Land Use Policy 41 (2014) 84–96

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

Measuring the effect of farmland preservation on farm profitability

Brian J. Schilling[a], Witsanu Attavanich[b,*], Kevin P. Sullivan[c], Lucas J. Marxen[c]

[a] Department of Agricultural, Food & Resource Economics and Rutgers Cooperative Extension, Rutgers University, Cook Office Building, 55 Dudley Road, New Brunswick, NJ 08901, USA
[b] Department of Economics, Faculty of Economics, Kasetsart University, 50 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand
[c] Office of Research Analytics, New Jersey Agricultural Experiment Station, Rutgers University, 88 Lipman Drive, New Brunswick, NJ 08901, USA

ARTICLE INFO

Article history:
Received 19 April 2013
Received in revised form 19 April 2014
Accepted 26 April 2014

Keywords:
Farmland preservation
Purchase of development rights
Agricultural land use policy
Program evaluation
Farm profitability
Propensity score matching

ABSTRACT

Purchase of development rights (PDR) programs have been created in 27 states to preserve farmland resources. These programs seek to advance several societal objectives, including the protection of farmland from development, retention of rural amenities, and promotion of the economic viability of farming. Using New Jersey farm-level data, this study evaluates whether participation in a state PDR program improves farm profitability. The propensity score matching method is used to correct for selection bias arising from the voluntary nature of these programs. No statistically significant profit differential is found between preserved and observationally equivalent unpreserved farms in our full sample of 4029 farms. When the analysis is replicated across different farm types, we find weak evidence that the profitability of preserved residential lifestyle/retirement farms is lower than that observed for their unpreserved equivalents. In contrast, we find that small farms (<$100,000 in annual sales) operated by individuals for whom farming is a principal occupation earn $414 to $436 more per acre in profit than their observationally equivalent unpreserved counterparts.

Introduction

The displacement of agriculture as a dominant element of American society and the national economic landscape is among the most significant transitions of the past century (Jackson-Smith and Jensen, 2009; Lobao and Meyer, 2001). Evidence of this decline includes the falling number of United States counties designated as farming dependent, the fact that fewer than two percent of Americans are now engaged in farming, and the large number of farms operating without a profit motive (so-called "lifestyle farms") (Dimitri et al., 2005; Ghelfi and McGranahan, 2004). However, it is the conversion of farmland to build infrastructure attendant to residential, commercial or industrial development that is the most visible manifestation of farm decline. These land use changes have elevated concern about the retention of agricultural lands, resulting in significant public investments in farmland preservation.

Protection of the nation's farm sector has long been a federal policy objective, rationalized in part by the priority of maintaining domestic food production capacity and reflective of inherent value Americans place on rurality and the Jeffersonian ideal of small family farms (Danborn, 1996). Since the mid-1900s, urban expansion and the low-density, exurban growth pattern commonly identified as "sprawl" have joined the vagaries of market fluctuations, weather, pests and disease as a significant threat to farming in many parts of the nation (Rudel et al., 2011; Heimlich and Anderson, 2001; Sorensen et al., 1997; Daniels and Bowers, 1997; Lopez et al., 1988; Berry, 1978). Research in the late 1970s conducted as part of the National Agricultural Lands Study increased awareness of the pressures on the nation's agricultural resources and concerns over the loss of farmland to development. The rate of land conversion to developed uses has been exceeding the rate of population growth and one-third of the total developed land area in the continental United States (approximately 40 million acres) was developed between 1982 and 2007 (USDA, 2009).

Jackson-Smith and Sharp (2008) find that more than half of national farm sales are derived by farms now operating at the rural–urban interface. An estimated 91 percent of the nation's fruit production and 78 percent of vegetable production occurs in counties designated by the USDA's Economic Research Service as "urban-influenced" (Sorensen et al., 1997). Notwithstanding these land use trends, farmland remains an abundant resource on a national scale and domestic food self-sufficiency is not imminently imperiled. However, at state and local levels, concern over

* Corresponding author. Tel.: +66 2 561 3474x211; fax: +66 2 561 3474x501; mobile: +66 82 471 4443.
E-mail addresses: schilling@njaes.rutgers.edu (B.J. Schilling), attavanich.witsanu@gmail.com, fecowna@ku.ac.th (W. Attavanich), sullivan@njaes.rutgers.edu (K.P. Sullivan), marxen@njaes.rutgers.edu (L.J. Marxen).

http://dx.doi.org/10.1016/j.landusepol.2014.04.019
0264-8377/

farmland fragmentation and conversion (and the loss of associated non-market amenities) has assumed an elevated position in public policy discourse, particularly in the Northeast region. In the 1970s, states began creating purchase of development rights (PDR) programs to preserve farmland and rural amenities, advance growth management objectives, and support farming as a business.[1] As of May 2012, 27 states have created PDR programs as a tool to preserve farmland. These programs have preserved nearly 2.3 million acres at a cost of $5.7 billion (AFT, 2012). Program activity has been heavily concentrated in the New England and greater Mid-Atlantic states.

Despite these substantial investments in PDR, empirical assessment of program success in effectuating the legislative intent of publically funded farmland preservation is limited. Common metrics of progress (e.g., acreage enrollment statistics) provide little insight, for example, into the effects of public farmland preservation investments on the economic performance and viability of preserved farms. Previous research has focused on the effects of easement restrictions on preserved farmland values (Nickerson and Lynch, 2001; Lynch et al., 2007, 2010; Anderson and Weinhold, 2008) and whether landowners invest easement monies in farm improvements and modernization (Lynch, 2007; Lynch and Duke, 2007; Duke and Ilvento, 2004a,b). Important questions, however, remain unanswered. Among them is whether farmland preservation is having a meaningful impact on the economic viability of farms, particularly in urban-influenced areas where farming and associated support infrastructure has undergone significant decline.

The objectives of this study are therefore to empirically examine the impact of PDR program participation on farm profitability and evaluate whether effects of participation are heterogeneous across different farm types. This is accomplished by estimating the average "treatment effect" of participating in farmland preservation on per-acre farm profitability. A challenge with this type of observational study lies in an inability to assume that treatment assignment (i.e., voluntary participation in a PDR program) is random. We employ a propensity score matching approach (Rosenbaum and Rubin, 1983a) to address issues of selection bias arising from a landowner's self-assignment into the treatment by controlling for inherent differences that may exist between preserved and unpreserved farms. New Jersey, a leader in farmland preservation, provides the geographic context for the analysis.

The balance of the paper is organized as follows. The following section provides background on the use of PDR as a farmland preservation technique. The third section introduces the propensity score matching technique and provides theoretical examination of factors that may influence a landowner's decision to preserved farmland. The fourth section describes data and matching estimators used in the analysis. The fifth section presents empirical results. The final section provides concluding remarks and policy implications.

Background on PDR programs

Over the past several decades, the unquestioned acceptance and encouragement of growth has shifted to a more tempered realization of the potential negative effect development has on rural economies, land use, and culture (Fodor, 1999; Libby, 2005). This has led to substantial academic discourse and planning practitioner attention centered on land use (Burchell et al., 2005). Farm retention and the cycle of decline predicted as urban expansion and exurban growth pressures expand into rural-agricultural regions has been a specific thread of academic research since the 1970s (Berry, 1978; Fischel, 1982; Lisansky, 1986; Lopez et al., 1988; Daniels and Bowers, 1997; Daniels and Lapping, 2001; Lynch and Carpenter, 2003; Oberholtzer et al., 2010). Embedded within this thread is the concept of a critical mass in agriculture, the premise that a local farming industry will become unsustainable once agricultural infrastructure (e.g., farms, farmland, agricultural suppliers and markets) declines to a certain level (Daniels and Lapping, 2001; Lynch and Carpenter, 2003). The "impermanence syndrome" is one symptom of this problem in urbanizing areas, as uncertainty about the long-term viability of agriculture causes farmers to reduce their planning horizons in farming and, subsequently, curtail investments in farm technology and modernization (Berry, 1978; Lopez et al., 1988; Adelaja et al., 2011).

Various farm retention mechanisms have been adopted in all fifty U.S. states to mitigate the adverse impacts of development on agriculture, including use-value assessment for farmland, right to farm legal protections, agricultural zoning, and farmland preservation programs. Support for farm retention in urban-influenced areas is commonly rooted in the public's interest in maintaining rural amenities conferred by farms that are often quasi-public goods under-provisioned in land markets (i.e., ecological and environmental services, cultural heritage, local food availability, and outdoor recreational opportunities), growth management, and retention of capacity for local food production (Gardner, 1977; Bromley and Hodge, 1990; Lopez et al., 1994; Kline and Wichelns, 1996; Hellerstein et al., 2002; Nickerson and Hellerstein, 2003; Duke and Ilvento, 2004a; Bergstrom et al., 2009).

While zoning and use value assessment programs may slow farmland loss and support the economic viability of farming, neither is a permanent form of land preservation. In contrast, a purchase of development rights program affords permanent protection of farmland from conversion to non-agricultural development. Participation in a PDR program requires a landowner to forfeit the right to develop farmland for nonagricultural purposes and a conservation easement (a negative easement) is placed on the land. In exchange, the landowner receives a monetary payment (or, in some cases, a tax incentive) and retains ownership and all other land rights.

PDR programs are an attractive public policy from a property rights perspective because landowner equity is protected due to the voluntary and compensatory nature of program participation, thus avoiding political and legal challenges to the constitutionality of regulatory-based land management approaches (Daniels and Bowers, 1997; Echeverria, 2005). In addition to the permanence of farmland protections, PDR programs offer several other advantages. It is theorized that the infusion of easement monies may help reverse the impermanence syndrome which Berry (1978) identified as afflicting urban-influenced farms. However, Duke and Ilvento (2004b) find that the majority of preserved farmland owners in Delaware used easement monies for personal savings or investments. Further, restricting future non-agricultural development options should, again in theory, reduce the cost of farmland. However, empirical research has yielded mixed results on the presence and extent of price reductions (see, for example, Nickerson and Lynch, 2001; Anderson and Weinhold, 2008; Lynch et al., 2010).

A downside of PDR programs is the large public expenditures required to purchase easements and the uncertainties regarding public funding availability. More than 10 years ago, it was estimated that the cost of preserving U.S. cropland faced with urbanization pressure would cost $130 billion (Heimlich and Anderson, 2001). Further, PDR deeds of easements restrict future nonagricultural development, but do not require that land be actively farmed (Daniels and Bowers, 1997). Lastly, Liu and Lynch (2011) observe

[1] A PDR program imposes a negative easement on an enrolled property that "runs with the land" and prohibits non-agricultural development in perpetuity, or a specified period of time. Unlike fee simple acquisition, whereby full interest of land is conveyed to a purchaser, PDR programs establish a non-possessory interest in land.