

The Impact of Energy Production on Farmland Markets: Evidence from the 2008 New York Shale Gas Moratorium

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The U.S. is well on its way to becoming a net energy exporter. Most of the current or planned energy production, whether conventional or renewable, will take place on farmland. However, little is known about how energy production influences farmland markets. Further, there have been multiple debates on the impacts of shale gas development (SGD) on the economy, environment, and social welfare. This study contributes to these debates by quantifying a major economic benefit of energy production for rural landowners, through estimating the net valuation of future SGD as reflected in farmland values.

We employ a dataset of farmland transaction or sales information, matched with geographical information and soil characteristics. Given the large number of variables in our original dataset related to soil quality, we use machine learning techniques to trim down the number of variables entering our main model. This approach allows us to better control for the agricultural use value of farmland and strengthens our ability to isolate the impact a major, unexpected policy announcement. We exploit the discrete change in expectations caused by the 2008 New York State moratorium on hydraulic fracturing, to investigate the impact of the moratorium on farmland valuation. We recover the net valuation of shale gas development with a hedonic price model and a difference-in-differences empirical strategy. The treatment area is counties in New York's Southern Tier (fairway counties) that are suitable for shale gas extraction and the control is adjacent counties, which are likewise not suitable for shale gas extraction. We also use "North Country" counties as a control and find similar results. We consider farmland sales prices 9 months before and 9 months after the moratorium, although our results are robust to a longer study period. We also split our sample by urban proximity and find a larger impact of the moratorium in areas with less urban influence, suggesting that the concurrent recession does not explain our result.

We estimate that agricultural properties in New York's Southern Tier experienced an average decline of approximately \$1,400/acre in value due to the shale gas moratorium. This is approximately 40 percent of farmland values in the region and comparable in magnitude with related studies. Our results suggest that energy production can lead to substantial returns for rural landowners and also influence farmland markets.

The major contribution of this paper is that we provide novel evidence of the impact of SGD on farmland values. This informs debates on the broader economic and societal impacts of energy production as well as provides insight into implications of energy development for the agricultural sector. To the best of our knowledge, this is the first study focused on the impact of the NYS shale gas moratorium on farmland values and one of the few studies on the impact of energy production on farmland. Further, our use of LASSO demonstrates how machine learning techniques are useful for variable selection in hedonic property valuation studies. In this study, LASSO leads to more robust controls for the agricultural use value of farmland.

Our estimate of the impact of the moratorium on farmland values and total farmland acreage in New York's Southern Tier implies an approximate potential loss of over \$1 billion for farm-

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land owners. This estimate is comparable to the expected impact of state government programs targeting this region. Overall, we show that rural landowners anticipated large economic benefits from shale gas production. Given that farmland makes up over 80 percent of farm assets, the broader impacts of energy production on agriculture is an important area for future research.