CAPITALIZED PROPERTY TAXES AND THE
VIABILITY OF RURAL ENTERPRISE
SUBJECT TO URBAN PRESSURE[*]

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There are two views on the impact of property taxation on the rate at which farm land is converted to urban uses. On one view the tax contributes to the break up of farms. This is because it forces farmers to reluctantly sell property in order to provide the funds which are needed to pay property taxes which are based on the potential of the land for conversion to urban uses - its "highest and best" use.[1] The opposing view is that the property tax is neutral because it is merely capitalized into lower land values; what farmers lose in the form of tax payments they have gained in the form of lower interest paid or forgone as a consequence of reduced land values and will therefore have the wherewithall to pay taxation. In this view property tax concessions to farm land are of no help in prolonging that land use in the face of urban pressure since they have not added to that pressure in the first place.[2]

This second view is consistent with the opinion of many academic observers that a property tax, which is fully capitalized and which is shifted back to the price of land, is neutral towards land use because of the classical argument that a land tax is always neutral.[3] Although I do not assert that complete capitalization always takes place - indeed when land owners are genuinely surprised by their tax liabilities this has not occurred - I shall show that in the context of rural-urban land use over time, a property tax which is capitalized and shifted back to the price of land is not neutral to the time at which farmland is converted to urban use. The direction of the effect is generally to hasten urban development, but not for the reason given above. Development is hastened because the discount rate effect of the property tax causes land owners to choose urban uses/for land which yield returns relatively quickly. and rural

Therefore, while the property tax leaves undisturbed the relative profitability of farming and urban use, it does bring forward the time of commencement of the most profitable urban use and this shortens farm life. The policy implication is that if the property tax system is to be reformed to extend farm life in the interests of providing urban amenity, reforms should be made to the *urban* property tax system, not just the rural property tax.

The impact of the property tax on the decision to transfer land from rural to urban uses is analysed in the two following simple models. In the first model there is only one urban use which competes with rural uses, while in the second model there are two.

I Model One - A Single Urban Use

Consider a piece of land which is currently in farm use and enjoys a pecuniary and non-pecuniary rental of $1 which is expected to be available in perpetuity. Imagine that there is an alternative urban use which offers higher perpetual rentals at rate k (k > 1), but that these are not expected to begin until some future time.[4] Intuitively it is obvious that the land will not be transferred into the urban use until the time that the higher rentals are available. The formal proof, which is useful in showing the inadequacy of a rural-urban model, is as follows.

The market value of the returns from the land comprises the present value of the farm rentals which will be available from time 0 until the time of transfer, say time u, and the urban rentals from that time thereafter. Thus, if r is the discount rate or the rate of return which the owner requires to hold the land based on given rates of return in financial markets, then the present value of the land is

$$P(0) = \int_{o}^{u} e^{-rt} \, dt + \int_{u}^{\infty} ke^{-rt} \, dt \qquad \ldots (1)$$

which is

$$P(0) = 1/r \ (1-e^{-ru}) + e^{-ru} \ k/r. \qquad \qquad \ldots (2)$$

When the land is urbanised the owner loses the farm rental and gains the urban rental. Accordingly he will choose the value of u, say, u*, for which the present value of land is a maximum. This is found by differentiating (2) with respect to u and setting the differential equal to zero to get

$$dP(0)/du = e^{-ru} - e^{-ru} \ k = 0 \qquad \qquad \ldots (3)$$

which is / when k = 1, so that u* is the time at which the urban rental is
satisfied
equal to the farm rental. The reader can verify for himself that the same conclusion holds in an only slightly less trivial case where the urban rental is initially positive at k_o but less than the farm rental and grows smoothly over time at rate g.

The important feature of this result is that the time of transfer, u*, is quite independent of the discount rate r. This implies that a property tax will also not affect the time of transfer because it is easily proved that the property tax raises the discount rate. The discount rate is the gross rate of return which the owner requires to hold the land. Thus if he requires a net rate of return of r, he requires a gross rate of return of r + b to achieve this when there is a property tax levied at rate b.[5] Thus, while the property tax raises the gross discount rate it does not affect the time of transfer in a rural-urban model since this does not depend on the discount rate. The common-sense explanation of this result is of course that, regardless of the rate of tax, it pays to use the land so that the current rental is maximized and this is achieved by farming it until higher

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rentals are available.[6] It will be obvious that this conclusion is a
direct consequence of a model which allows two sequential uses for the land,
one rural and one urban, so that no "waiting" is required. In my opinion,
this model has been implicit in the minds of those who have asserted
neutrality.

II Model Two – Two Competing Urban Uses

It is possible that there are two or more urban uses which compete
for the use of land through time in the sense that these uses are mutually
exclusive. Consider an example where use 1 is housing and use 2 is an
industrial estate. I assume that use 2 offers a higher rental, k_2, than
the rental offered by use 1, k_1; $1 < k_1 < k_2$. However, this higher rental
is not available until time u_2, whereas k_1 is available sooner at time u_1
so that $u_1 < u_2$. Accordingly, the owner will choose between the two uses
on the basis of their present values. The need to choose between them
rests on the fact that the difference between u_1 and u_2 is too small to
have both uses in sequence as was the case in the previous model – that is,
it is not profitable to construct houses at time u_1 and then convert them
to industrial uses at time u_2. In other words the costs of transferring
from use 1 to use 2 are prohibitive.

It is obvious that this model is entirely different from model one.
In that model both uses – rural and urban – are feasible, and the problem
was to predict the time of transfer. In this model the urban uses are
mutually exclusive, and the problem is to determine which is most profitable.
Thus the present value of use i (i = 1, 2) is

$$P_i(0) = \int_o^{u_i} e^{-rt}\, dt + \int_{u_i}^{\infty} k_i e^{-rt}\, dt \qquad \ldots (4)$$

where the first term represents farm rentals which are available until use 1 commences at time u_i, while the second term represents the rentals from urban use i itself. The use with the highest present value will be preferred and use 2 will be chosen if it begins soon enough so that

$$u_2 - u_1 < 1/r \ln [(k_2 - 1)/(k_1 - 1)]. \qquad \qquad \ldots (5)$$

If this is the case the land will be urbanized at time u_2 and the rural use will continue until this time. Thus if $k_2 = 4$, $k_1 = 2$ and u_1 is time 0 then with $r = .1$, use 2 will be preferred if it is expected to commence within 10.99 years.

The important feature of this result is that the pattern and time of urbanization do depend on the discount rate; a higher discount rate is favourable to use 1 and hostile to use 2. The direction of the effect of the discount rate is so because a higher discount rate reduces the present value of distant returns (use 2) more than the present value of less distant returns. This suggests that a property tax, which raises the gross discount rate for reasons given in the previous section, will also be hostile to use 2. Thus if the rate of property tax is b then use 2 will be preferred if

$$u_2 - u_1 < 1/(r + b) \ln[(k_2 - 1)/k_1 - 1)] \qquad \qquad \ldots (6)$$

With a property tax of .01 and the same values for other variables as previously, use 2 will now be preferred if it is to begin within 9.99 years. Thus where use 2 was marginally preferable without the tax, the tax will cause use 1 to replace use 2 and the life of the farm will have been shortened by almost 11 years - from year 11 to year 0.

This result depends critically on the assumption that the urban uses are mutually exclusive so that waiting for use 2 involves sacrificing

returns from use 1 which are higher than the existing rural rentals. In the absence of a property tax the costs of waiting are use 1 rentals and interest forgone on those rentals. With the property tax there is an additional cost of waiting. This is the higher property taxes paid by use 2 on the basis of the present value of its rentals which are not received until the end of the waiting period.[7] Hence the greater is the rate of property tax, the greater will be the disadvantage suffered by use 2.

This effect of the property tax is avoided when it is based on the capitalized value of the *current* rental of existing uses. If this is done, uses offering a deferred return are not penalized. This is because they do not pay taxes on their superior rentals until those rentals are earned. Under this regime, the tax base for the rural use is $1/(r + b)$ — the capitalized value of its rentals — while that for urban use is $k_i/(r + b)$. Then the present value of land is

$$P(0)_i = \int_o^{u_i} [1-b/(r+b)]e^{-rt}\, dt + \int_{u_i}^{\infty} k_i\, [1-b/(r+b)]e^{-rt}\, dt \qquad \dots (7)$$

and the criterion for choosing between Use 1 and Use 2 is the same as in the zero tax case given in (5).

It should also be noted that the discount-rate effects of the property tax could influence the pattern of rural uses in the direction of uses offering an immediate return – say grassland farming or market gardening at the expense of uses offering a deferred return, such as orchards or forest. Thus the fact that trees with a long gestation period are rarely felled to make way for housing development, while market gardening and grazing land frequently makes way for housing, not only reflects the ability of those who make land use decisions to predict the timing of changes in land use. It also reflects the influence of property taxation which shifts land uses away from tree crops and in favour of housing, given that urban pressures place limits on the life of both rural and urban enterprises. These effects of the property tax in the rural and urban sectors conspire to urbanize land more quickly than would otherwise be the case.

III Policy Issues

As a result of recognition that the existing urban population derives much amenity from local rural enterprise, there is considerable interest in using property taxation to maintain viability.[8] It should be noted, however, that property taxation cannot *prevent* the urbanization of land. It can only delay or hasten it; Model 1 showed that land will be urbanized when the rental in the most attractive urban use rises above the farming (pecuniary and non-pecuniary) rental. Therefore, if the community wishes to *permanently* preserve open space which is subject to urban pressures, then some form of restrictive zoning is required. This would reduce the market value of such land and its property tax liabilities.

If this is not desireable or possible then it is interesting to note that relatively small changes in the rate of property taxation can have large effects on the time to urbanization. A previous example showed how a property tax rate of .01 could diminish farm life by 11 years, even though it only reduced by one year the time that the owner would have been prepared to wait for a future urban project; therefore tax relief of similar magnitude would have an equal effect in the opposite direction. In this example the strong effect resulted from the assumption that the interval between the earlier urban use and the later one is 11 years. This assumption could be realistic. In general, however, the greater the number of competing urban uses, the greater the likelihood that they are distributed evenly through time, and the smaller will be the difference between the commencement times of any project and its immediate competitor. The smaller is this difference the smaller is the gain in years of farm life from a given degree of property tax relief.

There are various forms of property tax relief which are advocated

from time to time. The most common is to tax farmland on the basis of its
rural value rather than its urban value. This proposal is superficially
appealing because it appears to maintain viability by reducing absolute tax
liabilities on farms. But if the tax is capitalized this is not the relevant
effect. As I showed above, a tax on rental values is neutral between the
various urban (and rural) uses of the land and it therefore does not affect
the pattern of rural and urban uses and the time of urbanization. By
contrast, a tax system which is based on market values discriminates in
favour of rural and urban uses which offer an early return. Therefore, a
neutral property tax only requires that all land uses be put on the same
tax footing, not that any special treatment be given to rural uses as such.

The policy implication of a property tax based on rental values is that
the tax rate also does not affect the time of transfer. This means that the
revenue cost of changing from a system which is based on current market
value can be avoided, with suitable adjustment to tax rates. The present
system frequently grants tax concessions to farms, under the guise of
extending farm life for the sake of urban amenity, while allowing land owners
to eventually reap the rewards of holding urban land. My analysis suggests
that the whole tax system should be reformed in the direction of uniform
tax rates based on rental values, with upward adjustment in tax rates if
necessary.

This does not mean that changes in property tax liabilities for rural
uses could be made without real effects. Unforeseen increases in
property tax liabilities would in many cases force farmers to switch to
urban uses even though the psychic returns from farming would dictate other-
wise. As with any tax system, care must be taken in moving from one regime
to another.

FOOTNOTES

[1] For an example, see opinions expressed by H.E. Conklin (1975) and Marian A. Nichol (1975).

[2] See Frederick D. Stocker (1975).

[3] Although early forest economists such as Fairchild (1935) were well aware that the property tax influences the choice of income streams, modern academic views, including those of some forest economists, reflect the belief that a capitalized tax on land values is neutral towards the allocation of resources. See Owen and Thirsk (1974); Pasour and Holley (1976), n. 4, p. 163; Klemperer (1978), p. 320. I have recently shown in Bentick (1979) that this is not the case.

[4] Many readers will be familar with models which analyse the withholding of land from urban development. However, these assume that the urban rental has already risen above the rural rental and that withholding occurs because the owner has formed expectations about capital gain from increases in urban rentals and prices. For an example see Bentick and Fischer (1975).

[5] The formal proof is obtained by observing that the price of any asset P which offers an annual return of k in perpetuity is $P = \int_0^\infty (k - bP)e^{-rt} \, dt$ where b is the rate of property tax. Solving for P gives $P = \frac{k}{r+b}$.

[6] If the farm continues to be operated despite high rents being offered by urban uses there must be non-pecuniary rentals in farming.

[7] There are two separate elements here. One is that Use 2 pays taxes in advance of its rentals. The other is the fact that the absolute tax liability of Use 2 over the waiting period is inflated by the higher value of its future rentals compared with Use 1.

[8] Conversely the future urban population has some interest in shortening the life of rural enterprise because it makes land more readily available for housing.

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