

Appendix 2—Econometric Analysis of the Adoption of PDR Programs

To conduct the econometric analysis of the factors influencing the adoption of agricultural PDR programs, county-level PDR data from seven of the most active States identified by Bowers (1997) are utilized. The data contain information regarding total preserved acres in each county since the inception of the PDR program. A description of this data summarized by State appears in appendix table 2.1. Although each of the seven States listed in appendix table 2.1 has a statewide PDR program,¹ not every county in each State participates.

The econometric model is estimated under the assumption that the existence of PDR programs is influenced by a number of factors, including income, population density, changes in population density, agricultural land density, and changes in agricultural land density. These variables are used to examine several hypotheses about what stimulates the adoption of farmland protection programs:

1. Amount of farmland and rate of conversion of farmland:

Since agricultural PDR programs focus on farmland, the available amount and the rate of conversion into urban uses are likely to be important factors that explain the distribution of these programs. It is expected that programs will occur in areas with ample amounts of farmland, but also with high conversion rates of farmland into urban uses.

¹In some States, the programs are funded at the county level with the State merely providing enabling legislation. In other States there are State-funded programs in which counties can choose to participate.

2. Population pressure:

As areas become more urbanized, residents are more likely to place a larger value on open space that is provided by farmland.

3. Rate of change of population:

Rapid rather than gradual expansion in population may spur the creation of PDR programs. Residents may notice a rapid change in development of farmland and demand institutions such as PDRs to preserve open space.

4. Income:

Income also plays a role both in the demand for farmland preservation and the amount of land preserved. Environmental goods such as open space are likely to be luxury goods. Residents in counties with high income levels would be more likely to demand PDR programs. Income levels are also an indication of the tax base, which would influence the amount of land preserved if the PDR program involves cost sharing at the county level.

Appendix table 2.2 shows the qualitative impacts of these variables both on the existence of a program and on the magnitude of land preserved. As anticipated, most of the variables have positive impacts on adoption of PDR programs. Although three of the five factors have negative influences in explaining the existence of PDR programs, they are not statistically different from zero in the model. In terms of explaining the amount of land preserved, all of the factors have the anticipated positive impact (although the coefficient for population pressure is not statistically different from zero).

Appendix table 2.1—County Level PDR Activity

State	Total counties in each State	Counties with PDR programs	Total acres preserved	Total acres preserved per sq. mile of area ¹
Pennsylvania	67	37	106,481	4.31
Maryland	23	21	215,142	26.21
New Jersey	18	14	48,621	8.60
Massachusetts	14	11	39,350	4.92
Connecticut	8	8	25,483	5.30
Delaware	3	3	15,749	8.58
Vermont	14	14	65,935	7.68
Total	147	108	516,761	9.82

¹Total acres preserved divided by total area (in square miles) of the counties practicing PDR programs.

Source: Bowers, 1997.

Appendix table 2.2—Qualitative impact of factors affecting PDR programs

Factor ¹	Direction of impact on:	
	Existence of program	Amount of land preserved
Mean income	Positive	Positive
Population pressure	Negative ²	Positive ²
Change in population pressure	Negative ²	Positive
Ag land density	Positive	Positive
Change in ag land density	Negative ²	Positive

¹ Income is the county mean income in \$1,000 units, “Change in population pressure” is the change in the urban influence measure from 1970 to 1990. “Population pressure” is the 1990 urban influence variable. “Ag land density” is the density of farmland per square mile. “Change in ag land density” is the ag land area in 1987 minus the ag land areas in 1997, per square mile of county or State area. The urban influence variable, used by Barnard, Whitaker, et al. (1997) takes into account both the density and proximity of population in a specific area using a gravity measure similar to one used by Shi et al., 1997. The variable itself is derived from the 1990 Census of Population data using a function in the ARC/INFO GIS software package.

² This indicates that the parameter was not statistically different from zero in the model (at a 95-percent confidence level). Note that the R-square for the “amount of land preserved” equation is 0.52.

The parameters of the model can be used to compute elasticities² of land preserved with respect to each factor. This gives an indication of how changes in these factors impact the amount of land preserved.³ Elasticity estimates appear in appendix table 2.3. The elasticity of land preserved with respect to income is quite large. Since the income variable measures annual per capita income, a small (one percent) change in income would represent a large change in aggregate county wealth, especially in comparison to the amount spent on PDR programs. Both the population pressure elasticities and the change in population pressure (measured in 1,000 person units) are also large. This indicates that the amount of land preserved by these programs is quite sensitive to income and population pressure. Changes in agricultural land density have a large impact compared to agricultural land density itself. Each of these variables are in the same units and their elasticities are approximately the same order of magnitude. However, changes in agricultural land per county (defined as the loss of farmland from 1987 to 1997) is a much smaller number than acres

of farmland in a county.⁴ This may indicate that land preservation is more sensitive to losses of farmland than to the total amount available.

⁴ On average, agricultural land density is 0.151 (thousand) acres per square mile of county area. Changes in agricultural land density average 0.016 (thousand) acres per square mile of county area.

Appendix table 2.3—Censored regression of participation intensity elasticities

Variables ¹	Elasticities ²
Mean income	4.964
Ag land density	0.322
Change in ag land density	0.260
Population pressure	2.485
Change in population pressure	0.614

¹ Mean Income is the mean county income in \$1,000 units. Change Ag Land Density is the area of farmland (1,000 acres) per square mile observed in 1987 minus the area (1,000 acres) of farmland per square mile observed in 1997. Ag Land Density is the area (1,000 acres) per square mile of farmland observed in 1997. Population Pressure is the 1990 urban influence measure divided by 1,000. Change in Population Pressure is the 1990 urban influence variable minus the 1970 urban influence variable divided by 1,000.

² Censored regression model elasticities where the dependent variables are total area preserved (1,000 acre units) per square mile.

² These elasticities can be interpreted as the percentage change in land preserved per a 1-percent change in a factor.

³ See Feather and Barnard for further details.