as:

$$p_X = p_X^S + p_X^M \quad (9)$$

where the specificity effect (superscript S) is the tax induced response of r_X when capital is immobile, and the mobility effect (superscript M) represents the portion of the tax that capital in sector X succeeds in passing on to other factors of production through mobility.

Trivially, with $\sigma_K = 0$, $p_X^S = -\hat{r}_{KX}$, i.e. r_X falls by the amount of the tax. Subtracting from (8), the mobility effect can be written as:

$$p_X^M = |\Sigma|^{-1} [\sigma_K \sigma_L \Pi_1 + \sigma_K \Pi_2] \hat{r}_{KX} \quad (10)$$

where $\Pi_1 = \theta_{KX} \theta_{LY} \sigma_D |\lambda| + \theta_{KY} \delta_X \sigma_X + \delta_Y \sigma_Y$ and $\Pi_2 = \sigma_Y \theta_{LX} (\sigma_X + \sigma_D)$. A necessary condition for any shifting to take place is that capital be mobile. On the other hand, equation (10) indicates that the degree of labor mobility largely determines the proportion of the tax that is shifted. The link between mobility and shifting that the former decomposition establishes is best characterized in two main results:

Proposition 1. Sufficient conditions for capital in sector X to bear less than

the full burden of the tax, i.e. $P_X^M > 0$, are: (i) $|\lambda| \geq 0$, for all $\sigma_K > 0$, $\sigma_L > 0$, and (ii) $\sigma_L = 0$, for all $\sigma_K > 0$.

Suppose that $\sigma_D = 0$ initially. Then, as labor is substituted for capital at a fixed level of output of X, the net return to capital will start to rise. If we now allow $\sigma_D \neq 0$, an additional factor intensity differential effect will further encourage shifting when $|\lambda| \neq 0$ by creating an economy-wide excess demand for the factor intensively used in the untaxed sector as industry X cuts down production. Result (ii) emerges as a special case when the intensity differential does not play any role. Provided that Y is not produced by means of a Leontief-type technology, capital in X always gains from mobility when labor is sector-specific.

Is it possible that capital in X actually loses from mobility when trying to escape the tax? We know that under the assumption of perfect capital mobility, capital may end up bearing more than the full amount of the tax (Harberger, 1962). Equation (10) indicates that this is not possible when any factor is immobile. This implies that although mobility is necessary for any shifting to be possible, it is not sufficient to improve the position of capital owners.

Proposition 2. Necessary conditions for capital in X to bear more than the full burden of the tax, i.e. $P_X^M < 0$, are that both factors be mobile and that sector X be relatively capital-intensive. These, together with either: (i) $\sigma_D \rightarrow \infty$ and $\sigma_Y = 0$, or (ii) $\sigma_D \rightarrow \infty$ and $\sigma_L \rightarrow \infty$, or (iii) $\sigma_X \rightarrow 0$ and $\sigma_Y \rightarrow 0$, suffice to ensure a negative mobility effect.

4. TAX SHIFTING UNDER INCREASED MOBILITY

The available literature on tax incidence has neglected the analysis of the

effects of changes in the degree of mobility upon tax shifting. This is not surprising, since the existing models are special cases of (1)-(7) when σ_i is either 0 or ∞ . From equation (10), we can obtain:

$$\frac{\partial p_X^M}{\partial \mu_K} = |\Sigma|^{-2} \left[\frac{\Pi_1}{\lambda_{KY}} (\sigma_L^2 \Sigma_2 + \sigma_L \sigma_X \sigma_Y \sigma_D) + \Pi_2 (\sigma_L \Sigma_2 + \sigma_X \sigma_Y \sigma_D) \right] \hat{r}_{KX} \quad (11)$$

$$\frac{\partial p_X^M}{\partial \mu_L} = |\Sigma|^{-2} \left[\frac{\Pi_1}{\lambda_{LY}} (\sigma_K^2 \Sigma_3 + \sigma_K \sigma_X \sigma_Y \sigma_D) - \frac{\lambda_{KY}}{\lambda_{LY}} \Pi_2 (\sigma_K^2 \Sigma_1 + \sigma_K \Sigma_2) \right] \hat{r}_{KX} \quad (12)$$

Since Π_2 is non-negative, the qualitative effect of changes in mobility upon tax shifting depends on the sign of Π_1 . Capital in sector X will favor policies intended to increase capital mobility when $\Pi_1 > 0$ (industry X relatively labor-intensive or "moderately" capital-intensive) and oppose those intended to increase the mobility of labor when $\Pi_1 < 0$ (industry X "highly" capital-intensive). From Proposition 2 we know that the mobility effect may be harmful for capital in sector X only if this industry is relatively capital-intensive and there are no immobile factors. When a negative factor intensity differential effect dominates, owners of capital in sector X will favor policies to reduce its impact. Restrictions on labor mobility will always do the job. The case for an increase in capital mobility is just symmetric.

Finally, note that when technical substitution is not possible in either sector ($\sigma_i \rightarrow 0$), tax shifting becomes independent of factor mobility considerations (whenever $\sigma_i > 0$). Capital in sector X gains (loses) relative to the immobility benchmark as $|\theta| > (<) 0$.

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