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# Illuminating Policy Implications in Appalachia:
## Satellite Imagery Responses to Natural Gas Development

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## THE RESEACH

An analysis of **nightlights data** to quantify sub-national economic development in response **to natural gas activities** and natural gas policies to determine if state approaches **limit or encourage regional economic growth**.

Three states

9.8 trillion ft$^{3*}$ of natural gas *2017 estimates

85,000* jobs *2018 estimates

## THE DATA

Derived from **remote sensing imagery**, more precise, high spatial resolutions and wide geographic coverage have enabled scholars to derive information on areas where information on economic development is available. **Nighttime lights** serves as a **proxy for settlement patterns, wealth and economic development at high spatial resolutions**

## THE METHODS

### Nightlight Analysis

- Analysis of luminosity emitted per county over time
- Simple regressions run between luminosity and drilling activity, measured by wells drilled and natural gas production per year to verify proxy measure for development

### Labor Statistic Correlation

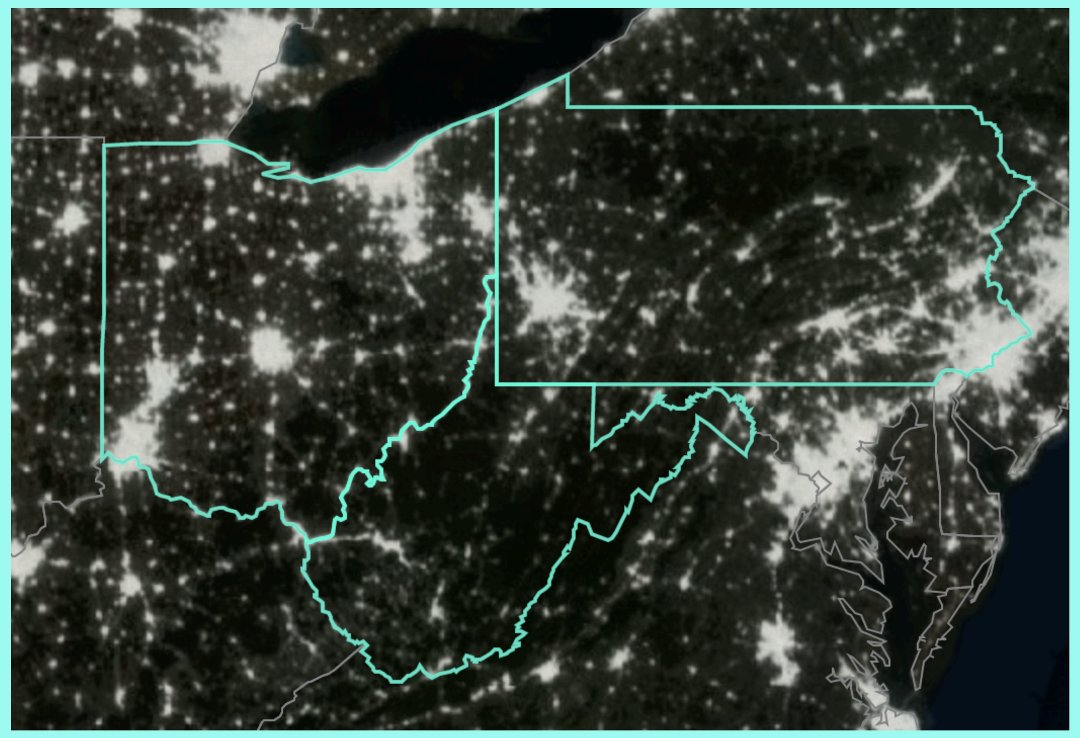
- Statistical analysis comparing socio-economic indicators including mean income, general employment and poverty

### Policy Analysis

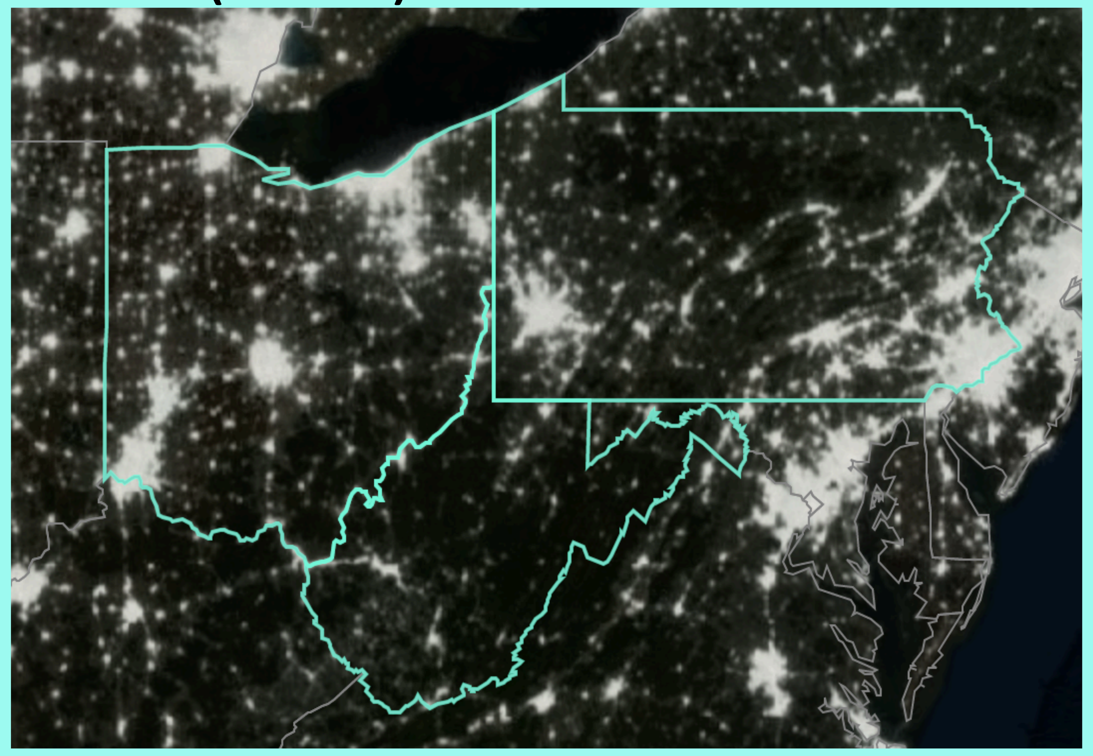
- Evaluation of individual state policies to determine clarity, level of effectiveness, equity and cost
- Cross comparison analysis of natural gas policies

## THE PRELIMINARY RESULTS

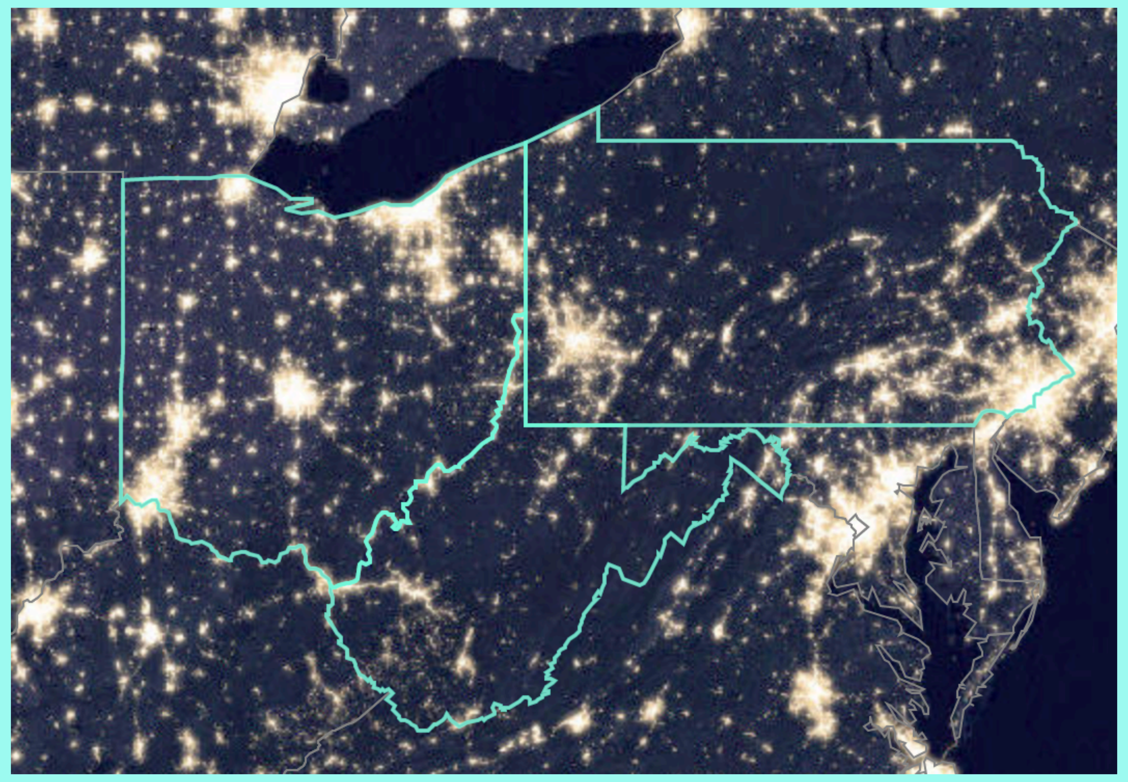
### Pre-boom (2000)

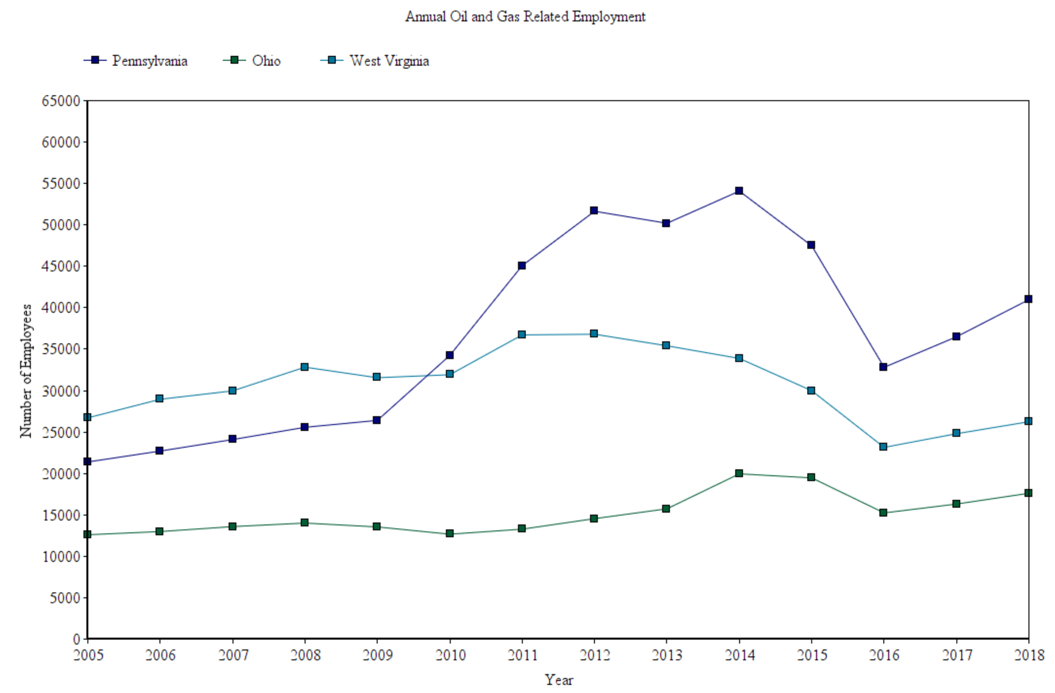


### Boom (2008)

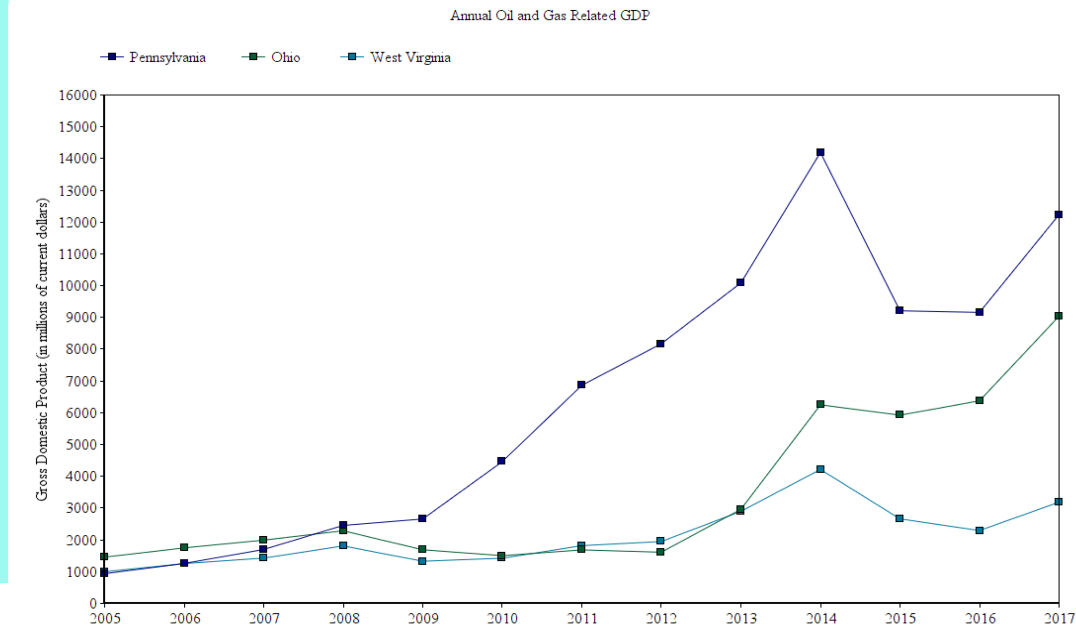


### Post-boom (2016)






Here, we will correlate labor statistics and natural gas production data with light density to determine if nightlights data can serve as a valid proxy measure for regional natural gas related development.




We couple this data with an institutional and policy analysis analysis to approach our second hypothesis: States that allocate taxation funding to municipalities will experience greater spatial economic development and spillovers when compared to states that limit or withhold funding from municipalities

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## NATURAL GAS POLICY ANALYSIS

*Local powers*

The governing structures of Ohio, West Virginia, and Pennsylvania are complex entities important in understanding the local governments influence on hydraulic fracking regulation. There are two forms of governing structures influencing municipalities: Dillion's Rule and Home-Rule. Dillion's Rule limits the lawmaking abilities of local government to those explicitly granted by state constitutions. Under Home-Rule, municipalities have the ability to exercise power not explicitly stated in constitution. Home-rule charters are only present in 2% of Ohio municipalities and 10% of Pennsylvania Municipalities. The rest fall under Dillion's Rule.

### NATURAL GAS POLICY POWER

**PA**

Powers are defined by state legislature which has created limited municipal legislative power. However, municipal power was expanded through the Robinson Township court case against strong state preemption.

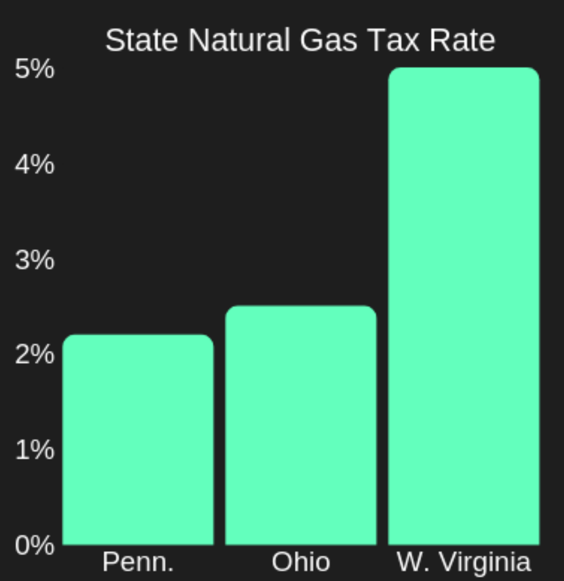
**OH**

Powers are consolidated so avoid confusion between companies and municipalities; fracking companies that operate out of different state cannot be taxed on their operations occuring in Ohio.

**WV**

Tax rates for Companies occur at the corporate, property, county, and state level. Companies must adhere to a water management and soil erosion plan as well as be subject to a horizontal well fee.

### MUNICIPAL REVENUE AND TAX




**Pennsylvania**

Impact fee money -60% money given back to municipalities , leasing of municipal land for natural gas development

**Ohio**

Municipalits do not rely on taxes or fees from companies but rather, use constituant taxes.

**West Virginia**

Municipalities recive 10% of severance tax