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Factors affecting rural land values along Corridor E in West Virginia

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Factors Affecting Rural Land Values Along Corridor E In West Virginia

Bulletin 639
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West Virginia University Agricultural Experiment Station

The Authors

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ABSTRACT

Land records of Preston and Monongalia counties in West Virginia for the 1966-1971 period were used to obtain information on 1,093 parcels of rural land transferred near the right-of-way of the Corridor E Appalachian Development Highway. Over half of the sales were for parcels of one acre or less, with a substantial share of these located in rural subdivisions, i.e., formally platted subdivisions not located within an incorporated area. Prices varied with location, size, and other factors and increased through time. Regression models using physical, locational, and transfer characteristics were employed to explain per acre land prices. Locational factors were the more important explanatory variables. No detectable effect on private transfers was found for the highway being built through the area.

WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
COLLEGE OF AGRICULTURE AND FORESTRY
DALE W. ZINN, DIRECTOR
MORGANTOWN

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Factors Affecting Rural Land Values Along Corridor E in West Virginia

ANDREW N. DUFRESNE AND DALE COLYER

Introduction

RURAL LAND resources are important for agriculture, forestry, residential, recreational, commercial, and other uses in West Virginia. "Land resources" and "land" are used interchangeably throughout this bulletin and represent both the legal concept of land (ownership rights) and the economic concept (the sum total of the natural and man-made resources over which possession of the earth's surface gives control including subsurface resource). Land resources include buildings and other capital improvements attached to the land. The term "rural" as used here and throughout includes all land not in a city or incorporated area.

The pattern of land utilization in West Virginia has continued to change in recent years. One notable shift has been a decrease in acres of land in farms and an increase in forest and other uses. A substantial turnover also has been occurring in land ownership in many parts of the state. Land values have been under increasing upward pressures as incomes and population have risen, tending to increase the demand for land. Completion of the limited access highway system will improve the accessibility to and from much of the interior of the state and probably will further intensify the demand for land.

Despite these changes relatively little is known about the operation of the land market or the factors influencing the price paid for land in rural market transactions in West Virginia. This study is a cross-sectional and time series investigation of land transactions in a defined area of Monongalia and Preston counties.

OBJECTIVES OF THE STUDY

A study of the land market at the West Virginia University Agricultural Experiment Station has the general objective of developing information and knowledge about the organization, structure and performance of the rural land market. The specific objectives for this part of that study are:

(1) To determine the nature of the organizational and operational characteristics of the rural land market in a specified area.

(2) To identify and rank in significance the factors that affect the price of rural real estate in the selected area.

(3) To establish benchmark data useful in determining and evaluating the impact of Appalachian Corridor E Highway construction on adjacent land values and land use.

METHODOLOGY

Primary data on real estate transfers located within approximately two miles of Corridor E, exclusive of those within municipal limits, for the years 1966 through 1971 were obtained from transfer certificates, deed books and public land books. Name of the grantor and the grantee, the date of the transfer, acreage, consideration, building and land assessments (before and after the sale), tax class and location for 1,093 land transfers were recorded. Soil maps and aerial photographs were made available by the Soil Conservation Service and, in combination with tax maps acquired from the Office of the State Tax Commissioner, provided information on the soil, physical and land use characteristics of each land parcel transferred. Information on the location of public water systems and dates of installation were obtained from the Monongalia County Planning Commission and the comprehensive development plans of Monongalia and Preston counties. County highway maps furnished additional information on the locational characteristics of each land parcel.

Time series and cross-sectional analyses were performed on the data pertaining to acreage, consideration and price per acre. Tests of independence between these ratios and several factors were made. Multiple regression analysis was used to determine the relationship between the price per acre paid for a parcel of land and a set of hypothesized explanatory variables. Regression models were derived for different classes of properties and to show the relative importance of physical, locational, and transfer characteristics in explaining the variations in price per acre of rural properties.

DESCRIPTION OF THE STUDY AREA

The study area lies in Monongalia and Preston counties and includes land adjacent to the 32.5 miles of West Virginia Appalachian Corridor E highway.

The unit for selection into the study was the county tax map. Each tax map contains 2,507 acres, approximately 3.9 square miles, and shows the location, acreage, and boundaries for each parcel of land. A tax map was included in the study if a portion of it was within two miles of the route of Corridor E. Transfers located within a municipality were not included. The area thus selected included approximately 92,755 acres or 145 square miles (Figure 1). Of this area, 40,110 acres were in Monongalia County and 52,645 acres were in Preston County.

Figure 1. The study area, Appalachian Development Highway "Corridor E" in Monongalia and Preston counties, West Virginia

Physical Description

The topography of Monongalia County is for the most part composed of very steep slopes and narrow, deep valleys. A tabulation of acreages (excluding the city of Morgantown) into four slope categories gives the following breakdown: 0-8 per cent slope, 14.8 per cent of area; 9-16 per cent slope, 14.0 per cent of area; 17-24 per cent slope, 9.1 per cent of area; and over 24 per cent slope, 62.1 per cent.¹ The western section of the county is predominantly steep in character, whereas the eastern section contains most of the less steep areas. There are 222,420 acres of land in Monongalia County.

The two magisterial districts in Preston County through which Corridor E passes contain 117,600 acres (28 per cent of the county total). Tabulation of acreages for these two districts into slope categories gives the following: 0-8 per cent slope, 56 per cent of area; 9-16 per cent slope, 25 per cent of area; 17-24 per cent slope, 5 per cent of area; and over 24 per cent slope, 14 per cent of area.²

Land Use

The existing rural land use for the three eastern magisterial districts of Monongalia County through which the study area passes can be summarized as follows:³

Developed (residential, commercial, etc.)	5,470 acres or 5.35%
Woodland	69,890 acres or 68.48%
Cropland, pasture, other	26,706 acres or 26.17%
Total	102,066 acres 100%

The majority of the recent development has occurred in the eastern half of the county and is composed predominantly of residences in ribbon-like patterns along the principal roads. A few sporadic concentrations of residences can be found.

Part of Coopers Rock State Forest is located within the study area. This 13,043-acre forest and recreational facility, 60 per cent of which is located in Monongalia County and 40 per cent in Preston County, has acted as a barrier to further eastward development, but the new highway may open the eastern area to more rapid development.

¹Carroll V. Hill and Associates, *Monongalia County Comprehensive Plan, Phase I—Basic Research, Surveys, Analyses*. Carroll V. Hill and Associates, Planning Consultants, Columbus, Ohio, p. 10.

²Candeub, Fleissig, and Associates, *Preston County Comprehensive Development Plan, Phase I—Basic Research, Surveys, and Analysis*. Candeub, Fleissig, and Associates, Planning and Community Development Consultants, Columbus, Ohio, 1968.

³Monongalia County Comprehensive Plan, *op. cit.*, p. 241.

Land use for Preston County can be summarized as follows:⁴

Developed	10,690 acres or 2.58%
Cropland, pasture	101,300 acres or 24.53%
Woodland	243,571 acres or 59.00%
Mineral Extraction	3,500 acres or 0.84%
Openspace (recreation, cemeteries)	32,624 acres or 7.90%
Other	21,115 acres or 5.15%
Total	412,800 100.00%

The northern section of Preston County can be broadly characterized as a dairy and beef cattle farming area with some coal mining activity.

Population

West Virginia's population declined by 7.2 per cent between 1950 and 1960. Between 1960 and 1970 it decreased by 6.2 per cent. Monongalia's population rose by 14.6 per cent during the last decade. Table 1 gives population data for the area. Morgantown and Star City were excluded from the districts intersected by the study area because this study deals only with non-municipal properties.

Corridor E Highway

Corridor E is a part of the Appalachian Development Highway System—covering 2,700 miles in ten states—being built to help eliminate the Appalachian Area's isolation and stimulate economic development. Corridor E will join the north-south I-79 at Morgantown and run east to I-70 near Hancock, Maryland. This new highway will open up north central West Virginia to the Baltimore-Washington area.

TABLE 1. POPULATION DATA.

	Year	Monongalia County	Preston County
Districts Intersected by Study Area	1960	13,537*	3,667
	1970	16,109†	3,258
County	1960	55,617	27,233
	1970	63,714	24,455

*Excludes Morgantown, population 22,487, and Star City, population 1,236.

†Excludes Morgantown, population 29,431, and Star City, population 1,312.

Source: U.S. Census of Population, 1960 and 1970.

⁴Preston County Comprehensive Plan, *op. cit.*, p. A-6.

Location of Corridor E was finalized and right-of-way acquisition began in late 1969. As of January, 1973, the status of the 32.5-mile portion of the highway located in West Virginia was as follows: 26.1 miles under construction with right-of-way acquisition underway for the remaining 6.4 miles. Right-of-way acquisition for the Monongalia segments has been underway since 1971. Most of the earlier contracts awarded were in Preston County, while the later contracts were in Monongalia County.

Analysis of Land Transactions

Between January 1, 1966 and December 31, 1971 over 1,500 property titles were transferred and recorded in the county courthouses for properties located within the study area. Each transfer was examined for evidence of non-market influences. The concept of a valid sale was one in which money was actually paid for the property transferred and that it was the only consideration of value for the sale of the property. An attempt was made to eliminate sales which might reflect extra-market factors and thus bias the results. The criteria used to eliminate transfers indicative of extra-market behavior included: (a) one-dollar transactions, (b) parent to child transfers, (c) transfers in which the grantor and grantee had the same surname, and (d) transfers in which the West Virginia Department of Highways was the grantee. A total of 1,093 transfers were accepted as valid market sales.

A breakdown of the transfers by location has been used to examine distinct differences existing in segments of the market. The three groups established locate the transactions according to: (a) Subdivision,⁵ (b) Monongalia, that is, in the Monongalia County section of the study area exclusive of the subdivision sales, and (c) Preston, that is, the Preston County portion of the study area. There were no subdivisions in Preston County.

LIMITATION OF ACREAGE AND CONSIDERATION DATA

Land values in the study area represent a very heterogeneous market. Unlike studies dealing with agricultural land or with county averages the transfers in this study represent all valid land sales in a delineated area for a six-year period. The study area lies in the Appalachian region where great variations in topography exist. Other factors which could cause variations in land prices are the locational and use characteristics of the land sold, which ranged from isolated forest lands to suburban housing developments. An attempt has been made to reduce the variations among properties sold by dividing them into locational groups, acreage groups, comparing values on a per acre basis, removing the influence of

⁵A subdivision as used in this study refers to an area for which a separate tax map has been created. In general, subdivisions are areas with a concentration of small parcels of land.

buildings, and examining the impact of time on market values. In some instances the small number of transactions of a particular size or from a specific location means that the information may not be characteristic of the general situation.

The reader is cautioned that the means for different groups do not reveal the wide degree of variations that were present in comparisons among transfers. In a later section a model will be developed to simultaneously measure the influence of physical, locational, and transfer characteristics on the value of land.

DISTRIBUTION OF TRANSFERS

Land sales were highly concentrated in the western portion of the study area. About one-third of all sales in the study occurred in subdivisions (Table 2). There were 26 different rural subdivisions in the study area; some of these were new housing developments or trailer courts and others were small concentrations of population. In addition to the 369 subdivisions sales, there were another 583 transfers in Monongalia County. Combined, these transactions accounted for 87 per cent of all transfers in the study area. The remaining 141 sales were located in Preston County.

The number of transactions per year in the study area increased slightly for each year between 1966 and 1970 but dropped in 1971. Fluctuations within the locational groups did not appear to follow any set pattern.

TABLE 2. DISTRIBUTION OF NUMBER OF TRANSFERS BY YEAR AND LOCATION.

Year	Location			Study Area
	Subdivision	Monongalia	Preston	
1966	45	98	27	170
1967	55	90	28	173
1968	80	88	22	190
1969	62	109	22	193
1970	75	101	32	208
1971	52	97	10	159
Total	369	583	141	1,093

ACREAGE TRANSFERRED

Sales involving small acreages made up the majority of all transactions. Over 50 per cent of the sales involved less than one acre of land and 81 per cent involved less than 5 acres (Table 3). Although the small acreage sales comprised the majority of all sales they accounted for a relatively small portion of the total land sold. Transfers of less than 5 acres accounted for only 7.8 per cent of the total acreage sold, while the 29 sales of 100 acres or more accounted for 42 per cent of all land sold. Table 3 also shows the distribution of total acreage transferred by location and size of parcel.

CONSIDERATION

Real estate sales for all years totaled approximately \$8,664,157 for the study area with a range from \$30 to \$350,000 per transfer and an average consideration of \$7,927 (Table 4). Sales of less than 5.0 acres accounted for 70.9 per cent of the total consideration paid. Total market consideration for the 369 Subdivision sales nearly equaled that of the 583 Monongalia sales.

Breaking the transfers into different groups according to the amount of consideration gives a more complete picture of the dollar value of most transfers (Table 5). Sales of less than \$5,000 accounted for more than half of all transactions, however, they accounted for only 12 per cent of the value of all property transferred. The average consideration for sales in the Subdivision, Monongalia, and Preston groups were \$10,567, \$7,026 and \$4,743, respectively.

PRICE PER ACRE

To compare market values for different sizes of parcels sold and for parcels in different locations a unit base of price (consideration) per acre was used. Price per acre was derived by dividing the average consideration for a particular location and/or acreage group by the average acreage corresponding to that location and/or acreage group. For sales under one acre, price per acre will be higher than consideration, whereas sales greater than one acre have the opposite relationship.

Various factors influence the price per acre paid for land. The demand for small tracts of land for residential and other uses is often high and thus prices for such parcels are high. Larger tracts of land may include portions that are non-useable, while small parcels may represent choice segments of larger tracts. Buildings and other improvements have a great influence on the price per acre for small parcels while their value is spread out for larger tracts of land.

The average price per acre for different acreage and location groups are given in Table 6. Prices per acre for the study area decreased most as acreage per transfer increased from 0.1-0.9 to 2.0-4.9. Parcels of similar sizes commanded a considerably greater price if located in a subdivision and those in Monongalia were higher than for similar size parcels in Preston County.

TABLE 3. ACREAGE TRANSFERRED BY SIZE OF PARCEL AND LOCATION.

Size of Parcel (acres)		Location			
		Sub-division	Monongalia	Preston	Study
0.0-0.9	No. of transfers	323	216	54	593
	Acres per transfer	0.34	0.45	0.48	0.39
	Total acres	109.8	97.9	25.8	233.5
1.0-1.9	No. of transfers	35	121	18	174
	Acres per transfer	1.22	1.26	1.23	1.25
	Total acres	42.6	152.7	22.1	217.4
2.0-4.9	No. of transfers	11	92	16	119
	Acres per transfer	2.94	3.04	3.72	3.12
	Total acres	32.4	279.6	59.50	371.5
5.0-9.9	No. of transfers	0	48	7	55
	Acres per transfer		7.18	7.16	7.17
	Total acres		344.4	50.1	394.5
10.0-24.9	No. of transfers	0	33	12	45
	Acres per transfer		15.90	18.30	16.54
	Total acres		524.7	219.6	744.3
25.0-49.9	No. of transfers	0	34	3	37
	Acres per transfer		32.86	37.27	33.22
	Total acres		1,117.3	111.8	1,229.1
50.0-74.9	No. of transfers	0	19	5	24
	Acres per transfer		56.90	66.12	58.82
	Total acres		1,081.0	330.6	1,411.6
75.0-99.9	No. of transfers	0	9	8	17
	Acres per transfer		86.98	87.92	87.42
	Total acres		782.8	703.4	1,486.2
100.0 plus	No. of transfers	0	11	18	29
	Acres per transfer		135.03	167.28	155.04
	Total acres		1,485.3	3,011.0	4,496.3
All Acreages	No. of transfers	369	583	141	1,093
	Acres per transfer	0.50	10.06	32.16	9.68
	Total acres	184.8	5,865.7	4,533.9	10,584.4

TABLE 4. AVERAGE AND TOTAL CONSIDERATION BY SIZE OF PARCEL AND LOCATION.

Size of Parcel (acres)	Location				
	Subdivision	Monongalia	Preston	Study	
0.1-0.9	Consideration per transfer Total consideration	\$ 10,152. 3,278,962.	\$ 3,878. 837,686.	\$ 2,813. 151,927	\$ 7,198. 4,268,515.
1.0-1.9	Consideration per transfer Total consideration	10,460. 366,100.	4,956. 599,628.	3,859. 69,458.	5,949. 1,035,186.
2.0-4.9	Consideration per transfer Total consideration	23,127. 254,400.	5,756. 529,561.	3,861. 61,779.	7,107. 845,740.
5.0-9.9	Consideration per transfer Total consideration	0 0	7,101. 340,858.	6,371. 44,600.	7,008. 385,458.
10.0-24.9	Consideration per transfer Total consideration	0 0	10,571. 348,856.	3,165. 37,975.	8,596. 386,831.
25.0-49.9	Consideration per transfer Total consideration	0 0	10,726. 364,677.	8,833. 26,500.	10,572. 391,177.
50.0-74.9	Consideration per transfer Total consideration	0 0	21,526. 409,000.	5,600. 28,000.	18,208. 437,008.
75.0-99.9	Consideration per transfer Total consideration	0 0	17,089. 153,800.	5,022. 40,175.	11,410. 193,975.
100.0 plus	Consideration per transfer Total consideration	0 0	46,530. 511,833.	11,577. 208,382.	24,835. 720,215.
All acreages	Consideration per transfer Total consideration	10,568. 3,899,462.	7,026. 4,095,899.	4,743. 668,796.	7,927. 8,664,157.

TABLE 5. NUMBER OF TRANSFERS AND AVERAGE CONSIDERATION BY VALUE CLASS AND LOCATION.

Range of Consideration	Location			
	Subdivision	Monongalia	Preston	Study
Under \$100.	No. of transfers	0	8	3
	Av. consideration	\$ 0	\$ 52.	\$ 58.
	Total consideration	0	416.	178.
\$100-\$499.	No. of transfers	21	63	21
	Av. consideration	256.	253.	254.
	Total consideration	5,376.	15,939.	5,334.
\$500-\$999.	No. of transfers	17	64	19
	Av. consideration	678.	648.	602.
	Total consideration	11,526.	41,472.	11,457.
\$1,000-\$4,999.	No. of transfers	138	240	48
	Av. consideration	2,510.	2,217.	2,409.
	Total consideration	346,462.	532,080	115,632.
\$5,000-\$9,999.	No. of transfers	55	78	25
	Av. consideration	6,781.	6,804.	6,744.
	Total consideration	372,955.	530,712.	168,600.
\$10,000-\$19,999.	No. of transfers	64	86	21
	Av. consideration	15,263.	14,270.	13,295.
	Total consideration	976,836.	1,227,207.	279,205.
\$20,000-\$29,999.	No. of transfers	49	25	4
	Av. consideration	24,379.	23,276.	22,100.
	Total consideration	1,194,571.	581,900.	88,400.
				7
				23,900.
				1,864,900.

(continued on next page)

(continued from page 13)

Range of Consideration	Subdivision	Monongalia	Preston	Study
\$30,000-\$39,999.	No. of transfers	10	0	27
	Av. consideration	33,576.	0	34,093.
	Total consideration	335,760.	0	920,511.
\$40,000-\$49,999.	No. of transfers	4	0	7
	Av. consideration	40,875.	0	42,786.
	Total consideration	163,500.	0	299,502.
\$50,000-\$74,999.	No. of transfers	2	0	7
	Av. consideration	59,400.	0	55,686.
	Total consideration	118,800.	0	389,802.
\$75,000-\$99,999.	No. of transfers	1	0	1
	Av. consideration	80,000.	0	80,000.
	Total consideration	80,000.	0	80,000.
\$100,000-and over	No. of transfers	2	0	2
	Av. consideration	234,000.	0	234,000.
	Total consideration	468,000.	0	468,000.
All	No. of transfers	583	141	1,093
	Av. consideration	7,026.	4,743.	7,963.
	Total consideration	4,095,899.	668,796.	8,664,157.

TABLE 6. AVERAGE PRICE PER ACRE FOR DIFFERENT LOCATIONAL AND ACREAGE GROUPS.

Acreage Group	Average Price Per Acre			
	Subdivision	Monongalia	Preston	Study
0.1-0.9	\$29,857.	\$8,618.	\$5,861.	\$18,456.
1.0-1.9	8,595.	3,933.	3,137.	4,759.
2.0-4.9	7,866.	1,893.	1,038.	2,278.
5.0-9.9	-	989.	890.	977.
10.0-24.9	-	665.	173.	520.
25.0-49.9	-	326.	237.	318.
50.0-74.9	-	378.	84.	310.
75.0-99.9	-	196.	57.	130.
100.0 plus	-	344.	69.	160.
All Acreage	\$21,136.	\$ 698.	\$ 147.	\$ 819.

EFFECTS OF BUILDINGS ON SALES VALUES

The market value of properties is influenced greatly if they contain buildings. The value of the improvements to a buyer is dependent on the type of building involved, the condition of the building, planned use of the property by the new owner, locational factors, and the acreage involved.

Property transfers were separated into two groups, those with buildings at the time of sale and those without buildings. Transfers with buildings comprised 55 per cent of all sales. Nearly two thirds of the transfers occurring in subdivision locations involved buildings. The number of transfers in each locational group with buildings and the difference in size and value between properties with and without buildings are shown in Table 7. It appears, based on average acreage, that size of the parcel was not influenced by the presence or lack of buildings. Although there was a large difference in average acreage among the different locational groups, there was very little difference in size between those sales with buildings and those without buildings in the same group.

The average consideration for parcels located in a subdivision and containing a building was \$15,635, while the average considerations for parcels with buildings in the Monongalia and Preston groups were \$11,143 and \$6,501 respectively. That the smallest average acreage is associated with the largest average consideration may appear contradictory. Part of the answer is because buildings in the subdivision locations tended to be newer than those for other locations. Also, in many of the more rural areas the buildings present may have been non-residential structures or house trailers.

TABLE 7. EFFECTS OF BUILDINGS ON TRANSFERS.*

		Location			
		Subdi- vision	Monon- galia	Preston	Study
No. of transfers	With bldg.	229	276	82	587
	Without bldg.	128	298	59	485
Av. acreage	With bldg.	0.53	9.64	34.62	9.58
	Without bldg.	0.45	9.68	28.73	9.56
Av. consideration	With bldg.	\$15,635.	\$11,143.	\$6,501.	\$12,247.
	Without bldg.	2,142.	3,214.	2,300.	2,820.
Av. price per acre	With bldg.	\$29,500.	\$ 1,156.	\$2,300.	\$ 1,278.
	Without bldg.	4,760.	332.	80.	295.

*21 transfers were omitted due to a lack of information on the presence of buildings.

Comparing prices on a per acre basis for bare land also reveals the great difference that exists between locations. Lots sold in the subdivision group, without buildings, had an average price equivalent to \$4,760 per acre. This is fourteen times as great as the average price per acre paid for non-subdivision bare land in the Monongalia group and nearly sixty times as great as the average price per acre in the Preston group. Lots in subdivisions often include clearing, landscaping, and other improvements which are included in the market value of the property.

To gain a better concept of land values, transfers also were grouped by acreages and location with and without buildings as shown in Tables 8 and 9. In general, both tables show a significant decrease in per acre price as size of the parcel increases regardless of the location. Table 8 indicates the decreasing relative importance of buildings as acreage increases. Table 9 and Figure 2 indicate that a high premium exists for small acreage parcels of bare land.

INFLUENCE OF TIME

Land values in West Virginia have been steadily rising in recent years. The U. S. Department of Agriculture's average farm real estate value per acre index (1967=100) for West Virginia was 96 in March, 1966, and 177 in March, 1972, an increase of 84 per cent.⁶ Land values in the study area showed an even greater increase (Table 10). Several factors may have contributed to this. Much of the area is becoming residential, increasing the value of land suited to this use.

⁶"Indexes of Farm Real Estate Values Per Acre, 1912-1972," *Farm Real Estate Market Developments*, Economic Research Service, USDA, Washington, D.C. Supplement No. 2, June, 1973.

TABLE 8. NUMBER OF TRANSFERS, AVERAGE ACREAGE, AVERAGE CONSIDERATION, AND AVERAGE PRICE PER ACRE BY ACREAGE AND LOCATION FOR TRANSFERS WITH BUILDINGS.

Size of Parcel (acres)	Location			
	Subdivision	Monongalia	Preston	Study
0.1-0.9	No. of transfers	196	30	324
	Av. acreage	0.33	0.48	0.39
	Av. consideration	\$15,262.2	\$ 4,639.3	\$11,906.6
	Av. price per acre	46,249.1	9,665.2	30,529.7
1.0-1.9	No. of transfers	23	9	92
	Av. acreage	1.22	1.30	1.27
	Av. consideration	\$14,600.0	\$ 6,445.4	\$ 9,381.6
	Av. price per acre	11,967.2	4,958.0	7,387.1
2.0-4.9	No. of transfers	10	10	63
	Av. acreage	2.90	3.64	3.13
	Av. consideration	\$25,320.0	\$ 5,652.5	\$10,755.1
	Av. price per acre	8,731.0	1,552.9	3,436.1
5.0-9.9	No. of transfers	0	4	22
	Av. acreage		6.95	6.82
	Av. consideration		\$ 8,800.0	\$10,374.1
	Av. price per acre		1,266.2	1,521.1
10.0-24.9	No. of transfers	0	6	25
	Av. acreage		19.25	16.08
	Av. consideration		\$ 5,379.2	\$11,473.9
	Av. price per acre		279.4	731.6

(continued on next page)

(continued from page 17)

Size of Parcel (acres)	Subdivision	Monongalia	Preston	Study
25.0-49.9	No. of transfers Av. acreage Av. consideration Av. price per acre	17 34.64 \$10,080.1 291.0	1 33.50 \$ 4,000.0 33.5	18 34.58 \$ 9,742.3 281.7
50.0-74.9	No. of transfers Av. acreage Av. consideration Av. price per acre	4 60.75 \$13,025.0 214.4	2 70.90 \$ 6,500.0 91.7	6 64.13 \$10,850.0 169.2
75.0-99.9	No. of transfers Av. acreage Av. consideration Av. price per acre	4 90.98 \$ 9,500.0 104.0	2 77.80 \$ 5,000.0 64.3	6 86.58 \$ 8,000.0 92.4
100.0 plus	No. of transfers Av. acreage Av. consideration Av. price per acre	7 140.0 \$14,969.0 106.4	6 198.8 \$10,692.5 53.8	13 167.6 \$12,995.2 77.6
All acreage	No. of transfers Av. acreage Av. consideration Av. price per acre	128 0.45 \$ 2,142.2 4,760.4	59 28.73 \$ 2,300.1 80.1	485 9.56 \$ 2,820.3 295.0

TABLE 9. NUMBER OF TRANSFERS, AVERAGE ACREAGE, AVERAGE CONSIDERATION, AND AVERAGE PRICE PER ACRE BY ACREAGE AND LOCATION FOR TRANSFERS WITHOUT BUILDINGS.

Size of Parcel (acres)	Location			
	Subdivision	Monongalia	Preston	Study
0.1-0.9	No. of transfers Av. acreage Av. consideration Av. price per acre	116 0.35 \$ 2,182.7 6,236.3	117 0.42 \$ 936.2 2,229.0	24 0.48 \$ 531.2 1,106.7
1.0-1.9	No. of transfers Av. acreage Av. consideration Av. price per acre	11 1.23 \$ 1,800.0 1,463.4	61 1.24 \$ 2,136.6 1,723.1	9 1.16 \$ 1,272.1 1,096.6
2.0-4.9	No. of transfers Av. acreage Av. consideration Av. price per acre	1 3.00 \$ 1,200.0 400.0	46 3.00 \$ 2,819.9 940.0	6 3.85 \$ 875.0 227.5
5.0-9.9	No. of transfers Av. acreage Av. consideration Av. price per acre	0 0 0 0	29 7.50 \$ 4,787.1 638.3	3 7.43 \$ 3,133.3 421.7
10.0-24.9	No. of transfers Av. acreage Av. consideration Av. price per acre	0 0 0 0	13 17.10 \$ 6,406.4 374.6	6 17.35 \$ 950.0 54.8

(continued on next page)

(continued from page 19)

Size of Parcel (acres)	Subdivision	Monongalia	Preston	Study
25.0-49.9	No. of transfers Av. acreage Av. consideration Av. price per acre	17 31.08 \$ 11,371.5 365.9	2 39.15 \$11,250.0 287.3	19 31.93 \$11,358.7 355.7
50.0-74.9	No. of transfers Av. acreage Av. consideration Av. price per acre	14 55.24 \$ 25,242.8 456.9	3 62.93 \$ 5,000.0 79.4	17 56.60 \$21,670.6 382.9
75.0-99.9	No. of transfers Av. acreage Av. consideration Av. price per acre	4 85.12 \$ 27,950.0 328.4	6 91.28 \$ 5,029.2 55.3	10 88.82 \$14,197.5 159.8
100.0 plus	No. of transfers Av. acreage Av. consideration Av. price per acre	8 117.80 \$135,016.6 1,146.1	12 151.50 \$12,018.9 79.3	15 144.76 \$36,618.5 253.0
All acreage	No. of transfers Av. acreage Av. consideration Av. price per acre	229 0.53 \$15,635.0 29,500.0	82 34.62 \$ 6,501.1 187.8	587 9.58 \$12,246.9 1,278.4

Figure 2. Average Price Per Acre by Acreage and Location for Transfers without Buildings.

TABLE 10. EFFECT OF TIME ON LAND TRANSFERS IN THE STUDY AREA.

Year	Number of Transfers	Total Acreage Transferred	Average Acres Per Transfer	Total Consideration Transferred	Average Consideration Per Transfer	Average Price Per Acre	Index of Price Per Acre
		(acres)	(acres)	(dollars)	(dollars)	(dollars)	(1966=100.0)
1966	170	1,941.9	11.42	981,801	5,775.3	505.7	100.0
1967	173	1,960.9	11.33	1,043,467	6,031.6	532.4	105.3
1968	190	1,440.4	7.58	1,555,245	8,185.5	1,079.9	213.5
1969	193	1,662.2	8.61	1,360,303	7,048.2	818.6	161.9
1970	208	2,622.2	12.61	2,170,854	10,436.8	827.7	163.7
1971	159	957.8	6.02	1,552,333	9,763.1	1,621.8	320.7

TABLE 11. EFFECT OF TIME ON LAND TRANSFERS IN SUBDIVISION GROUP.

Year	Number of Transfers	Total Acreage Transferred	Average Acres Per Transfer	Total Consideration Transferred	Average Consideration Per Transfer	Average Price Per Acre	Index of Price Per Acre
		(acres)	(acres)	(dollars)	(dollars)	(dollars)	(1966=100.0)
1966	45	25.2	0.56	360,270	8,006	14,285	100.0
1967	55	25.3	0.46	449,845	8,179	17,780	124.5
1968	80	46.4	0.58	870,560	10,882	18,762	131.3
1969	62	31.0	0.50	589,930	9,515	19,030	133.2
1970	75	36.7	0.49	1,029,150	13,722	28,004	196.0
1971	52	20.2	0.39	599,716	11,533	29,572	207.0

The years showing the largest increases in average price per acre, 1968 and 1971, were years in which the average size of parcel sold was smaller and, as noted earlier, there is a premium on small parcels. A second factor contributing to the rising land values may have been the expectation of and the purchase of land by the highway department for the construction of Corridor E. In addition, inflation has added to the cost of new buildings over the five years. This would be reflected in the value of properties sold with buildings.

The influence of time on each of the three locational groups was examined and can be seen in Tables 11 through 13. The average price for subdivision sales, on a per acre basis, rose by 107 per cent between 1966 and 1971. Actual average consideration per transfer was up by 44 per cent, from \$8,006 to \$11,533, while the average size of a subdivision lot decreased by 30 per cent, from 0.56 to 0.39. Transfers in the Monongalia group also showed an increase of approximately 100 per cent in the per acre value of land between 1966 and 1971. In this group the average dollar value per transfer increased 62 per cent, from \$5,522 in 1966 to \$8,922, in 1971. At the same time the average acres of land per parcel decreased from 11.64 acres to 9.42 acres.

Land values in the Preston group also followed a notable upward trend. Sales in this group for 1971 differed considerably from previous years and thus the overall comparison is not indicative of the changes that occurred. The average price per acre rose by approximately 50 per cent between 1966 and 1970. Unlike the Subdivision and Monongalia groups, the Preston group showed an increase in both average size and consideration between 1966 and 1970. However, transfers for 1971 were significantly smaller in size and totaled only 23.6 acres. The presence of buildings and small size of these parcels resulted in the great increase in real estate values per acre noted.

Regression Analysis

Studies of the land market have in general focused on agricultural land values with the emphasis being on identifying and measuring factors associated with the value of agricultural land. A few recent studies have been directed towards determining the effects of urbanization, water resource development, and public investment on the variation in land values. Little research has been conducted on land values in an Appalachian area where land is neither intensively agricultural nor highly urbanized. The analysis in this section was done to determine the relationships between a set of independent variables hypothesized as affecting land values and the dependent variable, value of land per acre. While not all of the value determinants can be isolated and measured, some being very individual or social in nature, an analysis of a large number of

TABLE 12. EFFECT OF TIME ON LAND TRANSFERS IN MONONGALIA GROUP.

Year	Number of Transfers	Total Acreage Transferred	Average Acres Per Transfer	Total Consideration Transferred	Average Consideration Per Transfer	Average Price Per Acre	Index of Price Per Acre
		(acres)	(acres)	(dollars)	(dollars)	(dollars)	(1966=100.0)
1966	98	1,140.7	11.64	541,156	5,522	474	100.0
1967	90	1,099.8	12.22	488,340	5,426	444	93.7
1968	88	837.8	9.52	613,712	6,974	732	154.4
1969	109	778.3	7.14	675,582	6,198	868	183.1
1970	101	1,095.8	10.85	911,525	9,025	832	175.5
1971	97	913.7	9.42	865,434	8,922	947	199.8

TABLE 13. EFFECT OF TIME ON LAND TRANSFERS IN PRESTON GROUP.

Year	Number of Transfers	Total Acreage Transferred	Average Acres Per Transfer	Total Consideration Transferred	Average Consideration Per Transfer	Average Price Per Acre	Index of Price Per Acre
		(acres)	(acres)	(dollars)	(dollars)	(dollars)	(1966=100.0)
1966	27	775.0	28.74	80,379	2,977	103	100.0
1967	28	835.8	29.85	105,280	3,760	125	121.4
1968	22	556.2	25.28	70,972	3,226	127	123.3
1969	22	852.9	38.77	94,798	4,309	111	107.8
1970	32	1,489.6	46.55	230,176	7,193	154	149.5
1971	10	23.6	2.36	87,180	8,718	3,694	3,586.4

actual real estate market sales should reveal the relation between value and some of the more important of these variables.

The independent variables considered in this study have been organized into three groups to clarify and provide a convenient frame of reference (1) those associated with the soil and physical land characteristics, (2) those associated with the location of the property, and (3) those characteristics associated with the transfer of the individual property.⁷

THE VARIABLES

The following is a description of the variables hypothesized to be related to land values. The dependent variable Y, price per acre, was derived by dividing the consideration for each transfer by the acreage involved and therefore includes the value of land, buildings, and improvements. A complete list of the variables used in the analysis is presented in Appendix A.

Factors Associated with the Soil or Physical Features. Land quality or characteristics of the soil and the physical features of the land were hypothesized to be related to the market value of land. Data on the land characteristics of each parcel were obtained from aerial photographs mapped to show different soil and physical features. The maps were made available by the Soil Conservation Service. Adequately measuring the physical and soil characteristics of a tract of land in a manner that can be easily coded and analyzed presents certain problems. The attempt here was to determine the predominant or average characteristic for the land parcel. The following variables were compiled as measures of the physical characteristics of the parcel transferred.

Variable X_1 was a measure of average slope of a particular property. The greater slopes were expected to be more difficult and costly for residential development, though in some specialized locations a property with a greater slope may be desirable in terms of aesthetic value, i.e. view of the surrounding countryside. In general, it is expected that land with a lesser slope would command a premium. Distribution of transfers by average slope is listed below.

- 0-8% slope, 302 transfers (28.01%)
- 8-15% slope, 452 transfers (41.93%)
- 15-25% slope, 230 transfers (21.34%)
- 25-35% slope, 70 transfers (6.49%)
- 35% slope, 24 transfers (2.23%)

⁷The classification system is similar to one used by Downing and Jansma. See Roger H. Downing and Dean J. Jansma, *The Economic Impact of Public Investment on Property Values in York County, 1950-1965*. Research Publication No. 61. University Park: The Institute for Research on Land and Water Resources, Pennsylvania State University, April, 1970.

Variable X_2 was a measure of land quality, the land capability classification of the Soil Conservation Service, which groups soils to show their suitability for most kinds of farming. Capability classes range from I to VII and denote decreasing land quality. It was expected that this variable would be negatively related to land values. Distribution of transfers by the dominant land capability class for the parcel is shown in Table 14.

Variable X_3 was a measure of the soil limitation for sewage disposal (filter field method). This index was developed by officials of the Monongalia County Soil Conservation Service. The degree of limitation—slight, moderate, or severe—indicates the severity of problems expected to be encountered for the specified use. Considered in arriving at this index were such characteristics of the soil as slope, depth to bedrock, permeability, depth to water table, and likelihood of flooding. Limitation of the soil for building construction purposes also was considered as a variable but the high degree of correlation to variable X_3 (r value of .93) made the measurement redundant as a separate variable.

Variable X_4 was a measure of land use in a general sense. Three categories of land use were recorded—cleared (meadows, pastures, and open spaces), forested, and other, which referred primarily to residential use. If the parcel was two acres or less and contained buildings it was coded as other. If the parcel contained buildings and was over two acres in size or if there were no buildings, it was coded as either cleared or forested. Variable X_4 was used as a classification (Dummy) variable.⁸

Factors Associated with the Location of the Property. Variables X_5 through X_{11} were used to evaluate some of the locational characteristics of a land parcel. It would seem logical that the proximity of a land parcel to an urban area, the availability of public utilities, or the amount of development would, all other things equal, influence the price at which land would sell. Population density also reflects the demand for land for non-farm activities and would be expected to show a positive relationship to land values.

Variable X_5 was used to designate the county in which the property was located and was a classification variable. Because Monongalia County is a more

⁸Classification variables contain information where the variation is between discrete groups and not a meaningful numerical scale. Variable X_4 is such a variable that contained three classes—cleared land, forested land and other land. The method used to handle classification variables in regression is to generate dummy variables, i.e. assign values of 0's, 1's or -1's for each class that makes the sum of observations of each dummy variable equal to zero. The number of dummy variables used in the regression equation is one less than the number of classes. The matrix below shows the values for the dummy variables that would be created for this example.

Class	Dummy 1	Dummy 2
Cleared	1	0
Forested	0	1
Other	-1	-1

TABLE 14. DISTRIBUTION OF TRANSFERS BY CAPABILITY CLASS OF THE LAND.

	I	II	III	IV	V	VI	VII
Number	2	256	379	175	2	129	135
Percentage	0.19	23.74	35.15	16.24	0.19	11.96	12.53

urban area and Preston County is more rural it would be expected that land located in Monongalia would command a higher price.

Variable X_6 was the driving distance from the land parcel to downtown Morgantown, measured in two-mile intervals. Parcels located the greatest distance from Morgantown may have closer ties to another city but Morgantown is the principal urban center for the majority of transfers and distance from it would be expected to be related to value of land with an inverse relationship.

Variable X_7 indicated the direct distance to the nearest Corridor E proposed interchange measured in concentric circles of one-mile intervals. Highway interchange areas are often centers of economic development and it was hypothesized that anticipation of the opening of Corridor E might positively influenced the value of land close to the interchange.

Variable X_8 was designed to measure the relative difference in value for properties located along different types of roads. This variable was a classification variable with four categories: (a) located along a major route, (b) located along a paved secondary road, (c) located along a gravel road, and (d) located along a street, i.e. in a subdivision or row of houses. Distribution of transfers by road type are: Major route, 178; Paved secondary, 108; Gravel road, 396; Street, 396. It was expected that there would be a positive relationship between the better roads and the value of land.

Variable X_9 indicated which properties have public water available to them. It was expected that this service would be desirable and positively related to the value of rural properties. By coincidence there were 539 transfers with public water available and 539 transfers without water at the time of sale.

Variable X_{10} was used to measure the locational advantage, if any, of the land parcel being in a subdivision. This also is a classification variable with 366 transfers occurring in subdivisions and 712 transfers outside of subdivisions.

Variable X_{11} indicated the number of parcels in a particular block, each block being composed of or equal in size to a tax map of 3.9 square miles. It was believed that the number of parcels per block would indicate the amount of development and in a sense the population density of a specific area. The number of land transfers that occurred per block was highly correlated with the number of parcels of land in a block (r of .941) and thus X_{11} also is a measure of the demand for land in a specific area.

Factors Associated with Transfer Characteristics. The last set of factors hypothesized to be related to land values was composed of characteristics associated with the individual transfer. The first of these, Variable X_{12} , was included to measure the general relation between time of sale and price of the property. An index of one to six was used for the year of sale ranging from 1966 to 1971.

Variable X_{13} was the number of acres transferred, measured to one decimal place. Small tracts usually reflect a more intensive type of land use and commonly sell for a higher price per acre than large tracts. There may also be a greater demand for smaller tracts because more people are in a financial position to buy them and also they may be closer to a city and are purchased for home sites.

Variable X_{14} indicated how the property was classified for tax purposes before it was sold and thus if the property was occupied by the grantor at the time of sale. A property not occupied by the owner may indicate it was being held by a speculator and this may be related to the sales value.

Variable X_{15} was the amount of road frontage on a particular tract. To allow for the difference in size of tract, this was put in terms of feet of road frontage per acre.

Variable X_{16} was an interaction variable created by multiplying Variable X_{12} , year of sale, by Variable X_7 , distance to interchange. It was hypothesized that distance to interchange would be more important in the later years.

CORRELATIONS

Correlation is a measure of the mutual relationship between two variables. The correlation coefficient r is a measure of the degree of closeness of the linear relationship between the two variables. It should be noted that (a) r is a pure number without units or dimensions and (b) r always lies between -1 and +1. Positive values of r indicate that X_1 and X_2 tend to increase together; when r is negative, they tend to vary inversely. The statistical significance of r shows the probability that a correlation coefficient as large or larger than the one calculated would have occurred by chance were the variables truly independent.

Table 15 gives the simple correlation coefficients for the variables discussed and price per acre for each class of property. Few of the variables showed very strong linear relations to the price per acre for the property. Variables measuring characteristics of the soil and topography of the tract of land sold seemed to show the least linear relations to price per acre. Variables associated with locational and transfer characteristics tended to show a significant and stronger linear relation than the physical variables. A complete matrix of the simple correlation coefficients for all transfers is presented in Appendix B.

TABLE 15. CORRELATION COEFFICIENTS BETWEEN PRICE PER ACRE AND THE INDEPENDENT VARIABLES USED IN LAND MARKET MODELS

Independent Variable	Price Per Acre ^b			
	Class I	Class II	Class III	Class IV
X_1 Slope	0.043	0.026	0.201**	0.007
X_2 Capability Class	0.091*	-0.022	-0.125	0.095
X_3 Sewage Limitation	-0.069	-0.217***	-0.039	-0.084
X_4 Land Use ^a	0.070	0.000	-0.075	-0.134*
X_5 County ^a	-0.128**	-0.168***	-0.194**	-0.232***
X_6 Distance to Morgantown	-0.174	-0.303***	-0.183**	-0.251***
X_7 Distance to Interchange	-0.038	-0.072	-0.192**	-0.116
X_8 Type of Road ^a	0.212***	0.353***	0.232***	0.473***
X_9 Public Water ^a	0.301***	0.309***	0.505	0.393***
X_{10} In a Subdivision ^a	0.384***	0.465***	-0.018	0.575***
X_{11} Number of Parcels	0.348***	0.419***	0.499***	0.410***
X_{12} Year of Transfer	0.029	0.184***	0.118	0.202***
X_{13} Acres	-0.270***	-0.470***	-0.267***	-0.309***
X_{14} Grantor Tax Class ^a	0.009	-0.194***	0.011	-0.083
X_{15} Highway Frontage	0.098*	0.381***	0.273***	0.233***
X_{16} $X_7 \times X_{12}$	-0.001	0.071	-0.012	-0.001

***Statistically significant at the 1 per cent probability level.

**Statistically significant at the 5 per cent probability level.

*Statistically significant at the 10 per cent probability level.

^aThese variables are classification variables. The correlation coefficients presented here are uncorrected for this difference.

^bClass I are properties of two acres or less with no buildings,
Class II are those of two acres or less with buildings,
Class III are those with over two acres with no buildings, and
Class IV are those of over two acres with buildings.

THE MULTIPLE REGRESSION MODELS

Whereas correlation measures a co-relation, a joint property of two variables, regression deals primarily with the means of one variable and how its values are influenced by another variable. The principle of least squares is used in fitting a linear model to the data. The model is of the general form

$$E(Y) = B_0 + B_1X_1 + B_2X_2 + \dots + B_nX_n$$

where $E(Y)$ means the "expected value of Y ," where Y is a dependent variable and the X 's are the independent variables. The B_i are known as "partial regression coefficients" and they indicate the effects of the independent variables on the dependent variable. Thus, B_1 measures the average or expected change in Y when X_1 increases by 1 unit, all other X 's remaining unchanged. In multiple regression, the value of any regression coefficient depends on the other

variable included in the regression. A t-test is used to test for the statistical significance of a partial regression coefficient.

The "coefficient of determination," R^2 , is a measure of the amount of variation in Y explained by all of the independent variables used. R^2 will indicate the proportion or per cent of variation in price per acre that can be explained by the regression model. Multiple correlation coefficients are tested for significance by F tests.

Standard partial regression coefficients are used to indicate the relative importance of different variables. The standard partial regression coefficients are the partial regression coefficients when each variable is in a standard measure, i.e., is a deviation from the mean in units of its standard deviation. Since each standard B is independent of the original units of measurement, a ranking of these coefficients (ignoring sign) indicates the relative importance of the independent variables involved.

Trial equations using all the variables were derived and examined for each class of property. Based on this evaluation certain changes were made in the model. Since B_1 indicates how Y would be expected to alter when X is varied, holding all other factors fixed, autocorrelation would reduce the equation's value as an estimate of the relative significance of the different variables. Autocorrelation between X_1 , slope of the land, and X_2 , land capability index, was quite high. For this reason X_1 was deleted even though it may have an important relationship to the dependent variable.

The manner in which the data for variable X_4 , land use, was coded resulted in Class II properties all having the same value for this variable and therefore variable X_4 was dropped from the Class II model. Variable X_4 was then used only to indicate if a difference existed between cleared and forested land values.

A very high correlation was found between county, X_5 , and distance to Morgantown, X_6 . Since public water systems and subdivisions were found in only one county, Monongalia, variable X_5 was deleted and variable X_6 was kept.

Variable X_7 , distance to nearest Corridor E interchange, was not significant for any class of property in the trial equations and thus was deleted. From personal observations and public notices it was known that a large shopping mall, a 200-room motel, some warehouse facilities, and other developments were planned near the Morgantown Corridor E interchange. Also, grantee names indicated that some of the purchases near interchanges were business oriented. Either these purchases near the interchanges did not sell for higher prices or they were too limited to the Morgantown interchanges to be statistically significant.

Trial equations indicated that the primary differences due to type of road, variable X_8 , arose between the non-paved roads and the other three classes of roads. To make this variable easier to evaluate it was converted to paved versus non-paved roads.

Variable X_{14} , grantor tax class, had to be dropped because approximately one-fifth of the cases did not have values present for this variable. Variable X_{16} , year by distance to interchange, was dropped because it was not significant in any of the trial equations.

Regression Results

Since the purpose of this analysis was to examine the relationships of various factors on the market price of properties, and since considerable difference in types of properties existed, all properties were divided into four classes to reduce the variations and examine the different relationships. Class I properties were tracts less than or equal to two acres and on which there were no buildings at the time of transfer. Class II properties were tracts less than or equal to two acres and on which there were buildings at the time of transfer. Class III properties were tracts of more than two acres on which there were no buildings and Class IV were tracts greater than two acres with buildings present at the time of sale. The number of valid transfers in the analysis for each of the four classes were: Class I, 347; Class II, 423; Class III, 135; and Class IV, 159. Transfers for less than 100 dollars were deleted from this analysis because it is questionable whether they are valid market transfers.

The average price per acre for the different classes of properties are: Class I, \$4,358; Class II, \$34,040; Class III, \$571; and Class IV, \$1,561. The partial regression coefficients, t-values, and standard partial regression coefficients for each class of property are presented in Table 16. All equations had F-values significant at the 0.0001 level. The coefficients of determination, R^2 's, for Classes I through IV were 0.216, 0.394, 0.431 and 0.537, respectively.

The following examination of the models is made on a variable by variable basis across the different classes of properties. Variable X_2 , land capability class, was significant only in the Class II model. Coefficient signs in Class I and IV did not agree with a prior reasoning, that is, that the better quality land would be worth more, all other things being equal. A partial explanation for this may be that the lower land classes, having greater slopes, have greater aesthetic value, but since the coefficients were not statistically significant, these results could have been erroneous.

Variable X_3 , soil sewage disposal limitations, was significant only for Class II properties. The sign of the coefficient was in the direction hypothesized for all classes.

Cleared land, variable X_4 , resulted in higher prices for Class III and Class IV parcels. However, Class I (less than or equal to 2.0 acres, no buildings) showed a negative coefficient for cleared land. Since these smaller parcels would typically be used for residences the negative sign probably reflects the desire for trees on residential lots.

TABLE 16. REGRESSION COEFFICIENTS, T-VALUES, AND STANDARD B VALUES FOR THE INDEPENDENT VARIABLES USED TO EXPLAIN VARIATIONS IN THE PRICE PER ACRE OF RURAL PROPERTIES.

Variable	Class I Properties			Class II Properties		
	Regression Coefficient	t-Value	Standard B Value	Regression Coefficient	t-Value	Standard B Value
X2 Capability Class	198.40	0.81	0.047	1,771.49	1.69*	0.067
X3 Sewage Limitation	-112.20	-0.41	-0.021	-3,214.92	2.49***	0.100
X4 Land Cleared	-855.89	-1.80*	-0.109			
X6 Distance to Morgantown	-69.33	-0.69	-0.043	-764.48	-1.76*	-0.086
X8 Non-paved Road	1,109.91	1.23	0.071	2,664.54	0.58	0.028
X9 No Public Water	-552.47	-1.26	-0.078	-227.15	-0.11	-0.005
X10 Not In a Subdivision	-1,475.36	-2.80***	-0.206	-7,946.21	-3.25***	-0.187
X11 Number of Parcels	4.12	1.97**	0.150	18.57	2.03**	0.118
X12 Year of Transfer	266.93	1.12	0.060	3,851.46	3.83***	0.152
X13 Acres	-2,854.50	-3.34***	-0.186	-24,858.79	-6.04***	-0.275
X15 Frontage	-0.22	-0.33	-0.017	18.16	3.67***	0.157
Intercept	4,118.37	1.83*		24,657.44	2.61***	
Number of Transfers	347			423		
F Value	8.37***			26.82***		
R ²	0.216			0.394		

(continued on next page)

Variable	Class I Properties			Class II Properties		
	Regression Coefficient	t-Value	Standard B Value	Regression Coefficient	t-Value	Standard B Value
X2 Capability Class	-4.09	-0.09	-0.008	160.36	1.46	0.102
X3 Sewage Limitation	-36.90	-0.70	-0.049	-186.87	-1.44	-0.083
X4 Land Cleared	30.92	0.41	0.034	511.86	2.66***	0.184
X6 Distance to Morgantown	9.05	0.92	0.072	21.89	0.96	0.070
X8 Non-paved Road	-96.89	-0.70	-0.052	-925.72	-2.58***	-0.165
X9 No Public Water	-322.12	-3.47***	-0.292	-345.08	-1.59	-0.112
X10 Not In a Subdivision	766.84	2.07**	0.145	-2,777.38	-6.52***	0.416
X11 Number of Parcels	1.42	4.12***	0.360	1.90	2.31**	0.172
X12 Year of Transfer	79.32	2.05**	0.144	319.93	3.51***	0.202
X13 Acres	-2.20	-1.64*	-0.130	-7.74	-1.83*	-0.129
X14 Frontage	2.22	2.13**	0.159	2.12	0.85	0.055
Intercept	-541.65	-1.10		2,936.38	3.22***	
Number of Transfers	135			159		
F Value	8.46***			15.53***		
R ²	0.431			0.537		

***Significant at 1 per cent level.

**Significant at 5 per cent level.

*Significant at 10 per cent level.

In general, it appears that the physical characteristics of the soil and terrain did not contribute much to an explanation of the variation in the price of rural property. The reasons for this may be that these characteristics were of only minor importance. It also is possible that the system used to gather and record this data was in error or that important physical characteristics were omitted from the models.

Variable X_6 , distance to Morgantown, was significant, at the 10 per cent probability level, only in the Class II model. The signs of the regression coefficients were not uniform. Classes I and II showed the expected decrease in price per acre as distance from Morgantown increased. The larger parcels of land, Class III and Class IV, showed a positive relation between distance from Morgantown and price per acre. This could reflect different motives in buying property with those desiring privacy and rural living buying the larger, more distant plots.

Variable X_8 indicates if the property was located on a non-paved road and was statistically significant, at the 1 per cent probability level, only for Class IV. Classes I and II had positive coefficients with non-paved roads. These classes represent the type of properties used primarily for residential purposes and their location along a dirt road may provide a greater privacy and thus be a positive aspect of the location or at least does not result in lower prices. The larger acreage sales followed the hypothesis that the value of property along a paved road would be higher.

The availability of public water, variable X_9 , showed the hypothesized association for all classes but was significant, at the 1 per cent probability level, only for Class III properties. This variable could indicate that a premium is placed on this service and that a portion of the public investments in water systems is capitalized into the value of adjacent properties.

Variable X_{10} indicates that properties not located in a subdivision were less valuable on a per acre base than those within a subdivision. This variable was significant at the 1 per cent level for Classes I and IV. The sign of the regression coefficient was positive for Class III, but this is not very meaningful as only two of the 135 Class III transfers were located in a subdivision.

The number of parcels per block, variable X_{11} , had regression coefficient signs as hypothesized and was significant at the 5 per cent probability level for Classes III and IV. This variable was relatively more important for the parcels of over two acres in size and may indicate the increased demand on these parcels in the more densely populated areas.

Variable X_{12} , year of sale, was positively related to the dependent variable for all classes of property and was significant at the 5 per cent probability level for Class II and at the 1 per cent level for Class IV. The fact that Classes II and IV were most significant and their standard partial regression coefficients were

relatively more important may indicate that buildings may have appreciated at a faster rate than land.

The coefficients of variable X_{12} , representing year of sale, indicate an annual price appreciation of \$267, \$3,851, \$79, and \$313 for Class I to IV respectively. When examined as a per cent of average price per acre the annual increases appear as follows—Class I, +6.1 per cent; Class II, +11.3 per cent; Class III, +13.8 per cent; and Class IV, +20.1 per cent.

Variable X_{13} , acres in the parcel, was significant at the 1 per cent probability level for Class I and II and at the 10 per cent level for Classes III and IV. This was one of the more important variables in explaining variations in per acre values. The signs of the regression coefficients were all negative indicating that, everything else being equal, the larger the size of the parcel the lower the expected price per acre for both properties with buildings and those without buildings. As might be expected the size of the coefficients were much larger for Classes I and II properties than for Classes III and IV, that is, differences in size had a greater influence on price per acre for the smaller parcels.

Highway frontage per acre, variable X_{15} , had a positive coefficient that was significant at the 1 per cent probability level for Classes II and III. In these equations additional feet of road frontage per acre added significantly to the price per acre paid by the buyer.

RELATIVE IMPORTANCE OF DIFFERENT GROUPS OF VARIABLES

To determine the types of factors most closely related to land prices each group of characteristics was examined separately.

Physical Factors. The variables in Table 17 that were characteristics of the soil and topography were X_2 , capability class, X_3 , sewage limitation, and X_4 , cleared land. Multiple regression equations were derived for each class of property using only these variables. The results are presented in Table 17. Taken alone these physical variables explained only 1.9 per cent to 4.7 per cent of the variation in the price per acre of the properties sold. No single variable stood out as being most important for all classes. Land capability class was relatively important for Classes I, III, and IV, whereas sewage limitation was more important on Class II properties and cleared land was most important on Class IV sales. While the physical characteristics may play a role in determining the price of rural properties, it may be that their value in relation to the total price of the property is so small that their relation is insignificant.

Locational Factors. The variables characteristic of locational factors were X_6 , distance to Morgantown, X_8 , location along a non-paved road, X_9 , availability of public water, X_{10} , location in a subdivision, and X_{11} , the number of parcels per tax block or equivalent area. Regression equations using only these

TABLE 17. REGRESSION EQUATIONS USING ONLY CHARACTERISTICS ASSOCIATED WITH PHYSICAL FACTORS OF THE PARCEL.

Variable	Class of Property			
	I	II	III	IV
X ₂ Capability Class	444.07 ^a 1.71* 0.104	438.20 0.34 0.017	- 56.43 - 1.06 - 0.107	296.52 2.03** 0.189
X ₃ Sewage Limitation	- 513.56 - 1.76* - 0.097	- 7,080.15 - 4.55*** - 0.220	- 51.28 - 0.77 - 0.068	-233.12 - 1.31 - 0.103
X ₄ Land Cleared	- 255.48 - 0.54 - 0.033		54.47 0.59 0.059	586.21 2.26** 0.211
Intercept	3,951.24 3.36*** 0.0	46,771.69 8.61*** 0.0	947.67 3.11*** 0.0	768.15 0.97 0.0
F Value	2.18*	10.44***	0.97	2.51*
R ²	0.019	0.047	0.022	0.046

^aUpper row, regression coefficients; middle row, t-value and level of significance where *** = 1 per cent, ** = 5 per cent and * = 10 per cent; lower row is standard B value.

variables are presented in Table 18. Used alone the locational factors explained between 17.5 per cent and 44.9 per cent of the variation in price per acre of different properties. The availability of public water, other things in the model remaining equal, may add on the average between \$375 and \$850 to the value of a parcel of bare land. Another locational factor that was highly significant in explaining the variation in rural property values was whether the property was located in a subdivision or not. For example, Class I properties or bare land less than or equal to two acres in size would be expected to sell for approximately \$1,900 less on the average than parcels located in a subdivision, the other locational variables remaining unchanged. The number of different parcels per a given unit area was significant for Class II, III, and IV properties. The larger number of parcels must be indicative of greater development and demand for more intensive land use.

Transfer Factors. The third group of factors were unrelated to physical or locational characteristics and were termed characteristics associated with the transfer. Used in the models were X₁₂, year of sale, X₁₃, acres in the parcel and X₁₆, highway frontage per acre for the parcel sold. Regression equations using only these transfer characteristics are shown in Table 19. The R² values for this group of factors ranged from .074 to 0.291. Acreage was the relatively most important factor in all classes. Except for Class I properties, highway frontage and year of sale added to the R² value and were statistically significant.

Summary and Conclusions

The purpose of this study was to gain information and knowledge about the organization, structure and performance of the rural land market in a specified area of West Virginia. The study area was one in which (during the time period of the study) a major land use change in the form of the construction of a four-lane limited access highway was begun. The specific objectives were:

- (1) To determine the nature of the organizational and operational characteristics of the rural land market in a specified area;
- (2) To identify and rank in significance the factors that affect the price of rural real estate;
- (3) To establish benchmark data useful in determining and evaluating the impact of Appalachian Corridor E Highway construction on adjacent land values and land use.

Public land records were used to obtain information on all real estate transfers between January 1, 1966 and December 31, 1971 located within approximately two miles of the new Appalachian Corridor E Highway route. All transfers were examined for non-market influences, after which 1,093 transfers

TABLE 18. REGRESSION EQUATIONS USING ONLY CHARACTERISTICS ASSOCIATED WITH THE LOCATION OF THE PARCEL.

Variable	Class of Property			
	I	II	III	IV
X ₆ Distance to Morgantown	- 32.36 ^a - 0.36 - 0.020	- 643.12 - 1.36 - 0.072	1.73 0.18 0.014	- 2.61 - 0.12 - 0.008
X ₈ Non-paved Road	731.52 0.83 0.047	- 469.40 - 0.09 - 0.005	-117.46 - 0.82 - 0.063	-1,199.01 - 3.19*** - 0.213
X ₉ No Public Water	- 856.93 - 2.04** - 0.121	- 2,911.56 - 1.31 - 0.066	-376.22 - 4.11*** - 0.341	- 367.66 - 1.61* - 0.120
X ₁₀ Non Subdivision	-1,896.30 - 3.68*** - 0.265	-13,236.14 - 5.04*** - 0.311	765.26 2.00** 0.145	-2,900.71 - 6.44*** - 0.434
X ₁₁ Number of Parcels	3.18 1.56 0.116	25.42 2.62*** 0.162	1.32 3.75*** 0.335	1.66 1.93** 0.151
Intercept	3,537.29 2.81***	25,810.44 3.90***	-195.28 - 0.46	4,737.91 7.92***
F Value	14.46***	28.71***	14.23***	24.98***
R ²	0.175	0.256	0.355	0.449

^a Upper row, regression coefficients; middle row, t-value and level of significance where *** = 1 per cent, ** = 5 per cent, and * = 10 per cent probability level; lower row is standard B value.

TABLE 19. REGRESSION EQUATIONS USING ONLY CHARACTERISTICS ASSOCIATED WITH THE TRANSFER OF THE PARCEL.

Variable	Class of Property			
	I	II	III	IV
X ₁₂ Year	42.14 ^a 0.18 0.009	4,008.03 3.85*** 0.159	69.20 1.53 0.126	320.27 2.80*** 0.207
X ₁₃ Acres	-4,050.96 - 4.87*** - 0.26	-33,925.43 - 8.37*** - 0.375	- 3.46 - 2.33** - 0.206	- 15.05 - 3.15*** - 0.251
X ₁₆ Frontage	0.28 0.40 0.022	26.02 5.01*** 0.225	2.72 2.22** 0.195	4.96 1.62* 0.129
Intercept	6,600.80 5.92***	30,762.61 5.60***	298.79 1.56	726.78 1.42
F Value	9.12***	57.29***	6.12***	9.23***
R ²	0.074	0.291	0.123	0.152

^a Upper row, regression coefficients; middle row, t-value and level of significance where *** = 1 per cent, ** = 5 per cent, and * = 10 per cent probability; lower row is standard B value.

were accepted as valid market sales. Additional primary data on these sales were obtained from deed books, tax maps, soil surveys, aerial photographs, public facilities maps and personal interviews.

The heterogeneous nature of the land market in the study area provided an opportunity to study three sub-markets—(a) subdivisions, which were small areas with a concentration of small parcels; (b) non-subdivision Monongalia County, which is becoming increasingly residential; and (c) the Preston County segment, which is more typically rural and agricultural.

It was found that over 50 per cent of the sales involved less than one acre of land. Average acreage per transfer differed considerably among the sub-markets: 0.50 acres per transfer in the subdivision group, 10.06 acres per transfer in the Monongalia group, and 32.16 acres per transfer in the Preston group. A total of 10,584 acres were involved in the transactions.

Real estate sales totaled \$8,664,157 for the properties in the study. There was a wide variation in values, \$30 to a high of \$350,000 per transfer. The mean value was \$7,927.

Average price per acre was used as a common basis of comparison among the different sub-markets. It was found that a significantly large difference existed in the average price per acre for the different sub-markets—the average price per acre for transfers without buildings was \$80 in the Preston group, \$332 in the Monongalia group, and \$4,760 in the subdivision group.

Average price per acre varied significantly with the size of the parcel both for transfers with buildings and those without buildings. The change was greatest among the small parcels.

The value of rural properties as reflected by average price per acre increased considerably over the years in the study. Average value per acre for subdivision sales rose each year from 1966 to 1971 and showed a total increase of 107.0 per cent. The Monongalia group showed a 99.8 per cent increase in average price per acre during the same period. In both of these groups there was a decrease in average parcel size in the later years. Since average price per acre varied inversely with acreage this change in parcel size also contributed to the increased value over time. The Preston group showed a 50 per cent increase in average price per acre between 1966 and 1970 and then an uncharacteristically large jump in 1971 due to a predominance of small acreage sales.

Analysis and evaluation of the rural property transfers in the study did not show a significant change in values that might be directly linked to the construction of the Appalachian Corridor E Highway. However, the 1971 increase in Preston County may have been due to the construction of the highway which makes residential use more attractive.

An attempt was made to identify and evaluate a set of factors associated with variations in rural land values. The sixteen explanatory variables used measured physical, locational, and transfer characteristics of each property sold.

Properties were divided into four classes based on size and presence of buildings. Correlation and multiple linear regression models were used to test hypotheses about the relationship between the selected variables and the sales price per acre of the rural properties. R^2 values of 0.216, 0.394, 0.431 and 0.537 were obtained for the different classes of properties. The locational characteristics (distance to Morgantown, location on a non-paved road, availability of public water, location in a subdivision and the number of parcels in a given area) were the most important factors in explaining the variations in different property values.

A study of the individual rural market transactions in a specified area is complicated by the imperfections of the real estate market and the tremendous variations in the market commodity. In addition, the characteristics and objectives of both the buyer and the seller greatly affect the supply and demand situations.

In this study the greatest demand for land was for residential use. Building lots in a subdivision or land that was subdivided into lots had market values between two and six times higher than similar size non-subdivision parcels. This may represent a considerable gain for the seller and encourage speculation and holding of land in areas that might be developed in the future.

Regression analysis was useful in explaining the combined effects of the independent variables on the variance in price of rural properties. Limitations are present in this method, one being that statements about the size of a regression coefficient is not unique, it is conditional on the other variables in the model. The low R^2 's for some of the equations suggest that other important factors were not identified. Some of these factors may be associated with the seller of the property and suggest areas where further research could be done.

Results of the study indicate that in the market area considered the factors associated with the physical characteristics of the parcel had a relatively small influence on price. Land was sold primarily for nonagricultural uses which may account for the minor role played by quality of land. Factors associated with the location of the property were the relatively most important characteristics in explaining price variations.

No major changes in land use or land values were found in this study that could be separated and identified as the result of the initiation of Appalachian Corridor E construction. It may be too early for such changes to be identified. Benchmark data have been established that can be used in the future to evaluate the impact of the new highway on surrounding land values and land use.

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APPENDIX

A. MATRIX OF SIMPLE CORRELATION COEFFICIENTS FOR VARIABLES USED IN LAND MARKET STUDY

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆
Y	1.0000																
X ₁	0.241	1.0000															
X ₂	0.089	0.089	1.0000														
X ₃	-0.166	-0.166	-0.166	1.0000													
X ₄	-0.133	-0.133	-0.133	0.241	1.0000												
X ₅	-0.141	-0.141	-0.141	0.089	0.089	1.0000											
X ₆	0.222	0.222	0.222	-0.166	-0.166	-0.166	1.0000										
X ₇	-0.071	-0.071	-0.071	0.133	0.133	0.133	0.241	1.0000									
X ₈	0.133	0.133	0.133	-0.141	-0.141	-0.141	-0.141	-0.141	1.0000								
X ₉	0.302	0.302	0.302	0.222	0.222	0.222	0.222	0.222	0.222	1.0000							
X ₁₀	0.461	0.461	0.461	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	1.0000						
X ₁₁	0.298	0.298	0.298	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.241	1.0000					
X ₁₂	0.122	0.122	0.122	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	1.0000				
X ₁₃	0.149	0.149	0.149	0.222	0.222	0.222	0.222	0.222	0.222	0.222	0.222	0.222	0.222	1.0000			
X ₁₄	0.073	0.073	0.073	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	1.0000		
X ₁₅	0.287	0.287	0.287	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.241	1.0000	
X ₁₆	0.010	0.010	0.010	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	-0.141	1.0000

(continued on next page)

A. VARIABLES USED IN ANALYSIS OF RURAL LAND VALUES.

Y	Price Per Acre, for land and improvements
X ₁	Average Slope of Land
X ₂	Average Land Capability Class
X ₃	Sewage Limitation
X ₄	Land Cleared
X ₅	County
X ₆	Distance to Morgantown (Driving distance)
X ₇	Distance to Nearest Corridor E Interchange (Direct distance)
X ₈	Type of Road
X ₉	Public Water Available
X ₁₀	Located in a Subdivision
X ₁₁	Number of Parcels in Block Location
X ₁₂	Year of Transfer
X ₁₃	Acres in Parcel
X ₁₄	Grantor Tax Class
X ₁₅	Highway Frontage Per Acre
X ₁₆	Year By Distance to Interchange (X ₇ x X ₁₂)

B. MATRIX OF SIMPLE CORRELATION COEFFICIENTS FOR VARIABLES USED IN LAND MARKET STUDY.

	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
Y	1.000***						
X ₁ Price Per Acre	-0.041	1.000***					
X ₂ Slope	-0.060**	0.741***	1.000***				
X ₃ Capability Class	-0.166***	0.159***	0.128***	1.000***			
X ₄ Sewage Limitation	-0.415***	0.233***	0.262***	0.066**	1.000***		
X ₅ Land Use ^a	-0.141***	-0.181***	-0.063**	0.055*	0.127***	1.000***	
X ₆ County	-0.222***	-0.129***	0.020	0.084***	0.201***	0.871***	1.000***
X ₇ Distance to Morgantown	-0.057*	0.087***	0.082***	-0.028	0.071**	0.199***	0.227***
X ₈ Distance to Interchange	0.250***	-0.019	-0.063**	-0.132***	-0.120***	-0.145***	-0.081***
X ₉ Type of Road	0.302***	-0.009	-0.060**	-0.112***	-0.206***	-0.350***	-0.339***
X ₁₀ Public Water ^a	0.462***	-0.066**	-0.089***	-0.188***	-0.291***	-0.275***	-0.292***
X ₁₁ In a Subdivision ^a	0.398***	-0.065**	-0.058**	-0.172**	0.173***	-0.429***	-0.492***
X ₁₂ Number of Parcels	0.122***	-0.040	-0.067**	-0.077**	-0.053*	-0.066**	-0.077***
X ₁₃ Year of Transfer	-0.149***	0.106***	0.119***	0.328***	0.271***	0.291***	0.328***
X ₁₄ Acres	-0.073**	-0.010	-0.017	0.089***	-0.021	0.107***	0.089***
X ₁₅ Grantor Tax Class ^a	0.287***	-0.062**	-0.076**	-0.175***	-0.171***	-0.138***	-0.175***
X ₁₆ Highway Frontage	0.050*	0.029	0.012	0.091***	-0.003	0.075**	0.091***
X ₁₆ Variables X ₇ x X ₁₂							

(continued on next page)

(B. CONT'D.)

	X7	X8	X9	X10	X11	X12	X13
X7 Distance to Interchange	1.000***						
X8 Type of Road ^a	0.134***	1.000***					
X9 Public Water ^a	-0.094***	0.374***					
X10 In a Subdivision	-0.044	0.516***	1.000***				
X11 Number of Parcels	-0.157***	0.379***	0.540***	1.000***			
X12 Year of Transfer	-0.067**	0.008	0.115***	0.034	1.000***		
X13 Acres	0.056*	-0.097***	-0.258***	-0.220***	-0.066**	1.000***	
X14 Grantor Tax Class ^a	0.084***	-0.059***	-0.012	-0.047	0.009	-0.030	1.000***
X15 Highway Frontage	0.001	0.177***	0.247***	0.282***	0.244***	-0.180***	-0.028
X16 Variables X7 x X12	0.567***	0.110***	0.056*	0.016	-0.127***	0.087	-0.196***
						0.722***	-0.005

B. (CONT'D.)

	X14	X15	X16
X14 Grantor Tax Class ^a	1.000***		
X15 Highway Frontage	-0.060**	1.000***	
X16 Variables X7 x X12	-0.070**	0.065***	1.000***

*** Statistically significant at the 1 per cent probability level.

** Statistically significant at the 5 per cent probability level.

* Statistically significant at the 10 per cent probability level.

^aThese variables are classification variables. The correlation coefficient presented here is uncorrected for this difference.