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**How Does Shale Gas Development Affect Housing Values in Rural Areas?**

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# How Does Shale Gas Development Affect Housing Values in Rural Areas?

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## Introduction

- Innovations in oil and gas drilling technologies have led to a great deal of investment in the Marcellus Shale region of the U.S., including in Pennsylvania and West Virginia
- Shale gas development provides jobs and income opportunities, but is also associated with negative externalities (i.e. Weber, 2012; Abdalla et al., 2012)

## Objective

- We assess how residents value shale gas development by examining how drilling activity is capitalized into nearby house prices in West Virginia

## Contributions

- Prior to this study, there has been no analysis in West Virginia (much of the previous research has focused on Pennsylvania - i.e. Gopalakrishnan and Klaiber, 2014; Muehlenbachs et al., 2015)
- Unlike previous studies in the Marcellus region, we examine predominantly rural areas with thin housing markets
- We implement the underutilized Coarsened Exact Matching (CEM), which is a relatively novel technique in rural areas

## Data

- Housing sales (including housing attributes) purchased from Corelogic for West Virginia covering 2006 to 2015
- Horizontal wells in West Virginia from Drillinginfo.com

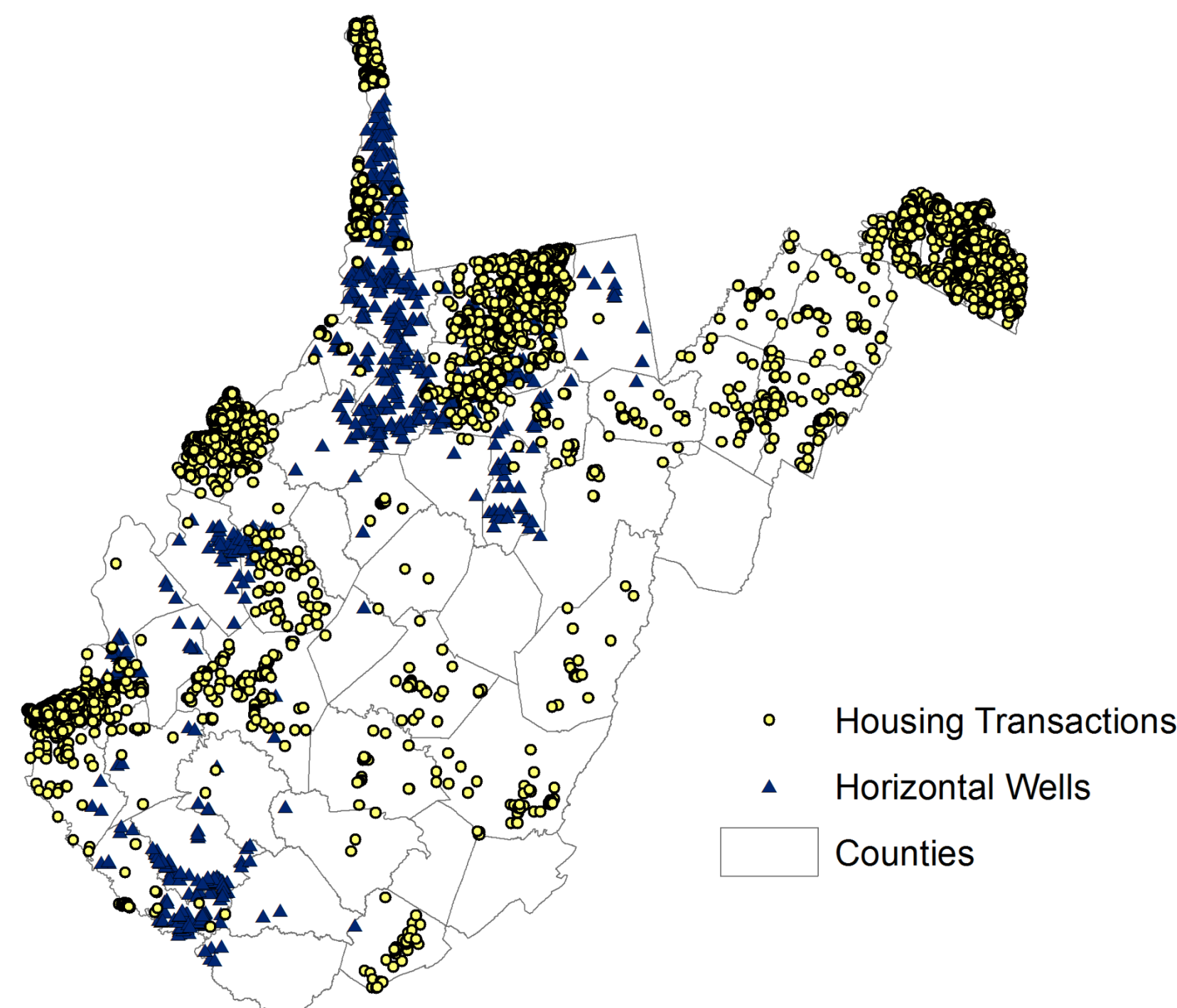
## Methods

- Estimation Equation:

$$\text{Log}(\text{Price})_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 D_{it} + \theta_i + \eta_t + \omega_i + \varepsilon_{it}$$

where...  $\text{Log}(\text{Price})_{it}$  is the natural log of the normalized house price,  $X_{it}$  is a set of house characteristics,  $D_{it}$  indicates drilling activity,  $\theta_i$  is a county fixed effect,  $\eta_t$  is a year fixed effect, and  $\omega_i$  is a commuting zone fixed effect

- Coarsened Exact Matching (CEM):
  - Imputes counterfactuals by matching houses with similar characteristics (Iacus et al., 2011; Iacus et al., 2012; Blackwell et al., 2009)
  - Has advantages over other matching methods by assuring each covariate of matched houses will be substantively similar (or the same)
  - Variables matched on include house specific variables, tract-level characteristics (i.e. population density, avg. price, etc.), and counties



## Results

Results: Proximity to Wells

	(1)	(2)	(3)	(4)
Mi. to Closest Well	0.00297** (0.0014)		0.0031** (0.0014)	
No. of Wells Within 5 Mi.		-0.02072*** (0.0040)		-0.02055*** (0.0041)
Groundwater Dependent			0.05541 (0.0554)	0.015052 (0.0523)
Mi. to Closest Well x Groundwater Dependent			-0.0024 (0.0017)	
No. Wells Within 5 Mi. x Groundwater Dependent				-0.00337 (0.0147)

- House prices increase 0.2% (\$446) for each additional mile farther a house is from a well
- House prices decrease 2% (\$3,106) for each additional well within 5 miles
- A variety of sensitivity analyses yield similar results, however, we did find that there are additional negative effects from being on well water in the north central part of the state

## Conclusion

- Based on the results, houses near drilling activity sell for approximately \$11,833 less
- Overall, house prices decrease in the presence of drilling activity, suggesting residents negatively value shale gas development