THE INCIDENCE OF PROPERTY TAXES ON AGRICULTURAL LAND

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Property tax systems have undergone rapid change in almost every state during the past few years. Consequently, their distributional impact merits investigation. The incidence of the property tax is at the heart of the distributional question. It is generally felt that land owners bear the full burden of property taxes and that changes in it are capitalized into property values. Usually it is assumed that property taxes are not shifted forward to the consumer, but there has been little empirical verification of this notion. This paper will develop a simple model of the land market to test several alternative hypotheses concerning the incidence of property taxes on agricultural land in the United States.

A SIMPLE MODEL OF THE LAND MARKET

The micro-economics of property tax is usually neglected in introductory agricultural economics courses, even though American farmers paid approximately 25 percent more for property taxes than for fertilizers and lime in 1972 [2]. While an individual firm manager has no control over property tax, it is important that he be able to anticipate the economic consequences of a change in property taxes on the behavior of the neo-classical firm. The following model has proved to be a useful conceptual device. It will serve as a point of departure for the present paper.

Assume a perfectly competitive market in which all agricultural land is rented out (realizing that much of the land is rented to the owner himself). Further assume that the supply of land is highly inelastic.[1] The owner of the land pays all property taxes. For static equilibrium to exist in the land market, both renter and owner must be in equilibrium. That is, rent paid by the renter must be equal to the value of the marginal product of land, and the owner must receive a return net of taxes on the land's value that is equal to the opportunity cost of his available capital.[2] Thus there are two profit maximizing conditions:

$$\text{Renters: } M_v = R \qquad (1)$$

$$\text{Owners: } V(i) = R - T \qquad (2)$$

where:

M_v = the value of the marginal product of land,
R = the rent paid by the renter,
T = the value of property taxes paid by the owner,
i = the opportunity cost of the owner's capital, and
V = the market value of the land.

Combining (1) and (2) gives:

$$M_v = V(i) + T \qquad (3)$$

In other words, the value of the marginal product of land must be sufficient to pay an adequate return to the owner plus property taxes. In a perfectly competitive, static equilibrium, renters and owners will adjust the intensity of use of land and other factors such that (3) is satisfied.

$$\text{Let: } M_v = M_p(P) \qquad (4)$$

$$\text{and } T = Vt \qquad (5)$$

where:

M_p = the marginal physical product of land,
P = the price of the aggregate product, and
t = the effective tax rate on agricultural land.

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[1] Throughout this paper "land" and "property" are used synonymously to refer to non-reproducible capital. The incidence of property taxes on that portion of farm property that is reproducible is not treated in this paper.

[2] Income taxes that might be paid on the net rental income of owners could easily be included in the model, but for purposes of simplicity these are ignored.

Then (3) may be restated in a more useful form:

$$V(i + t) = M_p(P) \qquad (6)$$

Equation (6) emphasizes that a change in property tax rates may affect the land market in a variety of manners. It is generally accepted that as t changes, modified property taxes are capitalized into property values causing V to vary inversely with t. Studies of land values indicating that cross-sectional differences in property tax rates are associated with land value differences are often cited in support of the notion that property taxes are capitalized into property values [1, 9].

THE HYPOTHESIS

The central hypothesis of this paper is that property taxes are not necessarily fully capitalized into property values, but instead may be shifted either forward or backward. While capitalization is certainly possible, equation (6) suggests that other adjustments in the land market are also possible in reaction to a change in property taxes.[3] Three other variables (i, M_p and P) may also adjust in response to a modified tax rate. A change in i, resulting from a change in t, would imply that the incidence of the property tax is not unlike that of a profits tax [6]. If M_p were to adjust under similar conditions, this would indicate backward shifting of the property tax to other factors of production.

Changes in property taxes may be shifted forward to consumers through changes in food and fiber prices. For this to occur, increased tax levels must be incorporated into the cost structure of the production unit rather than being capitalized into lower property values. That is, if property taxes were to increase, property owners would be forced to increase rental rates by the amount of tax or face a decline in property values.[4] Increased rental rates would increase average fixed costs of the renter, ceteris paribus, and the break-even price for the production unit would go up. Marginal units would be driven out of production and product prices would increase.

The key question in this chain of events is whether the owner can, in fact, change rental rates to reflect tax changes. Recently, Mieszkowski suggested that a distinction must be drawn between local and global impacts of property taxes [6, 7]. Suppose that every taxing district in the United States had identical property tax rates. In this case, property taxes would be included in the rent charged by owners and would be passed on as a portion of the fixed costs of the firm. In equilibrium, these fixed costs would be passed on to the consumer. The property owner would receive a rental payment sufficient to provide a return on land equal to that of other capital, and to pay the property tax. The distributional effect of full shifting of property taxes versus no shifting (capitalization in land values) is to favor land owners at the expense of consumers.

Now assume that one county imposes an additional tax over and above the uniform property tax. Local owners would find that product prices and rents were both determined by conditions in the aggregate market. Consequently, the renter would be unaffected, but net return to the owner would fall. Hence, a differential local tax above the global tax rate would be capitalized into V, while the global portion of the tax is shifted forward to the consumer.[5] If such is the case, then the incidence is shared between consumers (who bear the global portion) and land owners. There is a partial shifting of the total tax on local land owners under these conditions.

ESTIMATION PROCEDURES

The above discussion suggests three alternative hypothesis regarding the shifting of property taxes. Which of these is the most appropriate shifting hypothesis can be tested, using a procedure suggested by Hall in his analysis of the shifting of corporate income taxes [3]. Basically, Hall's procedure is to compute the rental value of land for each element of a sample under alternative shifting assumptions (detailed below). Then each of the alternative rental values are employed in the estimation of a Cobb-Douglas production function, all other factors being the same for each estimation. That is, a Cobb-Douglas production function is estimated using ordinary least squares for each computation of rental value of land. The rental value with the best fit is presumed to represent the most appropriate shifting assumption.

Three shifting hypotheses will be tested using aggregate production data for U.S. agriculture. The three hypotheses concerning rental values (R) are that property taxes are *fully* shifted (R_f), *not*

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3 For no shifting of property taxes to occur, the supply of land must be perfectly inelastic [9]. That the inverse is not necessarily true is the topic of this paper.

4 This adjustment process is particularly feasible in the majority of cases where owner and renter are embodied in a single manager.

5 Note that the empirical results of cross-sectional land value studies such as [1, 9] are consistent with this argument.

shifted (R_n), and *partially* shifted (R_p) forward to consumers. If the full burden of property taxes is shifted forward to the consumer, then rental value of land in the production function (R_f) must be $R_f = Vi$. On the other hand, if all taxes are capitalized into land values, then gross return to land is $i + t$ and $R_n = V(i + t)$. If there is partial shifting such that only that portion of local property taxes that are above the global tax rate ($t - t_g$) are capitalized, then the appropriate rental value for each element of the sample is $R_p = V(i + t - t_g)$. The three shifting hypotheses will be tested using Hall's procedure described above and a Cobb-Douglas production function of the form

$$\lg Q = \lg a + b_1 \lg R + b_2 \lg L + b_3 \lg K \qquad (7)$$

where Q, L and K are output, labor and capital, respectively. Equation (7) will be estimated using $R = R_f$, then again with $R = R_n$ and finally for $R = R_p$. Ordinary least squares estimates will be obtained for 1959, 1964 and 1969 to provide some generality to the results.

Cross-sectional data treating each of the 48 contigious states as an observation will be used to estimate (7). These data are appropriate to test global, rather than local impacts of property taxation. Individual variables used are specified in the following manner:

V: The value of farm land excluding buildings [4, Tables 2-49].

i: The opportunity cost of capital, assumed constant at five percent.

t: Farm real estate taxes per $100 market value [4, Tables 2-49]. In 1969 the value of t ranged from a minimum value of $0.25 to a maximum of $2.43.

t_g: The global tax rate (described above) equal to either the minimum or mean value of t.

Q: Realized gross farm income [2, Table 6].

L: The value of all farm labor computed by dividing hired labor expense [2, Table 8] by the annual average number of hired workers on farms [10]. This implicit wage is then multiplied by the annual average number of total farm workers (hired and family) [10] to give total labor value.

K: Capital is equal to production expenses plus depreciation. All data used in the estimation of K are from [3, Table 8]. K is computed as the sum of total current farm operating expenses plus depreciation and other consumption of farm capital minus miscellaneous expenses and hired labor expenses.

RESULTS

The estimated parameters for (7) are presented in Table 1. All coefficients were of the proper sign and significantly different from zero at 99% confidence levels. In his study, Hall compared the R^2 obtained under different shifting assumptions as a criterion for selecting the most appropriate shifting assumption. The higher the R^2 obtained, he argued, the more appropriate the procedures used to compute the variables. Musgrave criticized Hall's conclusions, arguing that differences in the R^2's were so small that it became impossible to determine the significance of the comparative explanatory power of different estimates [6]. The same problem exists with the R^2's presented in Table 1.[6]

An alternative criterion for selecting the most appropriate shifting assumption is the partial sum of squares accounted for by land. The partial sum of squares of land is nothing more than the sum of squares that is accounted for by land, after both labor and capital have already been brought into the model. The right column of Table 1 presents the partial sums of squares for the land variable under each of the three shifting assumptions.

DISCUSSION

Results for 1959 and 1964 seem to favor the assumption that the full value of the property tax is shifted forward to the consumer. Estimates in Table 1 fail to contradict the hypothesis that property taxes are not fully capitalized. Results for 1969 seem to favor the partial and no shift models. Further scrutiny of the results is needed to determine why 1969 cross-sectional differences in the property tax were apparently capitalized into land values, while such differences in 1959 and 1964 were apparently shifted forward to the consumer rather than being capitalized. One possible explanation of these results may rest in the dynamics of the land market.

[6] The author is unaware of an appropriate statistical test for significant differences between the estimates. As a consequence, any inferences based on the statistical results presented must be treated with caution.

Table 1. ESTIMATED COEFFICIENTS OF COBB-DOUGLAS PRODUCTION FUNCTIONS FOR U.S. AGRICULTURE ALTERNATIVE HYPOTHESES REGARDING THE SHIFTING OF PROPERTY TAXES

Model and Year	Production Elasticities[a/]			R^2	Partial Sum-of-Squares Added by Land
	Land	Labor	Capital		
No Shift					
1959	0.273	0.173	0.553	0.9893	0.468
1964	.167	.181	.698	.9888	.193
1969	.192	.168	.661	.9910	.169
Full Shift					
1959	.261	.188	.551	.9905	.523
1964	.160	.195	.691	.9894	.230
1969	.160	.192	.671	.9907	.149
Partial Shift (T_g = lowest U.S. tax rate)					
1959	.273	.172	.554	.9893	.463
1964	.167	.180	.670	.9887	.190
1969	.193	.167	.661	.9911	.170
Partial Shift (T_g = average U.S. rate)					
1959	.273	.171	.555	.9890	.450
1964	.166	.180	.701	.9885	.182
1969	.196	.163	.661	.9911	.171

[a] All estimated coefficients are significantly different from zero at the 1% level of significance.

Current land values may be influenced by the expectations of future earnings streams. As these expectations vary around some established norm, ceteris paribus, land prices vary. In periods of stable prices and tax rates, the rental value and cost structure of the typical firm adjust to include global property taxes, thus shifting the burden of the tax forward to the consumer. But in times of price variability and/or changes in the effective tax rate, there may be some temporary capitalization effects, as owners and renters continually adjust to a new equilibrium. Lags in the adjustment process will produce pure economic profits and losses that may be capitalized into the market value of agricultural land if they accrue to owners. Consequently, forward shifting is expected to be more intense after prices and tax rates have been relatively stable, and capitalization or less shifting may suggest prior years of unstable prices and taxes.

Data in Table 2 show that for several years preceding 1959 and 1964, product prices and the level of property tax rates were relatively stable, while land prices increased by 6¼ percent and 4½ percent respectively.

However, in the period preceding the 1969 observation, product prices increased substantially. An annual increase of this magnitude over

a five-year period would certainly tend to increase earnings expectations and hence the value of land. But land values only increased at a rate of 6.38 percent, which is not unlike the average rate of increase during the previous decade. The reason that land prices did not shoot up during the 1965-1969 period may be that the effective tax rate also increased at an annual rate of 2.5 percent. This increase in the property tax must have been capitalized into property values, thereby offsetting increases in expected earnings associated with increasing prices. This may explain why 1969 estimates of (7) using R_n and R_p were preferred over estimates using R_f.

Table 2. AVERAGE GROWTH RATES OF LAND VALUES, PRICES, AND TAX RATES ON AGRICULTURAL LAND IN THE U.S., 1955-1969

Period	Average Annual Rate of Growth		
	Land Values[a]	Food Prices[b]	Effective Property Tax Rate[a]
1955-59	6.25%	-0.16%	0.23%
1960-64	4.46	0.36	1.08
1965-69	6.38	3.78	2.52

[a] Source: [4].
[b] Source: [11].

If this explanation is valid, then when tax rates and prices stabilize, the build-up capitalization of taxes in land values probably will be transferred into the renters' cost structure, as landowners adjust their rental agreements to reflect increased tax burdens. Through this process, landowners do bear the initial burden of property tax adjustments. The likelihood remains, though, that the burden will eventually be shifted forward to the consumer in the form of higher food prices.

SUMMARY

A simple tax model was developed to analyze the incidence or shifting of the property tax in American agriculture. While it is generally agreed that property taxes are capitalized into land values, the model points out that forward and backward shifting are also possible.

The central hypothesis of this paper is that at least a portion of the property tax on agricultural land in the United States is shifted forward to the consumer in the form of higher food prices. For this to occur, land owners must increase the rent they charge land renters to reflect property tax payments. Since most "renters" are their own owners, the possibility of forward shifting is not as remote as it may first appear. A unique test of this hypothesis using a procedure suggested by Hall showed that in two of three years studied forward shifting may have occurred.

The discussion was then extended to consider the dynamics of the land market and other factors that may have influenced the results. While the results of this study are interesting, additional testing of the hypothesis is needed before any solid conclusions may be reached. Further analyses might follow a similar procedure using data collected at a more micro level than was the case in the present study.

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