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:**
  \[ \text{Log(Price)}_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 D_{it} + \Theta_i + \eta_t + \omega_i + \epsilon_{it} \]
  where... Log(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: Proximity to Wells

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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>Mi. to Closest Well</td>
<td>0.00297***</td>
<td>0.0031**</td>
<td>0.02072***</td>
<td>-0.02055***</td>
</tr>
<tr>
<td></td>
<td>(0.0014)</td>
<td>(0.0014)</td>
<td>(0.0040)</td>
<td>(0.0041)</td>
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<tr>
<td>No. Wells Within 5 Mi.</td>
<td>-0.02072***</td>
<td>-0.02055***</td>
<td>0.015052</td>
<td>0.015052</td>
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<tr>
<td></td>
<td>(0.0040)</td>
<td>(0.0041)</td>
<td>(0.0523)</td>
<td>(0.0523)</td>
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<tr>
<td>Groundwater Dependent</td>
<td>0.05541</td>
<td>0.015052</td>
<td>0.0024</td>
<td>-0.00337</td>
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<tr>
<td></td>
<td>(0.0554)</td>
<td>(0.0523)</td>
<td>(0.0017)</td>
<td>(0.0147)</td>
</tr>
</tbody>
</table>

- 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.