Do Agricultural Land Preservation Programs Impact Land Values?

Lori Lynch, Wayne Gray, and Jacqueline Geoghegan

● Lori Lynch is an Associate Professor in the Department of Agricultural and Resource Economics, University of Maryland, College Park, Maryland.

● Wayne Gray and Jacqueline Geoghegan are Professor and Associate Professor, respectively, in the Department of Economics, Clark University, Worcester, Massachusetts.

Do Agricultural Land Preservation Programs Impact Land Values?

State and local farmland preservation programs have existed throughout the United States since the late 1970's to slow the conversion of agricultural lands to other uses. These programs take two basic forms, either purchase of development rights/purchase of agricultural conservation easements (PDR/PACE), or transfer of development rights (TDR). They result in an easement becoming attached to the agricultural land that restricts the right to convert the land to residential, commercial and industrial uses. The landowner is provided with a cash payment and/or state and federal tax benefits for participation.

Preservation programs are motivated by a number of policy objectives, including: local and national food security; viability of the local agricultural economy; efficient development of urban and rural land; and the protection of rural and environmental amenities (Gardner; Hellerstein et al.; Gale). More than 124 governmental entities in the United States have implemented farmland preservation programs and over 1.67 million acres are now in preserved status at a cost of almost $4 billion (American Farmland Trust 2005a, 2005b). Citizens continue to pass ballot initiatives to generate the funds to purchase easements. The state of Maryland, the focus of the research in this paper, has had a variety of state and county agricultural land preservation programs since the late 1970's, with almost 250,000 acres preserved by 2004 in the state Maryland Agricultural Land Preservation Foundation (MALPF) program.[1]

While there is some evidence that preservation programs provide net benefits to society (Feather and Barnard; Duke and Ilvento) in terms of amenities, little evaluation exists that they help retain farmland in farming and make farmland affordable to new or existing farmers. Capital Asset Pricing theory predicts that the restrictions imposed on further development with agricultural easements will reduce the sales price of a farm. States and preservation programs find this expected reduction in parcel value to be one of the benefits of farmland preservation programs (Gale) as it will help retain a viable agricultural sector. Therefore, it was surprising when Nickerson and Lynch, using sales data for 223 farms (20 with easements) in Maryland during 1994-1997, found little evidence that easement restrictions affect sales price.

Lynch, Gray and Geoghegan re-examined the impact of agricultural easements on sales prices using a substantially expanded data set of 3,554 market transaction from 1997-2003 in 22 Maryland counties, including 249 preserved properties, using both hedonic pricing models and propensity score models. Results from the hedonic analysis suggest substantial and statistically significant reductions in land price pre acre due to preservation, ranging from 11.4% to 16.9%. However, the results of a propensity score approach are quite different, taking advantage of a very strong predictor of program participation: the distance to the closest preserved parcel. With this distance variable in the model, the estimated impact of preservation on price becomes small and statistically insignificant. This means that unrestricted land located near preserved parcels tends to sell for the same low price as the preserved land.

We found this result to be quite puzzling and suggested further research was necessary. We re-investigate the question once again, using a new measure to capture the influence of near-by preserved parcels. Instead of the distance to nearest preserved parcel, we use GIS techniques to calculate the percent of preserved agricultural land in a 1 kilometer and a 5 kilometer buffer surrounding each agricultural sales parcel. We then analyze the impact of agricultural easements on sales prices conditioning on these new variables, using both hedonic regression and propensity score approaches. We also investigate a sample that contains agricultural parcels without structures, as these parcels are strictly for agricultural use to eliminate the potentially confounding effect of residential services associated with structures.

Theoretical Framework

In a competitive land market, prices reflect the sum of a stream of net returns from the land. For example, in Hardie, Narayan and Gardner, theories of Ricardian rent of soil characteristics are combined with the locational aspects of von Thunen models, showing that market values of parcels in suburban counties are the sum of the Ricardian rent and the location or accessibility rent. Capozza and Helsley and later Plantinga and Miller and Plantinga, Lubowski, and Stavins modify the basic framework of valuing land at the urban fringe by adding the expectation of possible capital gains.

This expected stream of rents and potential gains determines the market price per acre (P_i) of the parcel *i* as the expected sum of agricultural rents, A_i, from time *0* up to an optimal conversion date t^*, at which time the land is converted into a residential use with expected net returns of R_i as shown in equation (1).[2] Agricultural and residential rents are a function of X_i, the characteristics and location of the land, and *s*, time.

$$P_i = E\left[\int_0^{t^*} A_i(X_i, s)e^{-r(s)}ds + \int_{t^*}^{\infty} R_i(X_i, s)e^{-r(s)}ds\right] \qquad (1)$$

Land ownership conveys a bundle of rights, including that of developing the parcel, which a landowner can sell without relinquishing ownership of the land. An agricultural land owner can extract the value of these development rights by selling them to a preservation program in return for a net easement payment, EV_i. The new market price, $P^R_{i,}$ would be the expected sum of agricultural rents forever as shown in equation (2).[3]

$$P_i^R = E\left[\int_0^{\infty} A_i(X_i, s)e^{-r(s)}ds\right] \qquad (2)$$

Therefore, land owners would enroll their parcels in an agricultural preservation program if $E\left[\int_0^{t^*} A_i(X_i, s)e^{-r(s)}ds + \int_{t^*}^{\infty} R_i(X_i, s)e^{-r(s)}ds\right] < E\left[\int_0^{\infty} A_i(X_i, s)e^{-r(s)}ds\right] + EV_i$ or

$$E\left[\int_{t^*}^{\infty} R_i(X_i, s)e^{-r(s)}ds\right] < E\left[\int_{t^*}^{\infty} A_i(X_i, s)e^{-r(s)}ds\right] + EV_i$$

Methodology

The hedonic model is the traditional approach for estimating such a capitalization effect, and we begin our analysis using this approach. Hedonic modeling has a long tradition in agricultural economics and has been used in innumerable applications. Unfortunately, simply including a dummy variable for the existence of an agricultural easement in the regression is problematic, since landowners may have (not) entered farmland preservation programs specifically because their parcel's market value was lower (higher) than other parcels. Nickerson and Lynch use a Heckman model to control for sample selection, but did not find a significant selection effect.

In this paper, we also use a non-parametric approach, the propensity score method. This method has multiple benefits. First, the matching protocol ensures that the preserved parcels will be matched to those non-preserved parcels that are most similar in terms of characteristics, so dissimilar parcels and outliers will have no or little influence. Second, it does not assume that preservation status is exogenous, i.e. the decision to participate could depend on the parcel's expected sale price. Finally, unlike the Heckman model, this approach does not assume a particular functional form for the price equation.

Rosenbaum and Rubin developed the propensity score matching method. It has been widely used in economic studies, including evaluations of the effects of environmental regulations on plant births (List, et al.) and the land market effects of zoning (McMillen and McDonald), in addition to our earlier work on agricultural easements (Lynch, Gray and Geoghegan).

Description of the Study Area=s Farmland Preservation Programs

In the late 1970s, policymakers responded to the rapid conversion of farmland in Maryland by instituting agricultural preservation programs. To be considered preserved, a farm had to have sold its development rights or a conservation easement. This study does not include land solely enrolled in a preferential property tax or use-value assessment program. A description of the institutional structures of the state and a few of the local programs follows.

In 1977, Maryland established the Maryland Agricultural Land Preservation Foundation (MALPF) to purchase permanent easements of farmland. MALPF sets the easement value as the lower of 1) a calculated easement value equal to an appraised fair market value minus the agricultural value and 2) a bid made by the landowner. The agricultural value is determined by a formula based on land rents and soil productivity or on the county=s 5-year average cash rent. If insufficient funds exist to purchase all sell offers, the parcels are ranked by the ratio of the bid to the easement value. Those parcels with the highest value per dollar are accepted first.[4] MALPF has minimum eligibility criteria: parcels must have at least 100 contiguous acres[5] or be contiguous to another preserved parcel and must have at least 50 percent of the soil classified as USDA Class I, II, or III soil or Woodland group 1 or 2.

To fund farmland preservation, MALPF receives approximately 14.5% of a state real estate transfer tax that is applied to all real estate transactions and 25-67% of the agricultural transfer tax.[6] Using a county-level matching fund financed by the agricultural transfer tax, individual counties can contribute up to 40% of the easement cost to increase their easement acres. During 1996-2000, MALPF had sufficient funds to purchase easements for 35% of the submitted bids (MDA, 2001). The bidding approach used by MALPF creates competition among landowners to name the minimum price they would accept to sell an easement. This competition results in easement purchases at less than the calculated easement values and has saved the program $91 million. Thus, theoretically the State could purchase easements on 51,896 additional acres (MDA 2001).

Calvert and Montgomery Counties began TDR programs in 1978 and 1979 under which farmland owners can sell their rights to build houses to a developer, who then uses the rights in a planned growth area to increase building density. The price is negotiated by the landowner and the developer. The number and price of TDRs sold are not constrained by available program funds but by developers= demand for increased density. Developers can choose from whom to purchase development rights. Developers would view development rights from one farmer as the same as from another farmer regardless of the parcel characteristics. The competition between landowners to sell their rights (between developers seeking the right to increase density) may lower (raise) the easement value.

Other counties have begun PDR programs such as one in Howard County. This PDR program initially used appraisals. Appraisals evaluated comparable market sales of agricultural land to determine the market price and then the easement value of the property. In 1989, the program switched to using a parcel characteristic-based point system to determine the easement value. In this case, the county ranked characteristics it thought affected market value (to ensure a high enough easement value to induce enrollment) and that it valued in a preserved farm. In addition, it began using an installment purchase agreement. These agreements pay tax-free interest for 30 years with the principal payment in year 30, which enabled the county to leverage the available resources.

Data

Our main data source is the GIS-based MDPropertyView 2002 Database (from the Maryland Department of Planning), consisting of all arm's-length agricultural land parcels that were sold between 1997 and 2003.[7] In order to calculate the per-acre land value, we subtracted the assessed value of any improvements[8] to the parcel (such as structures) from the market price, and then divided by parcel size to get PRICE.

We dropped all parcels from the sample with:

--less than 10 acres (as too small to be viable agricultural parcels);

--improvement values over $1 million (as unrepresentative of the parcels a land preservation program might target or as good controls for the preserved parcels);

--residential structures listed as present but with a zero improvement value listed in the database (as apparent data errors);

--and per-acre land value less than $300 (as this was the minimum assessed agricultural use value thus data error is most likely);

-- and any waterfront property (as these parcels are under separate regulations (Maryland Critical Area regulations) which might limit their development options).

This resulted in 3,359 observations, of which 245 had easement restrictions.

AGEASE indicates the presence of an agricultural easement, while ELIG indicates that the parcel met the minimum eligibility requirements for the easement program.[9] STRUCT indicates whether there was a structure on the property, which could increase parcel values (even though the assessed value of the structure was subtracted from the sales price). In addition, the log of the size of the parcel (LACRES) is included to allow for potential nonlinearities in the effect of parcel size on per-acre land values. WATER indicates a property adjacent to the Atlantic Ocean, Chesapeake Bay or major tributaries, recognizing that waterfront property is more attractive for development.

Using land use and soil data from the State of Maryland and GIS techniques (see Lynch, et al. for more details), we calculated the approximate percent of land for each observation in cropland use (CROP), forest use (FOREST), in pasture use (PASTUR), and in prime agricultural soils (PRIME).[10] GIS techniques were also used to calculate the road distance to the nearest metropolitan area (Washington, D.C., Baltimore, Salisbury, Cumberland, and Hagerstown), included in log form (LDCITY). We also include information on distance to the nearest easement property.[11] These variables include the distance to nearest preserved parcel (CONTIG); the fraction of land that is in agricultural easement within 1 kilometer of the sales parcel (%EASE1k); and the fraction of land that is in agricultural easement within 5 kilometers of the sales parcel (%EASE5k). These measures can capture the proximity criteria for eligibility in the agricultural easement program and to some extent the unobservable aspects of the preservation decision such as profitability in agriculture, positive expectations for the future of agriculture, family heritage, etc…(Lynch and Lovell) and/or limited development prospects. Finally, we include geographic dummy variables (USDA CRD codes) [12] to allow for differences across regions in public goods and agricultural easement policies.

Table 1 presents descriptive statistics for the full sample as well as the subsamples of preserved and unpreserved parcels and parcels without structures. As expected, preserved parcels have a lower per- acre price on average, $2,935 compared to $5,931. The distance to the nearest preserved parcel (CONTIG) differs greatly between the two groups. In fact, the maximum CONTIG value for preserved parcels is 0.68 miles, well below the mean CONTIG value of 1.5 for unpreserved parcels. Similarly, preserved parcels have a greater amount of preserved land in its vicinity: approximately three times as much for the smaller 1 kilometer area, and about twice as much for the larger measured area. Preserved parcels are (not surprisingly) more likely to qualify for the MALPF program; they are also larger, with a higher percent of prime soils and cropland, and have less forest cover. The price per acre is lower for parcels without structures, even after subtracting off the assessed value of the structure, while most of the other variables are more similar between the full sample and the no structure sub-sample.

Results

Table 2 presents the results of a hedonic model of parcel prices for the entire sample, estimated using OLS, for four different specifications. Model 2a is a base case that includes no variables relating to nearby easements; model 2b is the model includes the CONTIG variable; and models 2c and 2d include the fraction of preserved lands in 1 km (%EASE1km) and 5km buffers (%EASE5km), respectively.

Estimated per-acre prices for preserved parcels are 10-17% lower, and this effect is statistically significant across model specification. There also seems to be something of a neighborhood effect of preservation; the coefficient on CONTIG indicates that farmland prices rise significantly (6% per mile) with distance from the nearest preserved property. Including CONTIG in the model also reduces the own-preservation effect by about one-quarter, from 17% to 10%. The other neighborhood preserved measures behave similarly, with the larger amount of nearby preserved land, all else being equal, decreasing the selling price of an agricultural parcel. These variables also decrease the own-preservation effect, but not to as great an extent as the CONTIG variable. The control variables generally have the expected effects: higher prices per acre for properties with prime agricultural soils, and with structures present; lower prices per acre for properties farther from cities, with larger total area, and with forest cover. Table 4 shows the hedonic results for the no structure sub-sample, similarly arranged to the full sample results presented in Table 2. These model results have a similar pattern to the previous model.

The first stage of the propensity score analysis involves estimating a probit model of the propensity for a property to be enrolled in a preservation program. Table 3 (for full sample) and Table 5 (for no structure sub-sample) include these results. Similar to the hedonic model, we estimate four different specifications: a base; with CONTIG; with %EASE1k; with %EASE5k. For the full sample, the base model, we see more easements on properties that are larger, less forest land, farther from cities, and (not surprisingly) properties indicated to be eligible for the program. Adding CONTIG to the model quadruples its explanatory power (pseudo-R-squared increases from 19% to 79%). It also changes the contribution of many of the variables compared to the base model. The inclusion of the %EASE1k or %EASE2k has a smaller effect on the pseudo-R-squared.

In Table 6, we find the end results of the propensity score analysis, for both the full sample and no structure sub-sample, the "average effect of treatment on the treated" (ATT) values. These are calculated as the difference between the sales price of each easement property (the treatment group) and the average sales price for a comparison (control) group of non-easement properties with similar estimated probabilities of participating in a preservation program. We consider two approaches for forming the control groups--nearest-neighbor (based on the single closest control observation to the treatment observation) and kernel (based on a distance-weighted average of all observations "reasonably close" to the treatment observation).

For the full sample, using propensity scores calculated for the base model, the nearest-neighbor matching method estimates the market price of preserved parcels to be 13.7% lower than comparable non-preserved parcels, although the bootstrapped t-statistics are somewhat weak. The kernel method substantially increases the estimated effect of preservation, with 21.5% lower prices for preserved parcels, while allowing nearly all of the non-preserved parcels to serve in one or more of the comparison groups.

When we include CONTIG in the propensity score measure, the estimated effects of preservation on prices are no longer significant. As noted above, the probit models with CONTIG do a much better job at differentiating between protected and non-protected parcels. This results in only a few non-protected parcels being chosen in the nearest-neighbor control groups for most of the protected parcels (only 48 distinct non-protected parcels, rather than 209, are closest to one or more of the 245 protected parcels). Using the kernel method expands the size of the control group (though most of the non-protected parcels are serving as controls for a few low-propensity-score protected parcels), but the results are similar to nearest-neighbor, with small and insignificant effects of the restrictions on price. However, using the other measures of nearby preserved lands, the fraction of land in a 1 km buffer around each sales point (%EASE1k) and the fraction of land in a 5 km buffer around each sales point (%EASE5k) results in statistically significant treatment effects for the kernel approach, suggesting about a 20% decrease in the selling price for preserved parcels. The results for the no-structure sub-sample demonstrate a similar pattern, with the CONTIG variable inclusion not having statistically significant selling prices, while the other specifications result in statistically significant selling differences, in the range of 20.6% to 22.9%.

Conclusions

Hedonic models of parcel price suggest substantial and statistically significant reductions in price due to preservation, ranging from 11.4% to 16.9%. However, the results of a propensity score approach using a very strong predictor of program participation: CONTIG, the distance to the closest preserved parcel result in a very different conclusion. With CONTIG in the model, the estimated impact of preservation on price becomes small and statistically insignificant. This means that unrestricted land located near preserved parcels tends to sell for the same low price as the preserved land. We expanded on this concept to include two new indicators of preservation in the area.

While the inclusion of these two does not have the same predictive power as CONTIG, this specification also suggests that easement parcels sell at a discount of around 20%.

However, even it we believe these results, why is the discount only 20%? If all development potential is stripped from the property and only agricultural value remains, one would think that the price would fall much more than 20% in many regions of the state. One interpretation of our results is that landowners do not enroll in preservation programs in those areas where land values are high (or likely to become high in the near future). Because high land values are likely to be linked to development pressures, we plan in future work to examine the spatial pattern of development in Maryland, and to focus on different subregions of Maryland as separate markets. We also plan to examine other characteristics which may provide value to properties for homestead use and/or agricultural niche markets.

Acknowledgements

Support for this project was provided by the Maryland Center for Agro-Ecology, Inc. and the Center for Smart Growth Education and Research. We would like to thank Karen Palm, Sabrina Lovell, Jay Harwood and Sam Dworkin for their assistance.

References

American Farmland Trust (AFT). "Status of Selected Local PACE Programs: Fact Sheet," Washington D.C. 2005a.

American Farmland Trust (AFT). "Status of State PACE Programs: Fact Sheet," Washington D.C. 2005b.

Capozza, D. and Helsley, R. "The Fundamentals of Land Prices and Urban Growth," *J. Urban Econ.* 26(3)(1989): 295-306.

Duke, J. M., and Ilvento, T. W. "A Conjoint Analysis of Public Preferences for Agricultural Land Preservation," *Agr. and Res. Econ. Rev.* 33(2)(2004): 209-19.

Feather, P. and Barnard, C. H. "Retaining Open Space with Purchasable Development Rights Programs," *Rev. Agr. Econ.*, Fall-Winter 25(2)(2003): 369-84.

Gale, H. F. "Why Did the Number of Young Farm Entrants Decline?" *Amer. J. Agr. Econ.*, 75(February 1)(1993): 138-146.

Gardner, B. D. "The Economics of Agricultural Land Preservation," *Amer. J. Agr. Econ.* 59(Dec.)(1977): 1027-36.

Hardie, I.W., Narayan, T.A., and Gardner, B.L. "The Joint Influence of Agricultural and Nonfarm Factors on Real Estate Values: An Application to the Mid-Atlantic Region," *Amer. J. Agr. Econ.* 83(1)(2001):120-32.

Hellerstein, D., C. Nickerson, J. Cooper, P. Feather, D. Gadsby, D. Mullarkey, A. Tegene, and C. Barnard *Farmland Protection: The Role of Public Preferences for Rural Amenities.* Washington, DC, U.S. Department of Agriculture, ERS Agr. Econ. Rep. 815, October 2002.

List, J., Millimet, D.L., Fredriksson, P.G., and W.W. McHone. "Effects of Environmental Regulation on Manufacturing Plant births: Evidence from a Propensity Score Matching Estimator." *The Rev. Econ. and Stat.* 85(4)(2003): 944 – 952.

Lynch, L., Gray, W. and J. Geoghegan. "Are Farmland Preservation Programs Easement Restriction Capitalized into Farmland Prices? What can a Propensity Score Matching Analysis tell us?" *Review of Agricultural Economics,* 2007 (forthcoming).

Lynch, L., Palm K., Lovell, S., and Harvard, J. "Expected Cost of Tripling Maryland's Preserved Acres: Using a Hedonic Price Analysis on Agricultural Land Values from 1997-2003," Maryland Center for Agroecology, University of Maryland, 2007.

McMillen, D. P., and McDonald, J.F. "Land Values in a Newly Zoned City," *The Rev. Econ. and Stat.* 84(1)(2002): 62–72.

Nickerson, C. J., and Lynch, L. "The Effect of Farmland Preservation Programs on Farmland Prices, *Amer. J. Agr. Econ.*, 83(2)(2001):341-351.

Plantinga, A.J., Lubowski, R.N., and Stavins, R.N. "The Effects of Potential Land Development on Agricultural Land Prices," *J. Urban Econ.*, 52(3)(2002): 561-581.

Plantinga, A.J., and Miller D. "Agricultural Land Values and Future Development," *Land Econ.*, 77(1)(February 2001):56-67.

Rosenbaum, P., and Rubin D. "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika*, 70(1983):41-55.

Table 1. Descriptive Statistics for Full Sample, Preservation Status and Vacant Land

Variable Names	Full Sample (N=3,359) Mean (s.d.)	Preserved Yes 245 Mean	Preserved No 3114 Mean	Unimproved Land 1534 Mean	
price	5,713 (9,032)	2,935	5,931	5,228	Price($/ acre, adjusted)
logpri	8.115 (0.993)	7.763	8.142	7.937	Log(Price)
agease	0.073 (0.260)	1	0	0.059	Preserved parcel (0/1)
contig	1.394 (1.540)	0.104	1.495	1.538	Miles to nearest preserved parcel
ease1k	0.066 (0.129)	0.162	0.059	0.063	Fraction preserved within 1kilometer
ease5k	0.078 (0.097)	0.122	0.075	0.072	Fraction preserved within 5 kilometers
elig	0.399 (0.490)	0.824	0.365	0.42	Meets criteria for MALPF (0/1)
prime	0.423 (0.423)	0.517	0.416	0.393	Fraction of prime quality soil
eligpri	0.167 (0.326)	0.435	0.146	0.163	elig x prime
struct	0.543 (0.498)	0.629	0.537	0	Structure present (0/1)
lacres	3.748 (0.915)	4.575	3.683	3.796	Log(Acres)
ldcity	3.392 (0.591)	3.501	3.383	3.412	Log(distance to nearest city)
forest	0.363 (0.328)	0.228	0.373	0.41	Fraction forest
pastur	0.057 (0.165)	0.049	0.058	0.042	Fraction pasture

Table 2: Hedonic Results: Full Sample

(t-statistics in parentheses)

Model :	2a	2b	2c	2d
# obs :	3359	3359	3359	3359
Depvar:	Logprice	Logprice	Logprice	Logprice
--------	----------	------------	------------	------------
intcpt	9.813	9.72	9.773	9.745
	(73.27)	(72.68)	(72.31)	(72.03)
agease	-0.168	-0.1	-0.147	-0.151
	(-3.28)	(-1.93)	(-2.80)	(-2.93)
struct	0.124	0.127	0.122	0.123
	(4.7)	(4.85)	(4.63)	(4.67)
lacres	-0.404	-0.399	-0.403	-0.402
	(-27.46)	(-27.27)	(-27.36)	(-27.37)
prime	0.239	0.26	0.234	0.228
	(6.88)	(7.5)	(6.74)	(6.57)
ldcity	-0.024	-0.028	-0.011	0.006
	(-0.83)	(-0.97)	(-0.36)	-0.21
forest	-0.428	-0.448	-0.435	-0.44
	(-10.01)	(-10.53)	(-10.15)	(-10.28)
pastur	0.156	0.131	0.165	0.166
	(1.9)	(1.6)	(2.01)	(2.02)
contig		0.062		
		(6.77)		
ease1k			-0.24	
			(-2.14)	
ease5k				-0.543
				(-3.32)
CRDcod	Yes	Yes	Yes	Yes
R-sq	0.451	0.459	0.452	0.453

Table 3: Probit Model of Easement Participation: Full Sample

(t-statistics in parentheses)

Model :	3a	3b	3c	3d
# obs :	3359	3359	3359	3359
Depvar:	agease	agease	agease	agease
intcpt	-3.554	-2.30	-2.960	-3.206
	(-8.10)	(-2.41)	(-6.57)	(-7.20)
elig	0.399	-0.283	0.432	0.434
	(2.49)	(-0.84)	(2.61)	(2.67)
eligpri	0.239	-0.012	0.243	0.217
	(1.26)	(-0.03)	(1.23)	(1.13)
struct	0.118	0.278	0.143	0.126
	(1.53)	(1.79)	(1.80)	(1.63)
lacres	0.361	1.004	0.333	0.344
	(5.05)	(5.95)	(4.50)	(4.76)
prime	-0.094	-0.40	-0.030	0.001
	(-0.60)	(-1.36)	(-0.18)	(0.01)
ldcity	0.149	0.089	-0.057	-0.011
	(1.69)	(0.48)	(-0.62)	(-0.12)
forest	-0.853	-0.519	-0.693	-0.761
	(-5.74)	(-1.80)	(-4.55)	(-5.05)
pastur	-0.277	-0.787	-0.461	-0.349
	(-1.08)	(-1.58)	(-1.66)	(-1.33)
contig		-10.016		
		(-15.73)		
ease1k			2.533	
			(9.37)	
ease5k				2.364
				(5.35)
CRDcod	Yes	Yes	Yes	Yes
R-sq	0.187	0.787	0.236	0.202

Table 4: Hedonic Results: No Structure Sub-Sample

(t-statistics in parentheses)

Model :	4a	4b	4c	4d
# obs :	1534	1534	1534	1534
Depvar:	lxpri	lxpri	lxpri	lxpri
intcpt	10.173	10.034	10.101	10.066
	(52.41)	(52.10)	(51.76)	(51.63)
agease	-0.228	-0.120	-0.188	-0.20
	(-2.77)	(-1.45)	(-2.26)	(-2.43)
lacres	-0.333	-0.329	-0.330	-0.329
	(-15.28)	(-15.27)	(-15.15)	(-15.15)
prime	0.161	0.199	0.148	0.146
	(3.02)	(3.78)	(2.78)	(2.74)
ldcity	-0.142	-0.146	-0.117	-0.092
	(-3.34)	(-3.49)	(-2.72)	(-2.08)
forest	-0.608	-0.627	-0.626	-0.634
	(-10.09)	(-10.56)	(-10.38)	(-10.52)
pastur	0.108	0.092	0.113	0.105
	(0.75)	(0.65)	(0.79)	(0.73)
contig		0.080		
		(6.61)		
ease1k			-0.503	
			(-2.96)	
ease5k				-1.028
				(-4.03)
CRDcod	Yes	Yes	Yes	Yes
	---	---	---	---
R-sq	0.483	0.497	0.486	0.488

Table 5: Probit Model of Easement Participation: No Structure Sub-Sample

(t-statistics in parentheses)

Model :	5a	5b	5c	5d
# obs :	1534	1534	1534	1534
Depvar:	agease	agease	agease	agease
intcpt	-3.259	-1.442	-2.843	-3.037

	(-4.75)	(-1.08)	(-4.05)	(-4.39)
elig	0.219	-0.419	0.266	0.213
	(0.90)	(-0.89)	(1.07)	(0.87)
eligpri	0.348	0.128	0.371	0.348
	(1.16)	(0.23)	(1.18)	(1.15)
lacres	0.383	0.862	0.343	0.376
	(3.49)	(3.63)	(3.04)	(3.39)
prime	-0.050	-0.338	-0.049	-0.032
	(-0.20)	(-0.76)	(-0.19)	(-0.13)
ldcity	0.076	-0.015	-0.067	-0.054
	(0.54)	(-0.05)	(-0.46)	(-0.37)
forest	-1.092	-0.819	-0.939	-1.028
	(-4.92)	(-2.13)	(-4.15)	(-4.59)
pastur	-1.423	-3.901	-1.510	-1.358
	(-1.75)	(-2.20)	(-1.77)	(-1.67)
contig		-8.081		
		(-9.92)		
ease1k			2.605	
			(5.55)	
ease5k				2.679
				(3.29)
CRDcod	Yes	Yes	Yes	Yes
R-sq	0.182	0.752	0.227	0.197

Table 6: Average Effect of Treatment on the Treated (ATT) Models

Full-Sample (3359 observations)

	ATT – nearest neighbor			ATT – kernel		
BASE	245 / 209	-0.137	-1.8	245 / 3034	-0.215	-4.9
CONTIG	245 / 48	-0.063	-0.4	245 / 1019	-0.043	-0.3
EASE1k	245 / 202	-0.093	-1.0	245 / 3008	-0.204	-4.3
EASE5k	245 / 207	-0.150	-1.8	245 / 3048	-0.207	-4.8

No-Structure Dataset (1534 observations)

	ATT – nearest neighbor			ATT – kernel		
BASE	91 / 78	-0.097	-0.6	91 / 1277	-0.251	-4.0
CONTIG	91 / 19	-0.287	-1.0	91 / 380	-0.231	-1.1
EASE1k	91 / 76	-0.207	-1.5	91 / 1255	-0.206	-3.2
EASE5k	91 / 78	-0.158	-1.2	91 / 1278	-0.229	-3.1

Endnotes

[1] MALPF uses appraisals and an "auction" to set the easement value. It uses the lower of a) a calculated easement value equal to an appraisal value minus the agricultural value, or b) a bid made by the landowner. Farms are accepted in order of highest value per dollar bid until the budget is expended. Minimum eligibility criteria were recently changed to include 50 contiguous acres or contiguity to another preserved farm, and having at least 50 percent of its soil classified as USDA Class I, II, or III, or Woodland group I or II.

[2] To simplify the model, only two land uses are used. However, in some cases, the landowner will maximize present value by shifting the land use to commercial, industrial or other alternative land uses.

[3] The landowner could sell the farmland in the future with the easement restrictions attached to the property. Even with a new owner, no residential, commercial or industrial development would be permitted. Theoretically, the market value would remain the same whether the landowner continued to farm in perpetuity or sold the land for the capitalized agricultural value in the private market.

[4]. In 2000, the Maryland General Assembly passed legislation to give counties an option to utilize MALPF=s existing way of ranking properties for easement sale through the competitive bidding process *or* to create a county prioritization method for MALPF to use when making easement offers. This proposed change would help to preserve the "better quality" farms over marginal land. Counties could make the Abest@ farms a priority, given the limited funds. They could also rank land close to other preserved land higher than those parcels farther apart in order to obtain large blocks.

[5]. In 2001, the state changed the acreage eligibility from 100 acres to 50 acres.

[6]. When farmland is converted to another use, an agricultural land transfer tax of between 3-5 percent is applied. This tax provided $2.6 million to MALPF and $8 million to counties for farmland preservation in fiscal year 2000. Counties with a certified farmland preservation program receive three-quarters of the agricultural land transfer tax on county parcels. Other counties receive one-third.

[7] Prices were adjusted using the Index of Prices Received by Farmers (USDA) to a base year of 2003 to account for any inflation/deflation that had occurred during this time period.

[8]Maryland appraised each parcel and all improvement each three years. Therefore while not a perfect proxy for the value of the residential structure, we feel it is reliable.

[9] An observation was deemed eligible for MALPF if it had more than 50 acres or if it was within ¼ mile of an already preserved parcel and had more than 50% prime soils. Note that this is not a perfect measure of actual eligibility, as table 1 shows not all easement properties have ELIG=1.

[10] We follow the Maryland soil classification system in defining prime soils as agriculturally productive, permeable, with limited erosion potential, and with minimal slope.

[11] The CONTIG variable was calculated using the entire population of preserved properties, not only the properties that sold during the time period of analysis.
[12] Counties within each CRD code are similar in terms of agricultural land characteristics. This assumes counties close to each other share similar geographic, location, and other characteristics and that one land market encompasses these similar and adjacent counties.