

THE PROPERTY TAX: AN EXCISE TAX OR A PROFITS TAX? ¹

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I. Introduction

A widely accepted proposition of incidence theory is that the burden of a local property tax on reproducible capital is shifted to consumers and is equivalent to an excise tax. This result dates back to the work of Marshall (1897), Pierson (1902), Edgeworth (1925), more recently to the work of Simon (1943), and is used repeatedly in empirical work, Musgrave et al. (1951), Gillespie (1965), and in the literature on housing and urban problems, Netzer (1966, 1968). Netzer has expressed property taxes on the housing stock in the nation as a whole as an excise tax on housing services. Also in the national accounts prepared by the U.S. Department of Commerce, property taxes are lumped together with sales and manufacturers' excise taxes in the category, indirect taxes.

While the proposition that the property tax is an excise tax represents conventional wisdom there are two opposing points of view. One is that the property tax is very similar, if not fully equivalent, in its distributive effects to taxes on profits. This view of the effects of the property tax was first developed by Brown (1924) in a well-known, though neglected section of his book, *The economics of taxation*, and has been restated by Thompson (1965). The second, somewhat different proposition is that a property tax on improvements (reproducible capital) is shifted through a reduction of site rents onto owners of land. This argument, first found in Marshall (1890), has also been recently

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were to consider the expenditure side we would have to specify the value placed on a particular bundle of services by different groups for varying rates of tax and to recognize that varying tax bases between communities lead to different levels of public services for the same tax rate. To avoid these complications we make the conventional simplification of taking the budget as given, essentially ignore it, and attempt to determine the change in factor and commodity prices that rest from a particular method of finance and compare these distributive effects with those derived for alternative tax regimes.

Given the above assumptions it follows that when all cities in the nation impose the same rate of property tax on all types of reproducible capital the burden of the tax falls on the owners of capital. Under marginal productivity factor pricing any attempt to shift the tax will be frustrated. For example a rise in commodity prices relative to wages results in a decrease in real wage below the value of the marginal product of labor and this will result in an increase in the demand for labor that will restore the real wage to its original level. Also as capital accumulation is assumed to be independent of tax changes the before-tax rentals on capital goods and the reproduction cost of capital goods are unaffected by the imposition of the tax. Asset prices will remain unchanged and the rate of return (rate of interest) will fall in proportion to the size of the property tax.

Contrary to the conventional wisdom the imposition of a general property tax does *not* increase the price of housing services. Although owner occupants have to pay a property tax the price of rental housing is not increased. The cost of housing for the owner-occupant also remains unchanged, as the opportunity cost of capital falls by the amount of the tax, leaving total housing costs unchanged. Changes in the relative income positions of different groups are due solely to the different amounts of wealth that they own. A renter who does not own any wealth will not bear any of the burden of the property tax. An individual who owns a \$20,000 house and another individual who owns \$20,000 worth of manufacturing equipment will both bear the same tax burden.

Furthermore for the special case under consideration the property tax is *not* a benefit tax. Households pay taxes only in their role of owners of capital. When an initial equilibrium is disturbed by a change in preferences and all communities increase public expenditures, and finance these expenditures by increasing the property tax rate by the same amount, the additional tax burden will fall on the owners of

capital. The overall marginal productivity of capital is not changed by an equal increase in tax rates in all communities. In the extreme case where all capital is owned by a single individual and all towns are composed of renters the benefits of the higher public expenditures will be enjoyed at the expense of the capitalist.

2. The excise tax effects of property taxes

The above results are highly stylized by the assumption that all towns tax all capital at the same rate. In fact, thousands of local governments and special districts impose property taxes at different rates with different coverage, and with varying assessment practices.⁴

Tax rate differentials between communities result in excise tax effects. These effects are the result of the perfect mobility of capital which equalizes the after-tax rate of return in all communities. A town, which because of a higher than average propensity, or need, to spend on public goods and services, imposes a relatively high rate of property tax on housing, impose a relatively high property tax rate on industrial capital, the cost of capital to these industries will rise and, depending on the competitive position of the industries in the high tax communities vis-a-vis firms in other areas, the price of the products of the heavily taxed industries will rise, and/or wages and the returns on land will have to fall so that the industries in the high tax town can remain competitive.

In order to highlight the excise tax effects of property tax differentials I shall (in this section of the paper) make a number of further simplifying assumptions. First that there are no 'economies of scale' associated with high density industrial and residential development, and transportation costs are negligible. Capital and workers are perfectly mobile between communities so that after-tax rates of return on capital and wage rates are equal in all communities.

Although there is little relation between place of work and place of residence, different households prefer, for a given set of housing prices, different residential locations (cities). If relative housing prices change some of the households will change their place of residence. I also assume that each town is surrounded by farm land and that the supply of land from agriculture to urban use is perfectly elastic at the opportu-

⁴ Beck (1963) analyzed the effective property tax rate for about one hundred communities in Northeastern New Jersey and found effective tax rates varying from less than 1% to over 7%.

* *will pay more for the services of capital. In vital and certain communities.*

work with income distributions for each separate taxing jurisdiction. But if this is not feasible and when the correlation between the level and distribution of income in various communities and the level of property tax is weak it will not be inaccurate to ignore the excise tax effects and to treat the property tax as a profits tax. For if the shape of the income distribution and mean income levels are the same in low tax towns as in high tax towns excise tax effects at the global level will cancel for each group at a particular level of income.

To this point we have abstracted from changes in relative prices in the industrial sector by assumption that all cities tax industrial capital at the same rate, which is equal to the average tax on residential capital.

As in the case of home goods an above-average rate of tax on a particular export commodity, which by assumption is specific to a given town, will increase the cost of capital to that industry. When there is little or no correlation between the production parameters of specific industries (the relative factor intensities and the relative sizes of the elasticities of substitution) and the tax rates imposed on different industries, the capital released from the industries located in high tax towns will be absorbed in industries subject to low rates of tax without an appreciable change in the *average* before-tax rate of return on capital. On the other hand if high tax areas produce predominately capital (labor) intensive commodities and the elasticities of substitution are relatively high (low) in these industries the average rate of return on industrial capital will fall (increase).

As in the analysis of taxes on home goods it is important to measure the excise tax effects of property taxes on industrial capital relative to the mean rate of tax on this type of capital. If the average property tax rate on industrial capital is 3% and the shoe industry is taxed at a rate of 4%, the price of capital to the shoe industry will be 1 percentage point higher. If the average before-tax rate of return is 10% and the share of capital is 0.25, the price of shoes will increase by 2.5%. The relative prices of commodities produced by industries, subject to tax rates below the mean rate for industrial sector, will fall and as in the taxation of residential capital excises taxes tend to cancel, with some commodities increasing in price and others decreasing in price. In empirical work these excise tax effects are important when commodities taxed at below average rates are disproportionately important in the consumption patterns of specific income groups.

We have discussed separately the excise tax effects of property taxes

on residential real estate and on industrial property. Assumptions were made to minimize the possible changes in overall rates of return on capital within each of the two broad sectors. In fact, capital is mobile between industry and residential real estate and the possibility of tax differentials between broad industry groups must be accounted for. Housing services, in the aggregate, may be taxed more heavily than industrial capital or vice-versa. If this is true the price of housing in general will rise relative to the price of industrial goods; there will be a reallocation of resources; and since housing is very capital-intensive the price of capital will fall relative to the price of labor. Consumers of housing services and owners of capital suffer a loss in real income while consumers of other goods experience an increase in real income as a result of a decrease in the price of commodities other than housing services.⁶

3. The immobility of labor, the capitalization of property taxes and their effects on land values

The major qualification to the result that local tax differentials increase or decrease the price of locally produced goods and services by the changes in the cost of capital services is the possible decrease in the returns to imperfectly mobile factors of production.

In this section we retain the assumption of perfect mobility of capital, allow for the imperfect mobility of labor and assume that the supply of land in each taxing jurisdiction is fixed. Also our analysis is

⁶In an earlier paper (Mieszkowski, 1970, p. 1110) I sketched an example which was designed to bring out Brown's major insight on the effects of property tax. Brown took exception to the view that a property (profits) tax on residential real estate is shifted to the consumer and argued that a tax on housing would shift capital out of housing and would be a tax on capital in the economy as a whole. Brown also pointed out that the small size of a taxed sector is not a sufficient reason for ignoring general equilibrium adjustments.

In our example, we assume an economy consisting of three groups, A, B, C. A property tax is imposed on apartment dwellings, a service consumed only by group A. Group C owns all of the capital, and originally 1% of the total capital stock is used as apartment buildings. With appropriate assumptions it is possible to show that the imposition of a tax on apartment buildings will decrease the after-tax rate of return on all capital by 1%. This means that total profits have decreased by the amount of the tax. Simultaneously the price of apartment units will increase by the amount of the tax. This means that in addition to the taxes collected by government the consumers of products other than the commodity subject to tax gain at the expense of capitalists. Brown's insistence that a tax on housing falls on the earnings of all capital through the shift of capital out of the capital-intensive housing sector can be at best partially correct when there exist substantial differences in the spending patterns among various income groups.

rent on land in all activities, high-rise residential, single-family residential, commercial and industrial will be the same. The size of buildings, per unit of land space, will depend on whether marginal cost of floor space increases with the size of the building, and on the return to the complementary services of land, such as parking space, recreational uses of land in apartment house developments and so on. The marginal revenue product of capital on a given plot of land is expected to fall as the size of the building is increased.

To make things as simple as possible all activities of a city are aggregated into a single output, X , which is produced with inputs of labor, L , capital, K , and land, R .⁸

The model is a system of six equations in six unknowns, L, K, X, P_X, w , and r , and an exogenous tax expressed as a per-unit tax on capital, T . The supply of land, R , is taken as fixed. The six equations are as follows:

- (1) $X = f_1(L, K, R)$, supply of X
- (2) $X = f_2(P_X)$, demand for X
- (3) $K = f_3(w, r, T, X)$, demand for K
- (4) $L = f_4(w, r, T, X)$, demand for L
- (5) $L = f_5(w)$, supply of L
- (6) $P_X X = wL + rR + (P_K + T)K$, price relation.

Equation 1 is a linear homogeneous production function which relates the output of X to the three factor inputs. Relation 2 is the demand relation which makes the demand for locally produced commodities a function of the price of local commodities, P_X . With this very simple demand formulation I ignore the income effects arising from changes in the population (labor force). Equations 3 and 4 are two of the three factor demand relations for labor, land and capital. Only two of the three equations are independent. These factor demand equations are based on cost minimizing considerations. For a given set of after-tax factor prices and for tax rate, T , the demand for capital labor, and land depends on level of output. When relative factor price change factor substitutions will occur and at each level of output factor proportions will change. Hence changes in the demand for factors will

⁸ The aggregation of home goods and industrial activities, into a single output omits an important feature, the possible differential change in the prices of the two broad commodity classes, home goods and exports. However, little is lost through the aggregation in understanding the effect of property taxes on factor prices, and the effects of different technologies on these changes.

occur as the result of output effects and factor substitution effects. As the after-tax return on capital, P_K , is given by national conditions and is taken as the numeraire, it has not included in the factor demand equations. The cost of capital changes only as a result of changes in the rate of property tax.

Equation 5, is a simple supply of labor equation that makes the supply of labor a function of the local wage rate (the wage rate in other communities is taken as given). For simplicity the effect of changes in the prices of home goods (housing etc.) on the supply of labor is ignored.

Equation 6 is a price relation, or total revenue function, that relates the price of the output to the prices of the factors.

In order to investigate the effects of changes in the tax rate, T , on the returns to labor and land, and on the price of X the system of equations 1-6, is differentiated totally with respect to T and a solution is obtained for dw/dT and dr/dT . As this differentiation is straightforward it is not presented in any detail.⁹ The differentiation of the factor demand equations may be the only unfamiliar part of the exercise.

The differentiation of the demand for capital equation, relation 3, yields after some rearrangement

$$\frac{dK}{K} = a_{KL} dw + a_{KR} dr + a_{KK} dT + \frac{dX}{X} \quad (3')$$

The a_{ij} 's are the elasticities of demand for factor i with respect to a change in the price of factor j . As defined by Allen (1950) a_{ij} is the partial elasticity of substitution between factor i and factor j weighted by the proportion of factor j in total cost: i.e. a_{KL} is $f_L \cdot \epsilon_{KL}$ where ϵ_{KL} is the partial elasticity of substitution between capital and labor. Allen showed that $a_{ii} < 0$ and that $a_{iL} + a_{iK} + a_{iR} = 0$ for $i = L, K, R$. He also demonstrated that either all three partial elasticities of substitution a_{ij} , $i = j$, are positive or that one of the three partial elasticities is negative

⁹ In carrying out the differentiation we make use of the convention that commodity and factor prices are originally equal to 1. Also because of the choice of capital as the numeraire, $dP_K = 0$. We make use of marginal productivity conditions and the assumption of constant returns to scale. For example in differentiating equation 1 we have $dX = f_{LL} dL + f_{LK} + f_{LR} dR$. Since factors are paid the value of their marginal products we can replace the partial derivatives f_{LL}, f_{LK} and f_{LR} with $w, r, K + T$ and r , and divide both sides of the expression by X to obtain $dX/X = f_{LL}(dL/L) + f_{LK}(dK/K) + f_{LR}(dR/R)$ where f_{LL}, f_{LK}, f_{LR} are the original shares of bot. capital and land respectively. In differentiating the commodity demand and supply of labor relations we transform the partial derivatives to elasticities.

response of labor to changes in the wage rate.

When land and labor are both perfectly immobile the change in the relative prices of labor and land depend on the relative responses in the demands for these two factors to changes in their prices and to the change in the cost of capital. If the factor substitution possibilities are greater for labor than for land, the price of labor will increase relative to the price of land. If as expected ($a_{LK} - a_{RK}$) is positive the second term of the numerator of the expression for dw/dT (equation 7) is unambiguously positive. When in addition ($a_{KL} - a_{RL}$) is positive the second term in the numerator of equation 8 is unambiguously negative.

As factor substitution terms appear in both the numerators and denominators of expressions 7 and 8 it is uncertain what effect the magnitude of these parameters will have on the absolute value of dw/dT and dr/dT . On the other hand the effects of these parameters on relative magnitudes of dw/dT and dr/dT are easier to interpret.

By rewriting equation (4'') in footnote 10 dr/dT can be expressed in terms of dw/dT

$$\frac{dr}{dT} = \left(\frac{a_{LL} - a_{RL} - E_L}{a_{LR} - a_{RR}} \right) \frac{dw}{dT} + \left(\frac{a_{RK} - a_{LK}}{a_{LR} - a_{RR}} \right) \quad (9)$$

Assuming $a_{RK} - a_{LK}$ to be negative it follows from equation (9) that when dw/dT is negative the fall in r relative to w will be less the more responsive is the demand for land to changes in the price of land. When dw is positive it is unclear, because of the constant term, whether it will be to the benefit of landowners (relative to workers) for ($a_{LR} - a_{RR}$) to be as small as possible. Nevertheless it is quite likely that the less elastic the demand for land with respect to its price the larger will be the increase in the return on land relative to the increase in wages. There is a straightforward interpretation to these results. If wages fall as a result of a tax-induced decrease in economic activity, the fall will be cushioned by the possibility of substituting labor for land and capital. If the factor substitution possibilities are smaller for land than for labor, the price of land will fall more. On the other hand when the demand for labor and land both rise, the return to labor will increase relatively less as the demand for this factor is more elastic with respect to changes in its price.

The close connection between the price of land and the wage rate also serves to explain the curious result that the price of land does not

necessarily fall more when the supply of labor is more responsive to wage rate changes.

As E_L , the elasticity of supply of labor with respect to wage rate change appears only in the denominator in the expression for dw/dT the wage rate will necessarily fall less when the supply of labor to the city is more elastic. However, it does not follow from (9) that an increase in E_L , which leads to a decrease in dw/dT , will necessarily increase (decrease) the magnitude of dr/dT . It is expected that a smaller decrease in the wage rate due to mobility of labor (assuming dw/dT negative) will depress the demand for X and will decrease land prices. Working counter to this effect is the increased demand for land as a result of the smaller fall in wages. The possibility the land prices will fall less, not more, when labor supply is more elastic should be considered as a curiosity as it depends on a high partial elasticity of substitution between labor and land relative to price elasticity of demand for X . Also the model under consideration leaves out the interaction between the demand of certain components of X (the home goods sector in X) and income and population in X .

A narrowing of the possible range for dw/dT , and dr/dT depends on estimation of the parameters in expressions (7) and (8). However, even without hard estimates reasonable restrictions can be placed on the likely range in the change in wages and land rents. For most cities the share of land rents in the total value of output is unlikely to exceed 5%.¹² The share of labor is around 70% and the share of capital 25%. The small share of land relative to labor and capital means land rents may fall dramatically and still not absorb the full burden of the tax on capital. The change in the price of X is related to the tax and changes in factor price by the relation

$$dp_X = f_K dT + f_L dw + f_R dr. \quad (10)$$

¹² The overall share of wages in national income is about 70%. This leaves 30% to be divided between real capital and land. The balance sheets in statistics of Income Corporation Income Tax Returns (1966) show that for all corporations the value of land relative to the value of depreciable assets is about 13:1. For corporations in the real estate industry, an industry in which large inventories of land are held for development purposes, this ratio is about 3:1. From Netzer (1966) tables 2-7 we calculate the ratio of residential structures to private residential land to be about 7:1. On the basis of these data it seems safe to conclude that average capital rentals are at least five times the level of land rents.

From (13) and (14) it follows

$$\frac{dX}{X} = \frac{E_X(dp_K/p_K)}{1 - \epsilon_r E_X} \quad (15)$$

We assume that ϵ_r is small relative to E_X . When $E_X = -1$ and $\epsilon_r = 0.1$ the fall in output will be 9% when capital cost are increased by 10%. When E_X is raised to -5 , output will fall by 33% when the cost of capital is increased by 10%. In order to simplify the relation between the level of land rents and the level of output we assume that total variable costs are given by the quadratic function

$$(cX + mX^2)p_K \quad (16)$$

Land rents are equal to the difference between price (marginal cost) and average cost multiplied by the level of output. For the quadratic total cost function this difference is equal to $(c + 2mX - (c + mX))X/p_K$ which reduces to

$$R \text{ (land rents)} = mX^2 p_K \quad (17)$$

Taking the cost of capital to be equal to 1 when the rate of property tax is zero the ratio of land rents with the tax to the level of land rents in the absence of tax is equal to

$$\frac{R_1}{R_0} = (1+t) \left(\frac{X_1}{X_0}\right)^2 \quad (18)$$

Approximating the ratio of X_1/X_0 by means of equation (15) and taking t equal to 0.1 the ratio R_1/R_0 for $E_X = -5$ is equal to (1.1)(0.66) = 0.48. Land rents fall by more than 50% of their original value. For E_X equal to -1 the fall in land rents is about a little less than 10%, i.e. $R_1/R_0 = 0.91$.

The decrease in land rents relative to the level of tax collections on the improvements depends on the value of land relative to the value of improvements. Assume that before the tax was imposed the ratio of capital rentals was 4:1 – and 100 units of capital were employed in the CBD. Capital is measured so that the after-tax return on capital is equal to 1. For $E_X = -0.5$ the imposition of a 10% tax will reduce the

amount of capital to 66 units, tax collection will equal 6.6 units and land rents will fall from 25 units to 12. For a ratio of improvements to land of 10:1 land rents will fall by 75% of tax collections.

For smaller values of the price elasticity of demand the fall in land rents will be much less dramatic. When E_X is equal to -1 tax collections will be equal to 9 units and land rents will fall by 9% of their original value when the capital to land ratio is 10:1. When the capital to land ratio is 4:1 the fall in land rents will be 25% of tax collections.

The simultaneous increase in prices and fall in land rents illustrates the need of dealing with both excise tax effects of local taxes and their effect on factor prices. In this model purchasers of the taxed commodities will pay prices that “include” the property tax and land prices may also fall by substantial amounts. There are two possible interpretations to the fall in land values. One is that it reflects a transfer of income from the owners of CBD land to the owners of suburban land where CBD activities have relocated. However if the CBD has some unique features that favor the concentration of economic activity at this site the imposition of the tax in the central city may lead to an overall fall in land values. The overall fall in land values reflects the dead weight loss associated with the dispersal of the CBD.

There are several reasons for doubting that land rents will fall by amounts which approach the level of tax collections on improvements. First dramatic changes in rents depend on very elastic demand for floor space at the CBD. Second by ignoring complementary labor inputs in the provision of floor space at the CBD we exaggerate the increase in prices that result from an increase in the cost of capital. Finally it is unlikely that the value of land will be greater than 10% of the value of improvements.

5. The benefits of public expenditures and the differential incidence of the property tax

On balance the introduction of the benefit side of the budget significantly complicates any analysis of the budgetary policies of local governments. A general way of introducing public expenditures is to write the demand for home goods X_H as a function of their price P_H and the level of public expenditures g . An increase in the property tax rate by increasing the cost of capital will increase the price of home goods. However, if the marginal utility of public goods is high consumers will be willing to pay the additional cost and the overall effect of a budget

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