The Land Tax Is Pretty Neutral

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Abstract

The inelastic supply of land suggests that taxation of land might be neutral. Feldstein (1977) suggests otherwise, in that taxation reduces risk, and this may raise demand among risk-averse lenders. We simulate the effect of this demand increase and find that it has minimal impact. The land tax is not neutral, but neither is the impact of risk reduction on the price of land particularly large on average.

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1. Introduction

A common argument runs as follows: Land is inelastically supplied. Therefore shifts in demand, particularly those shifts caused by taxation, do not change the quantity available in the market. It follows that the impact of the land tax is purely one of price, and that the burden of the tax falls on the land owner, who suffers a fall in the value of the asset equal to the amount of the tax. Henry George (1873) famously used this model to promulgate the idea of a single tax on the whole of land value in order to finance all government programs. Economists find this model, and the attendant policy recommendations, agreeable in many ways because it takes advantage of the *neutrality* of the tax. The only consequences of the land value tax are wealth transfers away from land owners, and there is no impact on the rest of the economy. No other markets are affected, because no substitution (away from land) can take place. It is thus an efficient means for the government to acquire revenue.

Feldstein (1977) attempted to throw cold water on this policy recommendation by noting two mechanisms that would induce non-neutrality of land taxation. The first argument notes that land taxation creates a reduction in wealth, and the wealth effect would change demands for other assets. Fane (1984), Eaton (1988), and Petrucci (1996), among others, discuss this proposition, and show that under some conditions the neutrality of the tax is preserved in any case. Feldstein's second argument has received less attention and is the subject of the present paper. Basically, the argument is a standard one. Taxation reduces risk (Atkinson and Stiglitz, 1980) and this can increase the demand for the taxed commodity by risk-averse agents. In Figure 1, the supply of land is Q, and the demand curve in the absence of the tax is D. With the imposition of the tax the first order effect is to shift down the demand curve by the amount of the tax. Because the supply curve is vertical, the price shifts down by the same amount, to P1. The second-order effect is the risk effect. The relative risk of the land asset is reduced, and demand rises (at least if asset-holders are risk averse) to P2. This relative price effect could create changes in household portfolios, and induce non-neutral responses to the land tax[1]. Our measure of the non-neutrality of the land tax is therefore P2-P1. In this paper we attempt to measure P2-P1 through simulation of householders' responses to the changing risk.

In Section 2 we flesh out this argument by constructing a model of household utility. This mean-variance utility function is supplemented by the estimation of a hedonic pricing function that allows us to separate the values of land and location, on the one hand, from the value of capital on the other and estimate risk and return parameter for these assets, for the purpose of calculating utility of the households. In Section 3 we discuss data issues, and in Section 4 we present the results of our hedonic estimation and calculation of the risk and return parameters. Substituting these values into the utility function yields estimates of the utility parameters of each household. We then simulate the effect, in particular the reduction in the variance of the household portfolio,

[1]The supply of land would of course remain unchanged, so in that partial equilibrium sense the tax is still neutral, but the gross-of-tax price of land relative to other assets has changed, so that the general equilibrium impact of the tax is not neutral.

due to the imposition of a land tax. We then calculate the gain in utility, this engenders, and how much loss in consumption of the composite commodity- that is, income-- would compensate for the loss in utility. Dividing this by the amount of land gives an average increase in the price of land that would so compensate, and this is our measure of P2-P1.

We find a wide range of values of risk aversion on the part of households, which makes difficult any facile characterization of the non-neutrality of the land tax. But for the large majority of households it appears to be quite small. The land tax is pretty neutral.

2. The Model

Let the household utility for time period t+1 (U_{t+1}) function be given by

$$U_{t+1} = X_{t+1}{}^{\alpha} H(K_t, L_t)^{1-\alpha} - \gamma\sigma_{t+1}{}^{2} \qquad (1)$$

where

X= expected consumption of composite commodity

K= housing capital

L= land

F^2=variance of consumption of X

and H(.) is a function which turns housing capital and land into the commodity we call housing. There are two immediate simplifications inherent in this description of household utility. Note first of all the simplification inherent in H, that we are treating housing capital as a single index commodity. All of the various types of housing capital (structure, air conditioning, etc.) are subsumed into H. The empirical treatment of this is discussed below. The second simplification is that capital and land values are set at time t, and assumed fixed through t+1. This is sensible to the extent that adjustments to one's current housing stock (through land additions or home improvements) are costly in the short run. This assumption appears to be fairly well justified in the data below

Equation (1) is a standard mean-variance utility function, similar to that used in Berkovec and Fullerton (1992), also to investigate the effect of taxation on households. Housing is purchased prior to the resolution of the uncertainty over the return on the assets held by the household, thus the household maximizes over actual L and K and expected X. The two assets, L and K, have values V_L and V_K, and yield returns r_L and r_K that are unknown at time t and realized in t+1. For convenience, we define the rates of return on a basis of end-period value (see below). Land value is taxed at rate a. Thus the budget constraint for t+1 is

$$aV_{L,t+1} + X_{t+1} + M = Y + r_{kt}V_{K,t+1} + r_{lt}V_{L,t+1} \qquad (2)$$

where Y is labor income and M is the flow expenditure required for housing level H. These two values are assumed to be known in advance. We have noted that we use a definition of rate of return on the two housing assets that uses the end period as the basis:

$$r_g = \frac{V_{g,t+1} - V_{g,t}}{V_{g,t+1}} \qquad g = K, L \tag{3}$$

At this point three objections can be raised. The first is that we are ignoring the income generated from other (non-housing assets). This is done for convenience and analytical simplicity. Our sampling procedure will help mitigate the incongruence of this simplification. The second objection is that it might be argued that residential land and housing capital might not be usefully be considered as separate assets in a portfolio, since they are tied together in a single asset called housing. There are at least three recent strands of literature that suggest that they can be separately considered. The first is simply the fact that the basic tool of the econometric analysis of housing markets and appraisal, the hedonic equation, often treats all attributes as either additively or multiplicatively separable, and so the treatment of land and capital as distinct commodities assets has been basically always been implicitly accepted, and we count on this below. Coulson (1989) finds that land is the "most separable" of housing attributes, in terms of its separability in the hedonic price function[2]. Secondly, and more to the point, Bostic, Longhofer and Redfearn (2006) treat these assets separately as part of their "Land Leverage Hypothesis", the hypothesis that land is far more important determinant than capital of housing appreciation. Finally, even the physical separability of land and capital, is demonstrated by the frequency of teardowns that occur, say, in the sample of Dye and McMillen (2007). The third objection to our treatment of household asset holdings is that it might further be argued that returns on residential land are not well-defined because residential land is not a distinct commodity from other types of land. To this, it can be responded that it is indeed a separate commodity, made so by the administrative allocation of land specified for that purpose through zoning. Again, our empirical strategy attempts to mitigate this simplification.

Substituting the rate of return definition (3) into the budget constraint (2), solving for X and eliminating those terms which are known at t yield the following expression for the variance of X:

$$\sigma^2 = \mathrm{var}(V_{k,t+1}) + (1-\mathrm{a})^2\,\mathrm{var}(\mathrm{V}_{\mathrm{L,t+1}}) + 2(1-\mathrm{a})\,\mathrm{cov}(\mathrm{V}_{\mathrm{k,t+1}}, V_{L,t\_+1}) \tag{4}$$

and this shows the reduction in variance due to an increase in a.

Our basic method, then, is this:

1. Using hedonic methods, we calculate the function H, the asset values V_L and V_K, and rates of return r_L and r_K. for a sample of households. Each housing unit delivers a separate value for these variables, to the extent that they have unique combinations of housing attributes.

2. Setting a=0, we use the budget constraint (2) to eliminate X from the utility function (1) and take the first order conditions of (1) with respect to K and L, and then inserting the values derived from step 1, calculate the implied values of the utility parameters and .

3. We allow *a*>0. Noting that the first order effect is to lower V_l by *a* percent, we then simulate the second order effect of a land tax by calculating the rise in utility due to the lowering of risk (i.e. the change in the F^2 term).

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[2]This depends on the setting. Colwell and Munneke (1999) find somewhat different results for downtown commercial properties.

4. We then ask what the willingness to pay for that change in risk would be, by calculating the equivalent variation. That is, we calculate the loss of X, which is to say, income, that would offset this rise in utility. Again noting the vertical supply of land, this change income can directly be converted to a change in the average price of land by dividing by the quantity of land. This is our measure of non-neutrality of the land tax due to risk.

To that end we specify a hedonic function of the form

$$H_i = (\sum_j \delta_j Z_{ij}) L_i + \sum_j \varphi_j Z_{ij} + \sum_k \beta_k X_{ik} + e_i \qquad (5)$$

where

H_i= price of ith housing unit

Z_{ij}= measure of jth locational attribute in housing unit i, and includes an intercept term

L_i = the measure of land for housing unit i

X_{ik} = measure of kth capital attribute in housing unit i

e_i= error term

and.,., and N are parameters to be estimated. The hedonic function is linear. Linearity, or at least separability between capital and land, is necessary for the construction of land and capital values, and presumably a necessity for land value taxation, as per the discussion above, and so is imposed in this hedonic equation

The specification of the land component requires some explanation. The usual hedonic specification which places lot size as a separate regressor is falls short of the ideal specification, because it imposes separation of the value of land from the value of location. Berliant and McMillen (2006) note that this violates simple arbitrage conditions. In the hedonic equation above, the location variables, Z, are weighted by lot size, so that the *marginal* price of land varies according to the value of that particular location. This way of specifying the hedonic price of land, seemingly first proposed by Parsons (1990), also seems to answer the objections of Scotchmer (1985, 1986) to the evaluation of environmental goods in hedonics, as long as land boundaries are fixed. Note that among the characteristics in Z is an intercept term, therefore the amount of land itself is one of the hedonic characteristics. The other coefficients should be interpreted as prices of locational characteristics on a per-square-foot-of-land basis, as they should be, according to the papers cited above.

But this cannot be all, from either a theoretical or an empirical sense. Part of the value of "land" is, in fact, the "entrance fee" or fixed cost of locating at a particular site. We label this henceforth as the (fixed) price of location, as opposed to the (marginal) price of land. This is related to the distinction raised by Glaeser, Gyourko and Saks (2003) between the extensive and intensive margins of land use, but here empirically considered at the property level (see Cheung, Ihlandfeldt and Mayock (2009)). This is implemented by including the Z terms in isolation (with coefficients N). Thus instead of "land value" as the thing which is taxed by a land tax, we will refer to the land and location value. A somewhat vexing question at this point concerns the treatment of the "pure" intercept term, which is treated as part of this entrance fee. Elementary considerations imply that this can be interpreted as the value of the entrance fee when all of the capital and land variables are equal to zero. We will see below that Z, the locational characteristics, are all binary indicators of neighborhood quality and thus assigning values of zero merely creates in the intercept term the value of a "default" location. However the specification of such a default location value with zero capital is nonsensical. The value of owning land in a particular location must include some amount of housing capital that is fixed in place, some minimal-standard house that creates value for the location. Any treatment of this is bound to be somewhat ad hoc. Our solution is to add to the value of land and location the hedonic value of the smallest levels of X observed in our data set. Thus the value of land and location is estimated as

$$V_{Li} = (\sum_j \delta_j Z_{ij}) L_i + \sum_j \varphi_j Z_{ij} + \sum_k \beta_k X^*_k \tag{6}$$

where X* are those minimal values. These will be in 1993 a house with 4 rooms and 500 square feet and no bathrooms. Minimal indeed.

The value of the housing unit must equal the value of location and land plus the value of capital, so the value of capital is estimated as

$$V_{ik} = \sum_k \beta_k (X_{ik} - X_k^*) \tag{7}$$

The error term is assumed to be measurement error in the dependent variable, uncorrelated with any of the housing characteristics and not attributable to either land or capital[3].

We estimate the hedonic for two different time periods, and calculate the rates of return based on the parameter values estimated in both periods and the characteristic values in time t. That is, the rate of return on capital in the ith house is[4]:

$$r_i = \frac{\sum_k (\beta_{k,t+1} - \beta_{k,t})(X_{ik} - X^*_k)}{\sum_k \beta_{k,t+1}(X_{ik} - X^*_k)} \tag{8}$$

where X takes on values at time t. Given the subtraction of the X* term, this should be viewed as the rate of return over and above the "required" amount of capital. Similarly for land

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[3]As discussed below, we use the American Housing Survey to estimate the parameters of the hedonic. Housing values are self-reported, and on that account subject to self-estimation errors. Zabel and Kiel (1995) note that this estimation bias is not correlated with anything of the independent variables, but imparts a positive bias to the intercept term. Thus our estimates of land values may have an upward bias but if this bias is approximately constant over the two time periods then the rate of return calculations should be approximately unbiased.

[4]There are a few instances where the amount of capital and even lot size changed between the two time periods. This raises the question of household portfolio changes in response to risk. Since the number of such changes is small we leave this topic to future research.

$$r_{Lit} = \frac{(\sum_j (\delta_{j,t+1} - \delta_{jt}) Z_{ij}) L_i + \sum_j (\varphi_{j,t+1} - \varphi_{j,t}) Z_{ij} + \sum_k (\beta_{k,t+1} - \beta_{k,t}) X^*_k}{(\sum_j \delta_{j,t+1} Z_{ij}) L_i + \sum_j \varphi_{j,t+1} Z_{ij} + \sum_k \beta_{k,t+1} X^*_k} \tag{9}$$

We use the covariance matrices of the estimated coefficients to define the variance terms of (4):

var(V_{kt}) = .'(X-X*)V()(X-X*) (10)

where V() is the covariance matrix of the coefficient estimates in the hedonic function (5),

var(V_{lt})= [.'ZV()Z.L^2+N'ZV(N)ZN+N'ZCOV(N,)Z'.L+
.'X*V()X*.+X*COV(,)Z'.L+X*COV(,N)Z'N](1-a)^2
(11)

with analogous notation, and

cov(V_{Lt}, V_{kt})=['(X-X*)COV(,.)Z.L+.'(X-X*)COV(,N)ZN+'XV()(X-X*)'.]2(1-a) (12)

with F^2 in (1) being the sum of these three terms.

3. Data

Because of our simplification that removes consideration of nonhousing assets from the analysis, we need a sample for which this assumption is not grossly violated. Homeowners in the early part of the 1990s would seem to fit this bill. Using the 1990 Consumer Expenditure Survey (CES) , Caplin et al (1997) find that for homeowners, housing assets were greater than 90% of total asset holdings. However, the 1990s evidently saw a significant rise in the equity and bond holdings of households, although real estate continued to play an important role in homeowner portfolios. Curcuru (2003), using the 2001 Consumer Expenditure Survey, notes that real estate holdings still comprise well over half of the portfolios of those who report real estate holdings. But well over half is not 90%, so for that reason it would be appropriate to use data on owner-occupiers from the early part of the 1990s to investigate this issue.

Because we also wish to calculate individual specific rates of return and risk measures, we require multiple observations on the same unit, with hedonic characteristics (including location, land and structural capital characteristics). To carry out the simulations, we further require data on income and mortgage payments for each household. For parameter homogeneity, data from a single metropolitan area is useful. Because the model assumes that land boundaries are fixed, data from one of the urban areas of the northeastern US would seem to be appropriate.

All of these requirements are met by the American Housing Survey (AHS). Given our omission of nonhousing assets, we employ the 1993 and 1995 waves of the AHS, using observations from the New York City PMSA only. The following additional screens were applied to this sample:

1. Only single-family detached units were included in the sample. This was obvious given our focus on the value of land.
2. Observations were only used if the unit is occupied and surveyed in both 1993 and 1995.
3. Observations are dropped if the value of the property is coded as less than $500 in either 1993 or 1995.

There were 356 observations in each of the two surveys were available for our regression estimation. Table 1 provides the mnemonics and definitions of the variables used. This table is divided into variables describing the structure, and those describing the location. Among the structural variables are the standard indicators of structural quality including square footage in the unit, number of garage spaces, the age of the dwelling, and a few others. Three relatively minor details about the structural attributes are worth mentioning here. First, there is sometimes a question whether the properties putatively matched in the 1993 and 1995 are in fact the same the properties. In order to assure ourselves that this is the case we checked that the structural attributes reported were identical, or close to it, across the survey years. In particular the information on the vintage of the dwelling needed to be identical. There were relatively few instances where this was not the case, and they were eliminated. As Table 1 indicates the units in the 1995 survey are precisely two years older than those in 1993[5]. Second, the most typical discrepancy between the 1993 and 1995 surveys was in the count of the number of bathrooms. In the survey the respondents are asked how many full baths and how many half baths are in the unit. These numbers sometimes varied across the two samples. However we found that when we summed the number of full and half baths, the total (almost) always matched across the two surveys. Thus there seems to be some confusion in the respondents about what constitutes a full and half bath, and on that account we report, and use as a hedonic regressor, only the summed total. Finally, there were occasions when an attribute was not reported, in particular the number of interior square feet and/or the number of exterior square feet. If the unit seemed to otherwise be the same we took this datum from the other survey year, if available. If it was not available the unit was discarded from the sample. In other instances the number of interior square feet, or other structural attribute did change slightly, which we attributed to home improvements. Note that the increase in the average unit size was very slight. There was also a very slight decrease in the average lot size. A few units did report a decrease in this characteristic, which is not inconceivable.

Our location attributes come from the survey's questions about the respondent's neighborhood; there are a variety of dimensions of neighborhood quality about which they are asked, and to include them all leads to inevitable overparameterization and suspect predictions of location value. Much of that volatility about location value comes from the fact for many of the indicators, very few respondents report problematic neighborhoods. In the end, we choose four attributes to use in the hedonic regression, and Table 1 provides information about them. We chose two more or less "objective" measures of quality, that measured the proximity of schools and shopping areas. We also include an evaluation of school quality, given the importance of this

[5]To be even more precise, the AHS reports the vintage of the buildings, typically in five or ten year intervals. The midpoint of this interval was subtracted from the survey year to give the age of the unit.

to many households, and finally an indicator for street noise. This may be considered a nuisance but on the other hand may measure proximity to highways, and be counted as a positive component to location.

4. Results

Table 2 reports the results of the estimation of the hedonic regression. The fits of the model are reasonable; the R-squared is 45 percent in 1993 and 39 percent in 1995. The signs and sizes of the structural variables are generally in accord with expectations. The price of air conditioning increased from about $15,000 in 1993 to about $22,000 two years later, and that of a garage space from $24,000 to $30,000. Our two measures of space, number of rooms and unit square feet, are naturally quite collinear, so it is not particularly troubling that the price of the latter declines while that of the former increases. The coefficient of age is small (about .3% of house value) and, while of the putatively incorrect sign is imprecisely estimated. This is perhaps due to the relatively limited sample variability of this characteristic. Note that the standard deviation of this variable in Table 1 is rather small.

The "default" price of land (i.e. the coefficient of lot size) is small, increasing from 54 cents per square foot in 1993 to about 85 cents in 1995. The base coefficients of location (N) are large, and often have signs that accord with expectations. Adequacy of schools is valued at almost $16,000 in 1993 and about $21,000 in 1995; close shopping has a positive impact in both years as well. Having schools close by is not viewed as a positive thing however, with a negative coefficient in both years. Street noise is highly detrimental to property values in 1993 (thus the nuisance effect evidently outweighs the proximity effect) but is comparatively quite unimportant, with a equally small t-ratio, in 1995. Indeed, few of these locational parameters have precisely estimated coefficients. Only street noise in 1993 and nearby shopping in 1995 have t-ratios above the conventional threshold values. The coefficients that are attached to the interaction of the location variables with lot size () are also not estimated with particularly high precision. None have t-ratios greater than one, except for the coefficient of (lot size x street noise) in 1993, where the sign is not that which was expected (and counteracts the negative sign for the coefficient of street noise itself. Thus, while the literature suggests that interacting location and land variables is in principle important, the empirical implications, in this data at least, turn out to be less critical. Land values do not particularly vary according to the quality of the location; what does vary is the fixed cost of neighborhoods of particular quality.

In any case, we calculate land value and structure value using (6) and (7) above. The distribution of land values in 1993 and 1995 are presented in Figure3. As can be seen, in both years (but particularly in 1995) the distributions are dominated by certain value ranges, those around the modal values of the four neighborhood conditioning variables. The average land and location value in 1993 is $64,877. The distribution shifts rightward in 1995, and becomes even more concentrated at modal values; the average land value rises to $91,291. In both years there are a number of extremely positive values, typically caused by large amounts of land holdings.

The distributions of capital values, displayed in Figure 4, are much less dominated by modal values of the characteristics; their distribution is rather more dispersed. The distribution shifts to the left over the two year period and the average capital value declines from about $139,000 to about $120,658. This is very much expected. Recall that these are observations on the same units, two years apart, and note also that there is relatively little change in those physical characteristics (aside from maintenance expenditures). Thus the change in the value of capital in the main reflects depreciation of those physical assets.

To that end Figure 5 displays the distribution of rates of return for land and capital across the two years as described in equations (6) and (7). The distribution of land is, as might be expected, also relatively dominated by modal values, with a mean of 46% over the two years. This is opf course quite large; land values in New York City were a good investment over these two years. Nevertheless, the standard deviation, at 38% is very large. There is, as we have seen, tremendous uncertainty in the hedonic prices attached to locational characteristics, and this is reflected in the disparity of the rate of return calculations. Compare this with capital, which has an average rate of return of about -15% (or about 7% depreciation per year) and a standard deviation of 18%. Land is risky relative to capital.

As described above, we insert these values into the budget constraint and utility function. We calculate the variance and covariance terms using equations (10), (11) and (12); we collect the mortgage payment from the 1993 AHS and double it (to reflect two years of payments) and use that in the budget constraint for the cost of housing. If the mortgage payment is absent, we use 14% of house value to represent the opportunity cost of holding the housing asset. This reflects the sample average of mortgage payments we do have. The quantity of housing in the utility function should represent a flow value, and not the stock of housing so to that end we again use the explicit or implicit interest rate represented by the mortgage payment and multiply that by the stock value of housing to represent that two-year flow. Using the first order conditions with respect to K and L for utility maximization we solve for the two utility parameters and[6].

Figure 5 presents a scatterplot of the values we obtain. There are three features of interest. First there are a large number of households (about 30%) with negative values of , i.e. are risk lovers. One might think that these households would purchase larger amounts of the most risky asset, land, however while the correlation is positive it is not particularly so; the associated t-statistic in the bivariate regression is 0.44. The second, also evident from the figure, is the absence of correlation between and . The t-statistic in that associated bivariate regression is 0.6. The aversion to risk is not necessarily correlated with the desire to avoid holding that risky asset for consumption purposes. The third feature is that the values for are very small. In some part this is a scaling effect, because we use the variance rather than (say) the standard deviation to measure risk. There are however, some relatively large values of gamma (both positive and negative), and this will complicate the interpretations below.
We turn finally to the impact of land taxation. We do the following. We assume a 2% tax on the value of land (corresponding to two years of a 1% tax) occurs in 1993. That is, in equations (10),

[6]The Cobb-Douglas form for the first part of the utility function requires that ∀ be between zero and one. We imposed this constraint when solving for the utility parameters in order to simplify the optimization program.

(11) and (12), we set a=.02. We then calculate the change in the variance of expected consumption (i.e. the sum of values from equations (10), (11), and (12)). Multiplying this sum by gives us the value of risk in utility units for each household. We then ask what change in X (alternatively, income) would compensate for this lowering of risk. Dividing this by the number of units of land provides an estimate of the change in the *average* price of land necessary to compensate (recalling that there is both a fixed and variable component to land prices.) This is our measure of P2-P1, and measures the non-neutrality of the land tax.

Figure 6 displays this distribution. The vast majority of values are very small; 70% are between zero and 10 cents per square foot and over 86% have absolute values less than 10 cents per square foot, although the extreme values of gamma observed in Figure 5 prevent any neat summary of this distribution. But consider the following benchmark calculation. The average land value in 1995 is $91,291, which we assume is associated with an average plot of 17,725 square feet. A two percent tax on land would cause a first order price decline of $1826, to $89,465. We have noted the complicating effect of distribution of the risk parameter; the average value of the compensating changes in income is actually negative, but this is a very misleading estimate of its typical value. So instead consider an estimate of the mean of the trimmed distribution (for values in Figure 6 less than one in absolute value) which is $.0026 per square foot. Multiplying this number by 17,725 gives a value of $46.08; the risk factor brings the value of land and location up to $89,465, an increase of .05%, which strikes us as trivial amount. The land tax is, on average, pretty close to neutral. As noted however, the distribution is wide. Figure 7 displays the *percentage* increase in land and location values due to the risk reduction effects of the tax. Again, the wide dispersion makes any neat characterization difficult, but for the very large majority of households the effects are small, even relative to the size of the tax. However, for some units the change is quite substantial, up to 40 cents per square foot. (The scale of the histogram makes these extreme values a little hard to see.)

5. Conclusions

Feldstein (1977) speculated that the land tax might not be neutral because the tax reduces the risk and that the demand for land might correspondingly increase. For a sample of New York City owner-occupier households we calculate land and capital values and rates of return, and simulate the risk impacts of a land tax. We find that while in general households are risk-averse the amount of that risk aversion is rather slight. The land and location tax has some effect on some households but for most households the amount that the price of land rises in response to the decreased risk is small. The land tax is pretty neutral.

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Tables and Figures

Table 1: Sample means and standard deviations (in parentheses)

Variable name and description	1993 Sample	1995 Sample
value= self-assessed price of housing unit	204019.7 (4159.34)	211949.4 (4653.93)
airsys=1 if central air condition exists	0.32 (0.025)	0.34 (0.025)
age= age of unit in years	41.42 (1.14)	43.42 (1.14)
garage= number of garage spaces	0.82 (0.02)	0.82 (0.02)
rooms= number of roomes	6.97 (0.084)	6.98 (0.083)
totb= total number of baths	2.13 (0.05)	2.19 (0.06)
unitsf= square feet of living area	2276.60 (48.88)	2296.08 (50.21)
lot= square feet of lot	17741.59 (1590.95)	17725.01 (1591.41)
schooladeq=1 if schools are rated adequate or better	0.35 (0.025)	0.35 (0.025)
shpcls=1 if shopping is “close”	0.75 (0.023)	0.75 (0.023)
schcls=1 if schools are “close	0.26 (0.023)	0.25 (0.023)
streetnoise=1 if streetnoise is “bothersome”	0.059 (0.013)	0.056 (0.012)

Table 2: Regression results

	1993 estimates			1995 estimates		
	Coef.	Std. Err.	t	Coef.	Std. Err.	t
airsys	15201.37	7452.29	2.04	21951.16	8901.12	2.47
age	193.45	163.35	1.18	247.72	194.56	1.27
garage	24081.57	8897.13	2.71	30093.12	10140.17	2.97
rooms	6119.51	2598.72	2.35	11333.49	3096.10	3.66
totb	28695.38	4835.00	5.93	25999.55	5358.69	4.85
unitsf	15.45	3.90	3.97	8.35	4.37	1.91
lot	0.54	0.35	1.53	0.85	0.42	2.01
schooladeqlot	-0.28	0.37	-0.77	-0.44	0.55	-0.81
shpclslot	-0.43	0.38	-1.14	-0.81	0.48	-1.70
schclslot	0.72	0.36	2.02	0.37	0.52	0.72
streetnoiselot	1.20	1.33	0.90	-0.12	0.44	-0.28
schooladeq	15830.41	10868.77	1.46	21043.87	14237.82	1.48
shpcls	9158.91	10419.16	0.88	28228.07	13093.71	2.16
schcls	-10457.10	11528.86	-0.91	-20283.10	14846.32	-1.37
streetnoise	-37644.40	20622.03	-1.83	2872.89	18526.86	0.16
_cons	17932.32	20523.91	0.87	-14802.70	25526.97	-0.58
R-squared	0.45			0.39		
Root MSE	59271.00			70003.00		

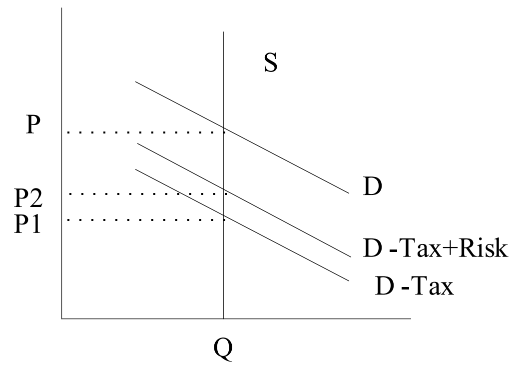


Figure 1

Figure 2: The value of land and location in 1993 and 1995

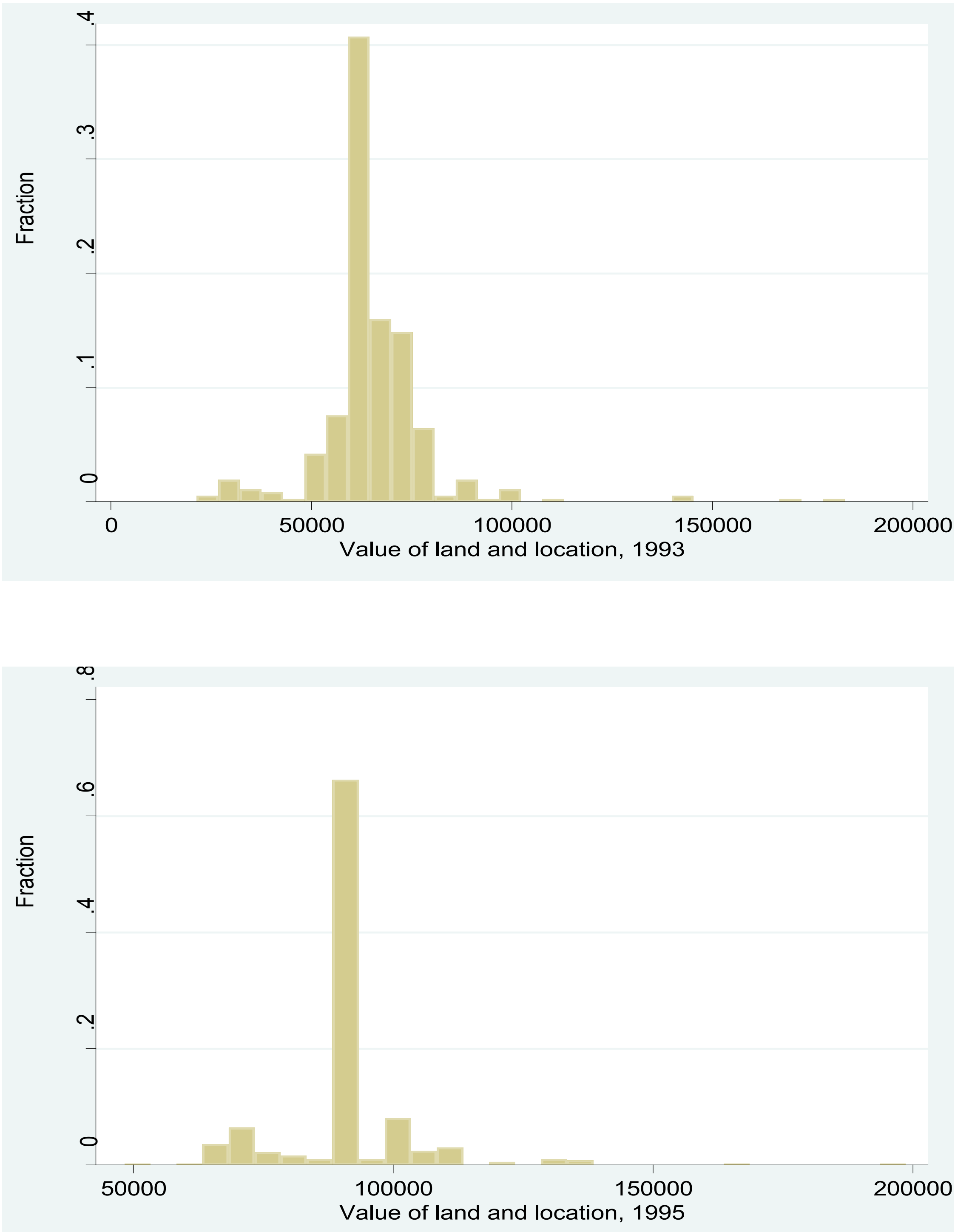
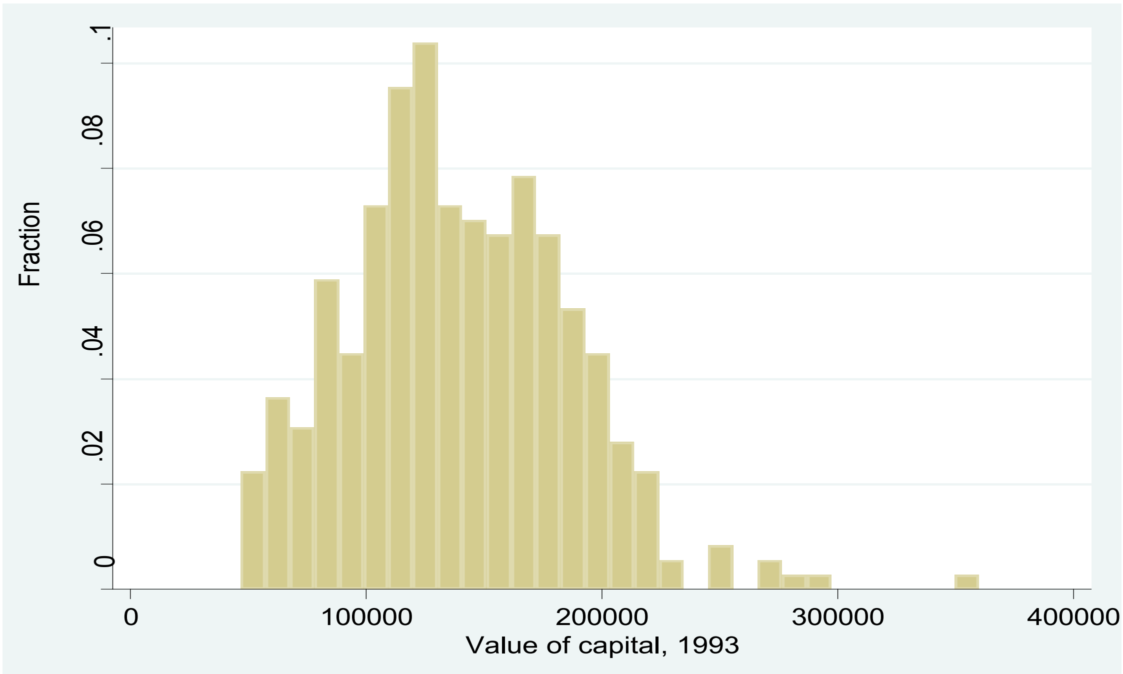


Figure 3: The value of capital, 1993 and 1995



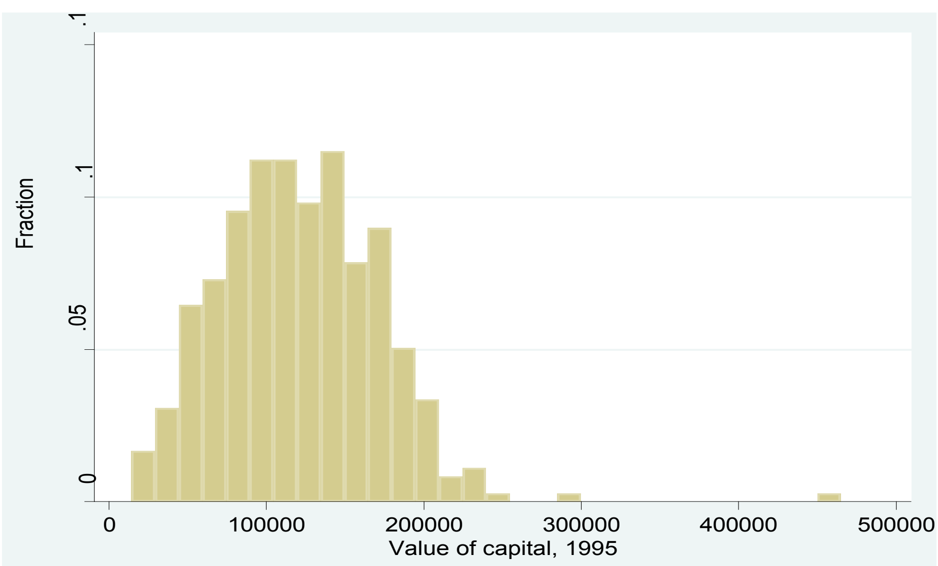


Figure 4: Two year rates of return on land and location, and capital

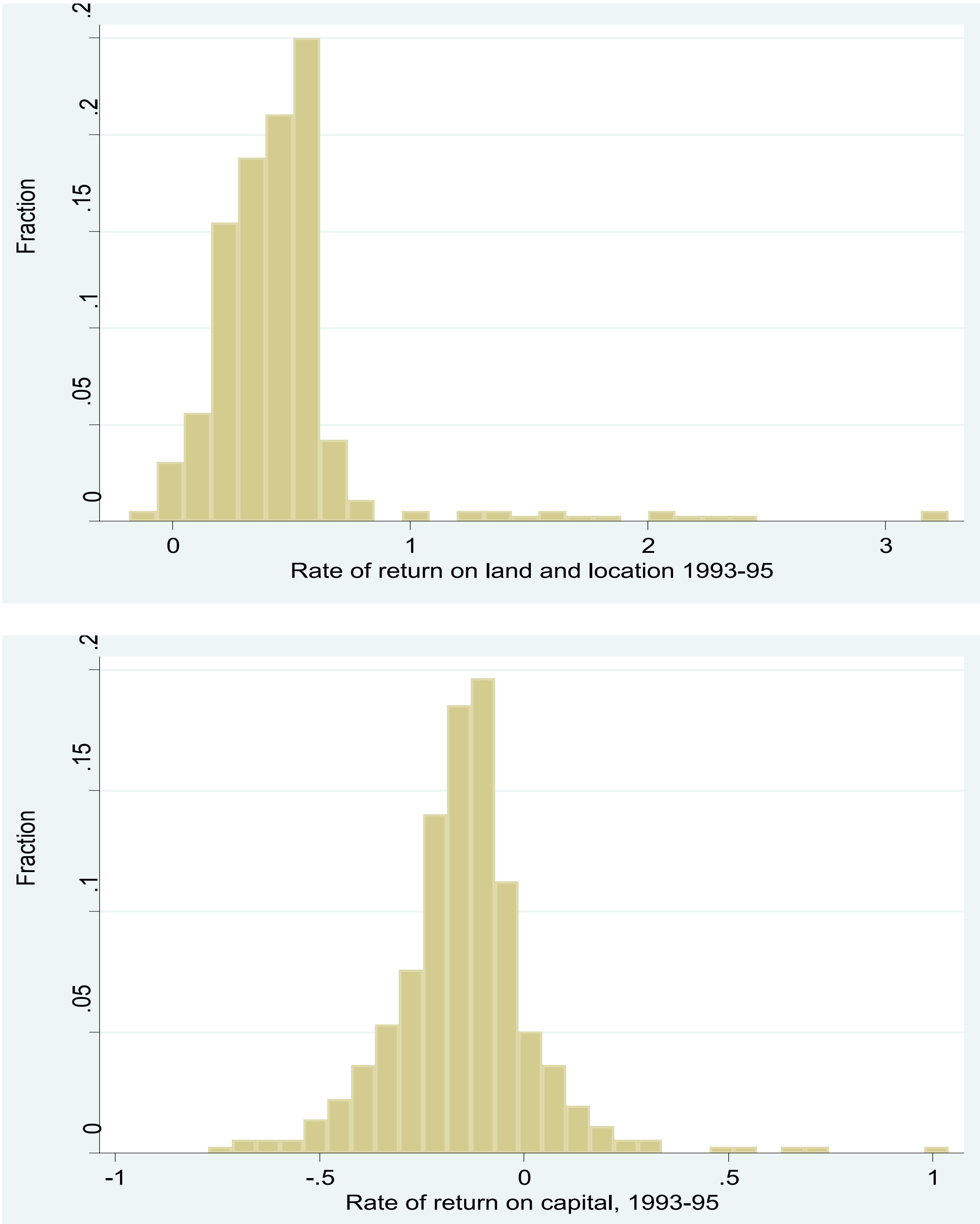


Figure 5: Scatterplot of utility parameters

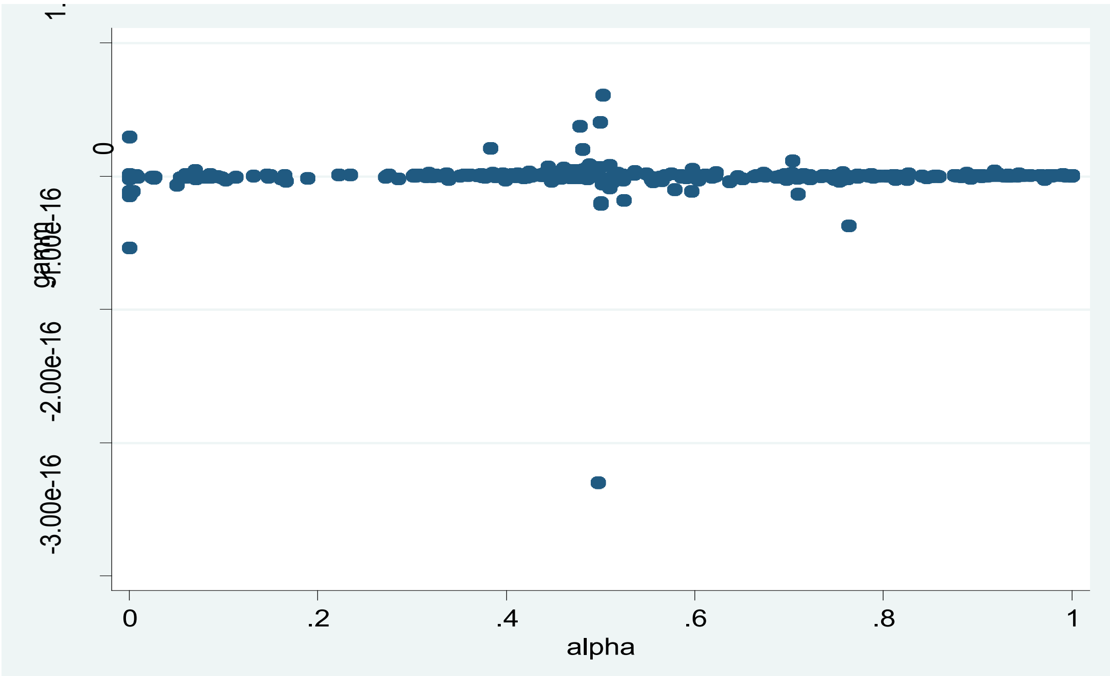


Figure 6: Average price change, per unit of land, that compensates for risk reduction due to land tax

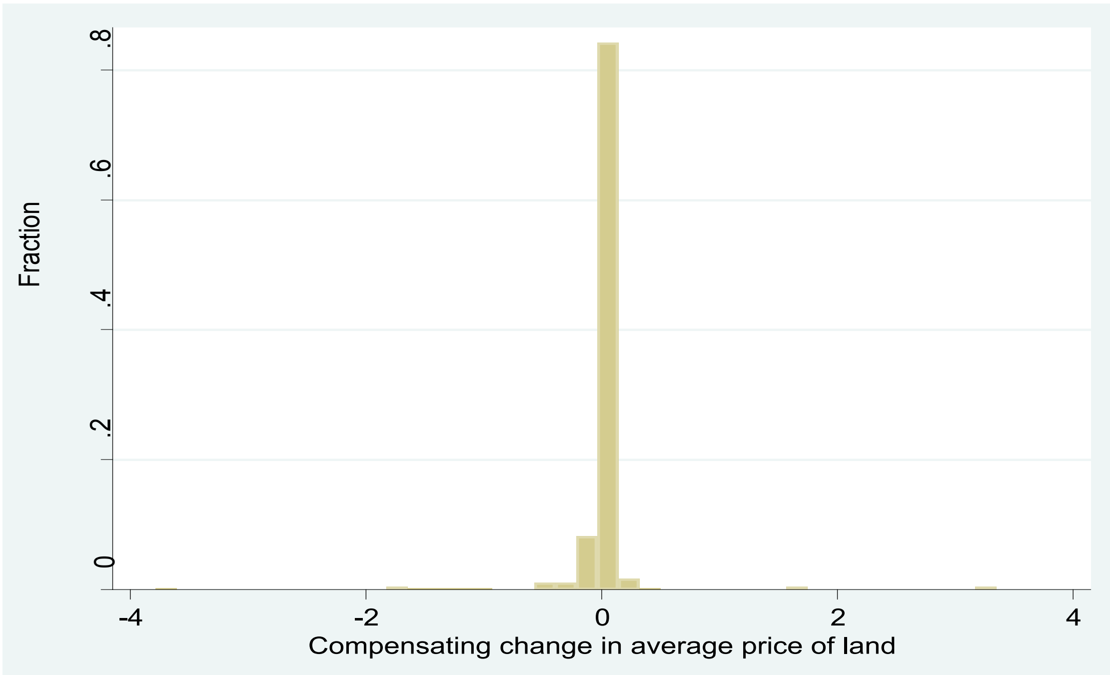


Figure 7: Percentage change in land values