THE NON-NEUTRALITY OF LAND VALUE TAXATION**

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A neutral tax is one that does not distort resource allocation. Its economic effect is purely distributional. It is well established that the real property tax is non-neutral. This is because the supply of structures and improvements is not fixed and the imposition of a tax on them distorts land-use decisions. Even so, that part of the property tax which falls on unimproved land is widely thought to be neutral.[1] Since the supply of land is fixed, the tax is said to be unavoidable. Landowners, therefore, are not induced to change their land-use plans when the tax is imposed, or its rate changed.

This view of the tax on land is badly mistaken. It is true that a (less than 100 percent) tax on land *income* is neutral, but this does not extend necessarily to a tax on capitalized land *value*, or changes therein. The reason is that the discounted sum of payments with the latter tax is not invariant to the intertemporal characteristics of the income stream produced by land. Among options with equal present value, it is greater for income streams skewed to the distant future than for those skewed to the near future.

Brian L. Bentick demonstrated as much in a recent paper.[2] He constructed a counterexample to the neutrality proposition by showing that an annual tax on land whose base is current market value favors land uses with early-payoff income streams.[3] Making explicit assumptions about the supply of competing development projects available to a landowner, he offered a measure of the resource cost of the tax, and found it to be of significant magnitude for plausible values of his model's parameters. He also showed that the resource cost can be reduced significantly if the tax base is changed from current market value to the hypothetical value where the current use is presumed by the appraiser to be maintained perpetually. This hypothetical value is subject to change only when the "current" use changes.

Bentick's analysis compared the present value of income streams produced by two, mutually exclusive development projects on a *single* land parcel before and after the tax is introduced. The tax was shown to be capable of reversing the order of the landowner's preference between the projects, and thus changing the use to which the parcel is put. Implicit in this approach is the assumption that introducing the tax does nothing to change the magnitude of income streams themselves. This is not objectionable where the tax is introduced for the parcel in question only. But if it is introduced through a tax jurisdiction where demand for projects is downward sloping, it will cause enough land to be shifted between projects to alter the income streams. The favored project will become more plentiful and the periodic income produced on land devoted to it will decline accordingly. The other project will become more scarce and its periodic income will increase.

This note extends the analysis of taxes on land value to include endogenous land-market adjustments precipitated by their imposition. While these adjustments do not eliminate the distortion Bentick described, they mitigate its effects and have considerable bearing on the proper measure of its resource cost. They also enable a conventional treatment of the incidence and burden of the tax.

I. A Model of the Land Market

Consider a tax jurisdiction with a fixed amount of homogeneous land, L, for the land market to allocate between two perpetual projects.[4] The amount allocated to project 1 is x. If demand for projects is sufficiently great that no land is left undeveloped, the amount allocated to project 2 is L-x. Land ownership is diffuse and the land market atomistic. Following Bentick, we assume the first project is

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undertaken in year 0 and the second in year $T > 0$. Demand for each project is downward-sloping, so their incomes are a decreasing function of the amount of land devoted to them. After all inputs are purchased, the annual income per unit of land is $c_1(x)$ for project 1 and $c_2(x)$ for project 2, where:

$$dc_1/dx < 0, dc_2/dx > 0.$$

Both $c_1(x)$ and $c_2(x)$ are constant over time and begin in the year projects are undertaken. Land used for project 2 earns no income between 0 and T.

Land market equilibrium requires that the present value of each project be equal on a per unit of land basis. If the annual discount rate is r, the present value of a unit of land for project 1 is

$$V_1 = c_1(x)/r.$$

For project 2 it is

$$V_2 = e^{-rT}c_2(x)/r.$$

Thus in equilibrium, x must satisfy

$$c_1(x) = e^{-rT}c_2(x). \qquad (1)$$

This is more than an equilibrium condition; it is also necessary and sufficient for an efficient land allocation. It implies that $c_2 > c_1$; since project 2 requires a gestation period without income, its annual income must exceed that of project 1 once it begins.

Now let us suppose that an annual tax on the income from land is introduced. If the tax rate is b and the discount rate does not change, the present value of a unit of land for project 1 is

$$V_1 = c_1(x)(1 - b)/r.$$

For project 2 it is

$$V_2 = e^{-rT}c_2(x)(1-b)/r.$$

These must be equal in land-market equilibrium. Since this upholds (1), the land allocation is the same as before. An annual tax on the *income* from land is neutral toward resource allocation.

II. The Tax on Land Value

Suppose instead that an annual tax on land *value* is introduced. Let the effective tax rate be b. In this case, the present value of a unit of land for project 1, V_1, must solve

$$(c_1(x) - bV_1)/V_1 = r,$$

where annual property taxes are bV_1. This means:

$$V_1 = c_1(x)/(r+b). \qquad (2)$$

The present value of a unit of land for project 2, V_2, is less easily derived. This is because the return to the owner of such land between 0 and T comes in the form of an increase in its market (and assessed) value rather than current income. Let the market value of a unit of land being held for project 2 at time t, $0 \leqq t \leqq T$, be $V_2(t)$. By the argument employed above to derive V_1, we obtain

$$V_2(T) = c_2(x)/(r+b). \qquad (3)$$

Between 0 and T, $V_2(t)$ must increase at a rate that provides the land-owner a rate-of-return (in the form of capital appreciation) of r after property taxes are paid. At t, property taxes are $bV_2(t)$, so this means that for $0 \leqq t \leqq T$,

$$\frac{\dot{V}_2(t) - bV_2(t)}{V_2(t)} = r,$$

or

$$\dot{V}_2(t) = (r+b)V_2(t).$$

This implies that $V_2(t)$ grows exponentially at the rate $r + b$, and that

$$V_2 = e^{-(r+b)t}V_2(t), \quad \text{for} \quad 0 \leqq t \leqq T. \qquad (4)$$

Solving (4) for $t = T$ using (3), we get

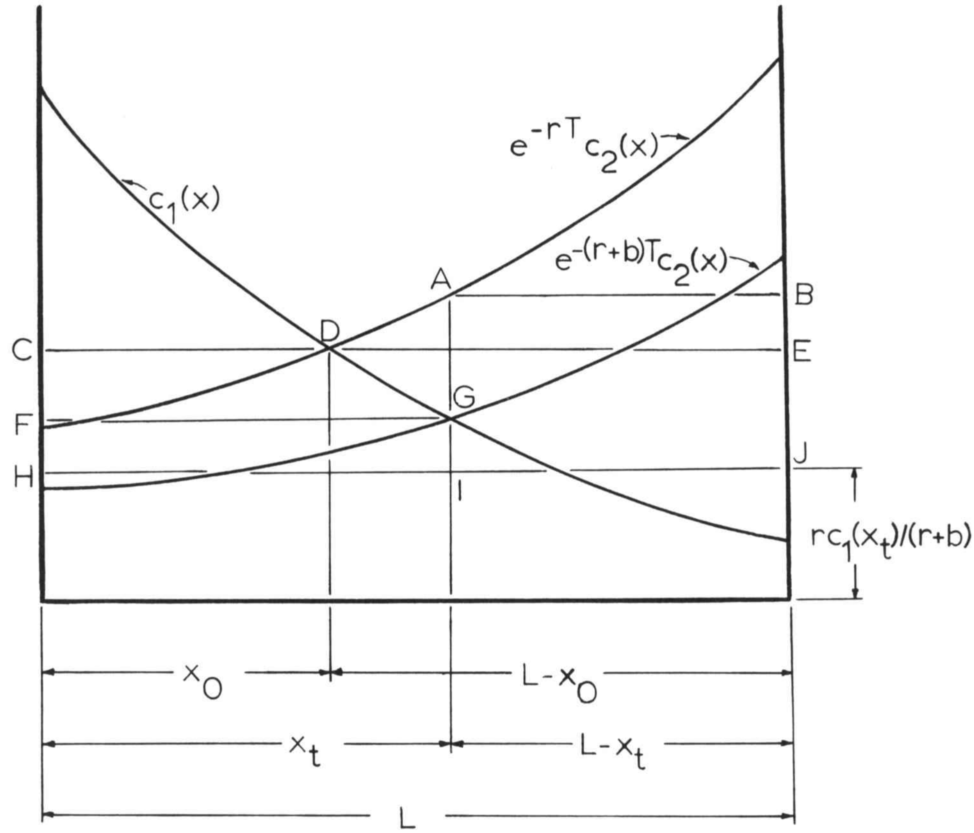

FIGURE 1

$$V_2 = e^{-(r+b)T}c_2(x)/(r+b). \quad (5)$$

In equilibrium, (2) and (5) must be equal. (1) is not upheld in this equilibrium, but instead we have

$$c_1(x) = e^{-(r+b)T}c_2(x). \quad (6)$$

(6) establishes the non-neutrality of the land value tax. By implicit differentiation, (6) implies that

$$\frac{dx}{db} = \frac{Tc_1(x)}{(e^{-(r+b)T}dc_2/dx - dc_1/dx)} > 0.$$

When a land value tax is introduced, or the tax rate increased, x increases. This means some land that would otherwise be used for project 2 is diverted to project 1. The tax favors the project with the early-payoff income stream.

An intuitive explanation for this bias is supplied as follows. Both (2) and (5) indicate that the imposition of the tax has an effect on land value *equivalent* to raising the discount rate to r + b. This is so because, as Bentick says, landowners "will require a gross rate-of-return of r + b in order to continue enjoying a net return of r" (p. 863). It is elementary that an increase in the discount rate would favor the project with the early-payoff income stream. Because the land value tax has an equivalent effect, it too distorts resource allocation.

This bias and its resource cost are illustrated in *Figure 1.* Units of land are plotted horizontally and x is plotted from the left. The slopes of labeled curves reflect earlier assumptions. The c_1 curve represents the annual derived demand for project 1 land beginning in year 0. Thus, the present value of net benefits (regardless of their distribution) provided by x units of such land are $\int_0^x (c_1(y)/r)dy$. The c_2 curve (not shown) represents the annual derived demand for project 2 land beginning in year T. The present value of net benefits provided by this land is $e^{-rt}\int_x^L (c_2(y)/r)dy$. The latter is equivalent to having an annual derived demand for project 2 of $e^{-rT}c_2$, as shown in the figure, beginning in year 0.

This equivalence can be exploited to illustrate conditions (1), (6) and their respective land allocations. Then it can be used to demonstrate the incidence and burden of the land value tax in *annual-equivalent* terms.

With no tax on land, (1) holds (see D) and x_0 units of land are assigned by the market to project 1. The remainder is used for project 2. This means land is allocated so that the net benefits produced in both uses are equal at the margin. After the land value tax is introduced, (6) holds (see G) and project 1 gets x_t units of land where $x_t > x_0$. With the increase in x, net benefits are not equated at the margin; too much land goes to project 1.

Because of this, demanders of project 1 gain at the expense of project 2 demanders. In annual-equivalent terms, the gain to demanders of project 1 is CDGF; the loss to demanders of project 2 is ABED. Landowners also lose. Before the tax, their annual-equivalent income is $c_1(x_0)$ for each of the L units (again, see D). After the tax it is rV_1, or from (2), $rc_1(x_t)/(r + b)$ for each unit of land (see I). Thus, their annual-equivalent loss is CEJH. The tax revenue gain from each unit of land is of course the difference between the revenue paid by demanders—$c_1(x_t)$ with project 1 and $e^{-rT}c_2(x_t)$ with project 2—and the after-tax income received by landowners. The annual-equivalent gain in tax revenues is thus FGIH + ABJI. When the gains in this analysis are set against the losses, there is a net loss equal to AGD. This is an annual-equivalent measure of the resource cost of the site value tax in every year.

A rough notion of the empirical magnitude of this annual resource cost can be provided. AG in Figure 1 equals $(e^{bT} - 1)c_1(x_t)$, so the annual resource cost is approximately $(e^{bT} - 1)c_1(x_t)/2$ per unit of land diverted. If for instance $b = .02$ and $T = 5.5$ years, the annual resource cost per each ten units of land diverted equals $c_1(x_t)$—the annual income from one unit of land used for project 1. The amount of land diverted depends of course on the magnitude of b, T, and the elasticities of the c functions.

III. Conclusion

The fact that real property taxation fosters inefficient land use by penalizing structures and improvements has been voiced by tax theorists for some time. It has been a major consideration among those who favor eventual displacement of the tax with a pure tax on site value. The chief virtue of the latter is held to be its neutrality. Daniel M. Holland, for instance, has said that:[5]

> "supporters of a tax on site value as a *substitute for the property tax now in use* make their case by stressing the neutrality of the former. Unlike the tax on improvements, a tax on site value would be invariant with the development decision. What was the optimal development in the absence of the tax will remain optimal in its presence" (emphasis in original).

The neutrality claim can no longer be maintained in the case of a tax based on land value. (The claim is sustained for a tax on land-generated income, but administration of such a tax is fraught with formidable problems.) This should provoke a reconsideration of the presumption that a site value tax is more efficient toward resource allocation than a property tax. Granted, two distortions are operative in the latter: the traditional one penalizes capital-intensive projects and the other favors projects with early-payoff income streams. But if a property tax is to be replaced with a site value tax producing equal revenue, the tax rate applied to land value must rise significantly with the switch. While this eliminates the first distortion, it enlarges the second. It is therefore possible (although by no means certain) that the resource cost of the site value tax is actually greater than that of the property tax.

Whether this would occur is of course an empirical question. It is not likely to be one easily resolved. The first distortion above has been well understood for some time, yet empirical efforts to measure the magnitude of its effect have been of limited success.[6] The intertemporal bias that is the subject of this note is considerably more subtle. Empirical measures of its importance will certainly be no easier to obtain.

FOOTNOTES

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[1]For instance, Dick Netzer writers (*The Economics of the Property Tax,* Washington, Brookings, 1966):

> "[T]he site value tax will be entirely neutral with regard to landowner's decisions, since no possible response to the tax can improve the situation. . . . [I]t is a lump-sum charge to the owner" (p. 205).

[2]Brian L. Bentick, "The Impact of Taxation and Valuation Practices on the Timing and Efficiency of Land Use," *Journal of Political Economy,* V. 87, no. 4, (August 1979): 859–868.

[3]This result is not without precedent. Donald C. Shoup demonstrated the bias a decade ago in "The Optimal Timing of Urban Land Development," *Papers of the Regional Science Association,* V. 25 (1970): 33–44. He observed that a site value tax creates an effect on development-timing decisions that is identical to that of an increase in the discount rate:

> "It is interesting that the difference between this optimal development timing condition and the one found previously in the absence of a land tax is one sense in which a pure site value tax may not be perfectly neutral in its effect on resource allocation, as is frequently claimed" (p. 39).

The bias is also described by Roger S. Smith, "The Effects of Land Taxes on Development Timing and Rates of Change in Land Prices," in *The Taxation of Urban Property in Less Developed Countries,* Roy W. Bahl, ed., Madison, Wisconsin, 1979.

[4]The homogeneity assumption means land parcels of equal size are perfect substitutes. This removes the possibility that some part of land rent is due to locational, topographical or other site-specific land features. To assume that parcels are imperfect substitutes would increase the model's generality but complicate the issue at hand unnecessarily. An alternative and more practical interpretation of the homogeneity assumption is to define a unit of such land using William S. Vickery's "standard state" basis ("Defining Land Value for Taxation Purposes," in *The Assessment of Land Value,* Daniel M. Holland, ed., Madison, Wisconsin, 1970). The two-project assumption is used merely to facilitate a graphical representation of land-market equilibrium; the analysis generalizes too many projects. The fixed-quantity assumption is a convenient way to incorporate the fact that land in the jurisdiction is scarce. If it is not, land rent is zero and tax distortions are irrelevant.

[5]P. 6, "Introduction," *The Assessment of Land Value,* Madison, Wisconsin, 1970: 3–8.

[6]This is admitted by Donald C. Shoup ("The Effect of Property Taxes on the Capital Intensity of Urban Land Development," *Metropolitan Financing and Growth Management Policies,* Madison, Wisconsin, 1978: 105–132), who makes a careful attempt with two case studies involving micro-data.