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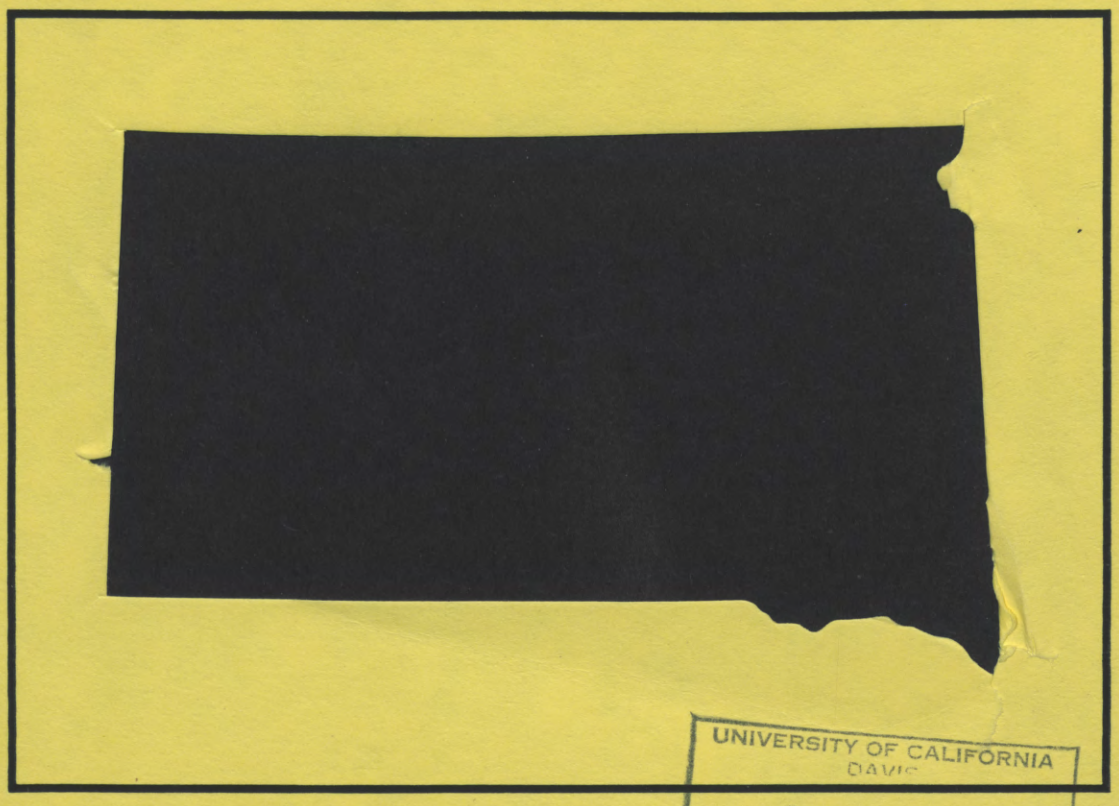

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Analysis of Agricultural Assessment Sales Ratios for Property Tax Purposes During Changing Trends in Land Values *

by
Larry L. Janssen, Mark Edelman
and Cindy Swinson **

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ABSTRACT: Assessment sales ratios are used to "equalize" property tax assessments. Mean soil productivity ratings did not indicate differences between productivity of land sold and all land in the counties examined during periods of rising and declining agricultural land values. Regression results did not indicate underassessment of more productive land in the counties considered.

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** Drs. Janssen and Edelman are associate professors in the Department of Economics at South Dakota State University. Ms. Swinson is a research associate in the same department.

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Analysis of Agriculture Assessment Sales Ratios for Property Tax Purposes During Changing Trends in Land Values

At the turn of the century, the property tax was the largest single source of government revenue in the United States. Property taxes accounted for one-half of total tax collections for all levels of government. While Federal and state revenue generation has shifted from property taxation to sales and income taxes, the property tax has remained the largest source of local government revenue.

Corresponding with the shift in sources of government revenue and the property tax's declining share of the tax mix, there have been attempts to "strengthen" the property tax (ACIR, 1963; ACIR, 1974). Assessment sales ratios--assessed value/sale price of real property--have been increasingly used as a major tool, during the past 30 years, to "equalize" assessments and encourage more "uniform and equitable" appraisal of property for tax purposes. Today over 40 states conduct assessment sales ratio studies. Assessment sales ratios are used in various states to equalize assessments, mandate reassessment, distribute school aid, or simply provide information for local assessors to improve their assessment practices.

Agricultural land values increased in most years from 1940 to 1981 with rapid increases from 1972 to 1980 (USDA, 1984). During this time span, assessment sales ratios have been increasingly used for property tax purposes. Starting in 1981 agricultural land values have declined in the United States and in the West North Central region (USDA, 1984; Janssen, 1984).

Recent declines in agricultural land values have led many public officials and students of the property tax to raise questions concerning the performance of assessment sales ratios under declining agricultural land market conditions. For example, one concern is that the alleged inconsistent performance of assessment sales ratios under changing trends in the land values, will result in changes in the distribution of state aid to local schools.

Purpose of Paper

This paper examines agricultural land assessment sales ratio performance during recent periods of increasing and decreasing agricultural land values. Three specific questions (issues) arise concerning the use of assessment sales ratios:

1. DO PARCELS OF LAND THAT SELL DIFFER IN PRODUCTIVITY FROM ALL AGRICULTURAL LAND IN THE TAXING UNIT?

If the average productivity of land sold significantly differs from the average productivity of all taxable agricultural land, the assessment sales ratio may be biased.

2. DOES A HIGHER PROPORTION OF MORE "PRODUCTIVE PARCELS" SELL WHEN LAND VALUES ARE DECLINING COMPARED TO RISING LAND VALUES?

Many realtors and lenders suggest that more productive land sells more readily than less productive land in declining market conditions. Both types of farmland tend to sell during conditions of rising land market values. If this common perception is accurate, then assesssment sales ratios may be biased and inconsistent indicators of assessment levels during changing trends in land value.

3. DO PARCELS WITH HIGHER PRODUCTIVITY RATINGS HAVE LOWER (OR DIFFERENTIAL) ASSESSMENT SALES RATIOS?

If parcels with higher productivity ratings have lower assessment sales ratios compared to less productive land, then assessment sales ratios may be biased.

The necessary condition for assessment sales ratios to be a biased assessment indicator is that assessment sales ratios must vary across the differing levels of agricultural land productivity. Sufficient conditions for bias and inconsistency require that productivity of farmland sold must either be inconsistent over time or nonrepresentative of the productivity of taxable farmland in the county.

South Dakota Case Study

The South Dakota situation is explored as a case study. The assessed value of agricultural land is approximately 50% of total real property assessments in this state. South Dakota law requires that assessment sales ratio studies are calculated from the previous three years. Assessment sales ratios are calculated for each county by type of property; urban, rural, agricultural and non-agricultural. A statewide average is also published, as are assessment sales ratios for selected cities.

South Dakota ratio studies are then used, by law, to "adjust" the distribution of state aid to local schools (SDCL 13-13-20.3). If the assessment sales ratios are biased for agricultural property then "inequitable" distribution of state aid to schools may occur. South Dakota law does not mandate reassessments based on the assessment sales ratio, but the Property Tax Division of the Department of Revenue suggests that

assesssors use the ratios to equalize assessments in their unit (South Dakota Department of Revenue, 1984).

South Dakota agricultural land is assessed at its present market value as determined by (1) the capacity of land to produce agricultural products, (2) soil, terrain and topography of property, (3) character of the area, and (4) other applicable agricultural factors. Total assessed value of agricultural land in the county is based on recent farmland sales included in the assessment sales ratio studies. Total assessed value is distributed to individual tracts based on their relative capability to produce agricultural products (Ring and Janssen, 1983).

Procedures and Data Sources

Sales of agricultural land in three South Dakota counties (Edmunds, McPherson, and Turner) were examined from 1978-1983. This permits an analysis of assessment sales ratio performance during a period of rising agricultural land values (1978-1980) and a period of declining agricultural land values (1981-1983). These rural counties were selected as representative of western cornbelt agriculture in southeastern South Dakota and northern plains wheat and small grains agriculture in north central South Dakota. For purposes of confidentiality, these counties are referred to by number.

The 517 sales examined in this study included all agricultural land sales occuring in the above mentioned counties during 1978-1983. Seventeen additional sales were excluded for lack of complete legal description and productivity data.

Data on sales were obtained from the South Dakota Department of Revenue (DOR) and the local assessor's office in each county. A sales summary report for each county was obtained from the Department of Revenue for the years covered by this study. These reports contain data on the date of sale, acres sold, selling price, assessed value of buildings, assessed value of land, total assessed value, assessment sales ratio and the complete legal description of each sale of agricultural land occurring in the county. Data were collected from the county assessor's offices on soil types and number of acres of each soil type found on the tracts sold.

The soil type data were used to calculate an average soil productivity rating for each sale tract using methodology developed by the Plant Science Department at South Dakota State University (Malo and Westin, 1978). This method is recommended by the South Dakota Department of Revenue for county assessors to use in determining the assessed value of all agricultural land in each county. A majority of South Dakota county assessors use this agricultural assessment method and the three counties selected for study use this method. The soil productivity rating for each tract is based on the assigned rating for each soil type weighted by the acres of each soil type in the tract.

Is the Productivity of Land Sold Different than the County Average?

The first issue examined was whether average (mean) soil productivity differs between agricultural land sold and all taxable land in each county in each time period. The null hypothesis is that there is no difference in average soil

productivity. The alternative hypothesis is that a significant difference exists. A standard two-tailed t-test was employed and confidence intervals constructed with significance tested at the 5 percent probability level (Dixon and Massey, 1969).

Results indicate that no significant differences existed between average soil productivity rating of agricultural land sold and all taxable agricultural land in each county and for each time period (Table 1).

Table 1. Comparison of Average Soil Productivity Ratings for All Agricultural Land County-wide and Acres Sold in the County.

County Number	County-wide Average-all Taxable Ag Land	Agricultural Acres Sold 1978-1980	Agricultural Acres Sold 1981-1983
County 1	44.2	41.4	44.4
Std. Err.		(1.7)	(1.6)
County 2	48.0	48.7	47.9
Std. Err.		(1.3)	(1.0)
County 3	72.9	72.3	71.6
Std. Err.		(1.6)	(1.4)

Do Changes in Land Market Values Affect the Assessment Sales Ratios?

The second issue examined was whether average (mean) soil productivity ratings of agricultural land sold under declining market value conditions is greater than land sold under rising market value conditions. The null hypothesis is no difference in average soil productivity rating is present. The alternative hypothesis is that average soil productivity of agricultural land sold in 1981-1983 (declining land values) is significantly greater than agricultural land sold from 1978-1980 (rising land

values). In this case a one-tailed t-test was employed and significance was tested at the 5 percent level.

Results for each county indicated no significant difference in average soil productivity of agricultural land sold in each time period (Table 1).

Do Parcels with Higher Productivity Ratings have Lower Assessment Sales Ratios?

The third issue examined was whether parcels with higher productivity ratings have lower assessment sales ratios. This issue is examined in two parts. First, a regression equation was defined to test the significance of the possible relationship between soil productivity and assessment sales ratios:

(Eq. 1) $ASR = B0 + B1 (SPR) + e$

WHERE

ASR = Assessment sales ratio for the tract, and

SPR = Soil productivity rating for the tract.

e = error term

Equation 1 was used to estimate parameters for each individual county and each time period 1978-80 and 1981-83.

Weak Regressions Indicate Adequacy of Assessment Sales Ratios

Of the six estimated equations, two of six were significant indicating that assessment sales ratios were related to soil productivity in counties one and two for the period 1981-83 (Table 2). However, the signs of the SPR coefficients in the two significant equations are positive indicating that more productive tracts in these two cases are associated with higher assessment sales ratios rather than lower ratios. All six

equations had R-squares of less than .15. This is considered an important result indicating that there is a weak relationship between the assessment sales ratio and average soil productivity of sale tracts. The implication of these results is that assessment sales ratios appear to be adequate in the counties examined.

Table 2. Results of Regression to Test Relationship Between Soil Productivity and Assessment Sales Ratio.

	Period 1978-80			Period 1981-83		
County	B0	SOIL RATING	N	B0	SOIL RATING	N
County 1	76.99	-0.19	87	23.01	0.98 *	51
Std. Err.	(7.53)	(0.17)		(17.19)	(0.38)	
Prob. F	0.2702			0.0126		
County 2	42.00	0.28	75	29.58	0.53 *	109
Std. Err.	(9.66)	(0.19)		(7.20)	(0.15)	
Prob. F	0.1417			0.0006		
County 3	47.14	-0.05	110	53.06	-0.16	145
Std. Err.	(11.79)	(0.16)		(9.45)	(0.13)	
Prob. F	0.7513			0.2237		

* = coefficient is significant at the 5 percent probability level

A second regression equation was defined to analyze the possible relationships between assessment sales ratios and other possible explanatory factors:

(Eq.2) $ASR = B0 + B1(P) + B2(SPR) + B3(T) + B4(C) + e$

WHERE

ASR = Assessment sales ratio for the tract,

P = Total sale price for the tract, ($1000s)

SPR = Soil productivity rating,

T = Time period dummy variable

C = Agricultural land class, and

e = error term

The variable time (T) was set to one if the sale occurred between 1978-1980; for sales occuring between 1981-1983 the variable time was assigned a value of zero. Agricultural land class (C) was set to one if the tract was a bareland tract, while tracts with buildings were assigned a value of zero.

While equation 2 is significant for all three counties, the R-square is relatively low indicating that less than 20 percent of the variation is explained for each county (Table 3).

The sale price (P) coefficient was significant and negative for all counties. This indicates that assessment sales ratios decline as total tract selling price increases--that larger, more valuable parcels tend to be underassessed in these three counties. Implied by this result is that factors other than productivity may be influencing sale value.

Table 3. Result of Regression to Determine Relationship of Assessment Sales Ratios and Other Explanatory Variables.

County	B0	PRICE	SOIL RATING	TIME	CLASS
County 1	66.80	-0.055 *	0.04	0.89	5.13
Std. Err.	(8.18)	(0.016)	(0.15)	(2.78)	(3.22)
R-Sq. = 0.1594	Prob. F = 0.0001	N = 139			
County 2	35.98	-0.019 *	0.47 *	0.30	-2.59
Std. Err.	(5.74)	(0.007)	(0.12)	(1.51)	(1.74)
R-Sq. = 0.1139	Prob. F = 0.0002	N = 185			
County 3	61.80	-0.124 *	-0.03	-1.28	-8.68 *
Std. Err.	(6.93)	(0.018)	(0.09)	(2.10)	(2.20)
R-Sq. = 0.1832	Prob. F = 0.0001	N = 256			

* coefficient is significant at the 5 percent probability level

The coefficient for soil productivity rating (SPR) was significant for county 2 but not significant in counties 1 and 3. Again similar to Equation 1 results, the coefficient was

positive indicating that higher soil productivity ratings are associated with higher assessment sales ratios in this county rather than lower ratios.

The dummy variable for agricultural land class of property has a significant parameter estimate in the equation for county 3 indicating a difference in the level of assessment by class of property. The parameter indicates that bareland tracts are possibly being underassessed compared to tracts with buildings in this county.

The parameter estimate for the time period variable was not significant in any of the equations. This indicates that assessment sales ratios in each county did not significantly vary between periods of rising and declining land values.

Summary, Conclusions, and Implications

This study was conducted to analyze the performance of assessment sales ratios for agricultural land during periods of rising and declining land values. Specifically, three issues concerning the use of assessment sales ratios were examined:

1. Do parcels of farmland sold differ in productivity from all agricultural land in the taxing unit?
2. Does a higher proportion of more productive parcels sell when land values are declining compared to rising values?
3. Do parcels with higher productivity ratings have lower or differential assessment sales ratios?

The necessary condition for assessment sales ratios to be a biased or inconsistent assessment indicator is that assessment sales ratios must vary across the differing productivity levels

of agricultural land. Sufficient conditions for bias and inconsistency require that productivity of farmland sold must either be inconsistent over time or nonrepresentative of farmland productivity in the taxing unit.

A case study of assessment sales ratio performance in three rural South Dakota counties was conducted for a period of rising land values (1978-1980) and declining land values (1981-1983).

Comparison of average (mean) soil productivity ratings for each county indicated that the mean of all taxable land in the county and agricultural land sold were similar and not significantly different ($p=0.05$) from each other. Furthermore, average (mean) soil productivity ratings of tracts sold in periods of rising land values and declining land values were also similar and not significantly different ($p=0.05$) from each other.

The regression results tend to reject the original hypothesis that parcels with higher productivity ratings have lower (or differential) assessment sales ratios. Evidence from one county suggests that if any bias exists in ratios with respect to soil productivity, the bias is toward over-assessment of the more productive land in the counties considered. An additional finding from the regression analysis is that assessment sales ratios are negatively associated with total sale price of the tracts in each county in both time periods. An additional analysis of variance, not reported here, confirms these results.

As a result, a bias does exist with respect to total sale price of tract for the taxing units studied and is very likely to exist in general. Recognition of this potential bias factor may

improve property tax assessment procedures and accuracy.

On the other hand, the necessary and sufficient conditions for biased and inconsistent assessment sales ratios over time and with respect to productivity were generally not confirmed in this case study. However, the study demonstrated that this bias may exist in some specific taxing units. One possible rationale is that biased ratios with respect to time and productivity might be associated with differing practices of individual assessors or changes in their specific operating environment as well as potential lack of representativeness of tracts that sell in the agricultural land market.

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