



DEPARTMENT OF  
AGRICULTURAL, ENVIRONMENTAL,  
AND DEVELOPMENT ECONOMICS  
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# Measuring The Economic Value of Shale Energy Development

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**Conference Presentation**

**New Access to Energy: Midwest and Global Industry Impacts**

# Is Shale-related Economic Development a Game Changer?

- New horizontal drilling technologies have produced game changing events that appear to have positive net effects.
- Commenting on Ohio's shale energy development:  
“This will be the biggest thing in the state of Ohio since the plow... This is truly extraordinary.”  
Aubrey McClendon CEO of Chesapeake Energy of Oklahoma.
  - Quoted in the *Columbus Dispatch* “Realism on Renewable Energy.” September 22, 2011, Pp. B1-B2.

Industry-funded studies predict very large economic impacts.

## **California Fracking May Boost State Economy 14%, USC Says**

By Alison Vekshin & James Nash - Mar 13, 2013 11:07 PM ET

Such drilling in the Monterey Shale Formation, in addition to increasing per-capita gross domestic product, may add as much as \$24.6 billion in state and local tax revenue and as many as 2.8 million jobs by 2020, according to the report released yesterday by the Los Angeles-based university.

Source: Bloomberg News: <http://www.bloomberg.com/news/2013-03-14/california-fracking-may-boost-state-economy-14-usc-says.html>

**Energy is a curious choice as a “job-creator” as it is among the most capital intensive industries.**

# Outline

- Some people have been very narrow in their focus, not thinking through global implications and there is considerable hype.
- Policy should be evidence based, not wishful thinking.
- 1. Shale development has major implications on world and US energy markets—which I will briefly describe in relation to U.S. growth.
- 2. Canadian oil production has greatly expanded since 2000. It is relatively larger than anything discussed for the U.S. I will assess how this affects Canada's growth.
  - This will be done in the context of “Dutch disease.”

# Outline--continued

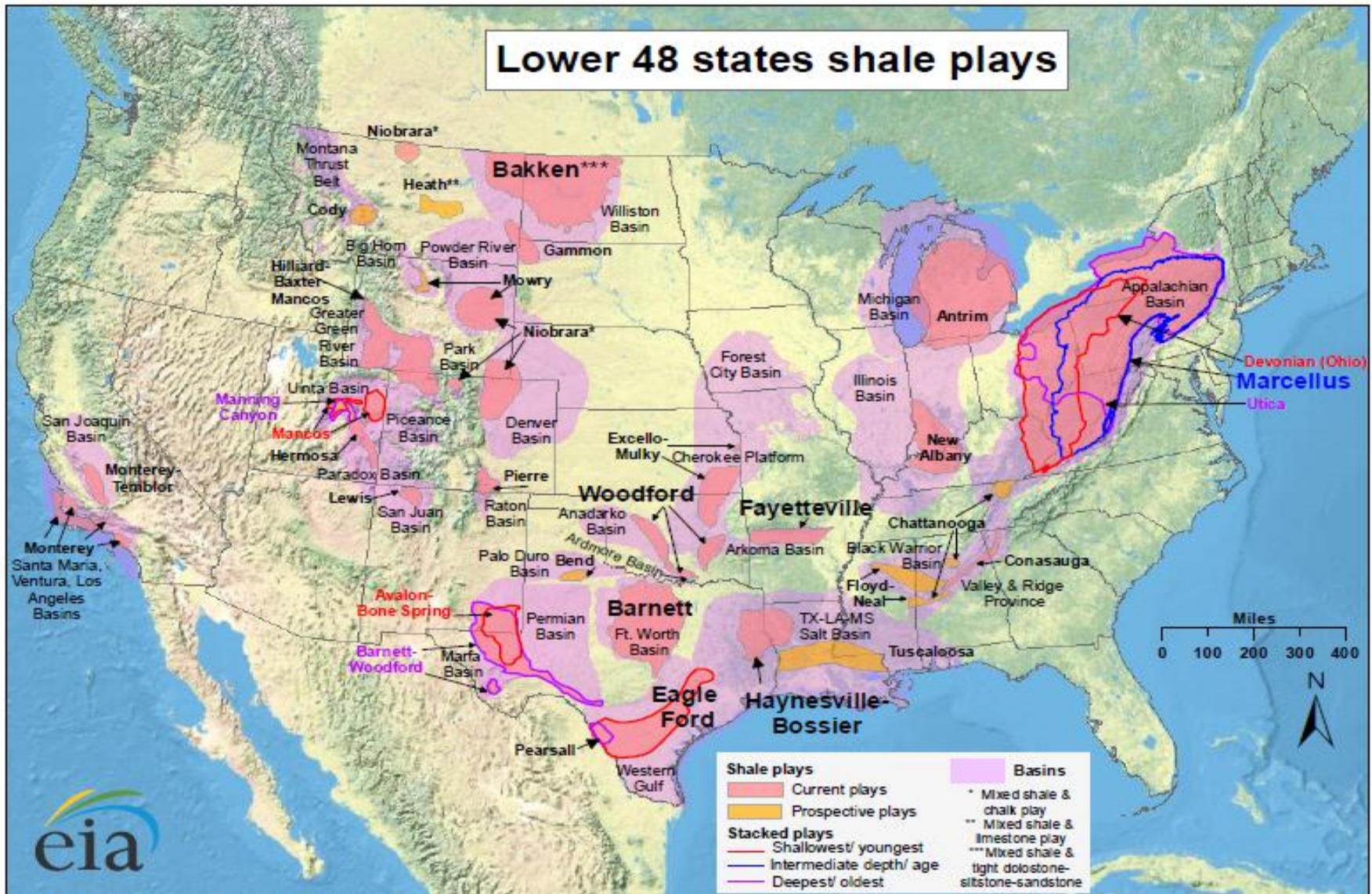
- 4. I will describe some local employment predictions for PA and Ohio to give a realistic assessment of what to expect.
  - On a national level, more domestic natural gas production will primarily offset coal production. Any resulting gains in natural gas jobs are at least somewhat offset by losses in coal production including indirect job effects. On balance, the net job numbers are more muted.
  - For those interested in local/regional growth, long-term economic outcomes should receive more weight than temporary booms revolving around construction.

# Shale is everywhere

1. People discuss an energy cost advantage if located near a shale play—e.g., help factories in Michigan or Ohio, or in U.S.
  - Citigroup discusses an American manufacturing renaissance with low energy costs being a driver.
    - See Swartz (2012) for a skeptical look.
  - But if energy prices are determined on world or regional markets, and shale is everywhere, then nobody gets an unique advantage.
  - Also the U.S. already had low energy prices—not as big deal as it is for say Europe or Asia.



# Shale Energy is found all over US and the world.



Source: Energy Information Administration based on data from various published studies.  
Updated: May 9, 2011

# Shale Plays are around the world: A selected check of *Bloomberg News*: U.S. is not a “shale island.”

## Chevron Enters Australian Shale Gas Industry With Beach Deal

By James Paton - Feb 25, 2013 1:49 AM ET

0 COMMENTS

0 QUEUE

[Chevron Corp. \(CVX\)](#), the second-largest U.S. energy company, agreed to pay as much as \$349 million to join [Beach Energy Ltd. \(BPT\)](#) in an Australian natural gas exploration campaign in its first shale investment in the country.

The agreement follows shale investments by [ConocoPhillips \(COP\)](#), Statoil ASA, BG Group Plc and Hess Corp. in a nation estimated by the U.S. Energy Information Administration to have the world's sixth-biggest potential reserves. Wilson HTM Investment Group says the accord is the biggest shale gas deal in Australia, which the government estimates may hold almost 400 trillion cubic feet of resources.

## Total Will Start Shale Drilling in Denmark This Year, CEO Says

By Tara Patel - Jan 10, 2013 6:27 AM ET

0 COMMENTS

0 QUEUE

[Total SA \(FP\)](#), Europe's third-biggest oil company, expects to start exploratory drilling in Denmark later this year as part of a push to develop shale energy projects outside the U.S.

The Paris-based company is also investing in Poland and China, Chief Executive Officer

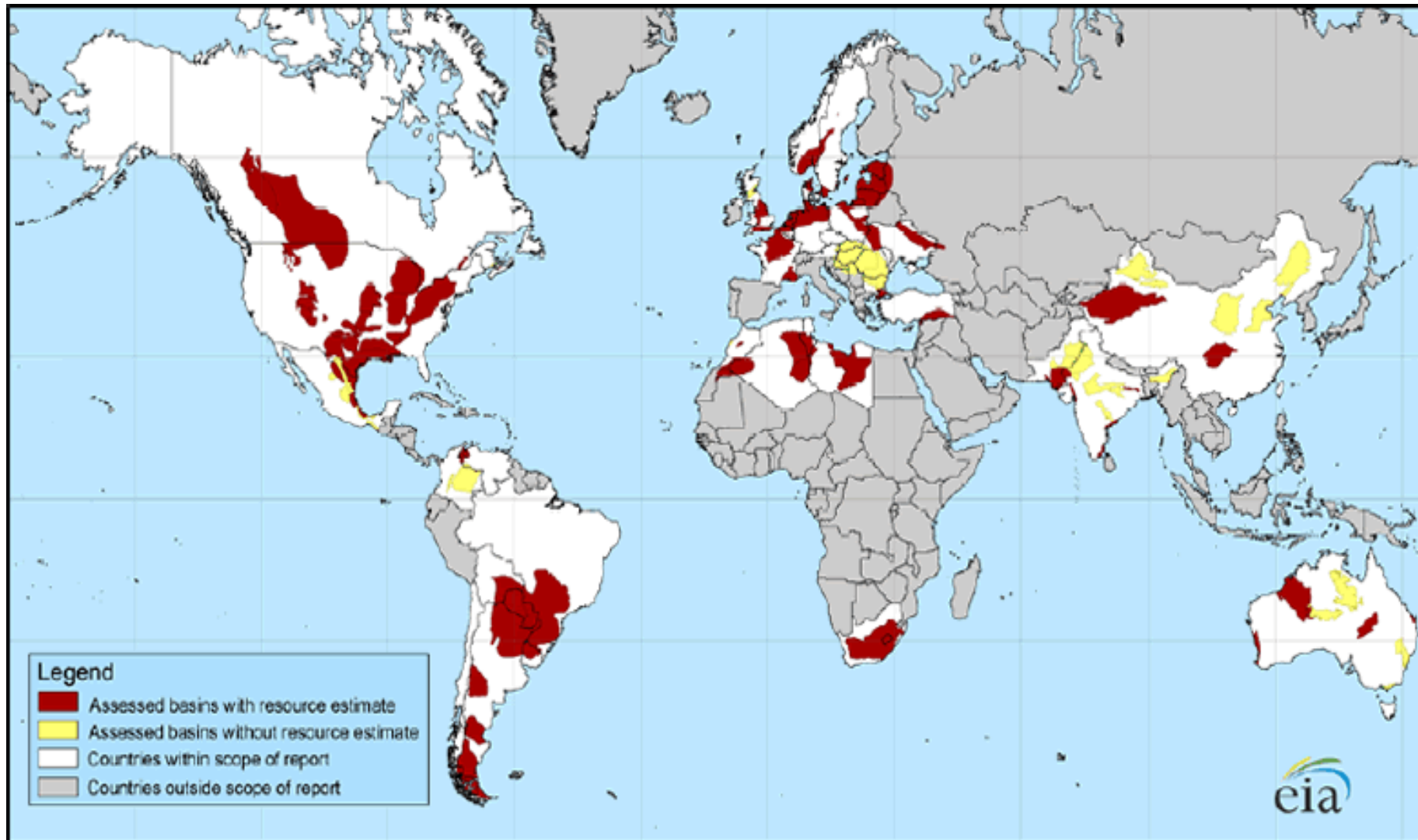
## Saudi Arabia to Drill Seven Shale Gas Wells: Al-Naimi

By Aibing Guo & Wael Mahdi - Mar 18, 2013 8:55 AM ET

The nation may hold as much as 645 trillion cubic feet of technically recoverable shale gas, the world's fifth-largest deposits behind China, the U.S., Argentina and Mexico, according to estimates by [Baker Hughes Inc. \(BHI\)](#). The kingdom also has about 282.6 trillion cubic feet of



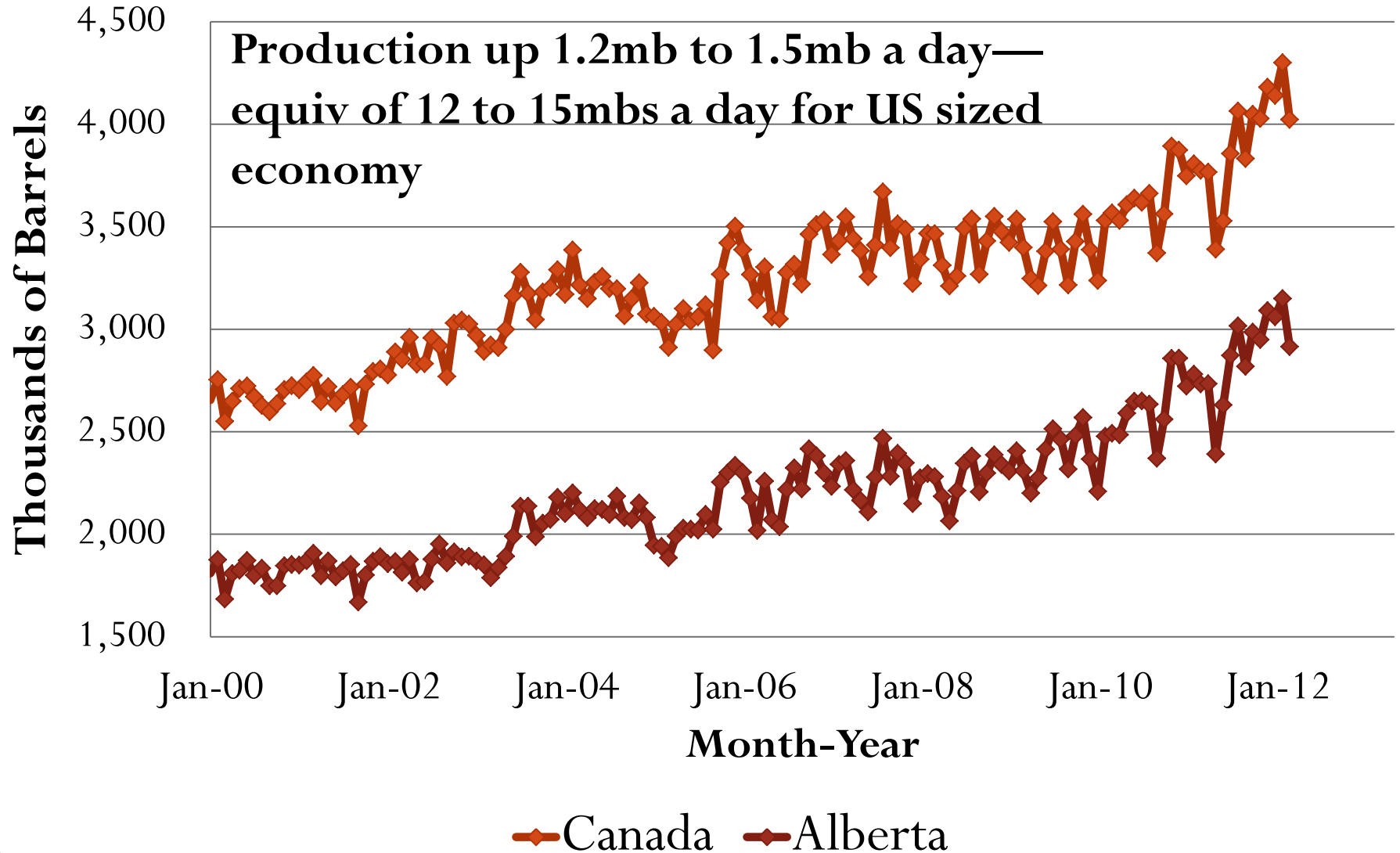
# Shale Natural Gas Energy is found all over US and the world.



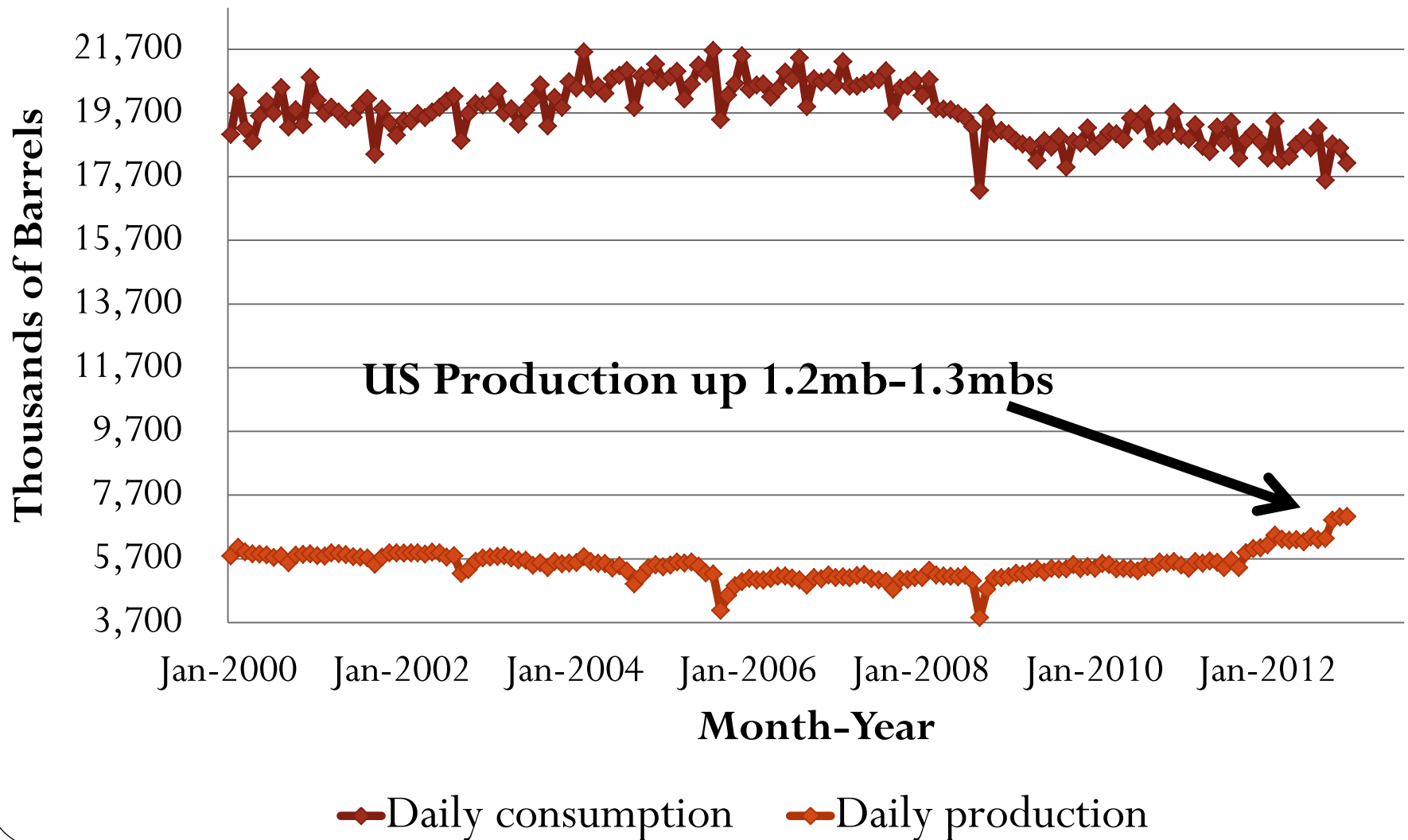
# Canada's Energy Boom

- Canada's energy boom began around 2000, centered in Alberta's tar sands.
- Set off “Dutch Disease” with appreciating Canadian Dollar and higher labor costs that hurt the competitiveness of other traded sectors—e.g., Canadian manufacturing.
- Net gains to the Canadian economy are modest (Beine et al., 2012).
  - Keep in mind Canadian economy is one-tenth the size of the U.S. economy.

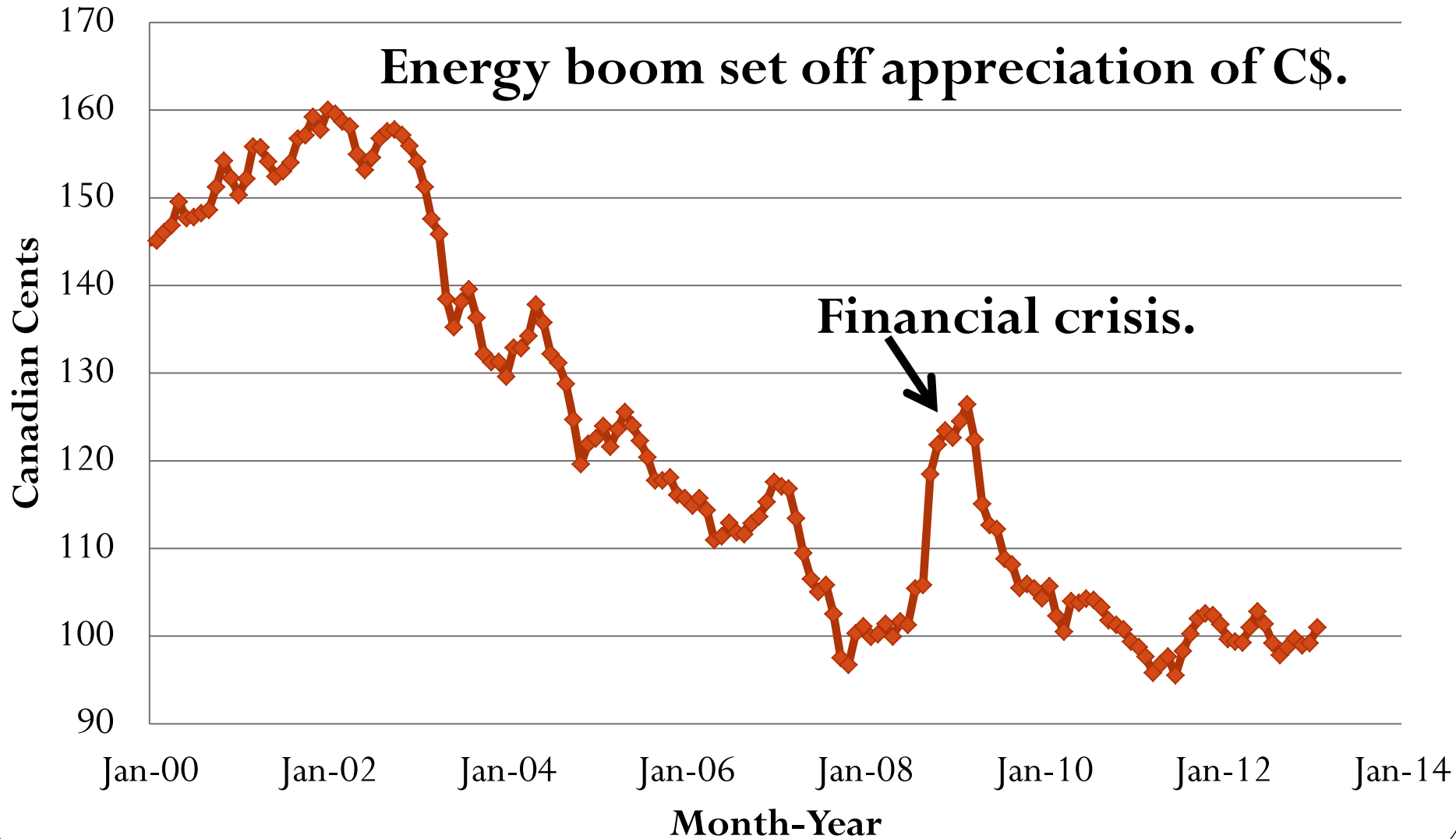
# Canadian Daily Crude Oil Production 2000-2012



# US Daily Crude Oil Production and Consumption 2000-2012

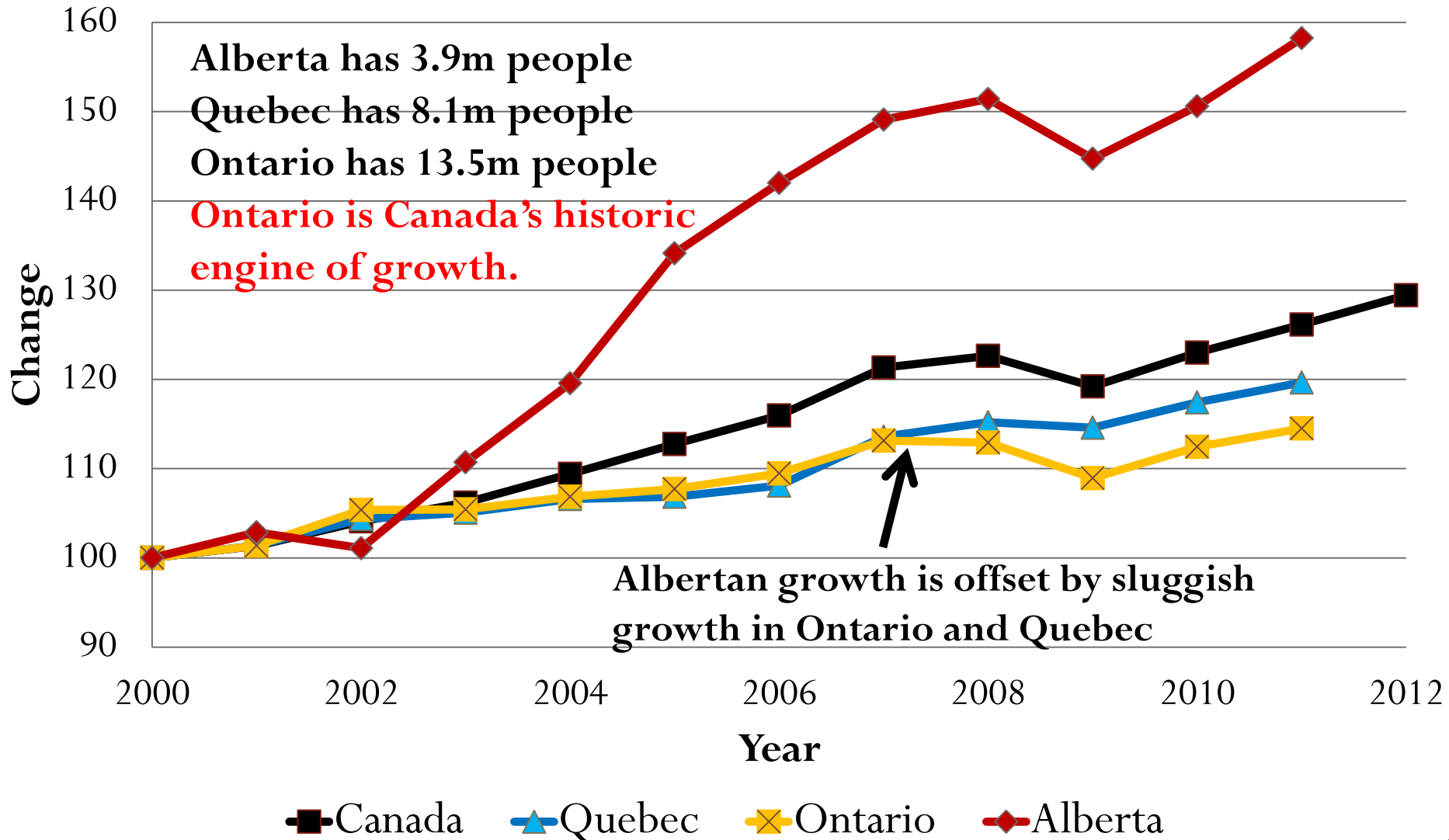


# Canadian Dollar per US Dollar

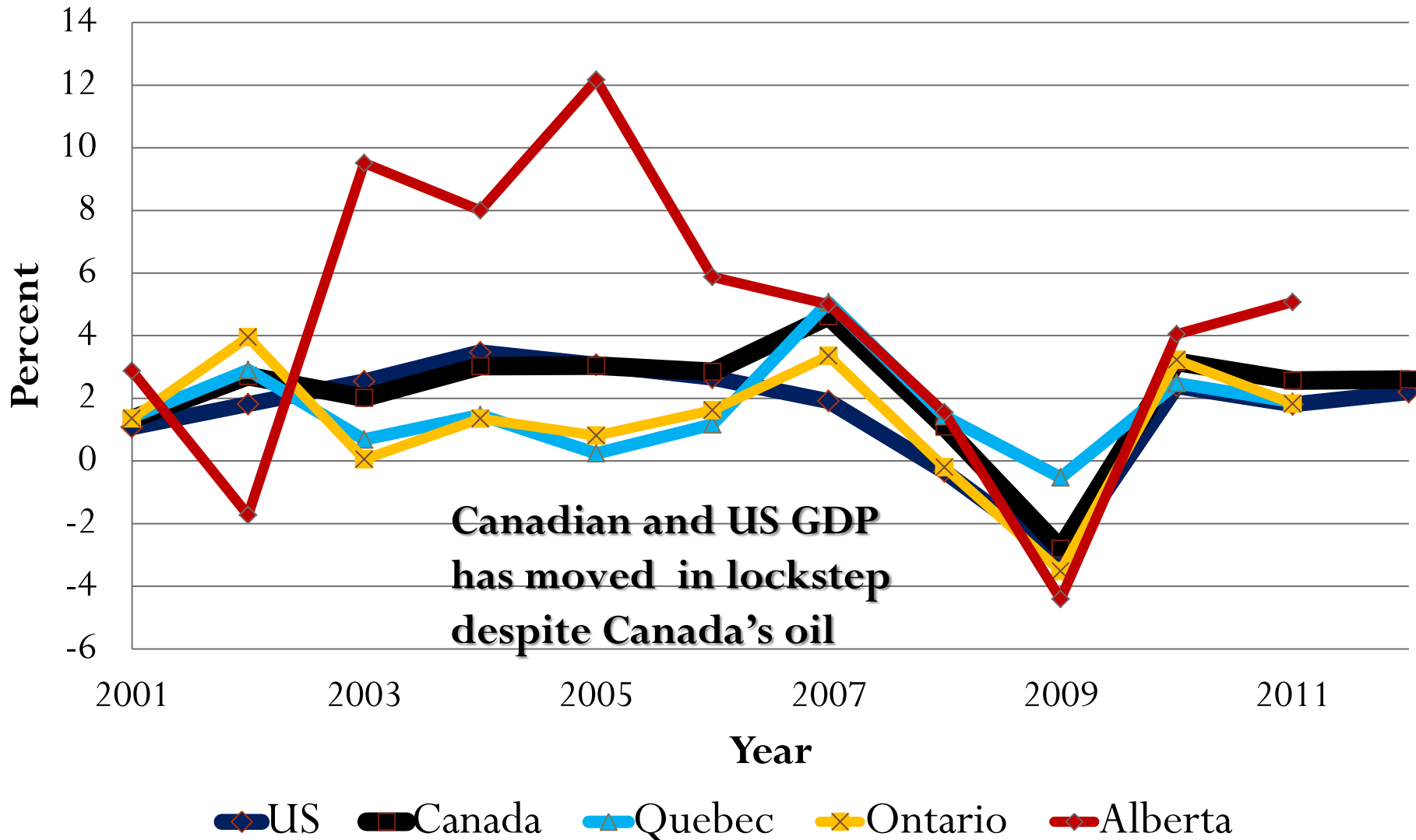




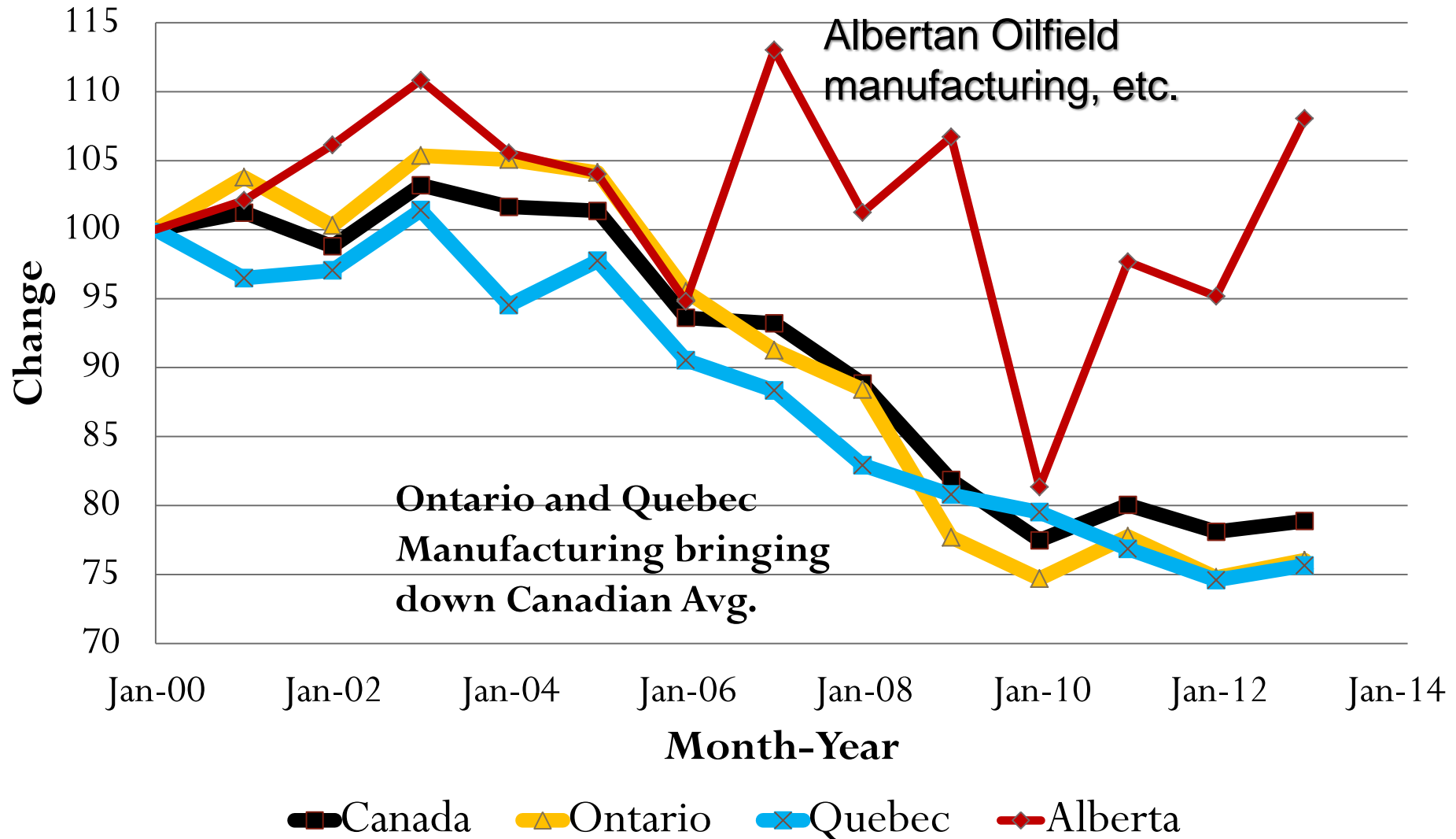
# Benchmark Real GDP Growth (2000=100)



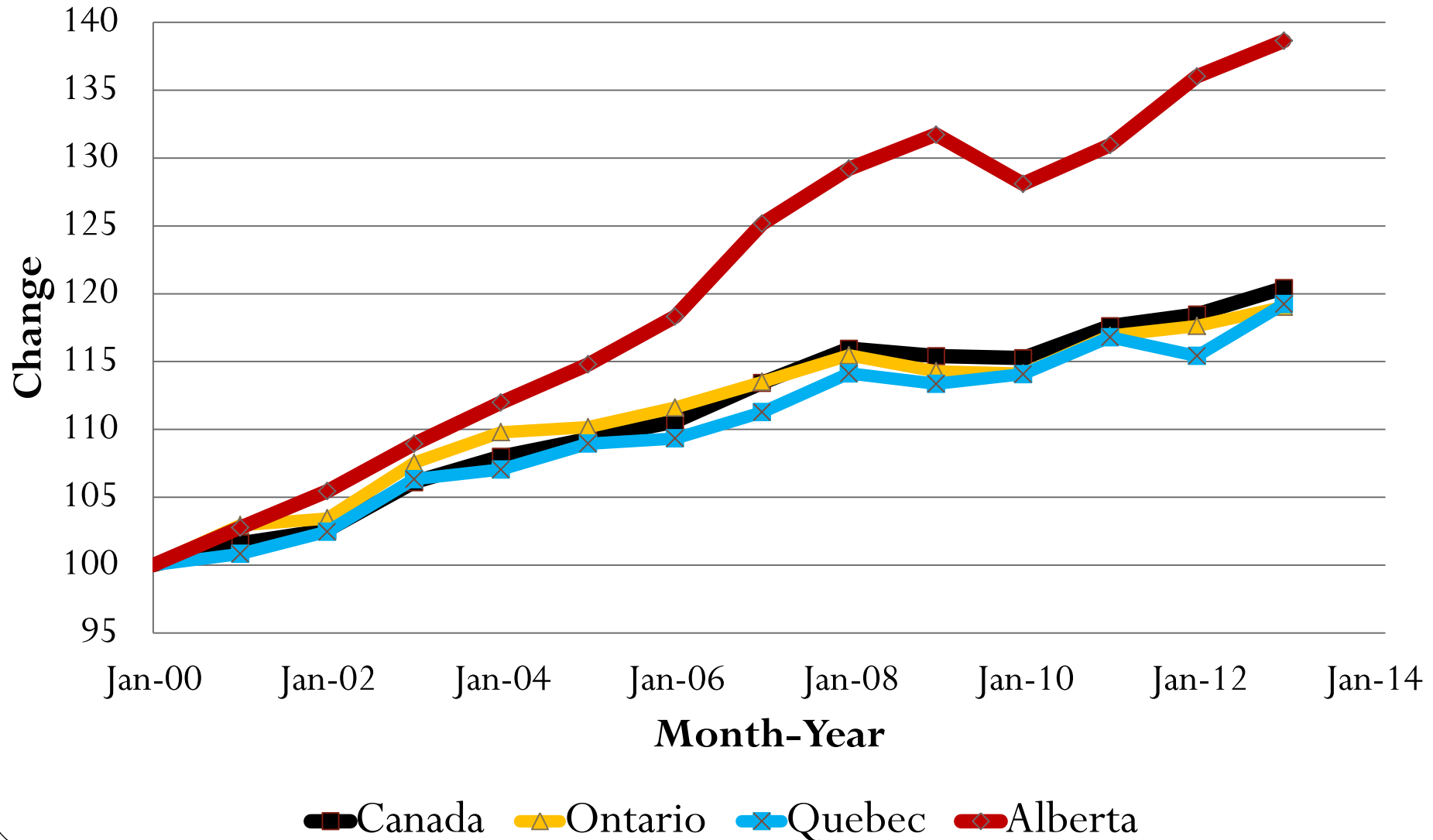
# Percent Change in Real GDP 2000-2012



# Benchmark Change in Manufacturing Employment (2000=100)

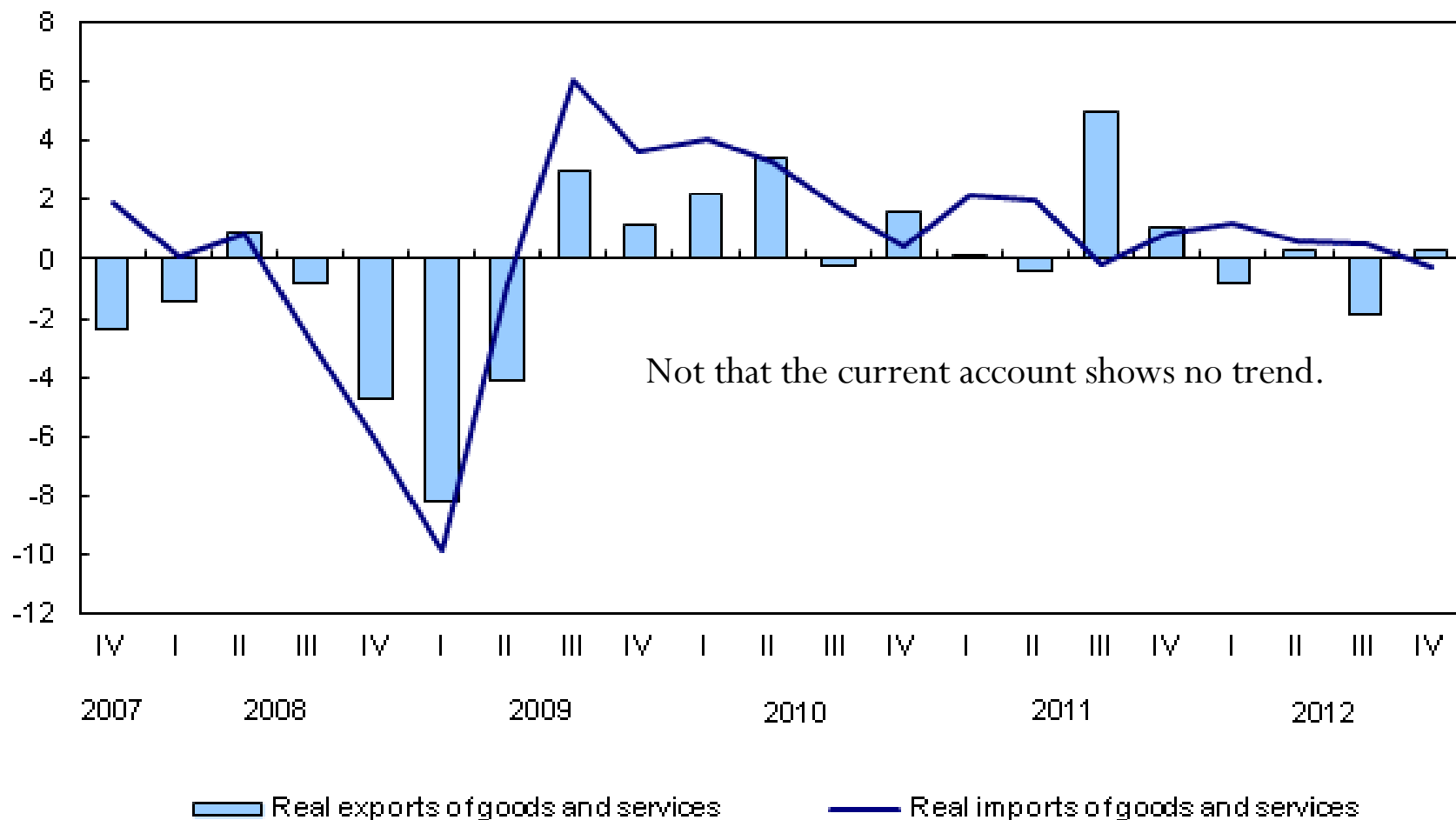


# Benchmark Change in Total Employment (2000=100)



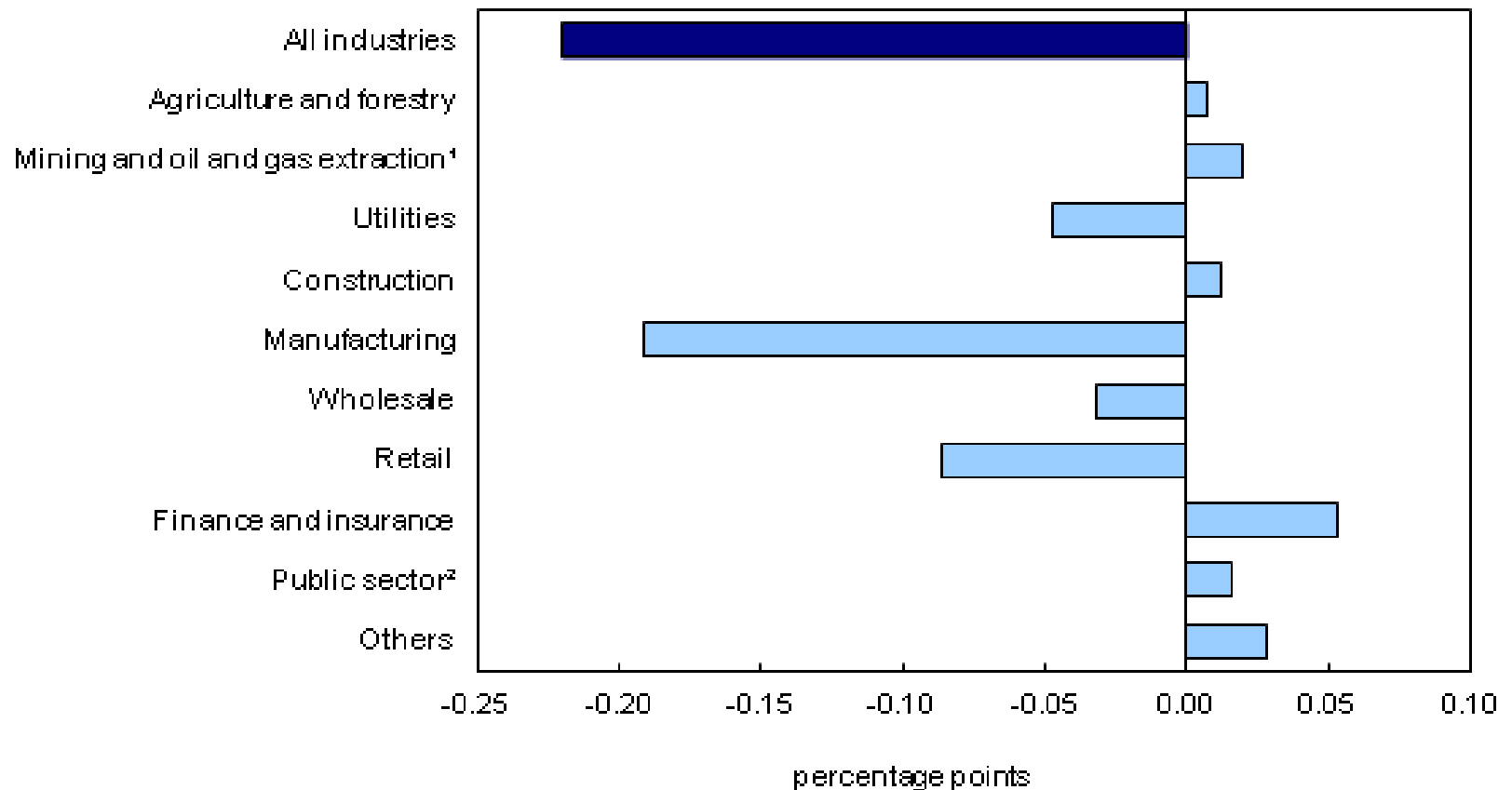
# Canadian Exports and Imports

quarterly % change, chained (2007) dollars





# Main industrial sectors' contribution to the percent change in GDP, Dec. 2012



1. Includes quarrying.

2. Education, health and public administration.

# Is shale a local “job” game changer?

- Between Jan 2006 and Jan 2013, PA has gained about 15,700 mining jobs (minus coal mining).

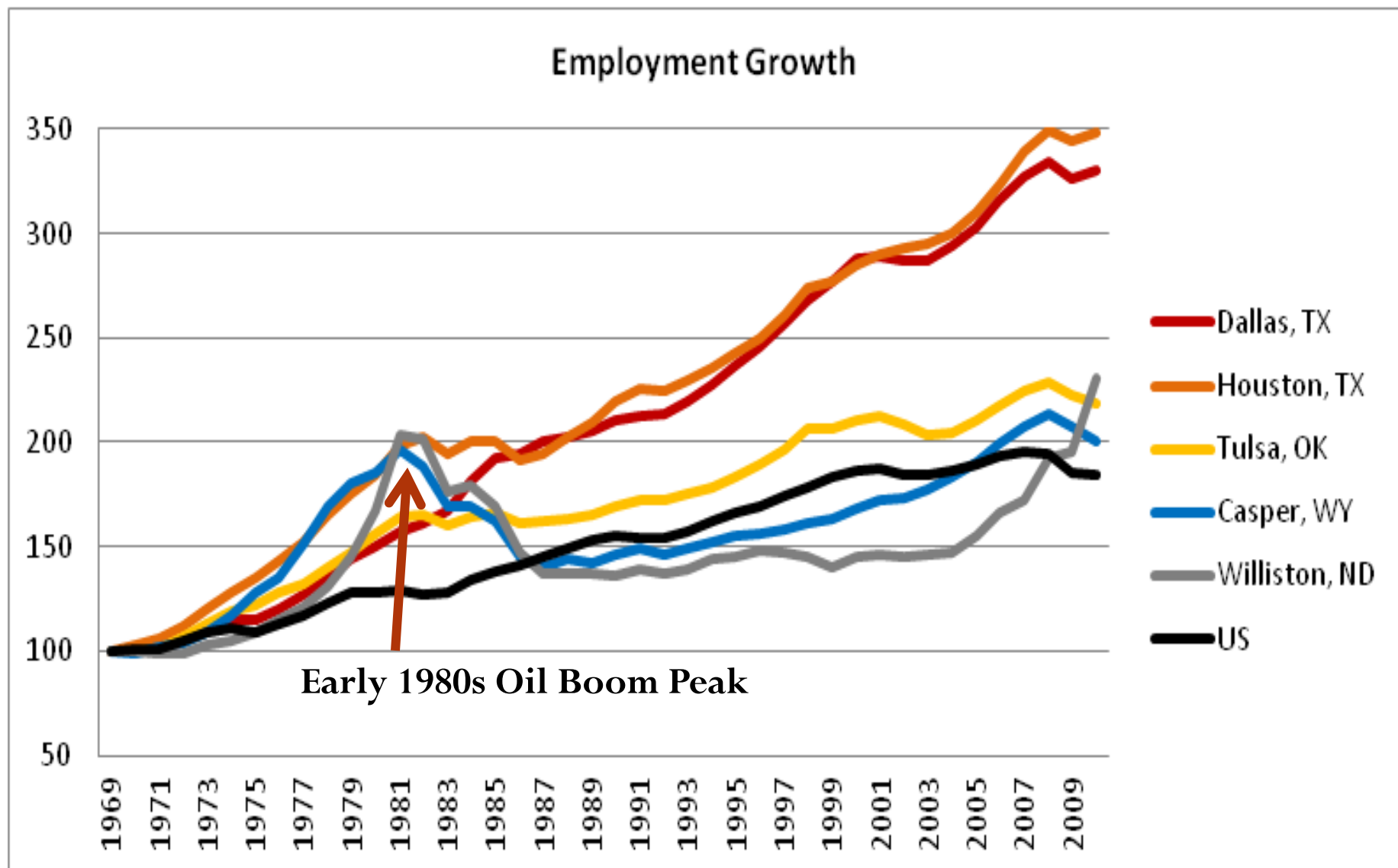
- Source: BLS, CES, downloaded March 21, 2013.

- Using a generous multiplier of 2, PA gained 31,400 jobs from shale drilling.
- PA’s total employment is over 5.7million

# Is shale a game changer?

- OH drilling took off in 2012. From Jan 2011 to Jan 2013, Ohio gained about 1,200 mining jobs.
  - Consistent with our PA estimate of 4 to 4.5 energy workers per drilled well.
  - Source: BLS, CES, downloaded March 21, 2013.
- Again, using a generous multiplier of 2, the total number of Ohio “shale supported” jobs is about 2,400.
  - For perspective, OH gained about 88,000 total nonfarm jobs from Jan 2011 to Jan 2012 and about 29,000 total nonfarm jobs from Jan. 2012 to Jan 2013.

# Figure 7: Total Employment and Previous Oil Booms in the U.S.: 1969=100



# Shale: Game Changer?

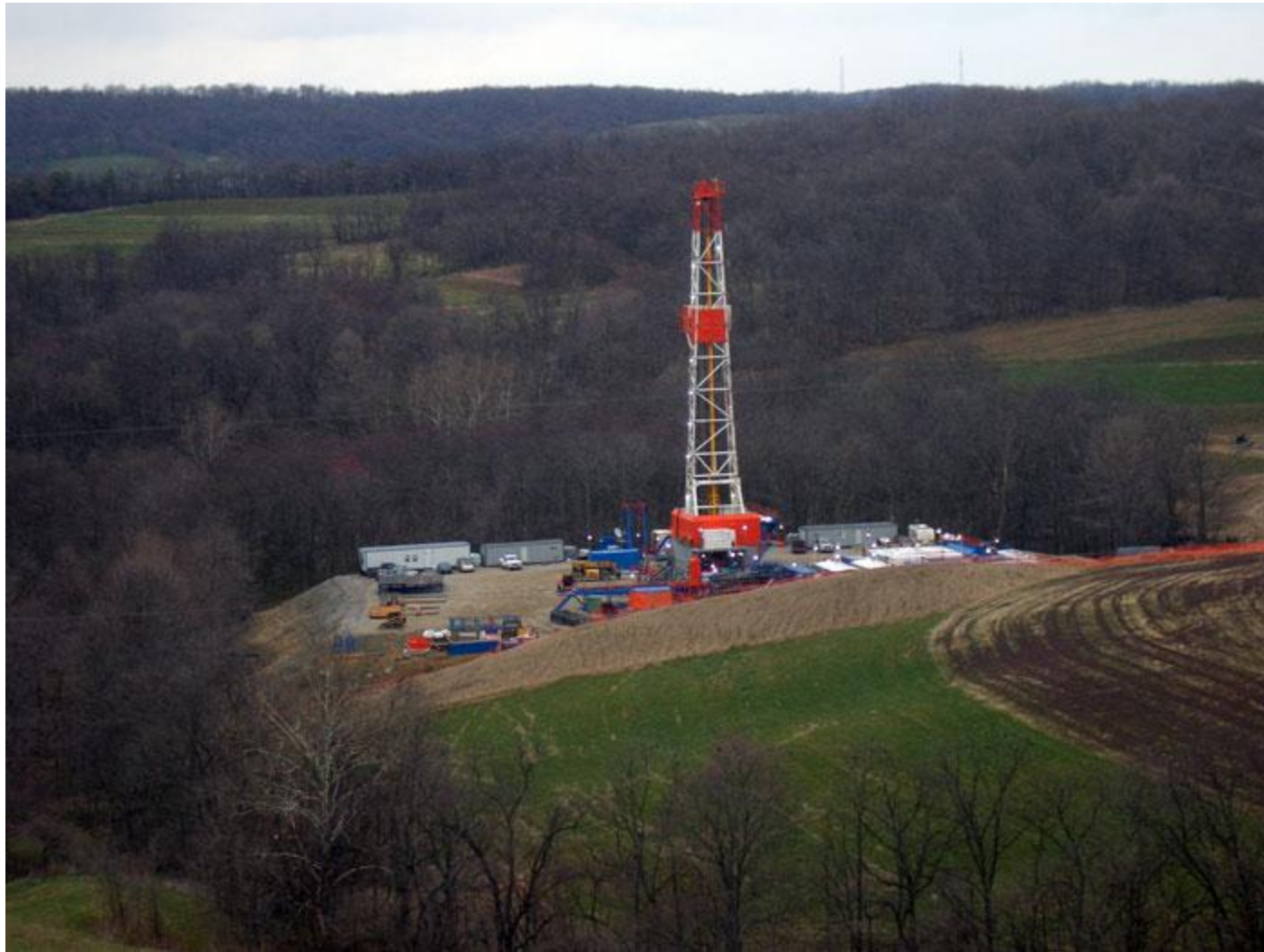
1. The best source of an industry's actual economic impact is NOT the industry itself, studies paid for by the industry, or sympathetic politicians and newspapers.
  - This is not a surprise 😊.
  - In serious research, we use peer review to weed out poor studies. We create **counterfactuals**.



# Shale: Game Changer?

- A counterfactual is what would have happened if there was no shale industry. The difference between the number of jobs that happened and the counterfactual is the actual jobs created.
- Even in well-done impact studies, the “employment” effects are not continuous but in a piecemeal fashion. Construction, then drilling, then pipelines, and so on.

# New drilling activity and its capital intensive nature in PA.



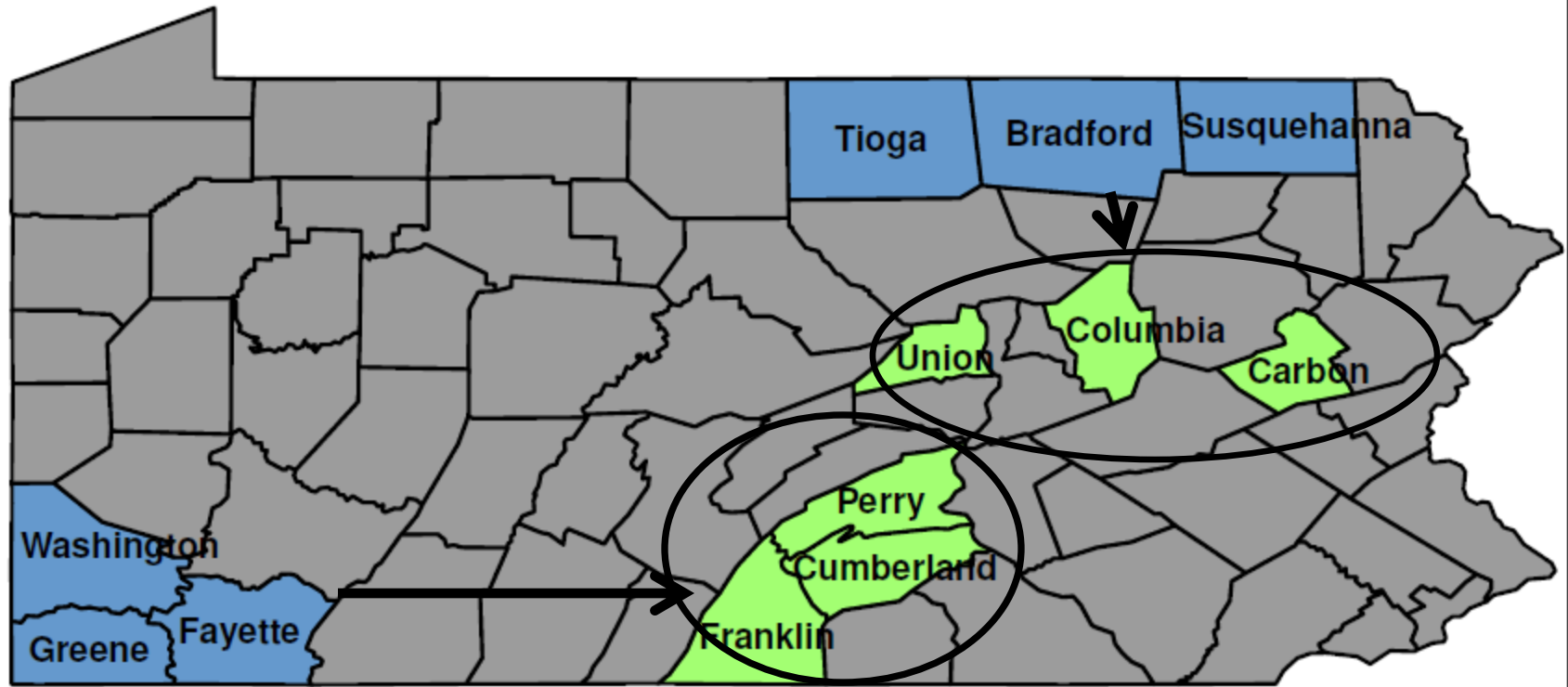
Taken from: [http://www.donnan.com/Marcellus-Gas\\_Hickory.htm](http://www.donnan.com/Marcellus-Gas_Hickory.htm)

# Table 1: Pennsylvania County Descriptive Statistics

	<b>Population 2005</b>	<b>Per Capita Income 2005</b>	<b>Employment Growth Rate 2001-2005</b>	<b>Employment Growth Rate 2005-2009</b>	<b>Income Growth Rate 2001-2005</b>	<b>Income Growth Rate 2005-2009</b>
<b>Non- Drilling Counties</b>	<b>255,508</b>	<b>\$32,187</b>	<b>5.3%</b>	<b>-0.4%</b>	<b>12.6%</b>	<b>13.6%</b>
<b>Drilling Counties</b>	<b>124,928</b>	<b>\$27,450</b>	<b>1.4%</b>	<b>-0.6%</b>	<b>12.8%</b>	<b>18.2%</b>

Source: BEA

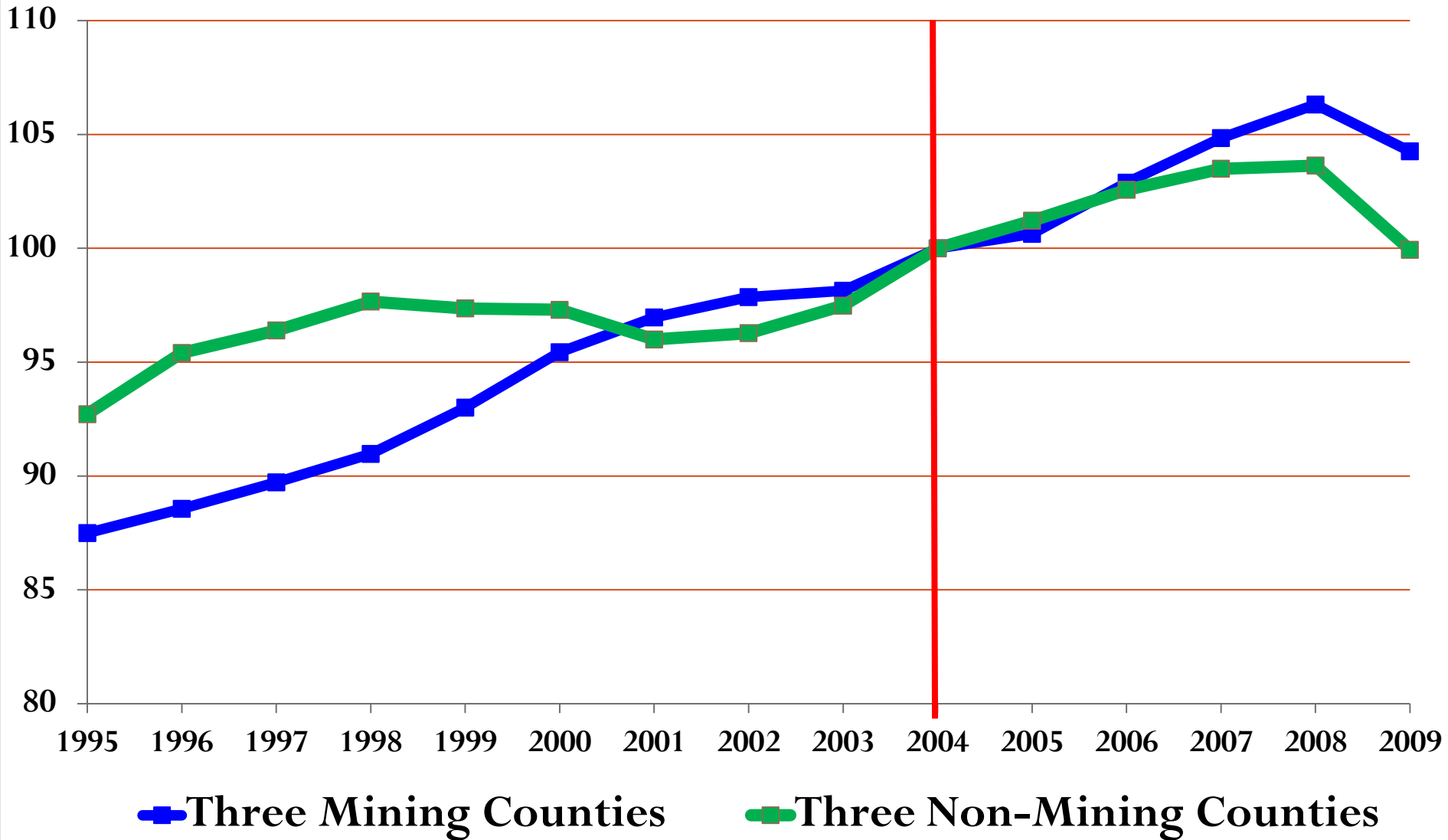
# PA Counties considered in our simple difference in difference counterfactual



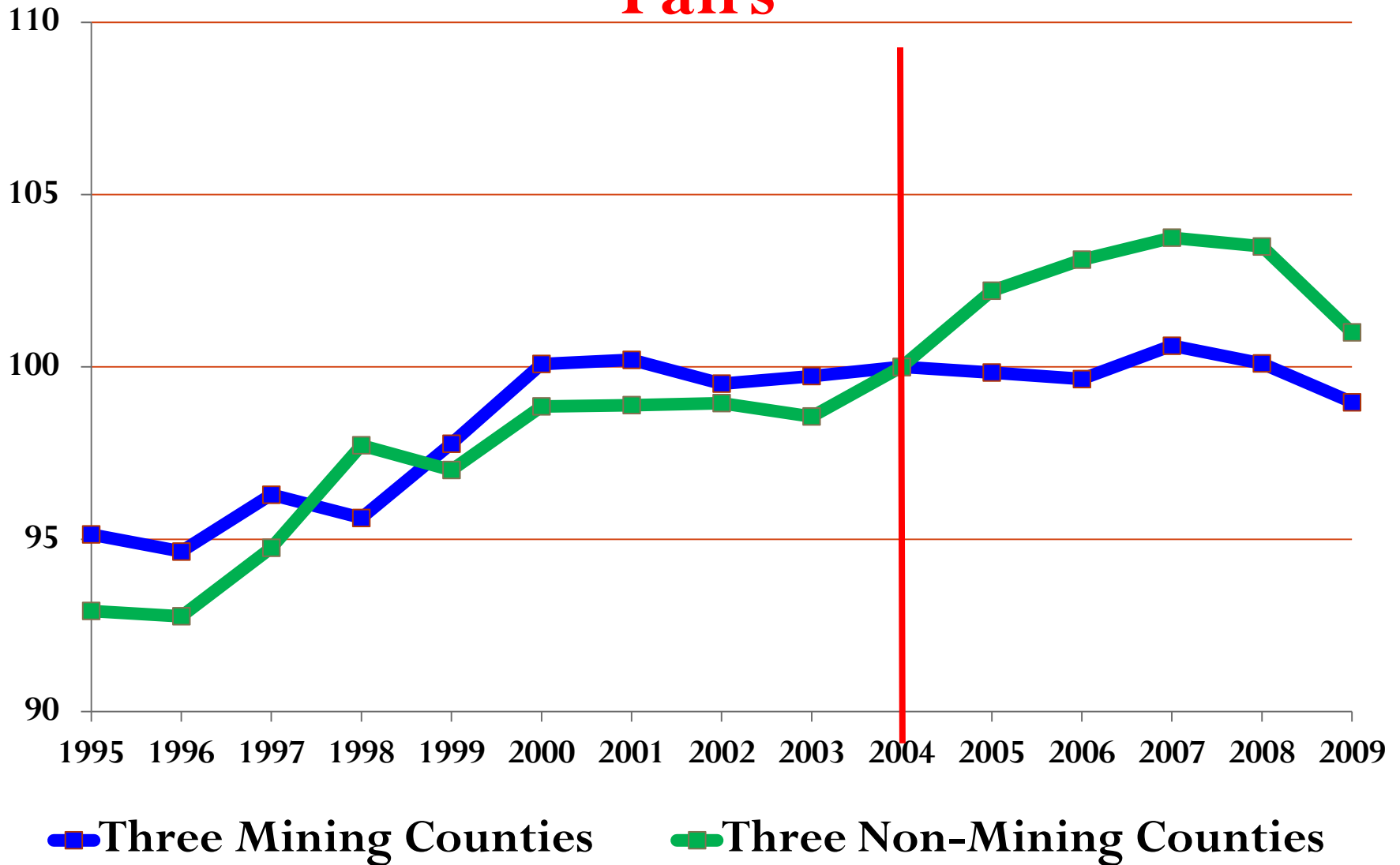
## Counties

-  Shale Mining
-  Non-shale Mining
-  All Others

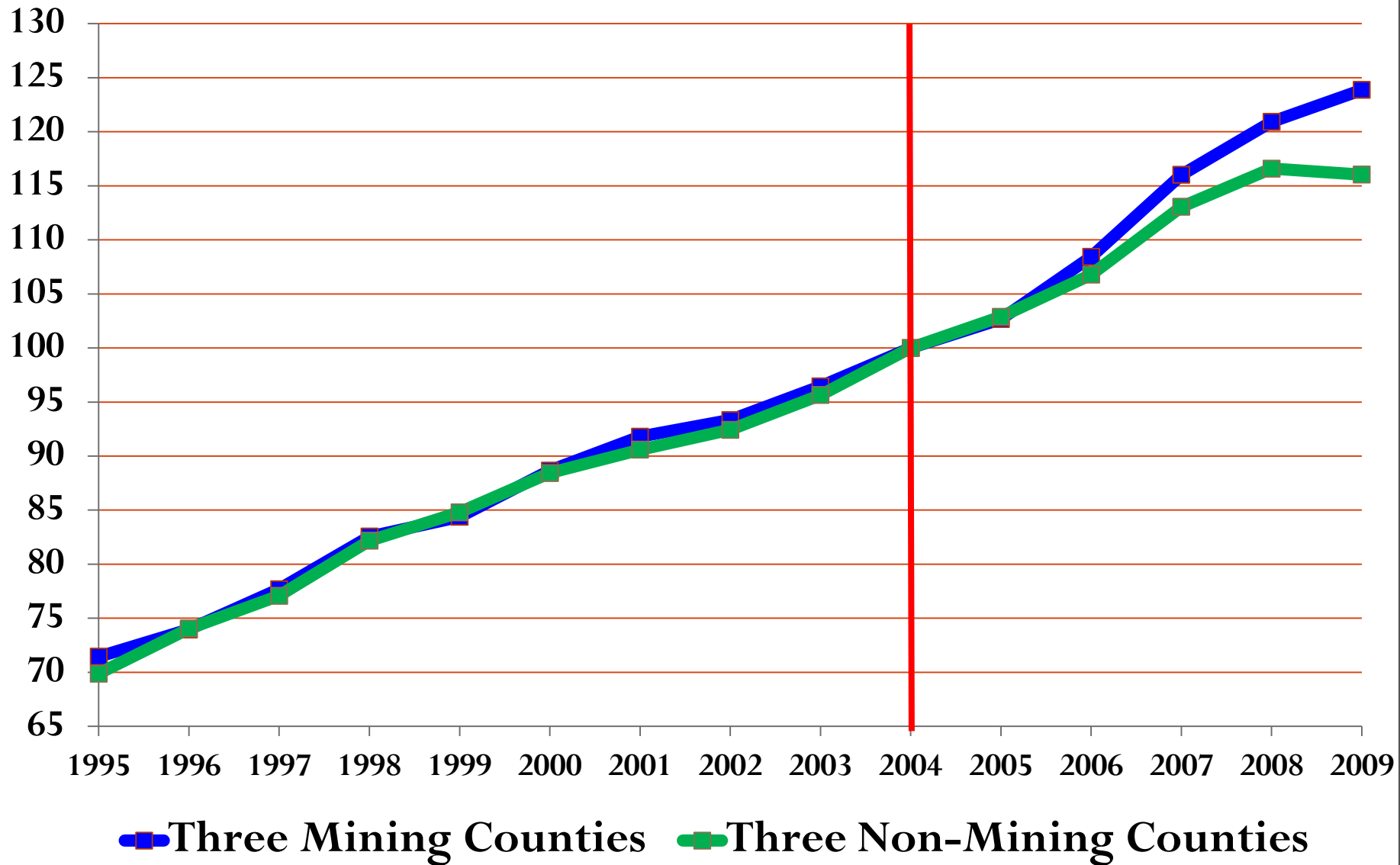
# Southern PA Matched Employment Pairs



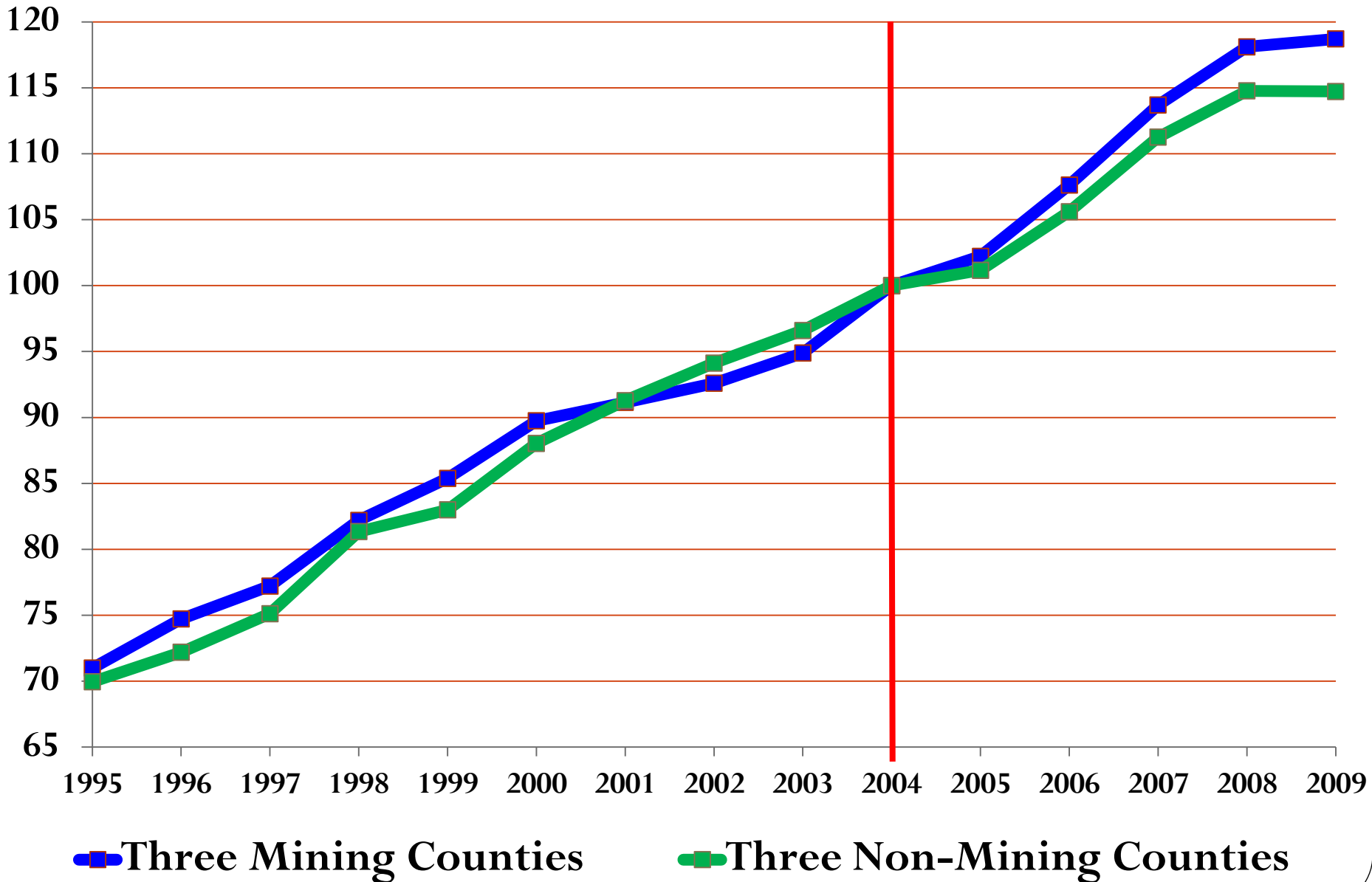
# Northeastern PA Matched Employment Pairs



# Southern PA Matched Per Capita Income Pairs



# Northeastern PA Matched Per Capita Income





# Conclusions

- Shale natural gas production is associated with significant income effects but modest employment effects.
- The real question of shale investment is **not** job creation, but net benefits vs costs including pollution costs.
  - In this question, 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.
- Domestic oil improves energy security. For NG, energy security is not an issue since NG replaces US coal.

**Thank you**

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