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Do Residual Development Options Increase Preserved Farmland Values?

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Previous research has reached inconsistent, if not paradoxical, conclusions regarding the impact of conservation easements on farmland prices. Expectations of price reductions, strongly grounded in economic theory, are not always observed. We develop a hedonic model to examine the sale prices of 325 New Jersey preserved farms. We find strong evidence that residual development options retained under farmland deeds of easement have significant and positive effects on preserved farmland prices. This suggests that appraisals are undervaluing deed-restricted farmland, resulting in possible overpayment for conservation easements. This may explain the limited price differentials researchers have observed between preserved and unpreserved farmland.

Key words: conservation easements, farmland values, residual development options

Introduction

For decades, lawmakers have created institutions seeking to alter equilibrium outcomes in agricultural land markets under development pressure. The principal economic rationale for farmland preservation arises from the undersupply of unpriced collective goods (Gardner, 1977). Restricting development options on farmland can also make farmland more affordable to farmers, addressing a significant barrier to farm expansion and the entry of new farmers (Gale, 1993). Conservation easements (CE), like several other farmland preservation techniques, impact public budgets and have thereby attracted significant attention from economists. CE are negative easements that run with the land and are generally perceived to preclude development opportunities in perpetuity.

Often misunderstood as adjusting prices in existing markets—acting as would a tax instrument—CE instead alter imperfect land-market outcomes by allocating (largely) public capital to create demand for a lesser right in land (Duke and Lynch, 2006). Consequently, the policy process creates a second farmland market. The first market is the same unrestricted market as before the intervention, characterized by demand arising from farming with the option to develop but now with decreasing supply, as farmland under CE enters a second market. The second market for unrestricted farmland only ought to have demand for farming uses. CE valuation through appraisals relies on this sort

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Table 1. Past Studies on the Effects of Easement Restrictions on Farmland Values

Study	Finding
Nickerson and Lynch (2001)	No statistically significant price reduction found among Maryland farmland parcels sold between 1994-1997 (n=224; n=24 under CE).
Anderson and Weinhold (2008)	(a) No statistically significant price reduction found among Wisconsin properties sold between 1999-2004 (n=150; n=19 under CE).
	(b) Weak evidence of price reduction of approximately 35% in subsample of vacant properties (n=87; 15 under CE). 48% price reduction observed for easements precluding all future development (n=73; n=8 under "hard" easement[a]).
	(c) Statistically significant price reduction of approximately 50% in subsample of vacant agricultural properties (n=58; n=11 under CE). 42% price reduction observed for easements precluding all future development (n=48; n=6 under "hard" easement).
Lynch, Gray, and Geoghegan (2007)	(a) Statistically significant price reductions of 11% to 17% found using hedonic price models. (n=3,554; n=249 under CE).
	(b) Propensity score matching (PSM) techniques provided variable results. In one model, statistically significant price reductions of 14% to 24% were observed; however, a more refined probit model yielded statistically insignificant effects.

Notes: [a]Anderson and Weinhold (2008) define a "hard" easement as one that "does not allow any development at all in the future (i.e., no additional development on already improved parcels and the preservation of vacant status on unimproved parcels.)"

of explanation; CE appraisals measure the equilibrium price difference between the two markets.[1] These appraisals form the basis for billions of dollars of direct public preservation expenditures (American Farmland Trust, 2012), as well as substantial federal tax incentives for CE donations.

Although the preceding explanation of CE and markets is conventional, a relatively limited body of empirical research repeatedly fails to find the full value of CE appraisals in observed data from farmland markets. Deaton and Vyn (2010) summarize the literature as inconclusive in terms of the effect of land-use controls (i.e., zoning) and CE on agricultural property values. In a groundbreaking study, Nickerson and Lynch (2001) use evidence from a hedonic analysis of land-market data in Maryland to show that easements had no statistically significant price reduction on farmland. Subsequent research on the "Nickerson-Lynch paradox" has identified price reductions associated with CE that are statistically significant but less than are suggested by appraisals (table 1). Lynch, Gray, and Geoghegan (2007) analyze an expanded set of 3,554 land-parcel sales in Maryland (with 249 under CE) and find significant price reductions of 11% to 24% using hedonic pricing models; however, findings from propensity-score matching techniques employed to control for selection bias were statistically inconclusive.

Anderson and Weinhold (2008) conduct a methodical assessment of 150 Wisconsin properties sold between 1999 and 2004, of which 19 were under a conservation easement. Analysis of the full sample of properties revealed no significant price effects associated with conservation easements. Statistically significant price reductions were observed in subsamples of development-restricted vacant or agricultural vacant parcels, supporting the authors' expectation that already improved properties under CE (e.g., those with residences) retain value because they facilitate owners' access to utility-generating amenities. The authors also make the important distinction between "hard" easements—those that preclude all future development options—and easements that allow some amount of future property development. While acknowledging the limits of analyzing a very small sample of properties, they find that absolute development prohibitions tend to produce the types of value diminutions predicted by economic theory.

[1] Specifically, appraisers derive two value estimates for a subject property. The first reflects its market value with full development rights (a "before" value), while the second is a hypothetical value estimate that incorporates whatever easement restrictions (i.e., preclusion of future nonagricultural development) are being imposed (an "after" value). While appraisers may create valuation estimates using several different appraisal techniques, the most prevalent valuation methodology employed in New Jersey's farmland preservation program is the direct comparable sales approach.

This article makes two contributions to this line of inquiry. First, a theoretical model and institutional analysis of CE offer a driver of eased farmland price that has heretofore lacked direct empirical measurement. This driver could help resolve the Nickerson-Lynch paradox without claiming that markets fail. Nickerson and Lynch (2001, p. 350) speculated in their conclusion about possible reasons for the paradox: (1) buyers do not understand that the land is restricted or what the restriction means, and (2) preservation "increases the opportunities for hobby farmers (or land buyers who value urban amenities but wish to live on a farm)". This article pursues the second possibility, augmenting the standard theory to include what will be termed in this article "residual development options" (RDO) that are available to preserved farmland owners. This is conceptually similar to the differentiation of "hard" and "soft" easement restrictions examined by Anderson and Weinhold (2008). If the RDO are permissive enough, the eased land market will not necessarily cause the price of preserved land to fall to a level associated with capitalized farming rents.[2] The augmented theoretical model then recasts the empirical question. While the Nickerson-Lynch paradox asks why eased land price has not fallen more, our model predicts less of a price drop because the baseline of eased land price is raised.

Empirical results constitute the second contribution. A unique data set is collected on the New Jersey eased farmland market. These data represent only preserved farms purchased by second-generation owners through arms-length transactions. By examining these transactions we avoid systematic selection issues that arise from the voluntary nature of the initial preservation decision. In this way, this study diverges from previous research examining farmland price effects associated with the attachment of conservation easements. Further, New Jersey's state PDR program has operated for thirty years and compiled land enrollments that are among the highest in the nation, resulting in a relatively deep pool of documented preserved farm sales. This market is also selected because the institutions associated with RDO are well known to the authors and because there is high perceived demand for "lifestyle" farms in New Jersey (that is, farms owned by individuals for whom enjoyment of rural amenities may outweigh the economic motivations associated with farm ownership). Augmenting agricultural demand for eased land with "lifestyle" demand generates the same type of predictions associated with the theoretical model.

The results of a hedonic analysis show that RDO drive a large fraction of price in the eased land market. Our results suggest a strong alignment between economic theory and market performance, though this does not imply the Nickerson-Lynch paradox is incorrectly conceived. Rather, our results suggest that the Nickerson-Lynch paradox persists in the policy-appraisal world rather than the eased farmland market and echo the policy recommendation from Nickerson and Lynch (2001) that the price paid for easements should fall by adjusting appraisals to better reflect actual market outcomes.

Conceptual Framework

The existing literature on the Nickerson-Lynch paradox explains two types of behavior: decisions to develop land and decisions to preserve land. The prices of restricted and unrestricted land are modeled with the capitalized returns to agriculture, accounting for one-time net development returns and easement payments. This model is estimated hedonically. Comparing restricted and unrestricted prices alone may provide a biased test of the Nickerson-Lynch paradox because of potential selection in the preservation decision. Therefore, the existing literature explains price differences while controlling for the preservation decision both parametrically (see Nickerson and Lynch, 2001; Anderson and Weinhold, 2008, both of whom find that endogenous treatment effects have no significant influence on study results) and nonparametrically (see Lynch, Gray, and Geoghegan, 2007).

[2] This postulation is supported by Sokolow's 2006 national assessment of agricultural easement programs, which presents anecdotal evidence that "nonfarmers" seeking rural lifestyles frequently outbid agricultural producers during sales of preserved farms, particularly around urban areas.

This article explores an alternative explanation for the lack of a price differential between restricted and unrestricted farmland parcels. Nickerson and Lynch (2001, p. 350) speculate that willingness to pay for restricted land may exceed the agricultural rents because some owners desire "the opportunity to own a farm near an urban area." This article operationalizes this into a hypothesis that the price differential observed will be nil or small enough to be statistically insignificant in a hedonic model if the development opportunities available on restricted parcels are substantial enough to be recognized as roughly equivalent to those on unrestricted parcels. To test this hypothesis, we need not address the complex selection issue. Instead, we focus solely on testing for price differences among restricted parcels directly using an especially rich data set that allows us to evaluate the permissibility of future nonagricultural uses.[3] This test will not offer a definitive answer to the Nickerson-Lynch paradox, but it will provide evidence suggesting that the answer to why large price differentials are not found may have to do with the variation in whether future development restrictions are permissive or absolute rather than whether or not the parcel is restricted. This in turn would guide researchers to collect data on a heretofore underexamined driver of land prices. Our argument can be modeled following the notation and setup in Lynch, Gray, and Geoghegan (2007). Assume the per acre price of unrestricted farmland is

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

where A_i measures net agricultural rents and R_i measures net returns to developing the parcel at optimal conversion time t^*. Both agricultural and conversion rents are functions of parcel characteristics X_i and time s. The discount rate r is also a function of time s.

If the owner sells the CE at $s = 0$, then he or she receives an easement payment for the land, EV_i, and the restricted land is worth

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

Lynch, Gray, and Geoghegan (2007) conclude that owner i will preserve the parcel if $P_i < P_i^R + EV_i$; otherwise the parcel will remain in agriculture with the intention of developing at t^*. This model has intuitive appeal and eventually results in an empirical test in which land price is affected by the restriction far less than expected. In effect, the Nickerson-Lynch paradox states that, when all else is equal (controlled in the hedonic estimation), $P_i - P_i^R$ should roughly equal EV_i. Instead, P_i roughly equals P_i^R, implying that markets value EV_i at nil. Paradoxically, readily available data on CE show that the per acre sale price of easements is often many thousands of dollars.

As explained above, this article follows the suggestion made by Nickerson and Lynch (2001) to examine the restricted market for evidence that the price of land exceeds the agricultural returns.[4] The hypothesized explanation is that CE attract buyers willing to pay more than P_i^R because of RDO. Specifically, let RDO_i^R be the capitalized value of residual development options on a preserved parcel i. This means that the restricted value of land would not be P_i^R as in equation (2), but instead would be

$$P_i^{R**} = E[\int_0^{\infty} A_i(X_i,s)e^{-r(s)}ds + \int_{t**}^{\infty} RR_i(X_i,s)e^{-r(s)}ds], \quad (3)$$

[3] There are several empirical issues with the restricted-versus-unrestricted empirical test beyond the issues of selection. The main issue is that the test assumes restricted and unrestricted lands are in the same market. It is unknown, however, to what extent the restricted farms become lifestyle farms. If lifestyle farms are a different market than traditional working farms—either in substance or from marketing—then the assumption of the same market is invalid. A second issue compounds this problem: farmland markets in urban-influenced areas are notoriously thin. Nickerson et al. (2012) suggest that only 0.5% of all U.S. farmland is sold each year. Thinness means that it becomes even more difficult to trust that the observed data reflect broad patterns and that the researcher can tease out submarkets (working and lifestyle farms across restricted and unrestricted parcels). Because this article concentrates on restricted land only, some of these complications are avoided.

[4] Nickerson and Lynch (2001) note that if "[deed-restricted] parcels each have a house, they increase the opportunities for hobby farmers (or land buyers who value urban amenities but wish to live on a farm) to buy preserved land. These buyers may be willing to pay more than the agricultural income stream for the opportunity to own a farm near an urban area."

where t^{**} is the optimal time at which the owner exercises the development options, securing yearly net development rents of $RR_i(X_i,s)$, such that $RDO_i^R = \int_{t^{**}}^{\infty} RR_i(X_i,s)e^{-r(s)}ds$. Although not tested in this analysis, notice that restricted development rents $RR_i(X_i,s)$ are not necessarily less than unrestricted development rents $R_i(X_i,s)$. There are several possible reasons why the restricted development rent is potentially large. Nickerson and Lynch (2001, p. 350) suggest that the legal act of preservation groups many small agricultural parcels together to meet minimum size requirements. After preservation, this grouping may allow individual parcels to be sold with a house or with the opportunity to build a house, which thereby becomes especially appealing to the "hobby farmer" buyer.[5] Potentially, there may be some transaction cost savings or new parcel configurations from regrouping parcels through preservation, which are cheaper or not available in the unrestricted market. For instance, preservation of many differently sized and not compactly shaped parcels into a single preserved unit that then can be subdivided into several preserved "farmettes" may be appealing to some land buyers with large willingness to pay. Also, it may simply be that preserved parcels are more attractive to lifestyle farmers than unpreserved farms; that is, the act of preservation legally or perceptibly changes the preserved land (as does the branding of a luxury good) so that it no longer perfectly substitutes for unpreserved land in lifestyle farming. Perhaps to the lifestyle farmer, buying a preserved farm is worth more than buying an unpreserved farm, preserving it, and pocketing the easement payment. These explanations can operate simultaneously, and even if restricted development rents do not exceed unrestricted rents the hypothesis can be supported if these restricted rents are substantive. Sociological research could possibly inform the thinking of preserved-land buyers.

To summarize the theoretical model, the Nickerson-Lynch paradox finds that P_i roughly equals P_i^R, implying that markets value restrictions (which were paid EV_i) at nil. This article hypothesizes that previous research has instead found that P_i roughly equals P_i^{R**}, implying that the restricted land price has agricultural and RDO rent components as in equation (3). This article argues that finding a substantive impact of RDO on restricted land values will therefore offer strong evidence that the existing assumptions leading to the paradox (equation 2) were incorrect because they ignored the RDO option. Adding a RDO variable to test whether it has a substantive and statistically significant impact on restricted land value can augment the hedonic empirical test used in this line of inquiry. If evidence of RDO significance is found, then the evidence would suggest that equation (3) offers a better explanation of restricted land value than equation (2) and therefore RDO offer a possible explanation for why the Nickerson-Lynch paradox was found in land markets with CE.

Study Area

New Jersey, located in the Mid-Atlantic region of the eastern United States, provides the geographic context for the study. Since 1950, New Jersey lost more than 14,500 farms and 995,000 acres of farmland, most often through conversion to nonagricultural uses. This represents a loss of 58.5% and 57.7% of farms and farm acreage, respectively, in the past six decades. Known today as the most urbanized and densely populated state in the nation, New Jersey still has 10,327 farms operating 733,450 acres of farmland (U.S. Department of Agriculture, National Agricultural Statistics Service, 2012). Agricultural land comprises 15.6% of the state's land base and accounts for the majority of the state's remaining privately owned open space. Farmland values in New Jersey consistently rank among the highest in the nation, largely due to urban and peri-urban growth pressure. Plantinga, Lubowski, and Stavins (2002) estimate that an average of 82% of New Jersey farmland value is attributable to future development options, the highest proportion among all states.

In 1983, concern over farmland loss and the future viability of farming in New Jersey led to the passage of the Agriculture Retention and Development Act (ARDA), which created a statewide

[5] Known as a "division of premises" request, a landowner may apply to subdivide a farm preserved under the New Jersey program. However, approval is not assured, as the owner must demonstrate that (1) there is a legitimate agricultural purpose that would be advanced by the division and (2) resulting parcels would be viable for a variety of agricultural uses.

farmland preservation program. Comprising a combination of fee simple and easement purchase options, the program is administered by the State Agriculture Development Committee (SADC). Through December 2011, 2,071 farms and 195,647 acres of farmland (roughly 26% of the state's farmland base) had been preserved, making New Jersey's farmland preservation program among the most aggressive in the United States. To date, public expenditures on farmland preservation total $1.5 billion. State-county easement purchase partnerships account for the majority of farmland preservation closings. State funding appropriated through the SADC amounts to 64% of total public expenditures on farmland easement expenditures. The balance has been funded by county or municipal government cost-sharing through bonding or dedicated land preservation taxes, as well as nonprofit organizations engaged in land preservation.

Farms have been preserved in eighteen of New Jersey's twenty-one counties. However, the majority of preserved farmland acreage is spatially concentrated in three large clusters (figure 1). The largest block of preserved farmland comprises 62,855 acres and is located in the mostly rural northwestern counties (Hunterdon, Warren, and Sussex). A southwestern cluster (Salem, Gloucester, and Cumberland counties) comprises 56,200 acres in the heart of the state's fruit and vegetable production region. In the more heavily suburbanized, central region of the state lies a dense agglomeration of 49,507 acres of preserved farmland (northern Burlington County, western Monmouth County, southwestern Middlesex County, and eastern Mercer County).

Empirical Model

This study employs a hedonic pricing model to measure the marginal values of preserved farm attributes. A hedonic model is a revealed preference method widely used for decomposing value into its constituent elements. It assumes that a good has multiple characteristics that affect utility and hence value (Lancaster, 1966; Rosen, 1974). The basic hedonic pricing model relates the price of farmland, P, as a function of attributes unique to the property. This may be expressed generally as $\boldsymbol{Z} = (z_1, z_2, \ldots, z_n)$, where $\boldsymbol{Z}$ is a vector of n preserved farmland parcel attributes.

Because farmland is a multifunctional resource, a hedonic pricing model of farmland should properly reflect not only characteristics indicative of the land's agricultural production capacity but also various nonagricultural factors (Shi, Phipps, and Colyer, 1997; Patton and McErlean, 2003). The former may include agricultural productivity factors such as soil quality, tillabilty, and farm infrastructure. The latter may comprise proxies for various consumption values such as rural amenities, existing residential infrastructure, and location attributes. Expectations regarding future nonagricultural development options may also be an especially important driver of farmland value, particularly in areas experiencing urban or exurban growth (Plantinga, Lubowski, and Stavins, 2002). Of course, the value of farmland under a conservation easement derived from future nonagricultural development options is theoretically zero; however, as previously discussed, several studies question whether observed price reductions are consistent with expected price reductions (Nickerson and Lynch, 2001; Anderson and Weinhold, 2008).

Our model follows the conventional hedonic pricing equation, which regresses the per acre sale price for each preserved farm against a vector of agricultural productivity and consumption attributes. Ma and Swinton (2012) note the lack of theoretical guidance for selecting the proper functional form for a hedonic regression. We chose the natural logarithm of per acre sale price as the dependent variable, confirming that this was the most appropriate transformation based on the Box-Cox method. The regression model therefore assumes the form

$$\ln P_i = \alpha_0 + \beta_1 z_{1i} + \beta_2 z_{2i} + \ldots + \beta_n z_{ni} + \varepsilon_i \tag{4}$$

where P_i is the average per acre sale price of preserved farm i, $\boldsymbol{Z}$ is the previously described vector of n parcel attributes, and ε_i is an error term assumed to be normally distributed. β_1 to β_n are the estimated coefficients of the vectors of independent variables represented by $\boldsymbol{Z}$.

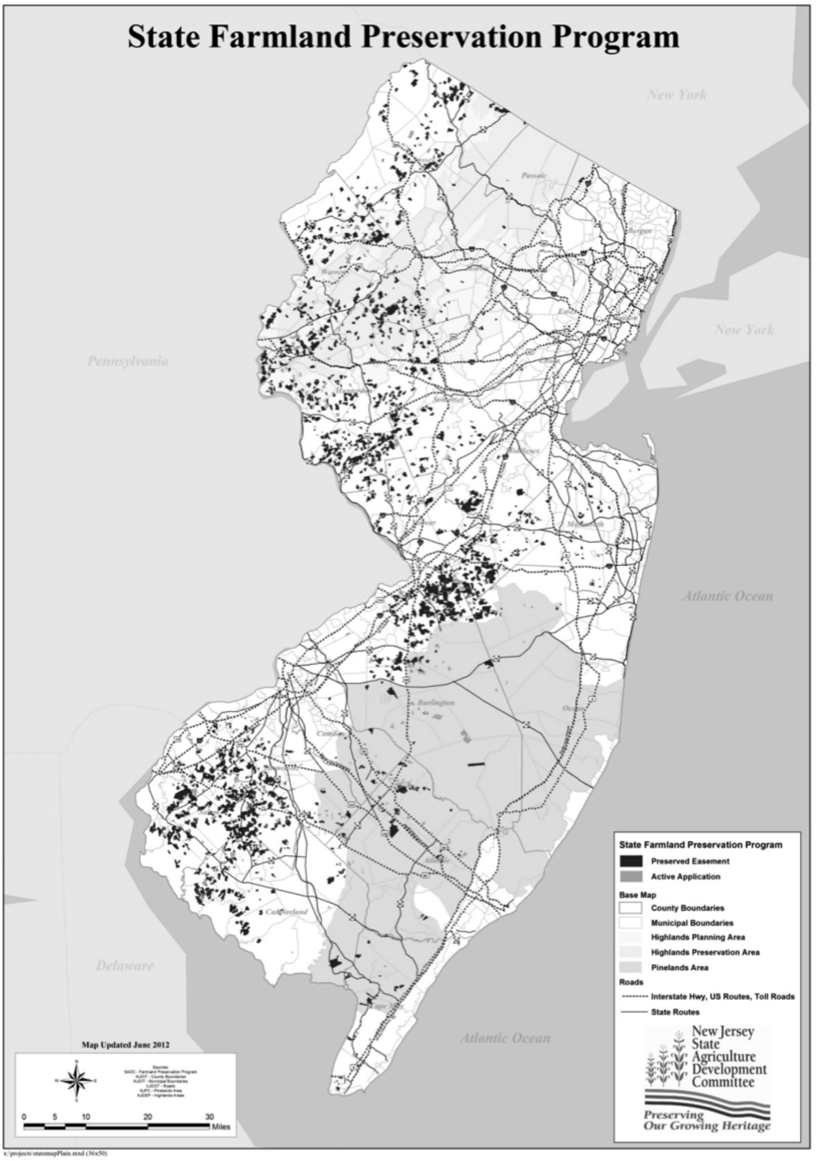

Figure 1. Map of Preserved Farmland in New Jersey

We assume that the preserved farmland market within New Jersey can be treated as a single market, allowing the assumption of stability in the hedonic model across the state. In other words, everything else held constant, the price effects of parcel characteristics do not vary across geography. While Palmquist (2005) notes the lack of criteria for delineating boundaries of a single market, Palmquist and Danielson (1989) suggest that the designation of a state as a single market is not unreasonable. In their evaluation of Illinois farmland values, Huang et al. (2006) justify a state-level single market designation due to the uniformity of farm taxation policies and regulations. The statewide application of farm use-value assessment, right to farm legal protections, and state-sponsored farmland preservation policies in New Jersey, as well as the state's small size, provide similar validation of the single-market assumption in this study.

Table 2. Summary of Preserved Farm Sales (1985 to February 2007)

Time Period	Total No. of Farms Preserved	Total Farm Acreage Preserved	No. of Preserved Farm Sales	Preserved Acreage Sold	Avg. Sale Price/acre (unadjusted)	Pct. Chg. In Avg. Sale Price/Acre
1985-1989[a]	58	7,604	9	1,070	$2,493	N/A
1990–1994	98	14,579	22	3,210	$3,113	24.9
1995–1999	290	37,360	89	10,891	$3,064	(1.6)
2000–2004	825	70,168	153	15,076	$5,857	91.2
2005–2007	313	21,689	52	4,172	$10,111	72.6
Total	1,584	151,400	325	34,419	$5,128	

Source: State Agriculture Development Committee.
[a] Excluded from the analysis.

Spatial Autocorrelation

Past hedonic valuation studies caution against the assumption of independence among spatially ordered observations (Dubin, 1998; Hardie, Narayan, and Gardner, 2001; Patton and McErlean, 2003; Huang et al., 2006; Ma and Swinton, 2012). Ordinary least squares estimates may be inefficient when error terms across spatial units (i.e., preserved farms) are correlated. Such spatial autocorrelation in the error terms could be a result of omitting spatially correlated variables from the model. Similarly, spatial autocorrelation in the dependent variable manifests when observations are not independent (for example, the sale price of one preserved farm affects the sale price of a nearby preserved farm) and will result in biased and inconsistent OLS parameter estimates (Anselin, 1988).

The presence of spatial dependence among the prices of preserved New Jersey farms was confirmed with Moran's I test ($p < 0.001$). As a global test for spatial autocorrelation, the Moran's I test performed on the dependent variable does not show whether spatial dependence is controlled by the spatially varying independent variables in the model or exists in the model's residuals. However, the inclusion of spatially varying independent variables (i.e., distances to major urban centers) is expected to control for spatial differences in preserved farmland values (Huang et al., 2006).

Dependent Variable

SADC records document the arms-length sale of 325 farms (comprising 34,419 acres) encumbered by a conservation easement between January 1985 and February 2007 (table 2).

SADC administrative records on pre-1990 farmland preservation transactions are less complete than later ones and were therefore not included in the final dataset.[6] Complete cases were compiled for 211 transactions. Each administrative record included farm acreage, year of preservation, and sale price. The average unadjusted per acre sale price (*PRICEAC*) was calculated for each preserved farm sold during the study period and is summarized in table 2. Appreciation in preserved farmland values was observed for sales across the study period, most notably after 2000. In nominal terms, the average per acre sale price of preserved farms sold between 2005 and early 2007 was nearly 73% higher than that observed during the preceding five-year period. The average per acre sale price derived from transactions between 2000 and 2004 was 91% higher than the average of those between 1995 and 1999.

[6] Further, when ARDA was passed in 1983, program participation was slow to build and geographically concentrated in only three central and northwestern counties. There were therefore predictably few preserved farm sales in the ensuing decade. Program enrollment accelerated significantly after 1998, when voters approved the constitutional dedication of sales tax funds for land preservation, resulting in a subsequent increase in preserved farm sales.

Independent Variables and Model Estimation

A time-trend variable (*YEAR*) is included in the model. Alternative specifications of the time-trend variable were evaluated (i.e., dummy variables), but a single time-trend variable was incorporated into the final estimations because the temporal pattern in prices is continuously positive with no shocks. Agricultural productivity factors may be used to capture agricultural income expectations (Shi, Phipps, and Colyer, 1997). Scoring sheets used by the SADC or county agricultural development boards to prioritize farm applications to the farmland preservation program were compiled to obtain information on the size and quality of farms for agricultural cultivation. Information obtained included total farm acreage (*ACRES*), the proportion of each farm characterized as having prime agricultural soils (*PRIME*), and the percentage of the farm classified as tillable (*TILL*). A positive relationship between soil quality and preserved farm prices is expected. Following Lynch, Gray, and Geoghegan (2007), the natural log of *ACRES* is used in the estimated models to allow for a nonlinear relationship between preserved farm size and sale price.

Past research has shown that farmland values tend to be higher when farms are in close proximity to large urban centers (Chicoine, 1981; Nickerson and Lynch, 2001; Huang et al., 2006; Lynch, Gray, and Geoghegan, 2007). Urban centers provide employment opportunities and cultural amenities. Additionally, access to cities may also benefit farmers via market access (i.e., dense consumer bases for direct marketing or infrastructure to support agricultural product processing and distribution). To capture spatial proximity effects, measures of linear distance to two primary metropolitan areas were determined using Geographic Information System (GIS) techniques. Preserved farms were geocoded using road networks from the U.S. Census Bureau and farm addresses provided by the SADC. Centroid point data for New York City and Philadelphia were obtained from ESRI StreetMap USA 2006. Linear distance from each farm to both major metropolitan cities was calculated in miles (*DIST_NYC* and *DIST_PHIL*).

Two variables were included in the model to estimate the effects of the regional environment on sale prices of preserved farms. New Jersey's farmland assessment statute allows actively devoted farmland to be taxed on the basis of its use value in agriculture as opposed to its full market valuation. The percentage of the municipality's land area enrolled under New Jersey's agricultural-use value-assessment program (*PCTFA*07) is constructed as a proxy for rural amenities within a municipality. Municipal median household value (*MEDHSVAL*), obtained from the 2000 Census of Population, is specified to capture the capitalization of local services and amenities (i.e., quality of schools, crime rates, natural amenities, etc.).

Local property tax record cards were reviewed for each preserved farm to verify farm acreage and compile additional information on the presence of a residence(s) and, if present, house characteristics (i.e., size of living area). *HOUSE* is a binary variable, defined as 1 if a house is present, 0 otherwise. *SQFTHOUSE* is the total living area of the farm residence(s). Data were also compiled on farm infrastructure (i.e., area of barns). *SQFTBARNS* is the total area of barns on the farm.

Evaluating the effects of state policies governing housing and future development flexibility on preserved farms is of primary interest in this study. SADC deed-of-easement records were reviewed to determine the extent to which landowners were approved for limited future development. Future development options assume two forms: an exception area and a residual dwelling site opportunity. An exception area is an owner-defined area of the farm that is unencumbered by deed-of-easement restrictions. A nonseverable exception is permanently attached to the farm, while a severable exception may be subdivided from the farm and conveyed as a separate parcel in the future. While designating an exception area reduces the amount of land subject to easement restriction (and hence compensation), its primary purpose is to provide future flexibility to, for example, build or expand a residence or nonagricultural business on the farm. The activity within an exception area may not conflict with or adversely impact the adjacent agricultural operation.

A second type of flexibility a farmland owner may contemplate—termed a residual dwelling site opportunity (RDSO) in the SADC deed-of-easement—is more constrained than an exception.

Table 3. Description of Data and Summary Statistics

Variable	Description	Unit	N	Mean	S.D.	Min.	Max.
Dependent Variable							
PRICEAC	Farm sale price per acre	Dollars	211	6,6691.0	7,710.2	499.0	69,545.0
Independent Variables							
ACRES	Total farm acreage	Acres	211	106.9	65.4	10.0	398.0
PRIME	% of farm with prime soils	%	211	51.8	29.5	0.00	100.0
TILL	% of farm that is tillable	%	211	70.0	23.2	0.00	100.0
SQFTBARNS	Area of barns	Sq. feet	211	1,586.8	4,342.2	0.0	33,125.0
HOUSE	(=1 if house present)	Binary	211	0.43	0.50	0.00	1.00
SQFTHOUSE	Area of house(s)	1000 sq. ft.	211	1.2	1.92	0.00	13.39
RDO	(=1 if exception/RDSO defined)	Binary	211	0.84	0.36	0.00	1.00
DIST_NYC	Linear distance to NY City	Miles	211	62.1	24.19	26.18	135.14
DIST_PHI	Linear distance to Philadelphia	Miles	211	41.7	16.40	13.26	93.65
MEDHSVAL	Median housing value	$10000	211	21.0	7.80	9.15	40.79
PCTFA07	% of town area farmland assessed	%	211	43.4	19.29	2.69	79.86

Recorded in easement documents, it provides the landowner the future opportunity to construct a residential dwelling and appurtenances with the approval of the relevant county agricultural development board and the State Agriculture Development Committee. A key proviso is that the occupant of such a residence must have direct and regular engagement in the farm's activities. An RDSO is available "by right" to landowners, provided that the density of existing residences and RDSOs may not exceed one unit per 100 acres.

A number of administrative SADC records noted that an RDSO or exception was present on a property but did not specify which form of development flexibility was retained. Therefore, a single binary variable, *RDO*, was defined to reflect the opportunity for developing a future residential or nonagricultural use on the preserved farm. It was assigned a value of 1 if the preserved farm had record of an exception area or RDSO, and 0 otherwise. *RDO* is expected to correlate positively with the per acre sale prices of preserved farms.

Table 3 provides a description and summary statistics of variables used in the model. The sample of preserved farms ranged from 10 to 398 acres in size, with a mean size of 106.9 acres. Sold farms, on average, had 51.8% prime soils and were 70.0% tillable. Municipalities within which preserved farms were sold varied significantly in terms of the proportion of land base devoted to agriculture, from 2.7% to 79.9%.

Forty-three percent (n=91) of farms had at least one house at the time of sale; 10% of farms (n=22) had multiple homes. The average living space was approximately 1,200 square feet for all farms in the sample; the average residential area totaled 3,258 square feet for farms with at least one residence at the time of sale. Eighty-four percent of preserved farm sales had a residual dwelling site opportunity and/or a defined exception area recorded in the deed of easement. Preserved farms sold for an average of $6,691 per acre (unadjusted for inflation), with a range of $499 to $69,545 per acre.

The empirical model derived from equation (2) takes the form:

$$\begin{aligned} \ln PRICEAC_i \quad = \quad & \alpha_0 + \beta_1 \ln ACRES_i + \beta_2 PRIME_i + \beta_3 TILL_i + \beta_4 SQFTBARNS_i + \\ & \beta_5 HOUSE_i + \beta_6 SQFTHOUSE_i + \beta_7 RDO_i + \beta_8 DIST\_NYC_i + \\ & \beta_9 DIST\_PHIL_i + \beta_{10} MEDHSVAL_i + \beta_{11} PCTFA07_i + \varepsilon_i. \end{aligned} \tag{5}$$

Equation (5) was first estimated using ordinary least squares (OLS). SAS version 9.2 was used for all estimation procedures. The model's semilog form allows the influences of explanatory values on the dependent variable to be easily interpreted. Parameter coefficients represent the percentage change in the per acre sale prices of preserved farms resulting from a unit change in the explanatory variable.[7]

Results

Results from the estimated model are presented in table 4.[8] With an adjusted R^2 of 0.77, the model explains variation in the log of per acre sale price well. Most coefficients in the model are highly significant and carry the expected signs. [9] A Shapiro-Wilk test confirms the normality of OLS model residuals ($p = 0.6242$), while a Moran's I test of the model residuals verifies the absence of spatial error ($p = 0.6660$).

The model shows that preserved farmland values appreciated by 10.6% annually between 1990 and 2007, after controlling for all other factors. As anticipated, the per acre sale prices of preserved farms were inversely related to farm size; for each 1% increase in farm acreage, per acre farm sale price declined by 0.4%. This result is consistent with economic theory and exemplifies the demand for small farm properties that afford owners rural lifestyles and the tax benefits of use value assessment.

As expected, preserved land values are positively correlated with soil quality. The coefficient on *PRIME* suggests that each 1% increase in the proportion of a preserved farm classified as prime soil increases *PRICEAC* by 0.27%. However, each percentage increase in the area of tillable land decreases the per acre sale price of preserved farms by 0.26%. The area of barns and other agricultural structures was not found to be a statistically significant determinant of preserved farmland sale prices. The lack of a conclusive effect of barns on farmland values may reflect the lack of information on the quality or physical integrity of existing farm infrastructure in the dataset. For example, barns in disrepair may be an ownership liability rather than an asset.

The spatial variables were significant and had the expected directional influences. Consistent with findings from previous studies, the model shows a decline in preserved farmland values as distance to large urban centers increases (Hardie, Narayan, and Gardner, 2001; Huang et al., 2006; Lynch, Gray, and Geoghegan, 2007). Estimated coefficients for *DIST_NYC* reveal that per acre preserved farm values decline by 0.73% with each mile further away a farm is located from New York City. A similar coefficient is estimated for the *DIST_PHIL* variable (0.68%). Each $10,000 increase in municipal median household value contributed 3% to the average per acre sale price of preserved farmland. A significant and inverse relationship was found between *PRICEAC* and the *PCTFA*07. For each additional percentage increase in the proportion of municipal land area enrolled under farmland assessment, the average per acre sale price of farms declined by 0.45%. While a predominantly agricultural area may benefit farm producers through scale economies in input or output markets or a more farm-friendly local business climate, previous research has shown that agricultural-use value is a small component of New Jersey farmland value (Plantinga, Lubowski, and Stavins, 2002). The negative parameter coefficient for *PCTFA*07 suggests that agricultural agglomeration benefits are outweighed by the influence of development demand.

The coefficients for *RDO*, *HOUSE*, and *SQFTHOUSE* summarized in table 4 are of particular interest due to their significant impact on preserved farmland values and their sensitivity to past and current policy decisions promulgated by the state farmland preservation program regarding

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[7] Following Rosen (1974), regressing the per acre sale price of preserved farmland on a parcel attribute allows for the implicit marginal price of that attribute to be recovered. Mathematically, $P_Z = \sum_{i=1}^{n} p_i$. The implicit marginal price of preserved farmland attribute i is derived as $p_i^Z = \frac{\partial P(Z)}{\partial z_i}$.

[8] A spatial lag model was estimated to test for robustness and whether preserved farmland values are influenced by the values of other proximate preserved farms (see Appendix A). The spatial autocorrelation parameter was not statistically significant, and model results correspond well with those reported.

[9] The OLS parameters all have variance inflation factors less than 2.5, confirming that any multicollinearity that may be present will not bias the results (see Montgomery, Peck, and Vining, 2006).

Table 4. Regression Results

Dependent Variable:	Natural log of *PRICEAC* (Price/Acre)		
	OLS (1990–2007)	**OLS (1990–2000)**	**OLS (2001–2007)**
Variable	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
INTERCEPT	8.8437	9.2429	7.6341
	(23.02)***	(15.00)***	(13.66)***
TIME	0.1062	0.0684	0.1890
	(11.55)***	(3.13)***	(8.51)***
LOGACRES	-0.4353	-0.37027	-0.46619
	(-9.04)***	(-4.50)***	(-8.24)***
PRIME	0.0027	0.0056	0.0024
	(2.51)**	(3.00)***	(1.98)**
TILLABLE	-0.0026	-0.0018	-0.0042
	(-1.87)*	(-0.85)	(-2.43)**
BARNS	0	0	0
	(-0.77)	(-1.23)	(-0.57)
HOUSE	0.315	0.2127	0.2621
	(3.95)***	(1.79)*	(2.49)**
HOUSEAREA	0.049	0.0423	0.0879
	(2.34)**	(1.72)*	(2.72)***
RDO	0.4352	0.2686	0.4811
	(5.59)***	(2.37)**	(4.78)***
DIST_NYC	-0.0073	-0.0111	-0.0052
	(-4.27)***	(-4.17)***	(-2.47)**
DIST_PHI	-0.0068	-0.0065	-0.0070
	(-3.80)***	(-2.11)**	(-3.31)***
MEDHSVAL	0.0305	0.0130	0.0389
	(6.02)***	(-1.46)	(6.78)***
*PCTFA*07	-0.0045	-0.0001	-0.0067
	(-2.89)***	(-0.03)	(-3.65)***
R^2	0.79	0.74	0.80
N	211	78	133

Notes: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels.

housing opportunities on preserved farms. Our findings conform with two important observations made in Anderson and Weinhold's 2008 analysis of development-restricted properties in Wisconsin. The first is that improved properties (e.g., those with residential infrastructure) retain considerable value because they enhance owners' consumption of environmental and other property amenities. In our model, the presence of an existing house on a preserved farm increases its market value by 31.5%, while each 1000 square feet of livable residential space increases the per acre price of a preserved farm by 4.9%.[10] This stands in contrast to vacant (unimproved) farm properties, which limit consumptive enjoyment of such amenities. Precluding an owner's ability to reside on a preserved farm may also constrain the types of agricultural production that can be pursued on the land (e.g., it may be less desirable to raise certain types of livestock that require around-the-clock observation and care availability).

[10] It was hypothesized that the relationship between preserved farm values and residence size was nonlinear; however, tests for nonlinearity did not support this hypothesis.

The second and arguably most important finding in common with Anderson and Weinhold (2008) relates to the magnitude of price effects associated with future development permissibility. Our *RDO* variable coefficient is large and significant. The existence of an RDO increases the market value of preserved farmland by 43.5%. Anderson and Weinhold postulate that the lack of statistically significant market price reductions observed between preserved and development-restricted parcels may be due to the "fact that conservation easements are themselves heterogeneous" (p. 443). Our analysis of an appreciably large sample of preserved farms comports nicely with this theorization and is strikingly similar to the authors' finding that the market prices of agricultural land with "hard" easements (absolutely no future development potential) were 50% lower than those observed for parcels retaining even limited future development potential.

We know of no nonmarginal shocks that occurred in New Jersey's farmland market during the study time period. However, shifts in market equilibrium over time can result in parameter instability if they are not properly modeled (Kuminoff, Parmeter, and Pope, 2010). Consequently, we divided our data set into two time periods (1990–2000 and 2001–2007) and estimated OLS regression equation (3) for each time period. Results of the time-restricted models are presented in the two right-most columns of table 4.

The 2001–2007 model is consistent with our model for the full time period. That is, all previously significant regressors remained statistically significant. Of notable interest, the RDO parameter increased from approximately 0.44 to 0.48. The time-trend parameter increased to 18.9% from approximately 11% in the full model, as did the marginal impact of house area (from 4.9% per 1000 square feet of living space to 8.8%). For the 1990–2000 model, three parameters became statistically insignificant (i.e., the percentage of the farm classified as tillable acreage, the proportion of municipal land area receiving farmland assessment, and median house value). The RDO parameter remained statistically significant, but dropped from 0.44 to 0.27.

Discussion and Conclusions

This article makes two contributions to the literature examining the effects of land preservation restrictions on agricultural land values. First, our analysis offers insight into the inconsistent and often paradoxical conclusions past studies have reached regarding the impact of conservation easements on agricultural land prices. This article offers an explanation for Nickerson and Lynch's 2001 finding that eased farmland prices are not statistically different from unrestricted farmland prices; however, it does not overcome one of the perverse implications of the paradox. Why have investors—recognizing that land is of approximately equal value before and after restriction—not simply bought land, enrolled, it, kept the CE payment, and then resold it?[11] Transaction costs and taxes offer only a partial explanation. This article provides evidence that the equal value before and after easement restrictions may be due to real, marketable RDO rather than some anomaly in land markets. Therefore, this article suggests that, in such cases, the appraisal process is flawed in assuming enrollment of land in a conservation easement program lowers farmland values to capitalized agricultural rents (at least in areas under urban influence). If the value of restricted land is not equivalent to capitalized agricultural rents, CE may therefore be purchased at lower costs (Michael, 2007; Lynch, Gray, and Geoghegan, 2010).

The second major contribution is as a policy evaluation. Conservation easement programs necessitate substantial public expenditures to meet desired land-preservation goals. An evaluation of the outcomes of CE investments is therefore warranted on the basis of sound public policy. Farmland is a primary factor of agricultural production and nationally accounts for 85% of the value of all farm assets (U.S. Department of Agriculture, Economic Research Service, 2012). Building a supply of deed-restricted farmland is viewed as a mechanism for ensuring the availability of affordable

[11] This question is the rational economic response to the findings of and is implicit in Nickerson and Lynch (2001) and Lynch, Gray, and Geoghegan (2007).

farmland to new entrants into the farming industry and existing farmers wishing to expand their operations. This is a particularly important goal of farmland preservation in urban-influenced areas where heightened competition for land elevates farmland prices and, according to Sokolow (2006), is an important test of farmland preservation program effectiveness. Our analysis demonstrates the significant influence exerted by existing residential infrastructure on preserved farmland prices as well as future development opportunities afforded by New Jersey farmland preservation program deeds of easement in the form of exceptions and residual dwelling site opportunities.

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References

American Farmland Trust. *Status of State PACE Programs*. Washington, DC and Northampton, MA: Farmland Information Center, 2012.

Anderson, K., and D. Weinhold. "Valuing Future Development Rights: The Costs of Conservation Easements." *Ecological Economics* 68(2008):437–446.

Anselin, L. *Spatial Econometrics: Methods and Models*. Dordrecht: Kluwer Academic Publishers, 1988.

Chicoine, D. L. "Farmland Values at the Urban Fringe: An Analysis of Sale Prices." *Land Economics* 57(1981):353–362.

Deaton, J., and R. J. Vyn. "The Effect of Strict Agricultural Zoning on Agricultural Land Values: The Case of Ontario's Greenbelt." *American Journal of Agricultural Economics* 92(2010):941–955.

Dubin, R. A. "Spatial Autocorrelation: A Primer." *Journal of Housing Economics* 7(1998):304–327.

Duke, J. M., and L. Lynch. "Farmland Retention Techniques: Property Rights Implications and Comparative Evaluation." *Land Economics* 82(2006):189–213.

Gale, H. F. "Why Did the Number of Young Farm Entrants Decline?" *American Journal of Agricultural Economics* 75(1993):138–146.

Gardner, B. D. "The Economics of Agricultural Land Preservation." *American Journal of Agricultural Economics* 59(1977):1027.

Hardie, I. W., T. A. Narayan, and B. L. Gardner. "The Joint Influence of Agricultural and Nonfarm Factors on Real Estate Values: An Application to the Mid-Atlantic Region." *American Journal of Agricultural Economics* 83(2001):120–132.

Huang, H., G. Y. Miller, B. J. Sherrick, and M. I. Gomez. "Factors Influencing Illinois Farmland Values." *American Journal of Agricultural Economics* 88(2006):458–470.

Kuminoff, N. V., C. F. Parmeter, and J. C. Pope. "Which Hedonic Models Can We Trust to Recover the Marginal Willingness to Pay for Environmental Amenities?" *Journal of Environmental Economics and Management* 60(2010):145–160.

Lancaster, K. J. "A New Approach to Consumer Theory." *Journal of Political Economy* 74(1966):132–157.

Lynch, L., W. Gray, and J. Geoghegan. "Are Farmland Preservation Program Easement Restrictions Capitalized into Farmland Prices? What Can a Propensity Score Matching Analysis Tell Us?" *Review of Agricultural Economics* 29(2007):502–509.

———. "Evaluation of Agricultural Land Preservation Programs." In S. Goetz and F. Brouwer, eds., *New Perspectives on Agri-Environmental Policies: A Multidisciplinary and Transatlantic Approach,* New York: Routledge, 2010, 72–92.

Ma, S., and S. M. Swinton. "Hedonic Valuation of Farmland Using Sales Prices Versus Appraised Values." *Land Economics* 88(2012):1–15.

Michael, J. "Impact of Easement Restrictions on Land Values in Baltimore County, Maryland." Working paper, Towson University, Towson, MD, 2007.

Montgomery, D. C., E. A. Peck, and G. G. Vining. *Introduction to Linear Regression Analysis*. Hoboken, NJ: Wiley, 2006.

Nickerson, C., M. Morehart, T. Kuethe, J. Beckman, J. Ifft, and R. Williams. "Trends in U.S. Farmland Values and Ownership." Economic Information Bulletin 92, U.S. Department of Agriculture, Economic Research Service, Washington, DC, 2012. Available online at http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib92.aspx.

Nickerson, C. J., and L. Lynch. "The Effect of Farmland Preservation Programs on Farmland Prices." *American Journal of Agricultural Economics* 83(2001):341–351.

Palmquist, R. B. "Property Value Models." In K. G. Mäler and J. R. Vincent, eds., *Handbook of Environmental Economics: Valuing Environmental Changes,* vol. 2. North-Holland, Amsterdam: Elsevier, 2005, 763–819.

Palmquist, R. B., and L. E. Danielson. "A Hedonic Study of the Effects of Erosion Control and Drainage on Farmland Values." *American Journal of Agricultural Economics* 71(1989):55–62.

Patton, M., and S. McErlean. "Spatial Effects within the Agricultural Land Market in Northern Ireland." *Journal of Agricultural Economics* 54(2003):35–54.

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

Rosen, S. "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition." *Journal of Political Economy* 82(1974):34–55.

Shi, Y. J., T. T. Phipps, and D. Colyer. "Agricultural Land Values under Urbanizing Influences." *Land Economics* 73(1997):90–100.

Sokolow, A. D. "A National View of Agriculture Easement Programs: Measuring Success in Protecting Farmland." Report 4, American Farmland Trust, Washington, DC, 2006. Available online at http://www.aftresearch.org/.

U.S. Department of Agriculture, Economic Research Service. "Land Use, Land Value & Tenure." 2012. Available online at http://www.ers.usda.gov/topics/farm-economy/land-use,-land-value-tenure.aspx.

U.S. Department of Agriculture, National Agricultural Statistics Service. *2007 Census of Agriculture: State and County Data: New Jersey, Volume 1*. Washington, DC: U.S. Department of Agriculture, 2012.

Appendix A

While spatially varying independent variables are expected to control for spatial differences in preserved farmland values, a spatial lag model was estimated to demonstrate the robustness of the RDO parameter estimate and test the extent to which preserved farmland values are influenced by the values of neighboring preserved farms.

Following Patton and McErlean (2003), a spatially lagged dependent variable is included as an explanatory variable as follows:

$$\ln P_i = \rho \sum_j w_{ij} P_j + \alpha_0 + \beta_1 Z_{1i} + \beta_2 Z_{2i} + \ldots + \beta_n Z_{ni} + \varepsilon_i, \tag{6}$$

where $w_{ij} = \frac{1}{d_{ij}^2}$ and d is an $N \times N$ dimensional spatial weights matrix comprising distance separating preserved farms i and j. This distance-squared decay function assumes that price effects are stronger for preserved farms in close proximity and decrease as distance between farms increases. Rho (ρ) is the spatial autocorrelation parameter. If ρ is statistically significant, the coefficient reflects the extent of price influences among neighboring preserved farms. Estimation results presented in table A1 show that ρ is not statistically significant, suggesting that the spatially varying independent variables are effectively controlling for spatial autocorrelation in farmland values. The RDO variable remains significant, and the estimated parameter coefficient remains comparable in magnitude to that obtained from the OLS model (table 4).

Table A1. Spatial Lag Model Results

Dependent Variable: Natural log of *PRICEAC* (Price/Acre)	**SLM (1990–2007)**
Variable	**Coefficient (t-statistic)**
INTERCEPT	8.7240
	(18.57)***
TIME	0.1091
	(12.47)***
LOGACRES	−0.4328
	(−9.56)***
PRIME	0.0022
	(2.00)**
TILLABLE	−0.0029
	(−2.24)**
BARNS	0
	(−0.78)
HOUSE	0.2996
	(4.04)***
HOUSEAREA	0.049
	(2.40)**
RDO	0.3689
	(5.01)***
DIST_NYC	−0.0062
	(−2.11)**
DIST_PHI	−0.0063
	(−1.69)*
MEDHSVAL	0.0324
	(4.60)***
*PCTFA*07	−0.0033
	(−1.78)*
RHO	0.0674
	0.85
Log-Likelihood (overall model)	232.8
N	211

Notes: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% level.