In the reduction of the system to equations (7.10), (7.3″) and (7.4′), only (7.10) is altered. It becomes:

$$(7.10') \qquad Ef_k(1+M)T = E[g_k - f_k(1+M)]\,dp_k + f_L\frac{dL_x}{L_x} + f_k\frac{dK_x}{K_x}.$$

Finally, the solution for dp_k, given in equation (7.12), now becomes:

$$(7.12') \qquad dp_k = \frac{Ef_k(1+M)\left(\frac{K_x}{K_y} - \frac{L_x}{L_y}\right) + S_x\left(f_L\frac{K_x}{K_y} + f_k\frac{L_x}{L_y}\right)}{E[g_k - f_k(1+M)]\left(\frac{K_x}{K_y} - \frac{L_x}{L_y}\right) - S_y - S_x\left(f_L\frac{K_x}{K_y} + f_k\frac{L_x}{L_y}\right)}\,.T.$$

Comparison of (7.12′) with (7.12) reveals that the determinants of the incidence of the corporation income tax play essentially the same roles in the "monopoly" case as they did in the competitive case treated in the text. And for plausible values of the key parameters and ratios, the magnitude of dp_k/T is not likely to be very sensitive to a change in the value of M from zero to something like 0.05 or 0.1 or 0.2.

A word should be said, however, about the interpretation of T in the monopoly case. Recall that the basic model treats T as a specific tax per unit of capital. If such a tax were in fact levied, it would not strike monopoly profits as such. If, however, a tax of a given percentage, t, is levied on all profits in the corporate sector, it will strike monopoly profits as well as the normal return to capital. Its total yield will be $t(MXp_x + K_x p_k')$, where the magnitudes in parentheses are measured in the post-tax situation, and p_k' represents the gross-of-tax price of capital in industry X. To fit such a tax into our model, it is convenient to view it as two different taxes: one, a direct tax taking percentage t of all monopoly profits, and the other, a specific tax at the rate $T = tp_k'$ per unit of capital in industry X. The incidence of the first tax is purely upon monopoly profits. Equation (7.12′) gives us the answer to the incidence of the second tax.

We may summarize the results of this note as follows: the main effect of introducing monopoly elements in the corporate sector is that now a corporation income tax of the usual type will fall on monopoly profits as well as on the ordinary return to capital. The part that falls on monopoly profits will be borne by them. The part, however, that falls on the ordinary return to capital in the corporate sector will introduce a disequilibrium in the capital market. To restore a full equilibrium in factor and product markets, the distribution of factors of production between the corporate and noncorporate sectors, the relative quantities of the two classes of products, and the relative prices of factors and products will all typically change. The ultimate resting place of the part of the burden of the tax that is not directly borne by monopoly profits will be determined by a mechanism that differs only in minute detail from that which determines the incidence of the corporation income tax in the competitive case.

Chapter 8

Efficiency Effects of Taxes on Income from Capital

NATURE OF THE EFFICIENCY COST OF TAXES ON INCOME FROM CAPITAL

The effects of the taxation of income from capital can be conveniently classified into (a) those affecting the distribution of income, and (b) those affecting economic efficiency. The first class of effects concerns the question of incidence, about which no general consensus of professional opinion has yet emerged. Although this paper is concerned with the second class of effects, I should like to emphasize at the outset the distinction between the issues that arise in the two classes of problems. This can perhaps best be seen within the confines of the simple model developed in my paper, "The Incidence of the Corporation Income Tax" [1], where it was shown that, so long as the elasticity of substitution between labor and capital is the same in both the taxed sector X and the untaxed sector Y and so long as the elasticity of substitution between the final products of X and Y is the same as the elasticities of substitution between factors of production within the two sectors, then the burden of a tax on income from capital in sector X (the corporate sector) falls exclusively on capital as a factor of production [1, p. 230]. Thus, regardless of whether the three elasticities of substitution in question are all equal to -1, or all equal to -4, or all equal to $-1/4$, the answer to the incidence problem will be the same. However, the efficiency costs of the tax in question will vary greatly, according as the elasticities of substitution are large or small.

To demonstrate the measurement of efficiency costs graphically, Figure 8.1a represents the schedule of the rate of marginal productivity of capital (net of depreciation but gross of tax) in the corporate sector, while Figure 8.1b represents the corresponding schedule for the noncorporate sector. In the absence of any tax, the equilibrium rate of return would be $\bar{r}$, equal in both sectors. However, when a tax is imposed on the income from capital in sector X, the rate of return gross of tax rises there to r_g, while the rate of return net of tax falls in both industries to r_n. The quantity of capital employed in sector X falls from K_{x0} to K_{x1}, while the quantity of capital employed in sector Y

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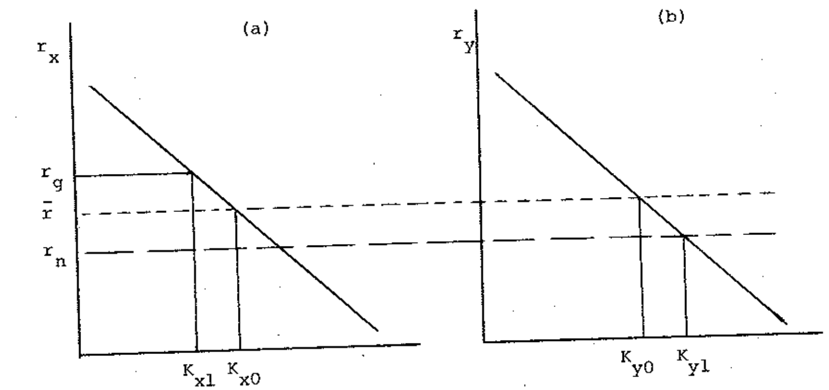

FIGURE 8.1

rises by an equal amount, from K_{y0} to K_{y1}. The economy thus transfers capital from high productivity applications in the taxed sector to low productivity applications in the untaxed sector, with a consequent loss in overall economic efficiency equal to the sum of the two shaded triangles in Figures 8.1a and 8.1b. That this loss equals $1/2\,(r_g - r_n)(K_{x0} - K_{x1})$ can easily be seen once it is recognized that $(K_{y1} - K_{y0}) = (K_{x0} - K_{x1})$. In shorthand form the loss can be written as $-1/2\ T_x\,\Delta K_x$, where $T_x (= [r_g - r_n])$ is the amount of tax per unit of capital employed in sector X, and ΔK_x is simply $(K_{x1} - K_{x0})$, the tax-induced change in employment of capital in industry X.

This measure of the loss in efficiency stemming from a tax on capital in industry X is an application of a more general formulation of the efficiency losses arising from a general set of differential taxes on income from capital in various industries in the economy. This more general formulation is

$$-1/2 \sum_i T_i\,\Delta K_i,$$

where T_i is the tax per unit of capital in the ith industry and ΔK_i is the change in the amount of capital in the ith industry arising as a result of the whole set of taxes $(T_1, T_2, \ldots, T_n)$. The derivation of this formula can be found in my paper, "The Measurement of Waste" [2], especially section IIIA.

Now the size of the loss depicted in Figures 8.1a and 8.1b obviously depends on the slopes of the marginal productivity schedules. For a given tax T_x, the size of the loss will be proportional to ΔK_x, and it can be shown, for the case in question, that ΔK_x will be proportional to the elasticity of substitution. When the three critical elasticities of substitution are all the same, the expression for ΔK_x is $\Delta K_x = S_x(K_xK_y/[K_x + K_y])\,T_x$. Thus, for given initial conditions $(K_xK_y/[K_x + K_y])$, and for a given amount of tax per unit of capital in the corporate sector, the size of ΔK_x, and therefore the size of the efficiency cost of the tax, will be proportional to S_x. The general expression for efficiency cost in this class of cases is $-1/2\ S_x(K_xK_y/[K_x + K_y])\,T_x^2$. It will clearly be 4 times as great for an elasticity of substitution of -1 as for one of $-1/4$, and 16 times as great for an elasticity of -4 as for one of $-1/4$. Since the incidence of the

corporation income tax is identical for the whole class of cases here treated, there can obviously be no close linkage between the effects of the tax in terms of incidence and its effects in terms of economic efficiency. The formulas for efficiency cost, $-1/2\ T_x\,\Delta K_x$ for a tax in capital in a single sector and

$$-1/2 \sum T_i\,\Delta K_i$$

for a set of differential taxes on capital in a variety of sectors, are valid regardless of the incidence of taxes in question. They depend only on three assumptions: (a) a fixed supply of capital to the economy as a whole; (b) equilibrium in the capital market, in the sense that net rates of return are equalized in all uses of capital; and (c) absence of distortions of types other than taxes on capital (or on the income from capital) in different uses. Even these assumptions can be relaxed, but only at a cost of complicating the formulas in question (see [2]).

DISTRIBUTION OF THE TAX BURDEN ON INCOME FROM CAPITAL BY MAJOR SECTORS

This section of my paper develops a rough measure for the efficiency costs of an assumed pattern of taxation on income from capital. The basic data are drawn from the U.S. economy in the period 1953–1959, but the results should be taken as merely suggesting the possible orders of magnitude for the efficiency costs involved, because the values of the relevant elasticities represent plausible assumptions rather than exact estimates. Table 8.1 presents the basic data.

TABLE 8.1

Taxes on Income from Capital, by Major Sectors (annual averages, 1953–1959, in millions of dollars)

	Total income from capital	*Property and corp. income taxes*	*Other tax adjustments*	*Total tax on income from capital*	*Net income from capital*
"Noncorporate" sector	$26,873	$6,639	$1,724	$8,363	$18,510
Agriculture	7,481	1,302	927[a]	2,229	5,252
Housing	18,429	5,140	797[b]	5,937	12,492
Crude oil and gas	963	197	—[c]	197	766
"Corporate" sector	52,399	22,907	9,945[d]	32,852	19,547
Total	79,272	29,546	11,669	41,215	38,057

[a] Fifteen percent of (1) minus (2). Assumes a typical effective tax rate of 15 percent on farm income.
[b] Assumes 70 percent of (1) generated by owner-occupied housing, on which income no personal tax liability is incurred. Assumes 30 percent of (1) and (2) generated by rental housing, with personal tax of 20 percent paid on the excess of income over property taxes. Thus (3) = 6 percent of the difference between (1) and (2).
[c] Assumes personal tax offsets on account of depletion; expensing and similar privileges counterbalance personal taxes on dividends and capital gains arising out of crude petroleum and natural gas operations.
[d] Twenty percent of (1)–(2). Assumes a 50 percent dividend distribution rate, and a "typical" effective tax rate of 40 percent on dividend income.
Source: For cols. 1 and 2, Leonard G. Rosenberg, "Taxation of Income from Capital by Non-Financial Industry Groups" (unpublished Ph.D. Dissertation, University of Chicago, 1963), Table 14.

The terms "Corporate" sector and "Noncorporate" sector are really misnomers: it might perhaps be better to call them the "Heavy-Tax" sector and the "Light-Tax" sector. Agriculture and Housing (i.e., the industry that provides residential housing services) are relatively lightly taxed and also predominantly unincorporated, but the Crude Oil and Gas Industry, although it is largely incorporated, is nonetheless favored by special tax treatment. Likewise, one finds within what I have called the "Corporate" sector a few industries (e.g., personal and business services and wholesale and retail trade) that are not overwhelmingly corporate in structure. These are, however, heavily enough taxed that, even without allowing for taxes on their dividends, approximately 30 percent of the income from capital generated by them is taken in the form of taxes. For the great bulk of the industries in the "Corporate" sector, corporation and property taxes together take 45 or more percent of the total income from capital. Thus no great damage is done by lumping together all nonfinancial industries other than Agriculture, Housing, and Crude Oil and Gas into a single "Corporate" sector for the purposes of this analysis.

The second aspect of Table 8.1 that requires emphasis is that, to my knowledge, it is the first attempt to approximate the total weight of taxation on the income from capital in various sectors. Leonard Rosenberg, from whose work the basic data in columns 1 and 2 are taken, has made a painstaking effort to allocate property tax receipts among industries. His complete results, which cover some fifty separate industries, will be made available in a forthcoming Brookings Institution volume. Here I have aggregated his data into the two broad sectors previously defined. In addition to Rosenberg's allocations, I have attempted to take into account the personal income tax burdens (or offsets) attaching to the income from capital generated in the sectors considered. In making the adjustments in column 3, I have tried consciously to err on the side of being conservative. Thus I have tried not to overstate the personal tax burden arising out of the corporate sector, both by assuming a comparatively low (for dividend recipients) effective tax rate on dividends and by neglecting capital gains taxes altogether. Capital gains themselves are indirectly taken into account by the fact that retained earnings are counted as part of the income from capital generated in the corporate sector, but no tax liability whatsoever is imputed to them. Similarly, I have attempted not to understate the personal tax liabilities nor to overstate the personal tax offsets arising in the noncorporate sector. For example, the effective tax rate on farm income is probably not as high as the 15 percent figure assumed in Table 8.1. Similarly, it is conservative, in the case of Oil and Gas, to assume that the personal tax payments due on the dividends, etc., arising out of Crude Oil and Gas operations are just barely counterbalanced by the personal tax offsets (depletion, expensing, etc.) generated by this set of activities — in fact the personal tax offsets probably far outweigh the personal tax liabilities arising from Oil and Gas.

From columns 4 and 5 of Table 8.1, it can be seen that total taxes on income from capital in the "Noncorporate" sector amounted to $8.36 billion, on the average, in 1953–1959, or approximately 45 percent of the annual average net income from capital generated in this sector during the period. On the other hand, in the "Corporate" sector, total taxes on income from capital

averaged some $32.8 billion per year during the same period, which amounted to some 168 percent of the annual average net income from capital here. (The figures are not so shocking when taxes are expressed as percentages of gross income — 31.0 percent for the noncorporate and 62.7 percent for the corporate sector — but convenience in applying the formula for efficiency cost dictates the use of taxes expressed as a percentage of net income.) The taxation of income from capital in the United States can therefore be very roughly approximated by a general tax of 45 percent on all net income from capital plus a surtax equal to some 85 percent of the net income from capital generated in the corporate sector ($1.45 \times 1.85 = 2.68$).

If we treat a general tax on all income from capital as neutral, as the analysis underlying the first section of this paper implies, we can approximate the efficiency costs of the existing tax system by measuring the efficiency losses associated with a tax of 85 percent of net-of-tax income from capital in the corporate sector. To do this let us take as our unit of capital that amount which generated, in the period considered, $1 of annual net income. Then $K_x = \$19{,}547$ million, and $K_y = \$18{,}510$ million. Applying these figures, plus $T_x = .85$ and $S_x = -1$, to the formula $-1/2\, S_x(K_xK_y/[K_x + K_y])\, T_x^2$, we obtain a measure of efficiency cost of the system of taxes on income from capital equal to approximately $3.5 billion per year. If, on the other hand, $S_x = -.5$, the efficiency cost of the same system would be around $1.75 billion per year.

To check on the plausibility of these results, we can examine the sorts of changes that would be implied by a shift to "neutral" taxation of income from capital, within the context of the model being used. Recall that in the first section, an alternative (equivalent) expression for the efficiency cost of a non-neutral tax on capital in a single sector was $-1/2\, T_x\, \Delta K_x$. Thus our results for an elasticity of substitution equal to unity imply a ΔK_x of approximately -8 billion units, while for an elasticity of substitution of $-.5$ they imply a ΔK_x of approximately -4 billion units. The alternative allocations of capital resources are summarized in Table 8.2.

TABLE 8.2
Alternative Allocations of Capital

	Corporate sector	*Noncorporate sector*
Existing tax system	19.5	18.5
Neutral taxes ($S_x = -1$)	27.5	10.5
Neutral taxes ($S_x = -.5$)	23.5	14.5

My own judgment is that the results for $S_x = -.5$ appear quite plausible while those for $S_x = -1$ appear rather extreme. Nonetheless, it should be recalled that there is some evidence in favor of the proposition that the elasticity of substitution between labor and capital, in manufacturing industry at least, may be in the neighborhood of unity (see Solow [4], and Minasian [3]).

ESTIMATES OF EFFICIENCY COST

Rather than elaborating the results of Table 8.2, which are built on the assumption that the elasticity of substitution (S_x) between labor and capital in the production of X, the elasticity of substitution (S_y) between labor and capital in the production of Y, and the elasticity of substitution (V) between the final products of X and Y are all the same. In this section, I attempt to derive a general expression for the efficiency cost of non-neutral taxation of income from capital in a two-sector model.

The basic model is that developed in my paper on incidence (8.1), and the notation used here will be the same as in that paper. The expression for $\Delta K_x/K_x$ obtained by solving that model is:

$$\frac{\Delta K_x}{K_x} = T \cdot \frac{-Vr_y\left[g_k S_x \frac{L_x}{L_y} + f_k S_y\right] - S_x S_y f_L}{Vr_y(g_k - f_k)\left(\frac{K_x}{K_y} - \frac{L_x}{L_y}\right) - S_y - S_x\left(\frac{f_L K_x}{K_y} + \frac{f_k L_x}{L_y}\right)} \quad (8.1)$$

where

V = elasticity of substitution between products X and Y (defined as a negative number).

S_x = elasticity of substitution between labor and capital in X (also negative).

S_y = elasticity of substitution between labor and capital in Y (also negative).

r_y = share of national income spent on Y.

Vr_y = price elasticity of demand for X (defined as a negative number).

f_k, f_L = shares of capital and labor, respectively, in the value added of industry X.

g_k, g_L = shares of capital and labor, respectively, in the value added of industry Y.

L_x, L_y = amounts of labor used in industries X and Y, respectively.

K_x, K_y = amounts of capital used in industries X and Y, respectively.

The sign of ΔK_x is unambiguously negative.

The wages bill of what is here defined as the corporate sector averaged approximately $200 billion per year in the 1953–1959 period, while that for the noncorporate sector averaged about $20 billion per year. Thus we shall use 10 as the figure to be inserted for (L_x/L_y) in equation 8.1. The return to capital, net of tax, was about $20 billion on both sectors; thus we shall use 1 as the figure for (K_x/K_y) in equation 8.1. The gross-of-tax return to capital in the corporate sector was slightly over $50 billion out of a total value of product of $250 billion; hence we shall set $f_k = .2$ and $f_L = .8$. In the non-corporate sector the gross-of-tax return to capital was about $27 billion out of a total value of product of about $50 billion; hence we set $g_k = .54$. The non-corporate sector accounted for some $50 billion out of a total value of product of some $300 billion for the two sectors combined, so we set $r_y = .17$.

Substituting these values in equation 8.1 we obtain:

$$\frac{\Delta K_x}{K_x} = T\,\frac{-.17V[5.4S_x + .2S_y] - .8S_xS_y}{-.52V - S_y - 2.8S_x}, \quad (8.2)$$

and for K_x = $20 billion, and $T = .85$ we have:

$$\Delta K_x = \frac{-15.6S_xV - .58S_yV - 13.6S_xS_y}{-.52V - S_y - 2.8S_x}. \quad (8.3)$$

Using this expression, Table 8.3 was derived.

TABLE 8.3

Estimates of Efficiency Cost of Existing Taxes on Income from Capital in the United States

S_x (1)	S_y (2)	V (3)	ΔK_x (billions of units) (4)	$-1/2\, T_x \Delta K_x$ (billions) (5)
−1	−1	−1	−6.9	$2.9
−0.5	−0.5	−0.5	−3.5	1.5
−1	−1	−0.5	−5.3	2.3
−1	−0.5	−1	−5.9	2.5
−0.5	−1	−1	−5.2	2.2
−1	−0.5	−0.5	−4.2	1.8
−0.5	−1	−0.5	−4.1	1.7
−0.5	−0.5	−1	−4.8	2.0
−1	0	−1	−4.7	2.0
−0.5	0	−0.5	−2.4	1.0
−1	0	−0.5	−5.0	2.1
−0.5	0	−1	−3.9	1.7

Table 8.3 explores the plausible ranges for the elasticities of substitution in question. For S_x and V, the plausible range is from −.5 to −1. In the case of S_y, because of the importance of the Housing Industry and the Crude Oil and Gas Industry in this sector, the possibility of a zero elasticity of substitution is also explored. In both of these industries — recalling again that the Housing Industry refers to the provision of the services of housing rather than the construction of buildings — there is probably little possibility of substituting labor for capital. Nonetheless, an elasticity of zero is not very plausible for the noncorporate sector taken as a whole because of the demonstrated possibilities of substitution between labor and capital in agriculture.

The general idea emerging from Table 8.3 is that the present pattern of taxes on income from capital in the United States probably has reduced the capital stock in the corporate sector by between 1/6 and 1/3. According to these calculations, the present capital stock of $20 billion (measured in units of net income from capital) would lie between $23 billion and $27 billion if the income from capital were equally taxed in all uses. By the same calculations, the efficiency costs of the existing pattern of taxation lie somewhere between \$1 billion and \$3 billion, more probably between \$1.5 billion to \$2.5 billion per year.[1]

These are probably underestimates of the true efficiency costs involved because, in the process of aggregating industries into broad sectors, distortions induced by the tax system among the industries within each broad sector were ignored. Taking these distortions into account would surely add to the estimated efficiency costs. Moreover, the calculations assume that the taxes on income from capital do not introduce any substitution effect away from saving and toward consumption — that is, so far as the substitution effect alone is concerned, it is assumed that the elasticity of response of savings with respect to the net rate of return on capital is zero. If this substitution effect were not zero, there would be an additional efficiency cost stemming from the distortion of choices between consumption and saving. I do not wish to press this latter point too far, however, because in any taxation of the income from capital — even if such income in all industries and sectors is treated equally — some distortion of the consumption-savings choice is implicit. Only a consumption tax of the Kaldor type would avoid this distortion altogether. My main point in presenting the cost calculations of Table 8.3 is to show that we could substantially improve efficiency by simply rationalizing our existing pattern of taxes on income from capital so as to approach more equal tax treatment of the income generated by capital in the various industries and sectors of our economy.

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[1] The results in Table 8.3 for the cases where $S_x = S_y = V$ are not the same as those emerging from the earlier calculations which were based on the algebraic solution of the system for this special case. The reason for the discrepancy is that the values chosen for (K_x/K_y), (L_x/L_y), f_k, etc., are derived from the tax situation rather than the pretax equilibrium. This is similar to the discrepancy one obtains in measuring demand elasticities over a very broad range, depending on whether one takes initial or terminal points as the basis on which percentage changes are computed.