



DEPARTMENT OF  
AGRICULTURAL, ENVIRONMENTAL,  
AND DEVELOPMENT ECONOMICS  
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# The Economic Value of Shale in Ohio

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OEC Webinar

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# Outline

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- Introduction
- The Shale Boom
- Realistic Economic Expectations for Ohio Shale Development
- The Long Run
- Steps to Avoid a Bust
- Conclusion

# Motivation

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- Innovations in oil and gas extraction along with rising oil and gas prices have led to shale development across the U.S.
- Dramatically reversed trends in U.S. oil and gas markets as imports are now decreasing
- Various impact studies have estimated large employment effects for Pennsylvania, Ohio, and other areas
- Commenting on shale energy development, Aubrey McClendon CEO of Chesapeake Energy of Oklahoma was quoted in the Columbus Dispatch saying, “**This will be the biggest thing in the state of Ohio since the plow.**”
- We are concerned that job numbers may be overinflated by the industry (or any industry)

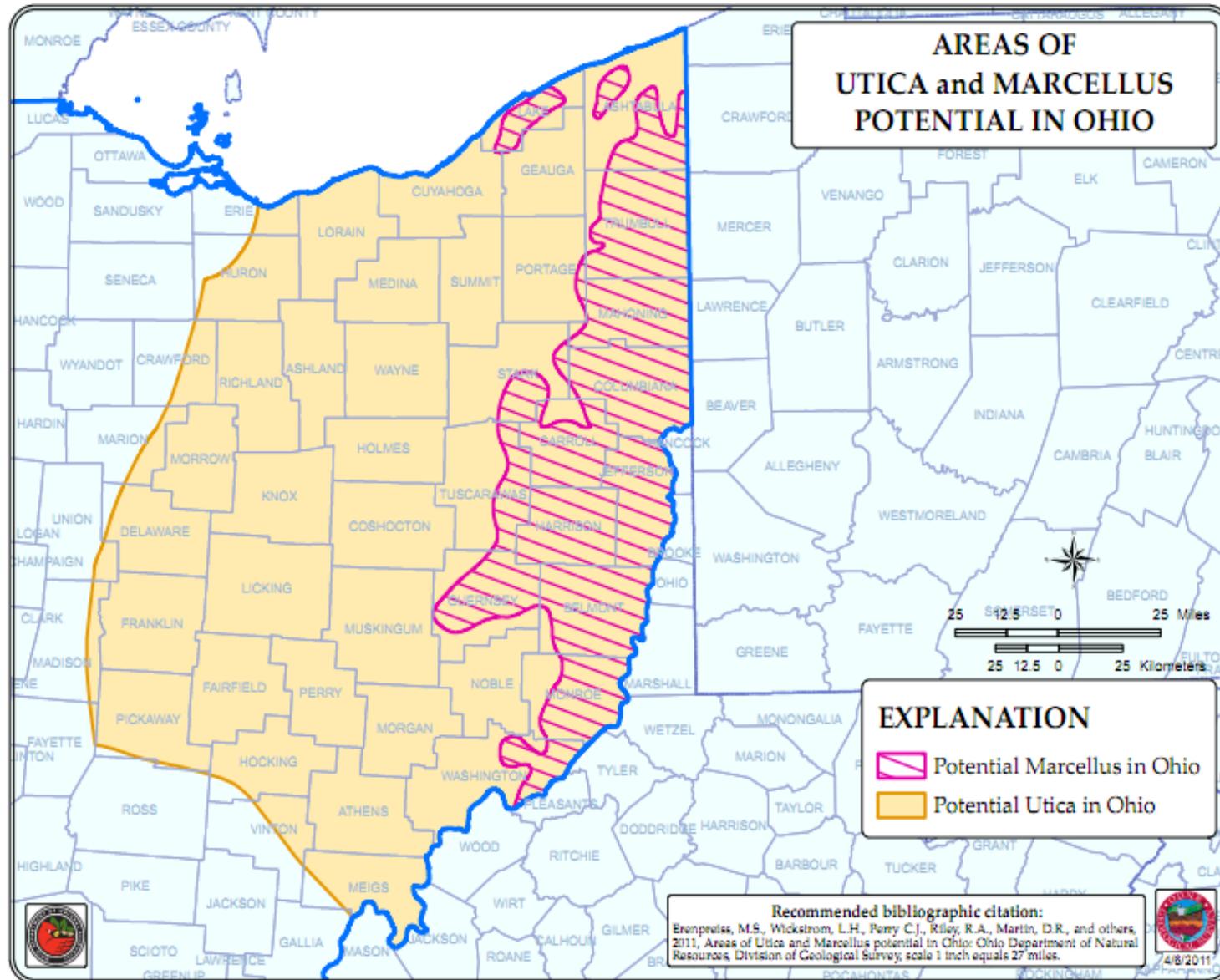
# Implications

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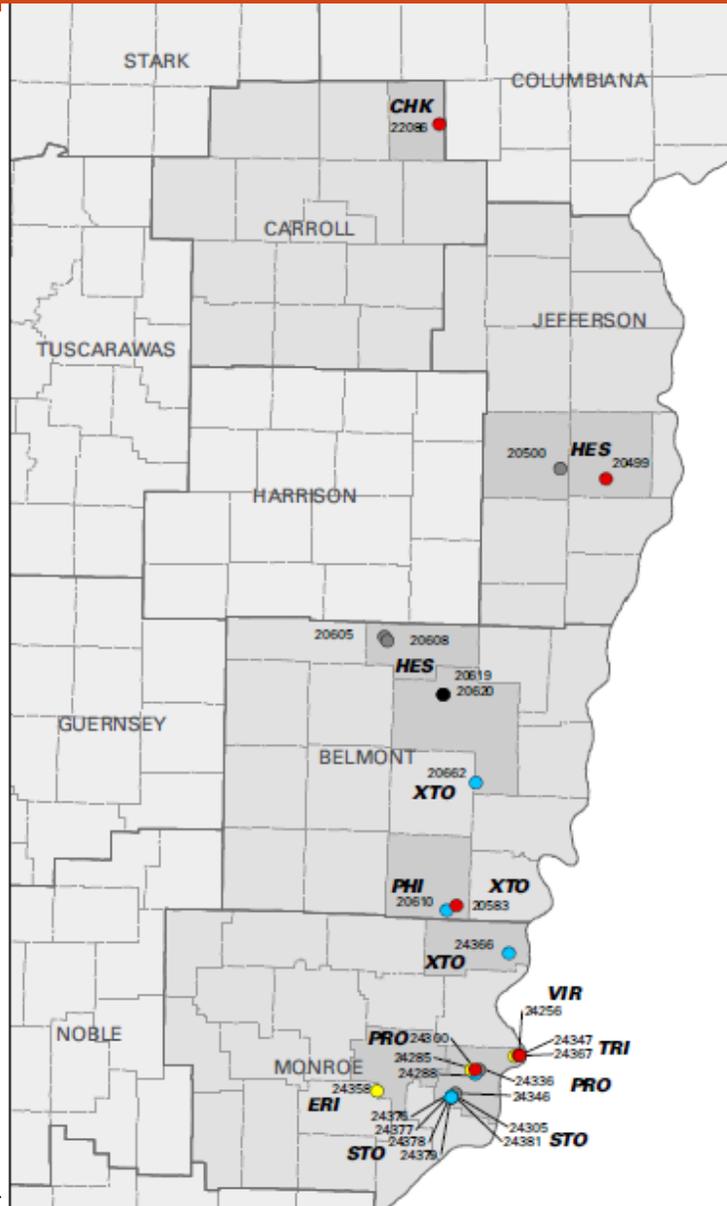
- Policy makers and the energy industry itself have used these job numbers to justify supporting the industry through tax breaks, favorable regulations, and other measures
- Pennsylvania spent **\$1.7 Billion** in subsidies to entice a Shell ethane cracker facility to locate in Beaver County, PA (near Pittsburgh)
  - With an average employment of 400 in these types of facilities, that amounts to **\$4.125 Million per job**
- To have a meaningful discussion weighing all of the benefits and costs of shale (including environmental), the economic benefits to local communities needs to be accurately assessed



# Ohio Marcellus and Utica Shale



# Marcellus Wells in Ohio

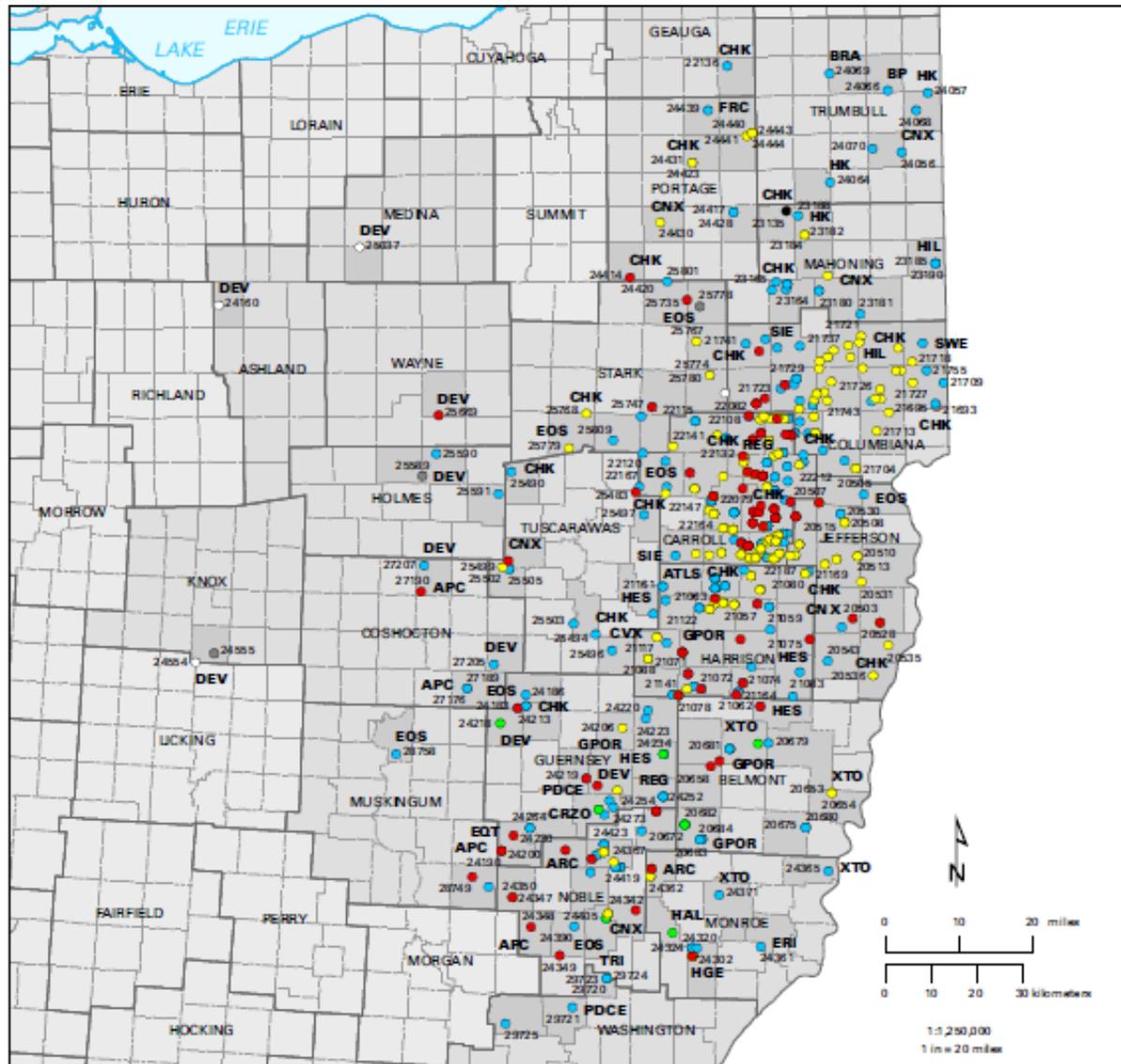


## EXPLANATION

Horizontal well status (as of 5/4/2013)

- Producing (6)
- Drilled (3)
- Drilling (0)
- Permitted (10)
- Plugged (0)
- Not Drilled (5)
- Inactive (2)

# Utica Wells in Ohio



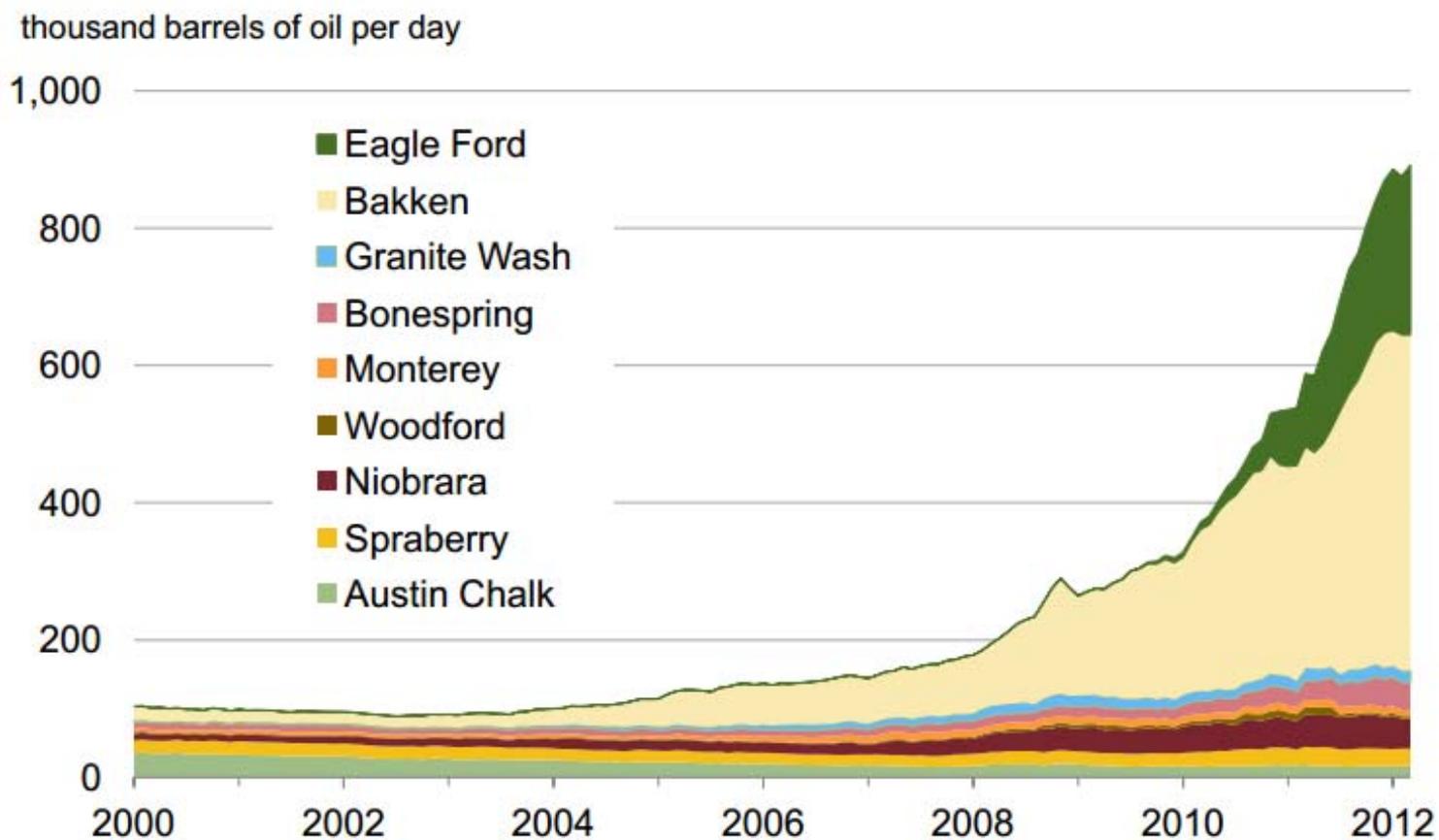
## EXPLANATION

Horizontal well status (as of 6/1/2013)

- Producing (102)
- Drilled (228)
- Drilling (14)
- Permitted (326)
- Plugged (11)
- Not Drilled (10)
- Inactive (2)

# Tight Oil production

Tight oil production for selected plays in March 2012 approaches 900,000 barrels per day

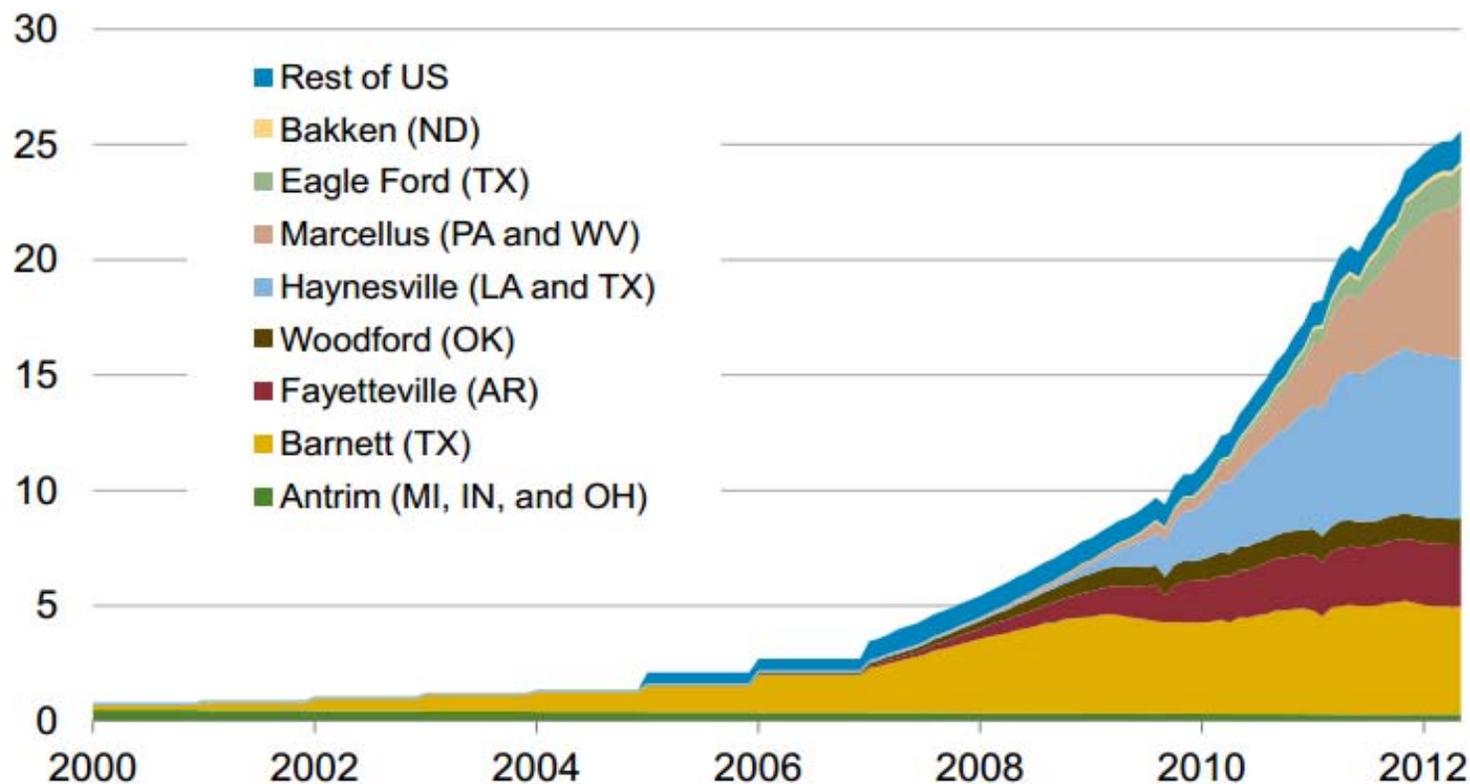


Source: HPDI, Texas RRC, North Dakota department of mineral resources, and EIA, through March, 2012.

# Shale Gas Production

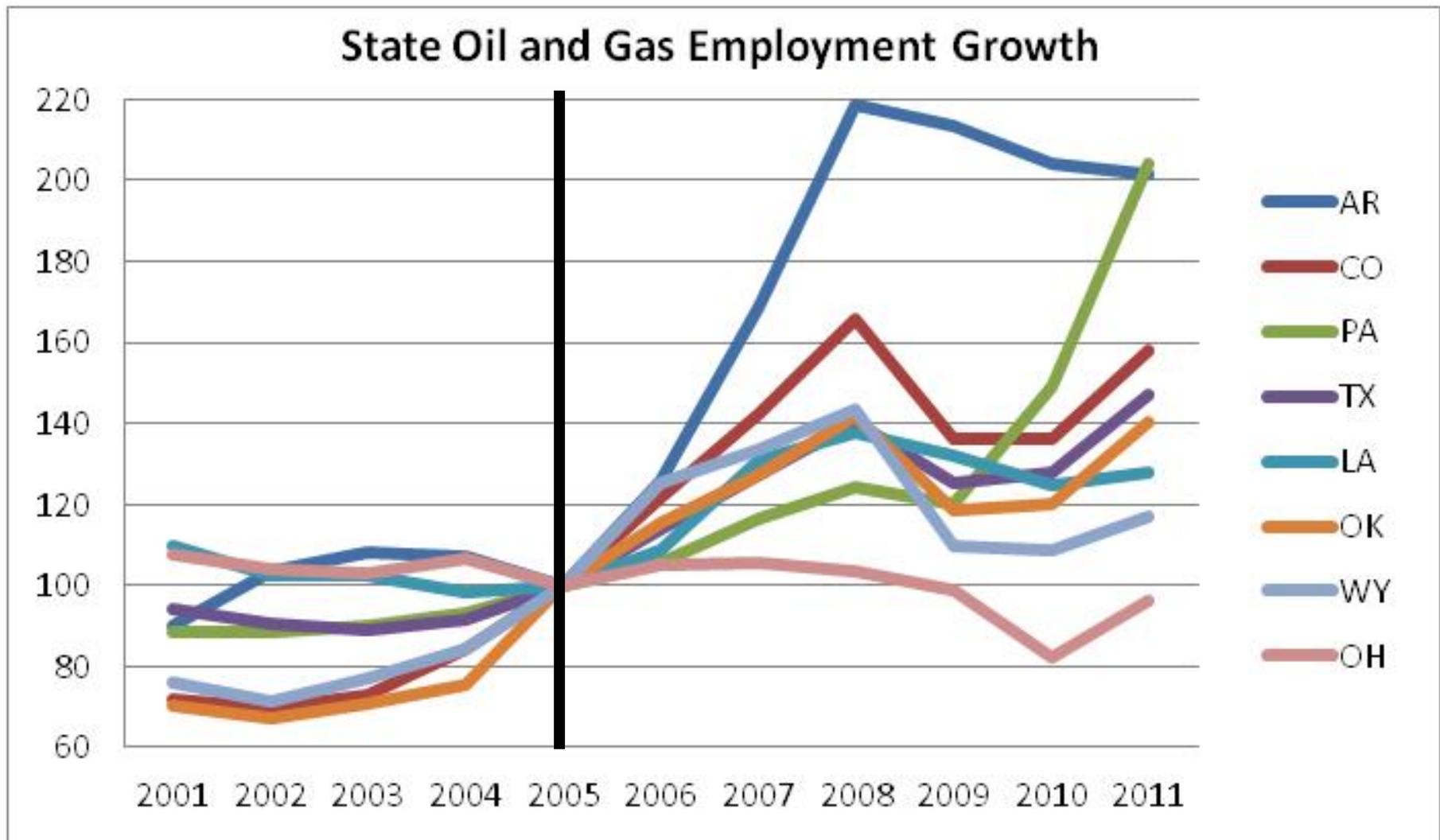
U.S. shale gas production comprised over 30 percent of total U.S. dry production, in 2011

shale gas production (dry)  
billion cubic feet per day



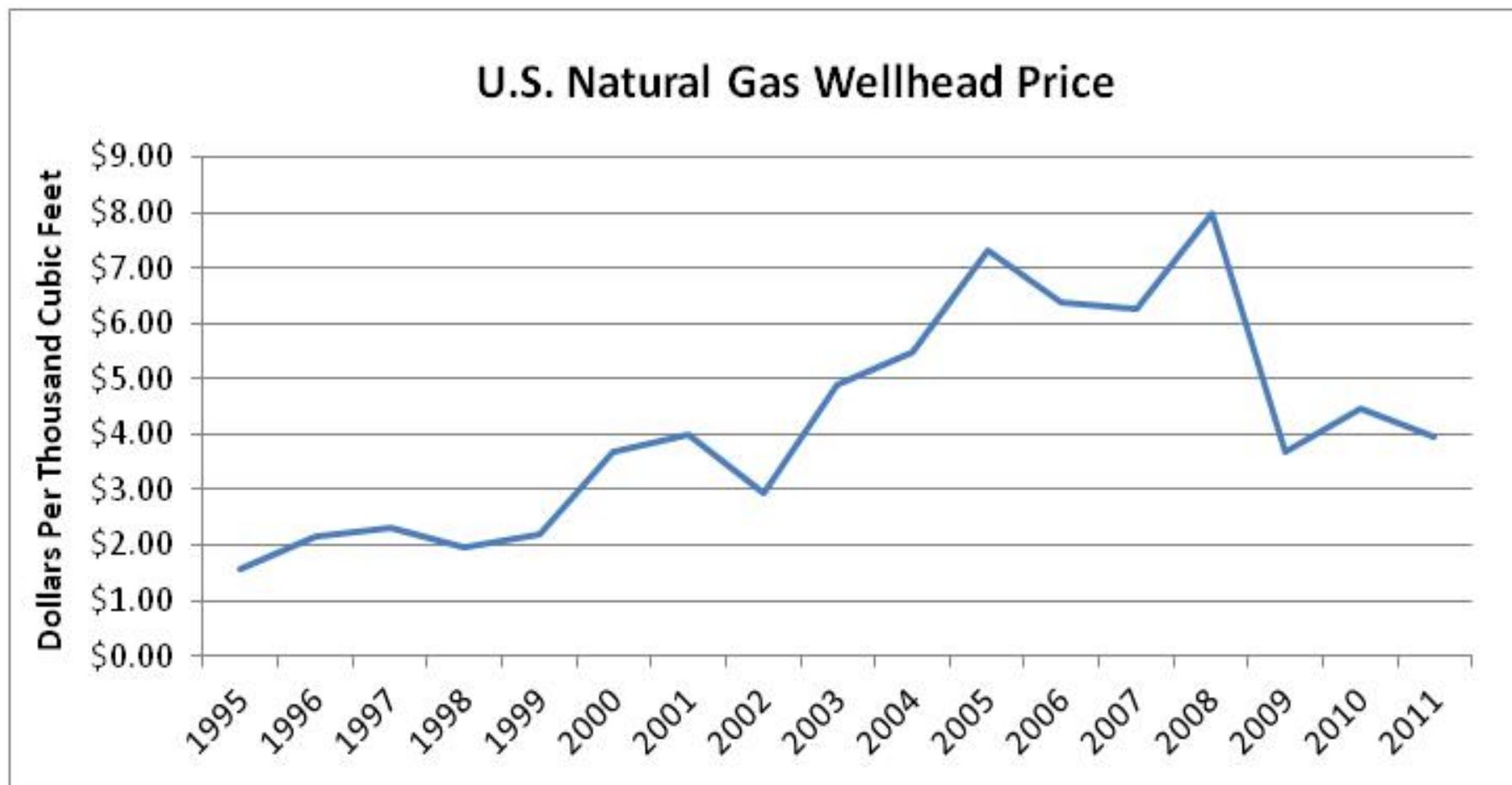
Sources: Lippman Consulting, Inc. gross withdrawal estimates as of May 2012 and converted to dry production estimates with EIA-calculated average gross-to-dry shrinkage factors by state and/or shale play.

# The Employment Boom



Source: U.S. Quarterly Census of Employment and Wages

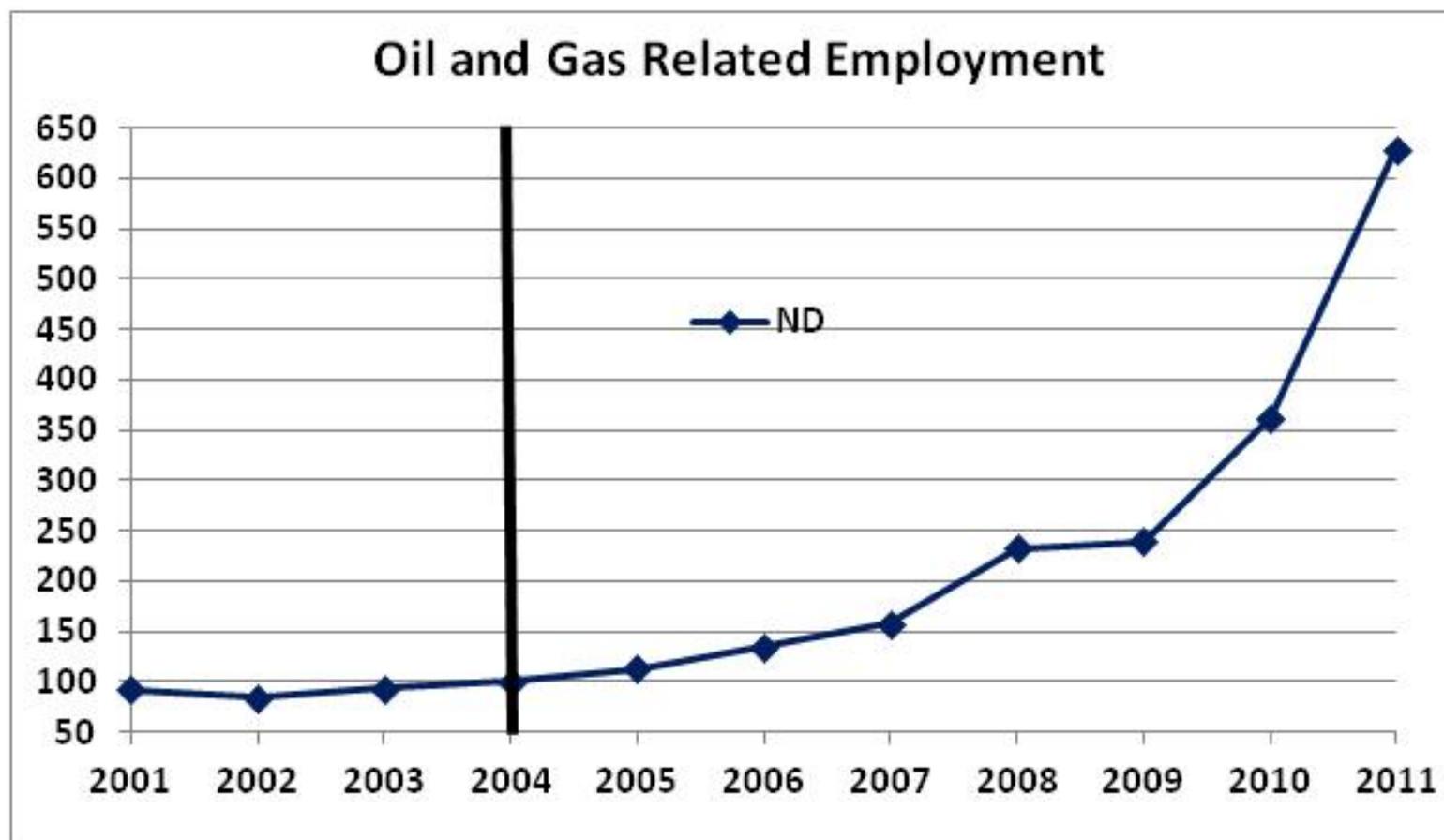
# Prices - Booms and Busts



Source: U.S. EIA

# North Dakota

- North Dakota oil and gas employment has shot up from holding steady at about 1,800 in 2004 to 11,700 in 2011.



Source: U.S. Quarterly Census of Employment and Wages

# Impact Studies

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- 140,000 jobs created in just 1 year (2010) in Pennsylvania (Considine et al., 2011)
  - Total direct natural gas extraction employment was just under 26,000 in 2010 (after adding approximately 20,000 from 2004-2010)
  - Implied multiplier: 7
  - Economists generally find multipliers closer to 2 for this sector
- North Dakota
  - From 2003-2013, the total nonfarm employment increased by 110,000
  - Mining employment increased by 21,000 in these 10 years
  - Even if all 110,000 jobs directly or indirectly from shale development (highly unlikely), this implies an economic multiplier of 5.2
  - Unemployment barely changed from 3.6% (2003) to 3.2% (2013)
  - Mining is still just a small share of the ND's economy at 6%

# Implications for Ohio

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- Based on the Considine report, Kleinhenz & Associates (2011) estimated 200,000 jobs would be created in Ohio by 2015
- Using actual natural gas extraction data from Pennsylvania (and a multiplier of 2), we estimate the total jobs created was closer to 20,000 in this timeframe which better estimates the impact Ohio should expect
  - Output multiplier for natural gas in Pennsylvania may be closer to a range between 1.86 to 1.90 (Kelsey et al., 2009)
  - Forthcoming journal paper finds the U.S. multiplier is closer to **1.3**
- Ohio Shale Coalition Answer: Ok how about 65,000 by 2014?

# Why the Difference?

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- ‘Impact studies’ that estimate direct and indirect effects are over-estimates of new job creation and serious regional economists have not viewed them as best practice for decades
  - At best, a well done impact study should tell you how many jobs are ‘supported’ by an industry, not how many jobs it ‘created.’
  - At worst, the economic effects can be double counted and unrealistic assumptions applied to the model to increase estimates
  - Don’t account for displacement effects and other negative effects of drilling
  - Rely on a computer model not actual employment data
- **NOT COUNTERFACTUALS!**

# What about the local area?

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- Even small employment gains may be big for rural and remote counties in Ohio and Pennsylvania
- Match drilling counties with similar non-drilling counties in PA (the counterfactual) and find modest employment effects and more significant earnings impact
- Statistical regressions on counties in PA and the U.S. show employment impacts are modest and the earnings impact is about double, but that impact decreases over time
- Every \$1 million in shale gas production results in just 2.35 jobs within counties in TX, CO, and WY (Weber, 2012)

# Economic Theory

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- The modest impact on jobs is not surprising
  - More capital intensive than labor intensive
  - Displacement effects – coal industry, tourism, ‘Dutch Disease’
  - Even with impressive growth rates, the energy sector is still a small share of the total Ohio economy at 5.34 million in Apr. 2013 (U.S. BLS) at approximately 0.3%
- Leakage in the economic benefits
  - 37% of Marcellus PA employment has gone to non-residents (Kelsey et al., 2011)
  - 55% of royalty/leasing money saved (Kelsey et al., 2011)
  - Absentee landowners may be receiving leasing/royalty payments

## Major Holders of Utica Shale Right in Ohio (April 2012)

- Major Holders of Utica Shale Right in Ohio (April 2012)

	Land Holdings (Acres)	Headquarters	Shale Permits	Active Wells*
Chesapeake	1,357,500	OK	82	58
Enervest & EVEP	780,000	TX	7	2
Chevron	600,000	CA	0	0
Anadarko	300,000	TX	3	7
Hess Corporation	185,000	NY	3	1
SA	154,750	France	0	0
Devon Energy Production	110,000	OK	2	2
Consol/CNX Gas	100,000	PA	3	2
BP	84,000	United Kingdom	0	0
Gulfport	62,500	OK	0	1
Rex Energy Corp	58,700	PA	0	0
Phillips Exploration	45,000	PA	1	1
Petroleum Development Corp	40,000	CO	0	0
HG Energy	30,000	WV	10	5
XTO Energy (ExxonMobil)	25,056	TX	2	0
Triad Hunter	16,000	TX	0	1

# Displacement Effects

- Displacement effects and effects on other industries ('Dutch Disease') reduce the employment effects
  - The effect on the coal industry and tourism
  - The impact of bid up wages on industries that rely on low wages
- "Among the inconveniences the boom has caused for locals -- including a higher cost of living, more traffic and **higher turnover rates among businesses that lose employees to the oilfields** -- there's a huge housing shortage." (CNN Money, 2011)



Sign in front of Taco John's in North Dakota

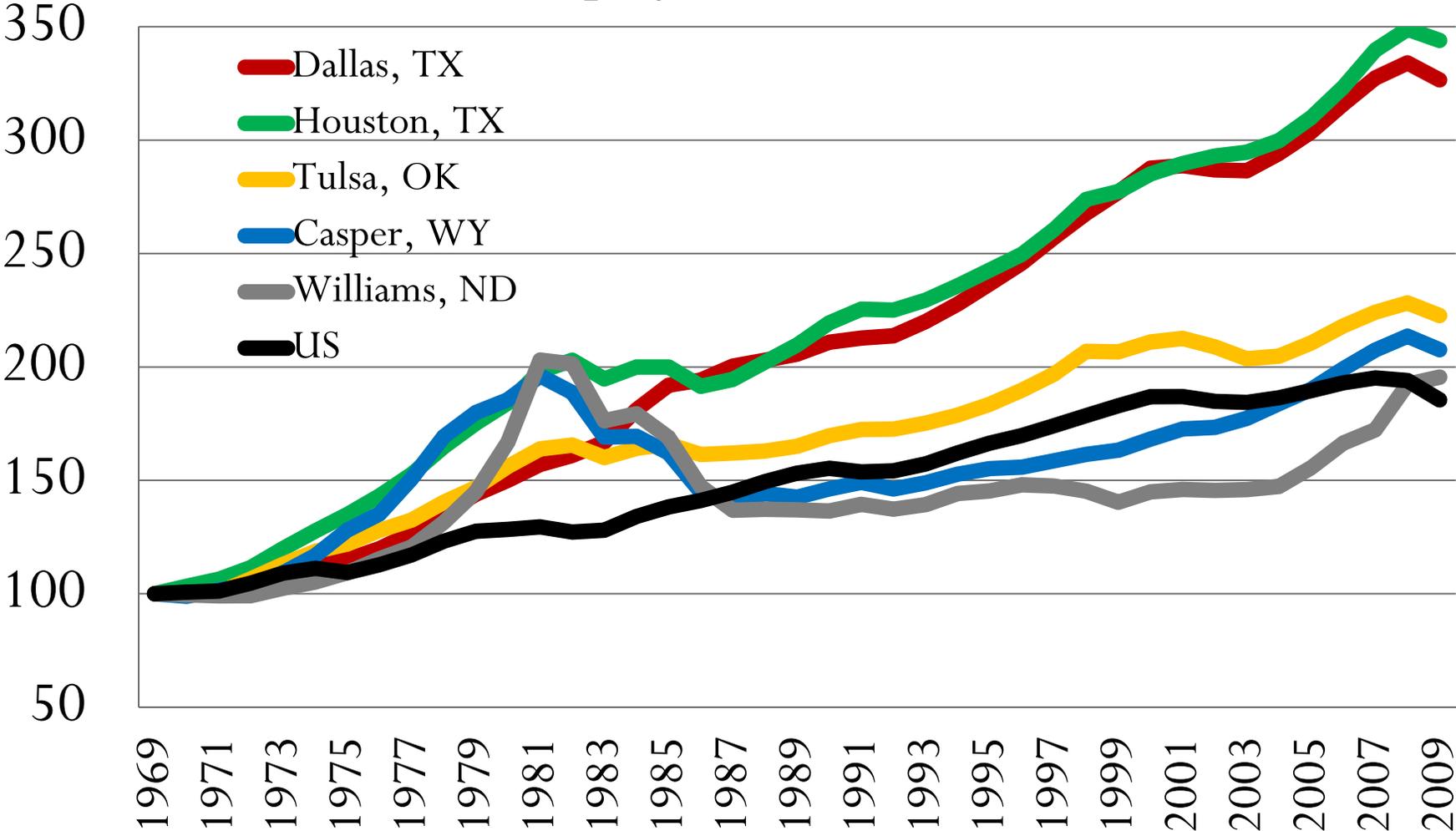
# In the Long Run

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- Economists have 150 years of evidence on natural resource booms and the evidence is often negative.
  - A number of studies have shown that countries are actually hindered and not helped by their resource abundance in terms of economic growth termed the ‘**natural resource curse**’
  - A similar trend has been shown for U.S. states and counties
- The Natural Resource Curse Causes
  - Volatile energy prices can lead to booms and busts
  - Dutch Disease crowding out other economic activity
  - Institutions- corruption, overspending
  - Personal incentive for investing in human capital

# Previous Natural Resource Shocks

## Employment Growth



Source: U.S. Quarterly Census of Employment and Wages

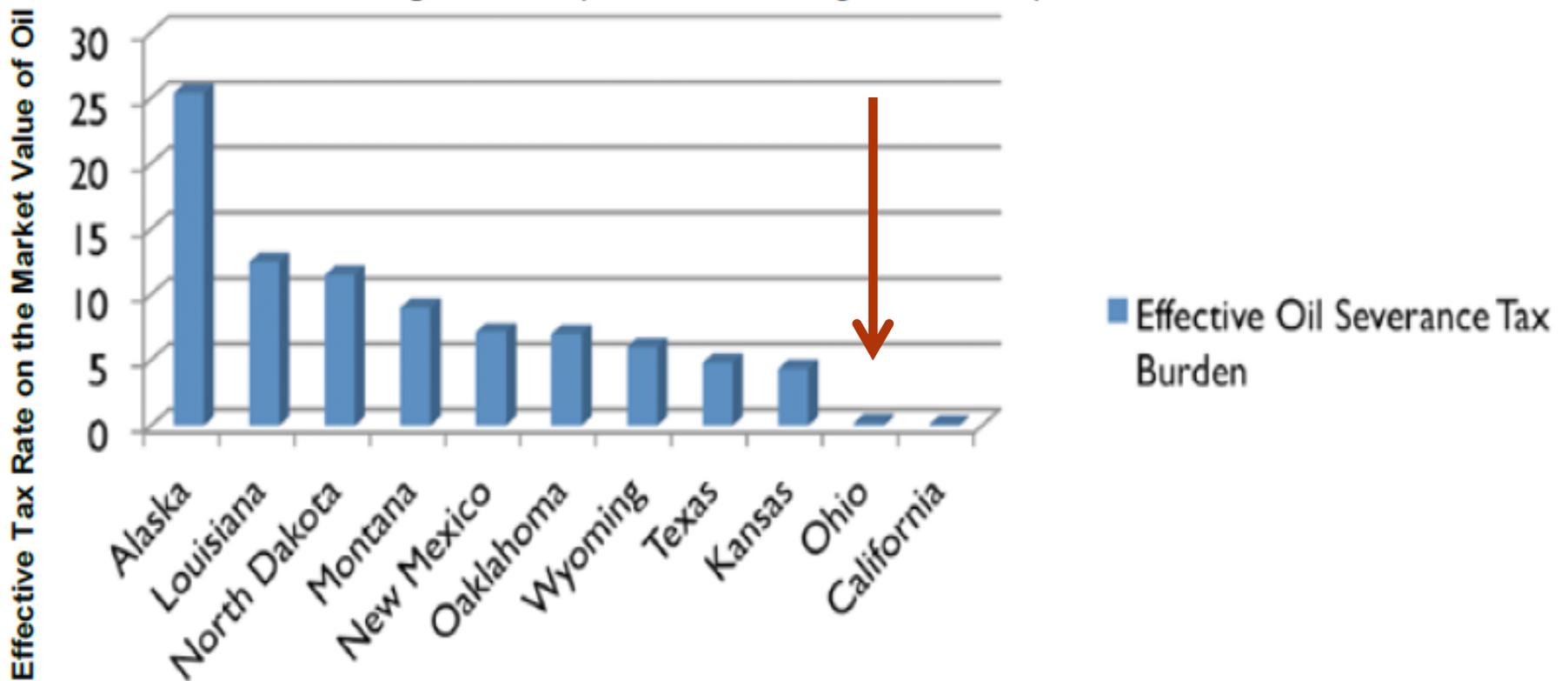
# Steps to Avoid the Bust and the Curse

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- Shouldn't rely on short term benefits in employment and earnings
- Address the short term and long term costs to communities
  - Infrastructure and public services
  - Environmental amenities
  - Replacing the permanent loss of physical capital by investing in human capital
- Taxes set appropriately to cover these costs

# Severance Taxes (Oil)

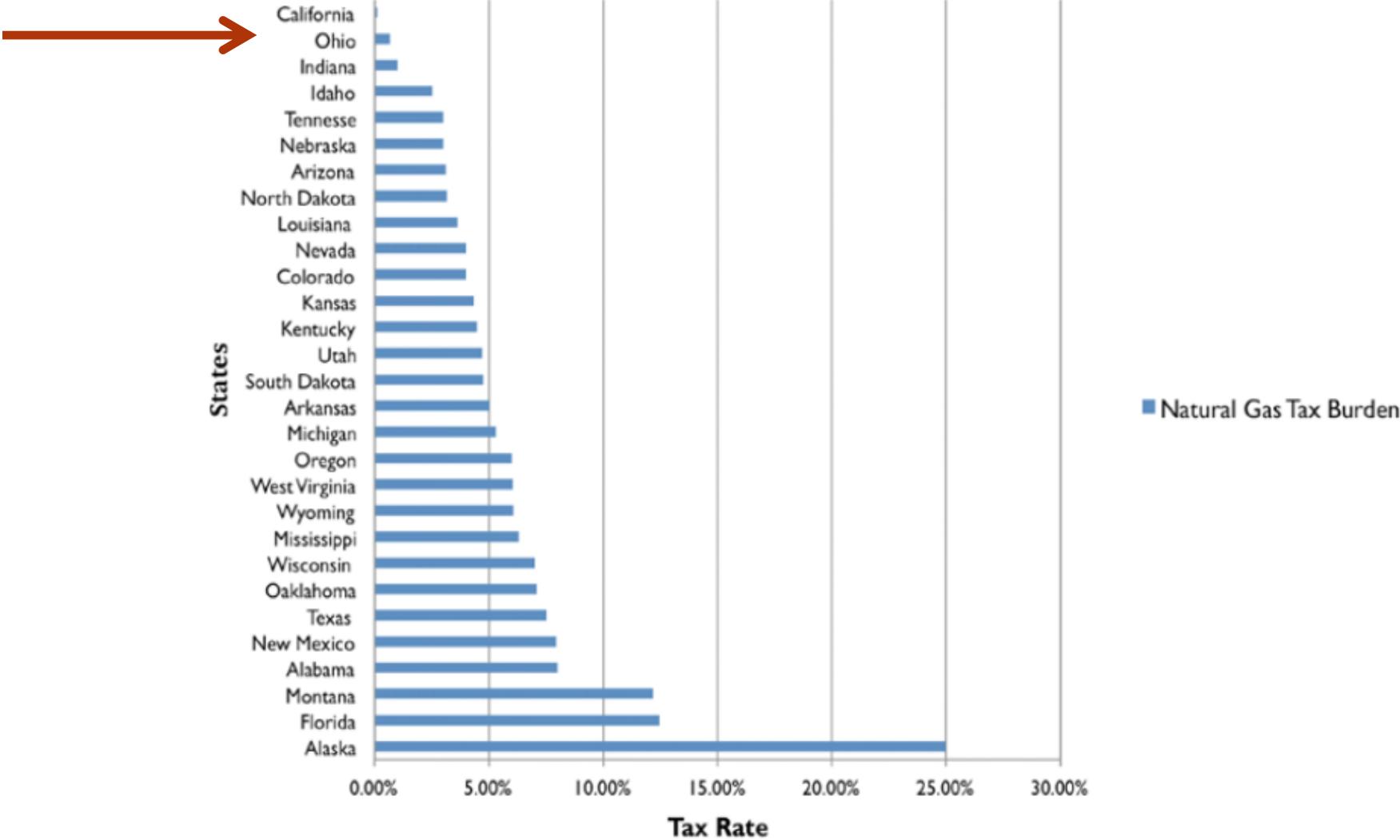
Figure 11: Top 10 Oil Producing States Compared to Ohio



Source: Innovation Ohio <http://innovationohio.org/wp-content/uploads/2012/02/Fracking-Fairness-and-the-Future-Full-Report.pdf>

# Effective Natural Gas Tax Burden

Figure 12: Effective Natural Gas Tax Burden



Source: Innovation Ohio <http://innovationohio.org/wp-content/uploads/2012/02/Fracking-Fairness-and-the-Future-Full-Report.pdf>  
 Note: The tax rate is based on the market value of the resource.

# Conclusion

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- The real question of shale investment is **not** job creation, but net benefits vs. costs (including environmental costs)
  - Having an accurate estimate of the economic benefits of shale development allows us to better weight the benefits and costs
  - In this question for the Marcellus shale in PA and OH, natural gas should be compared to coal, the true alternative
  - Shale natural gas is lower cost, less carbon, and like coal has local pollution impacts. Shale natural gas will also reduce natural gas imports
- Ohio should consider higher severance taxes to counteract some of these costs and pay for long-term benefits
  - Schools, infrastructure, environment
  - Invest in assets to account for the lost extracted assets

# Thank You

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# Extra Slides

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# Hydraulic Fracturing

Roughly 200 tanker trucks deliver water for the fracturing process.

A pumper truck injects a mix of sand, water and chemicals into the well.

Natural gas flows out of well.

Recovered water is stored in open pits, then taken to a treatment plant.

Storage tanks

Natural gas is piped to market.

0 Feet

Water table

Well

1,000

### Hydraulic Fracturing

Hydraulic fracturing, or "fracing," involves the injection of more than a million gallons of water, sand and chemicals at high pressure down and across into horizontally drilled wells as far as 10,000 feet below the surface. The pressurized mixture causes the rock layer, in this case the Marcellus Shale, to crack. These fissures are held open by the sand particles so that natural gas from the shale can flow up the well.

2,000

3,000

4,000

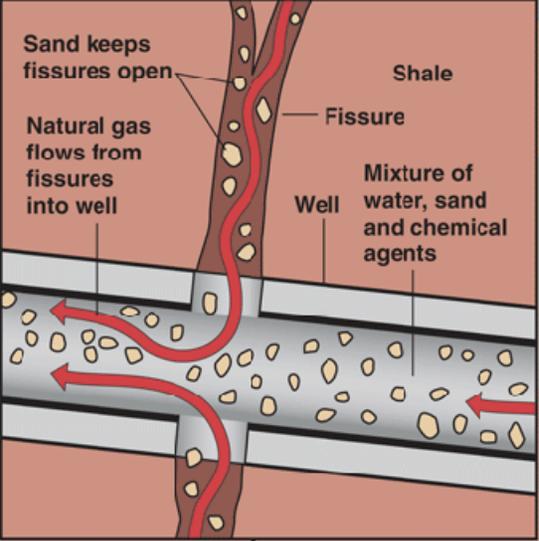
5,000

6,000

7,000

Marcellus Shale

Well turns horizontal

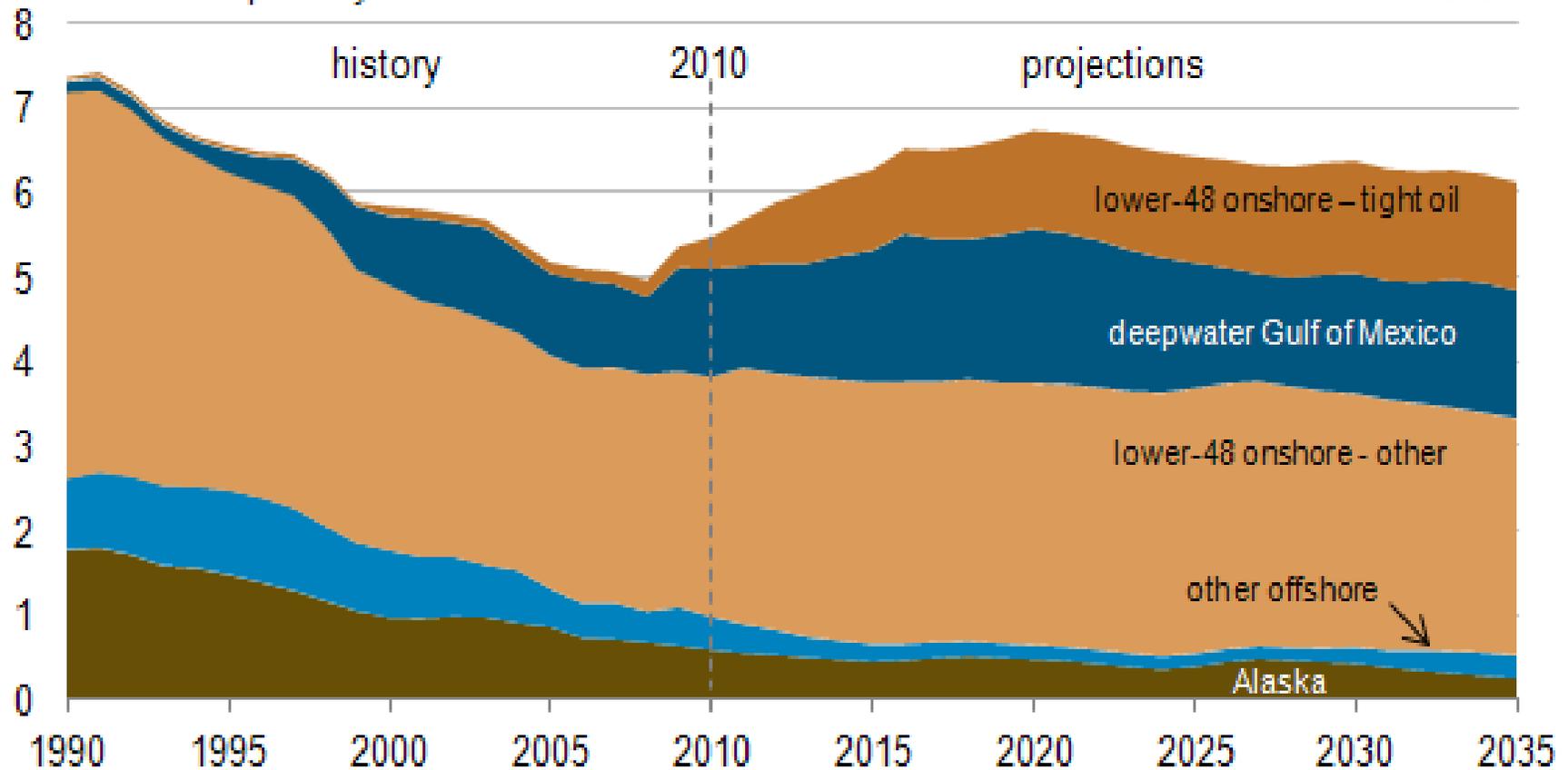


Fissures

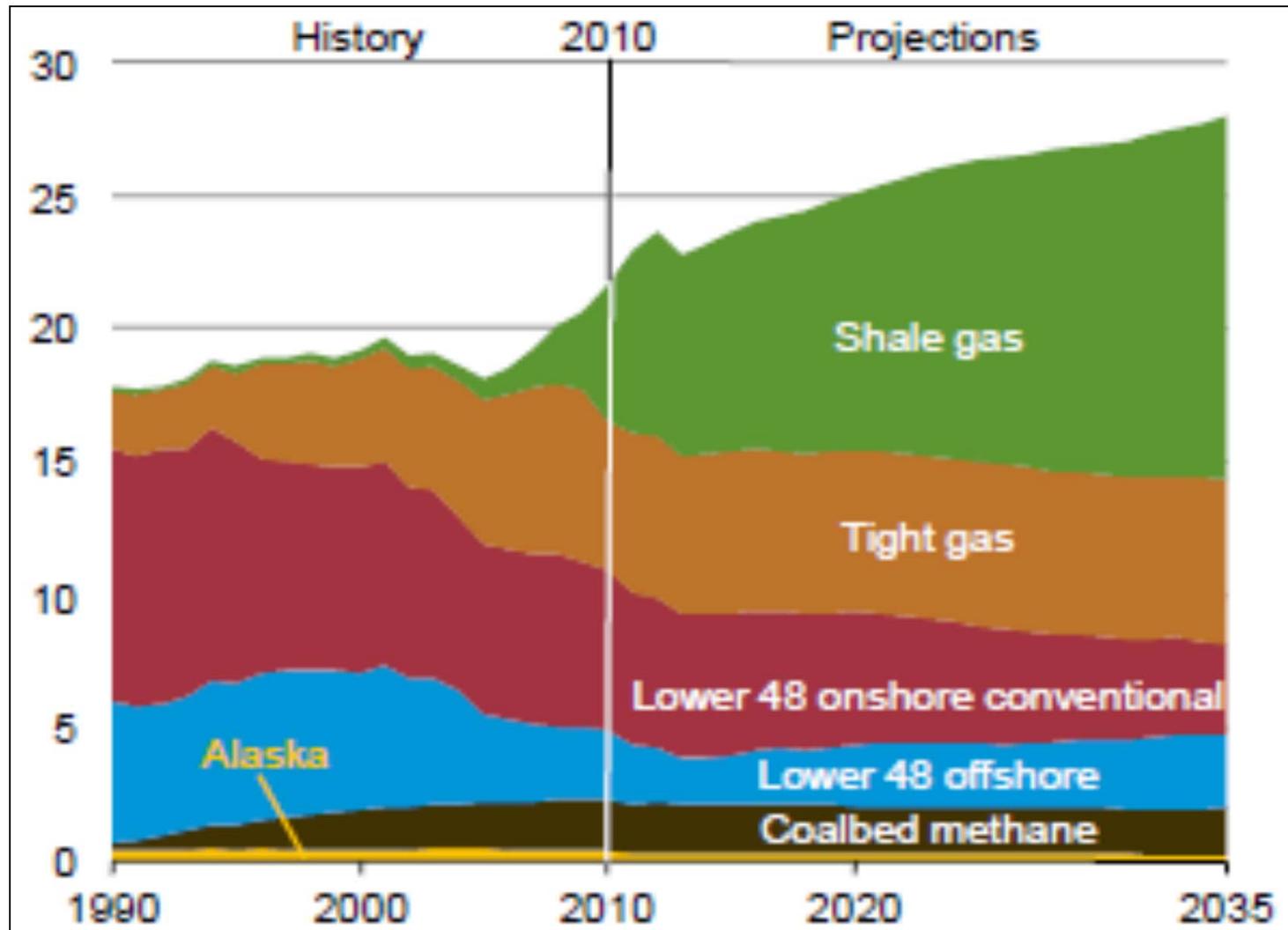
The shale is fractured by the pressure inside the well.

# Actual and Projected Production

**U.S. crude oil production**  
million barrels per day

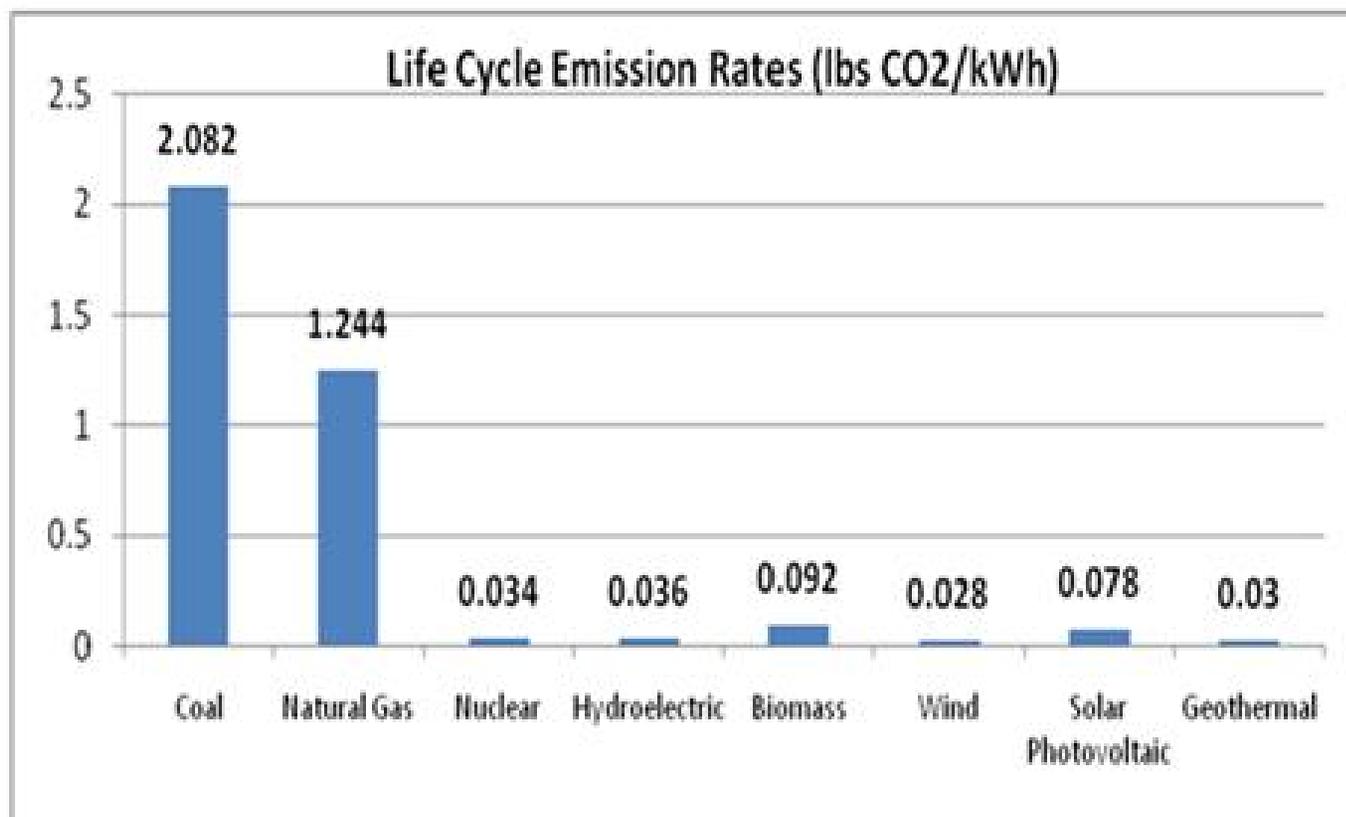


# Actual and Projected Production (EIA)

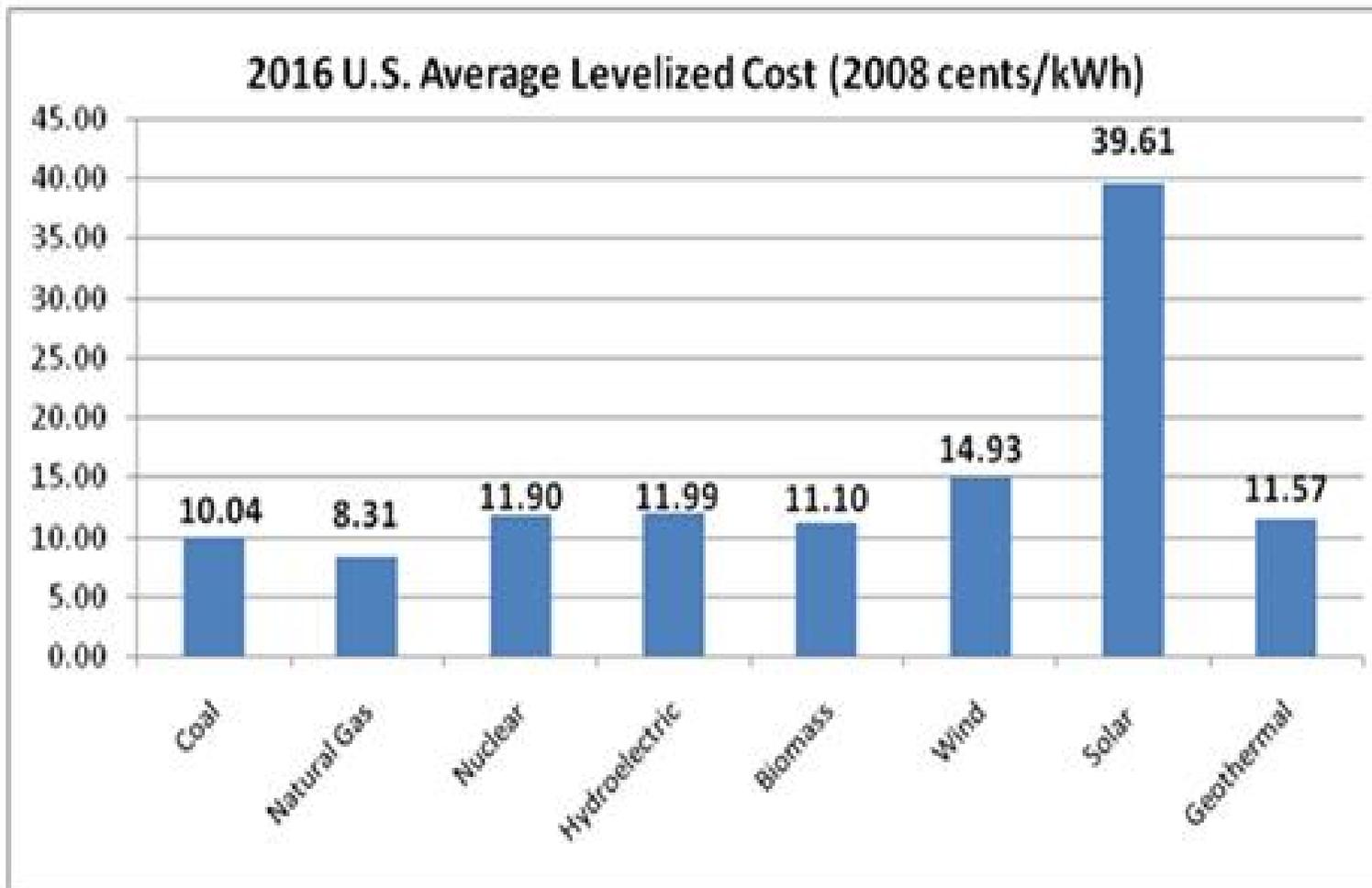


# Environmental Impact

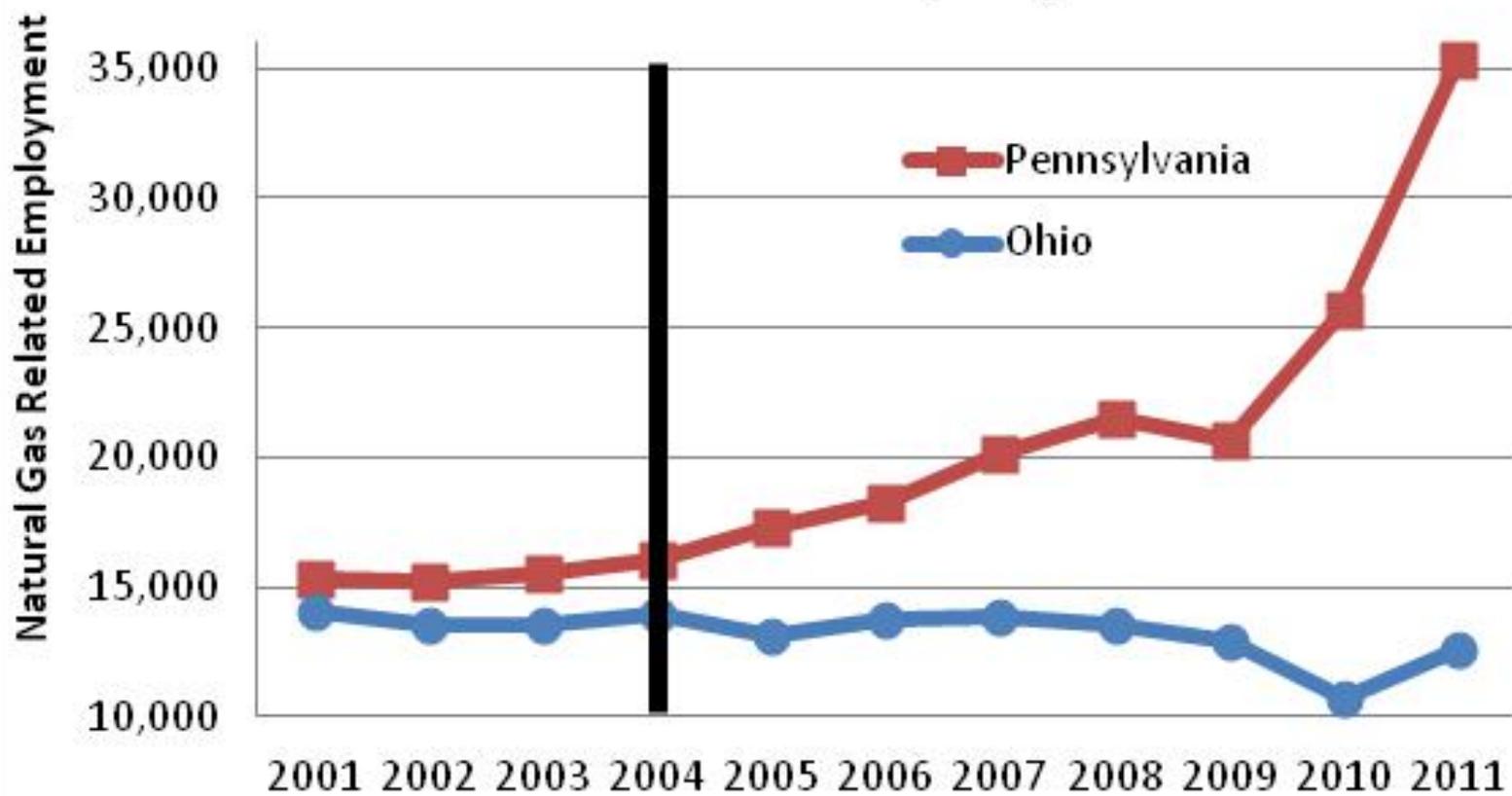
- A bridge to more environmentally friendly energy production
- Carbon benefits may be slightly less due to the trucking requirements, but carbon emissions remain significantly less than coal



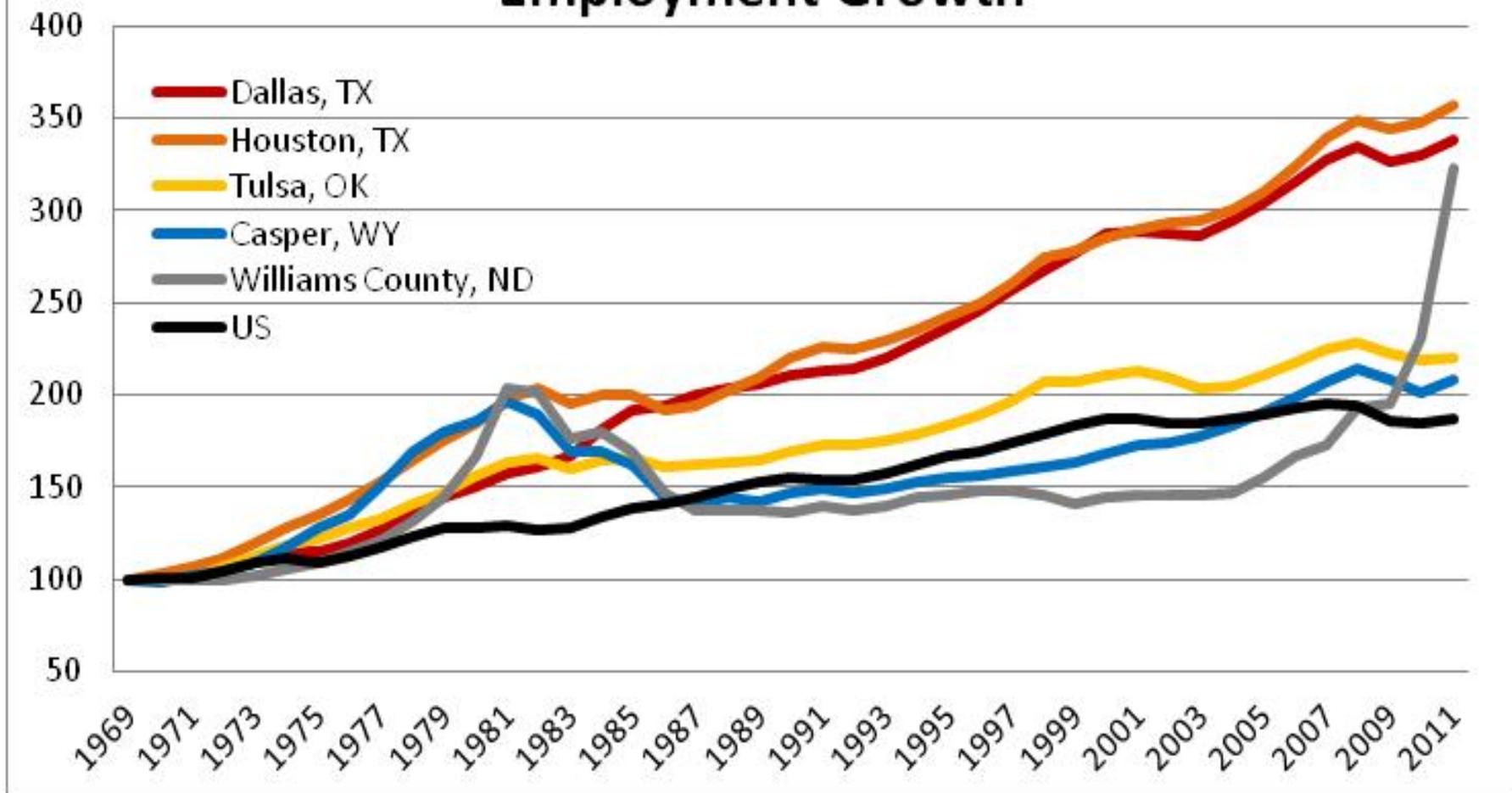
# Energy Price Comparison



## Natural Gas Employment



## Employment Growth



Source: U.S. Quarterly Census of Employment and Wages

# Perspective on Environmental Impact

- Coal ash spill –
  - In 2008, the New York Times reported that experts called the Tennessee ash flood that dumped over 1.1 billion gallons of coal ash waste “one of the largest environmental disasters of its kind”
  - 2011 Coal ash spill in Lake Michigan

