BAUER
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Is the Boom a Bubble?

Presented by: Adam W. Perdue, PhD

Pillars of the Houston Economy

- Oil & Gas & Derivatives
- Manufacturing
- Port (Transportation, Logistics)
- Texas Medical Center
- Nasa

Drivers of the Boom

- Oil & Gas & Derivatives

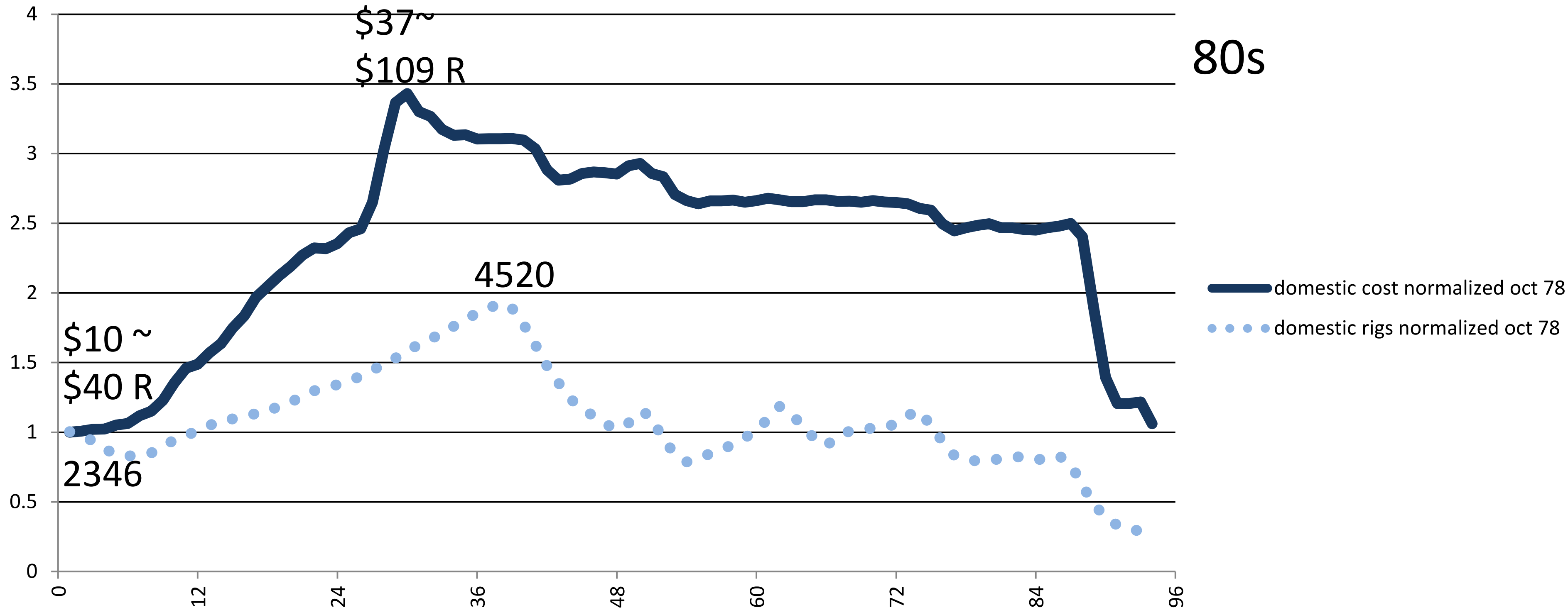
- Manufacturing
  - Oil & Gas & Derivatives
- Port (Transportation, Logistics)
  - Oil & Gas & Derivatives
  - Panama Canal
- Texas Medical Center

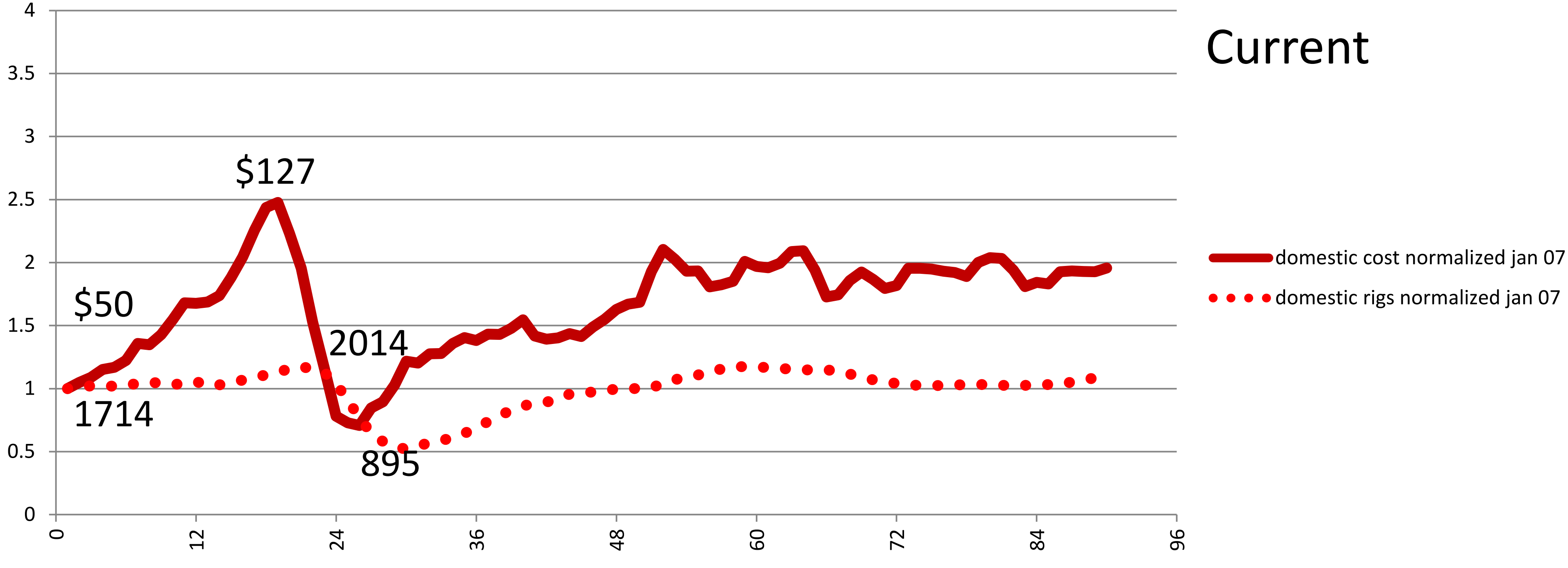
- Nasa

We’ve heard this tune before

We’ve heard this tune before

How does it compare to the 80’s version

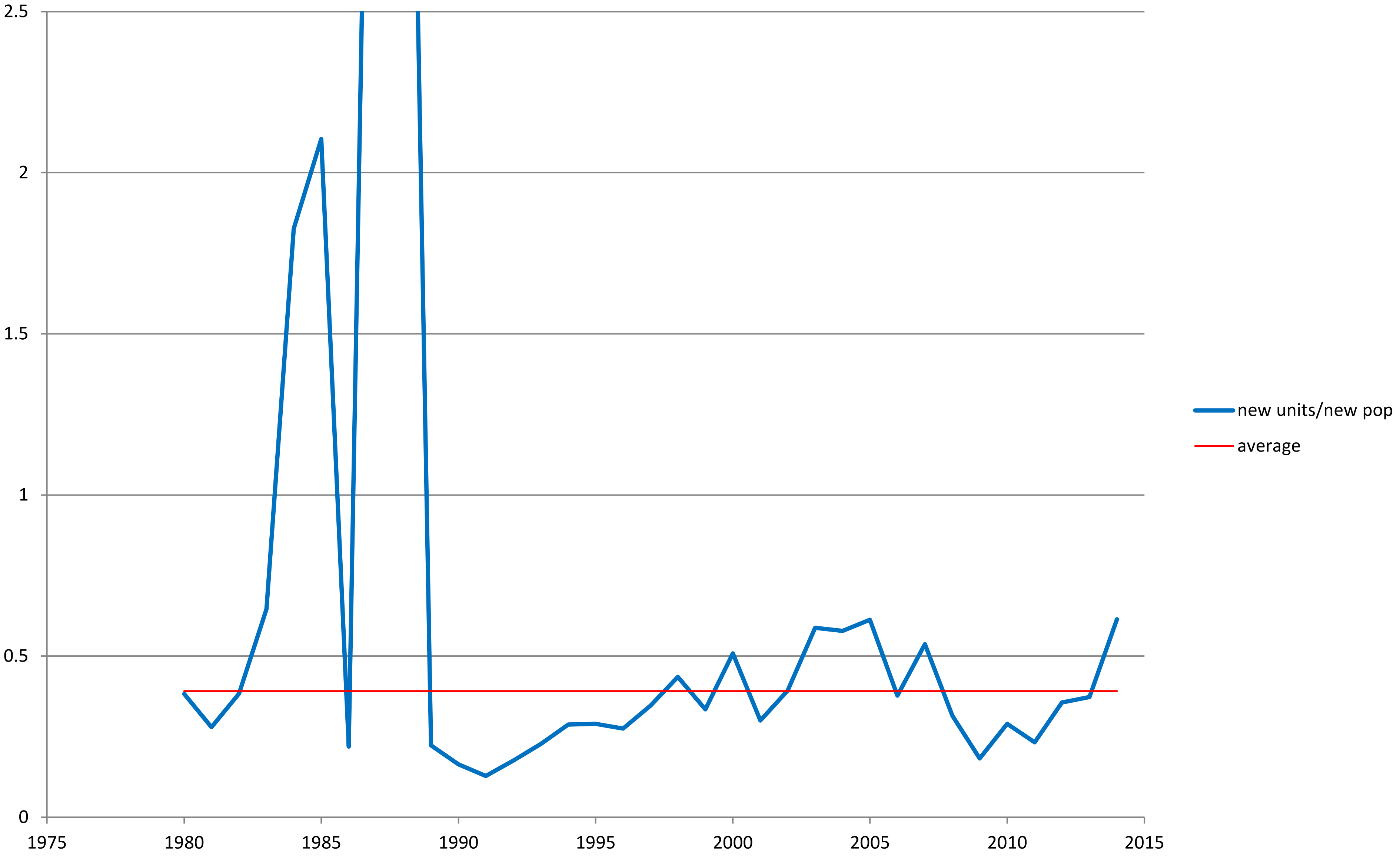

80s
$37~
$109 R
4520
$10 ~
$40 R
2346
domestic cost normalized oct 78
domestic rigs normalized oct 78
0 0.5 1 1.5 2 2.5 3 3.5 4
0 12 24 36 48 60 72 84 96


Current
$127
$50
2014
1714
895
domestic cost normalized jan 07
domestic rigs normalized jan 07
0 0.5 1 1.5 2 2.5 3 3.5 4
0 12 24 36 48 60 72 84 96

Population and Residential Permitting

Date	Population	% Change	Change	Res Permit	Permit/ Population Change	Date	Population	% Change	Change	Res Permit	Permit/ Population Change
1972	2,340,700	2.6	58,700			2001	4,840,712	2.7	125,305	37607	0.30
1973	2,410,000	3	69,300			2002	4,960,496	2.5	119,784	47092	0.39
1974	2,488,100	3.2	78,100			2003	5,060,493	2	99,997	58801	0.59
1975	2,596,100	4.3	108,000			2004	5,157,358	1.9	96,865	56025	0.58
1976	2,704,400	4.2	108,300			2005	5,258,743	2	101,385	62122	0.61
1977	2,809,500	3.9	105,100			2006	5,448,766	3.6	190,023	71716	0.38
1978	2,925,300	4.1	115,800			2007	5,566,601	2.2	117,835	63274	0.54
1979	3,043,200	4	117,900			2008	5,702,270	2.4	135,669	42724	0.31
1980	3,147,640	3.4	104,440	39,934	0.38	2009	5,852,194	2.6	149,924	27326	0.18
1981	3,321,105	5.5	173,465	48,549	0.28	2010	5,946,800	1.6	94,606	27450	0.29
1982	3,517,227	5.9	196,122	75,130	0.38	2011	6,081,133	2.3	134,333	31269	0.23
1983	3,619,029	2.9	101,802	65,743	0.65	2012	6,202,549	2	121,416	43286	0.36
1984	3,636,821	0.5	17,792	32,505	1.83	2013	6,340,014	2.2	137,465	51334	0.37
1985	3,643,248	0.2	6,427	13,528	2.10	2014			137,465	61,449	0.45
14 year increase in pop			1,361,248			14 year increase in pop			1,624,607		
percentage increase in pop			0.581556			percentage increase in pop			0.335613		
1977-1983	(seven years)		914,629			past seven years			1,028,713		
percentage increase in pop			0.325549			percentage increase in pop			0.184801		

Population and Permitting



80’s vs. Today

1980s

- Much larger impact relative to size of economy
- Belief in continuously rising oil prices (boom)
- Volcker Recession (oil bust)
- Housing overbuilt
  - Permitting did not slow fast enough
- Saudi, USSR and North Sea oil (oil glut)

Today

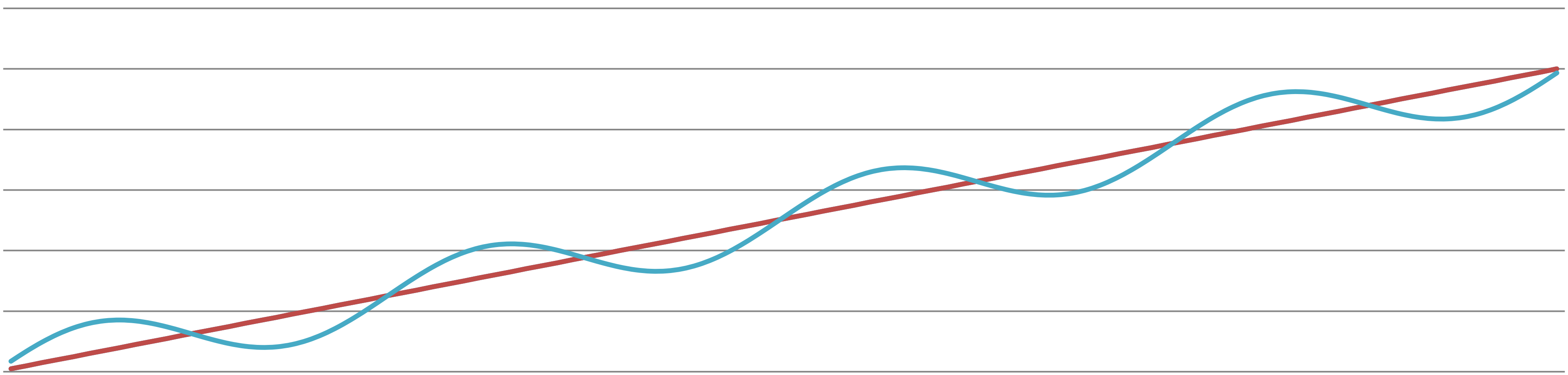
- Financial Crisis
- Reactions consistent to actual changes in prices
- Shale, Horizontal drilling lead to increase and changes in mix of output of American upstream market. Driving Midstream and Downstream
- Rig count (upstream) is not directly the driver of the continuing boom

Changes in the Oil & Gas & Derivatives Industries

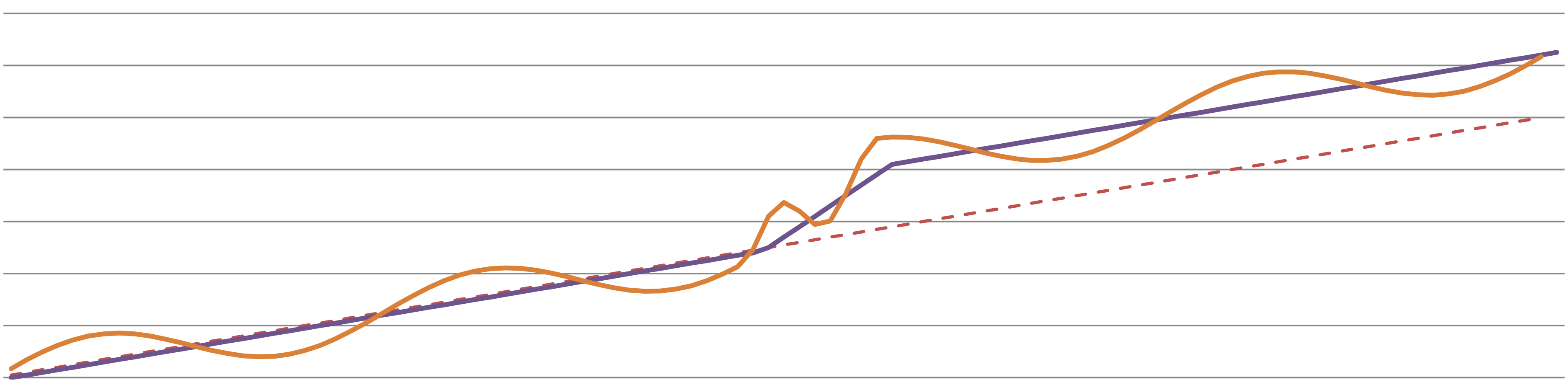
- Upstream Technological change (Horizontal drilling, Fracking)->
  - Midstream
    - New fields and increased production from old fields
  - Downstream
    - Historically low Natural Gas Prices
    - Historic separation between Oil & Gas prices

Business Cycle and Technological Shifts
my operating model

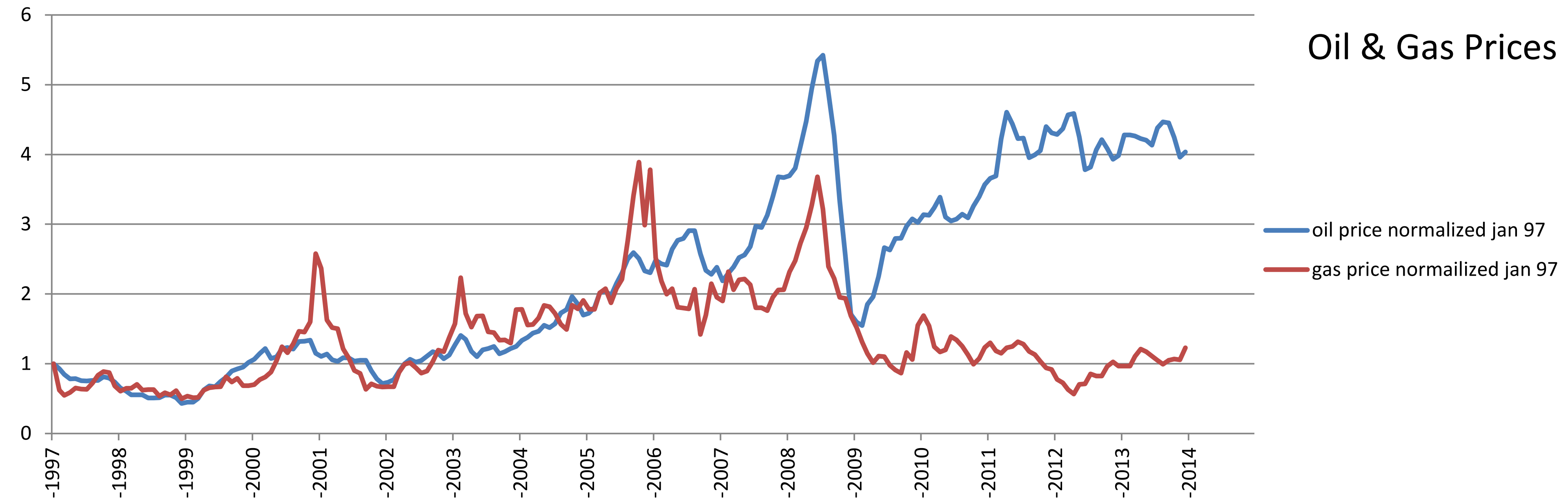
Business Cycle

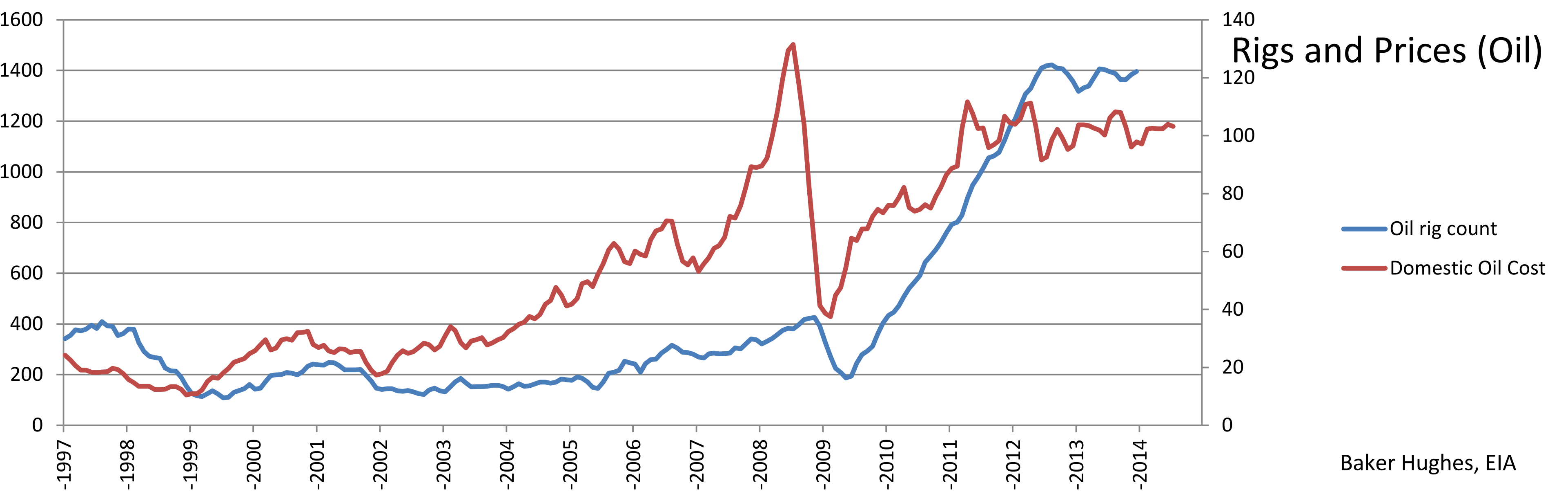


with Technological Change



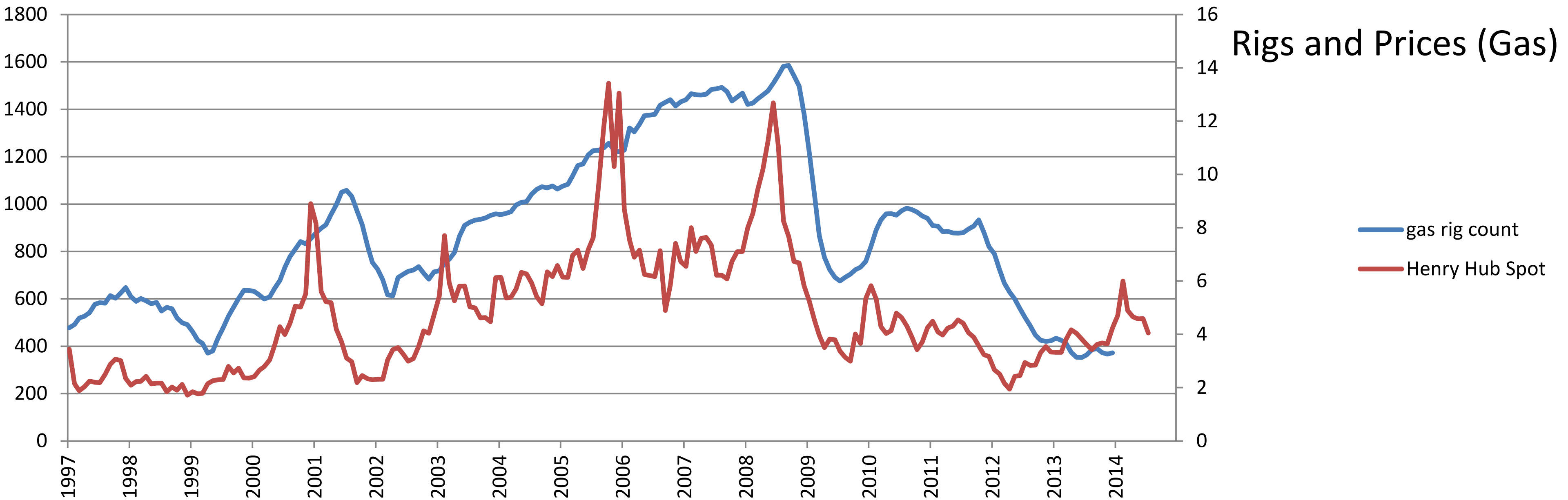
Upstream

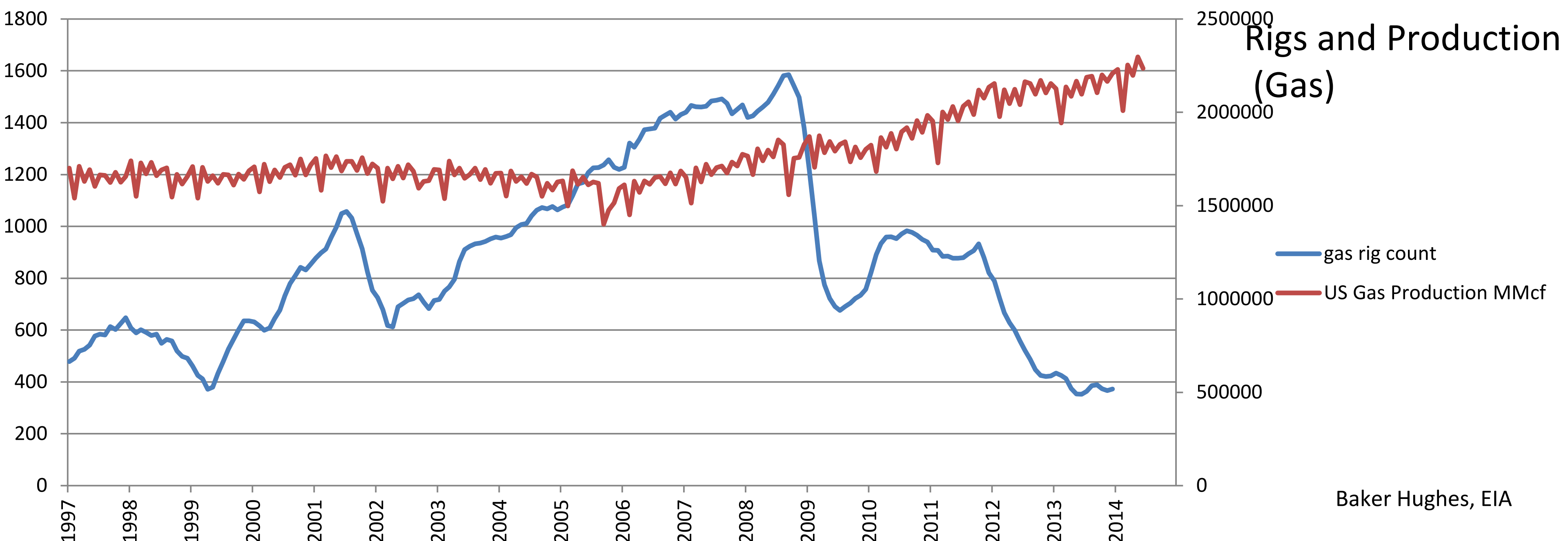




Baker Hughes, EIA

Upstream





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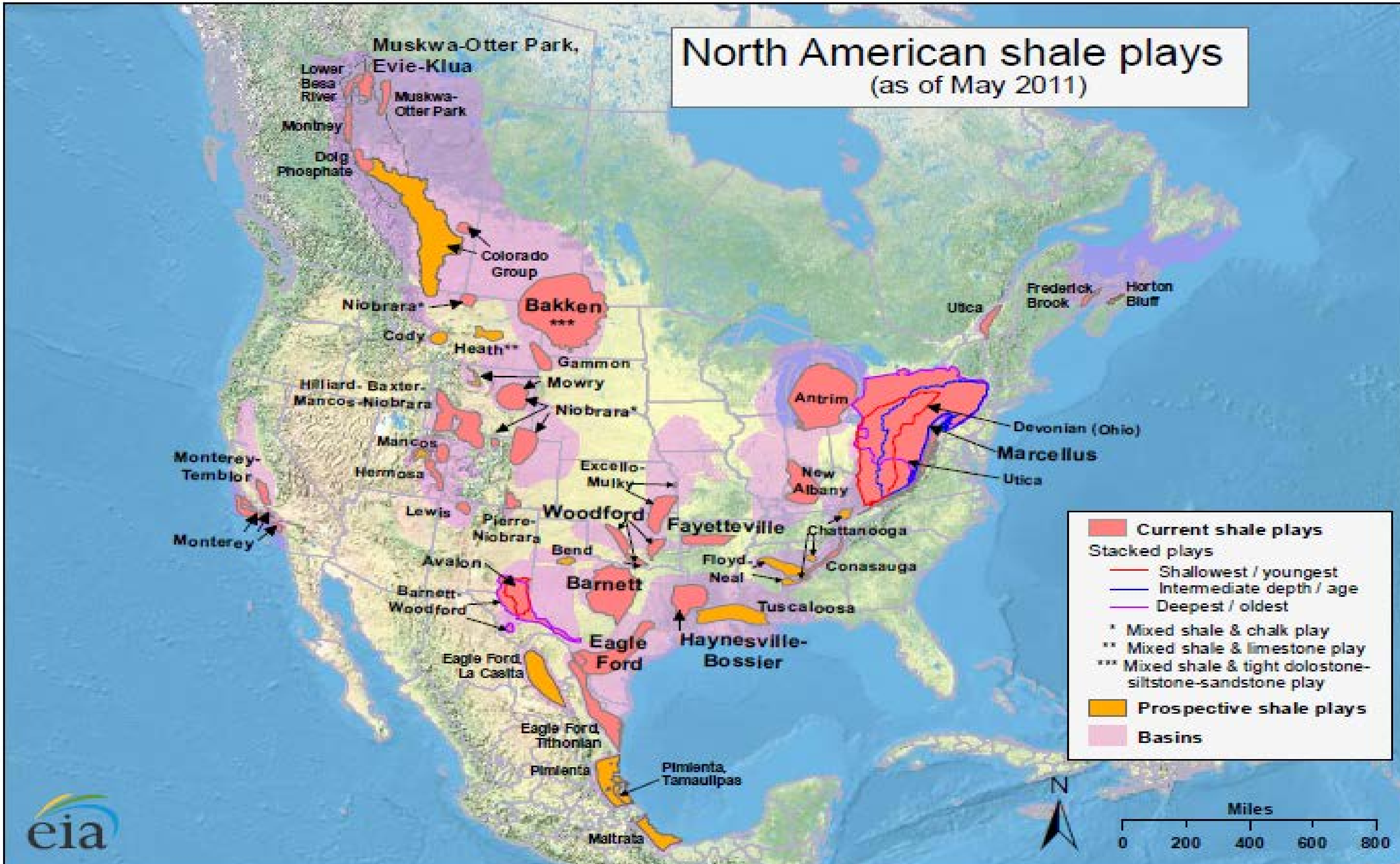
Upstream



Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

Hydrocarbons

Methane CH_4(124 API)

Condensate ->Natural Gas Liquids->Natural Gas
API >50,45 (no standard cutoffs)

WTI API~39.6

Light Crude API>31.1

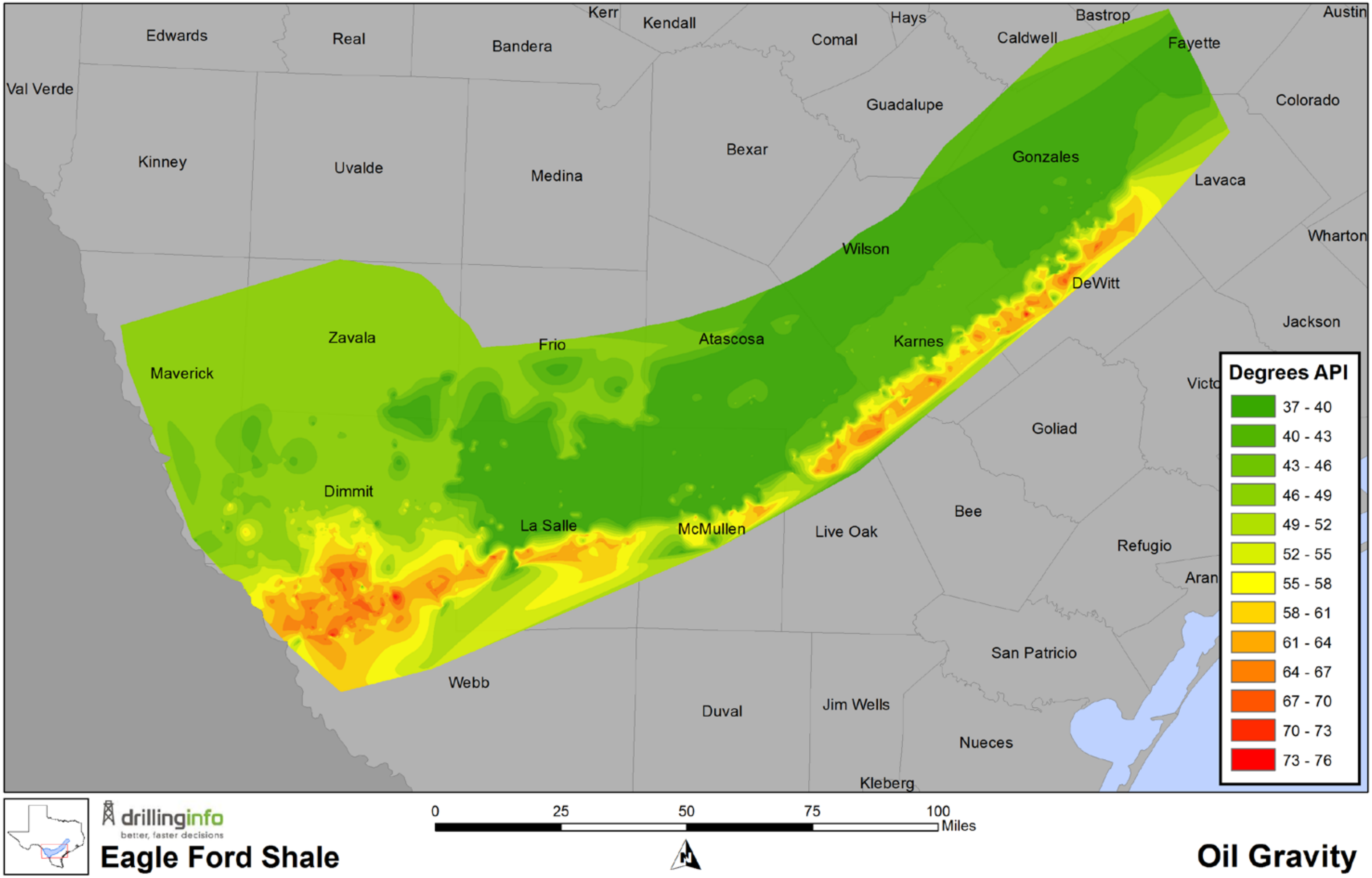
C/H ↑

Medium Crude 22.3<API<31.1

Heavy Crude API < 22.3

Extra Heavy Crude API <10

American Petroleum Institute
API gravity = (141.5/Specific Gravity) – 131.5
no units generally expressed in degrees
Water API=10

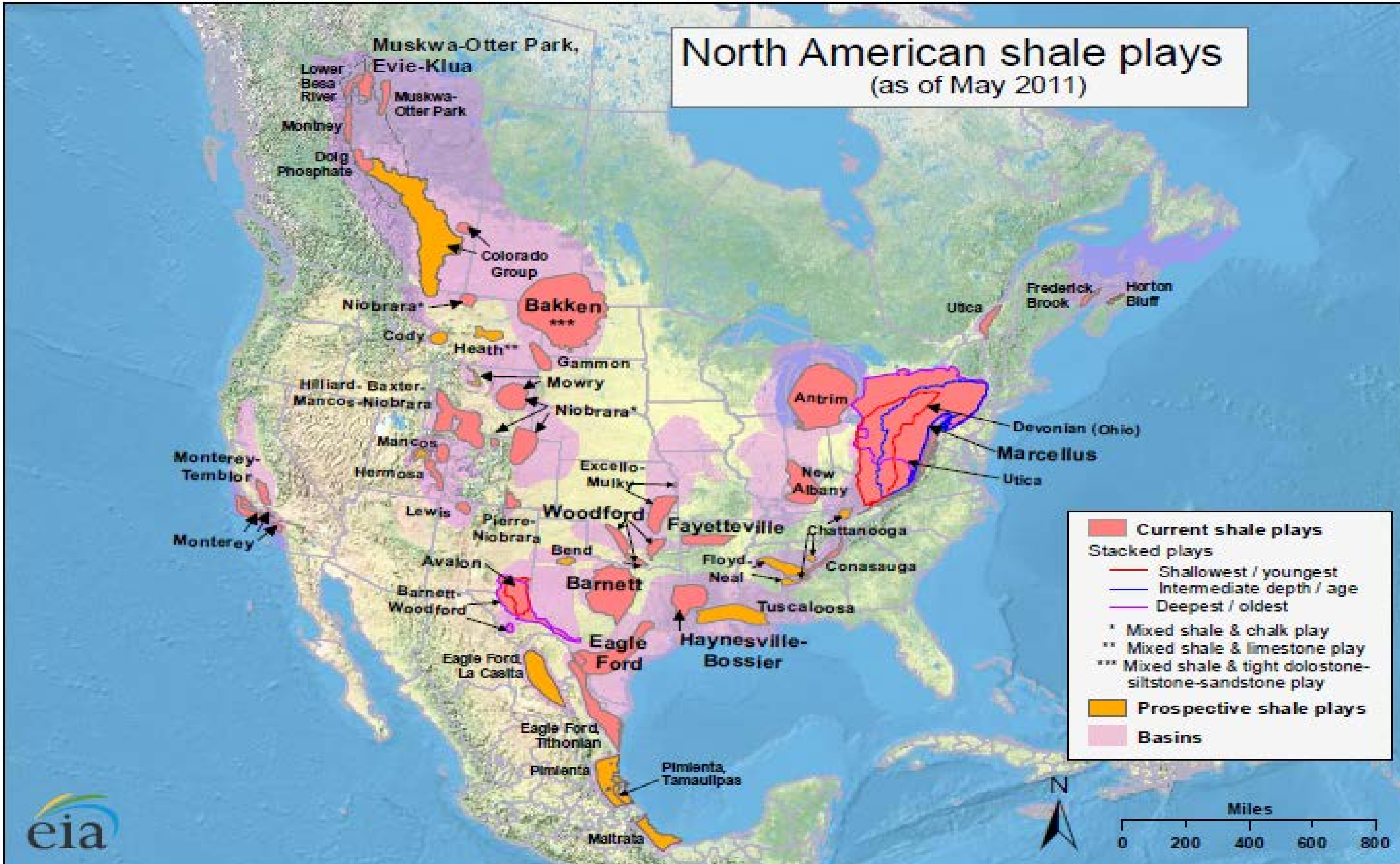


- Condensate typically has a API gravity between 50 °API and 120 °API (not agreed standard)
- Light crude oil is defined as having an API gravity higher than 31.1 °API
- Medium oil is defined as having an API gravity between 22.3 °API and 31.1 °API
- Heavy crude oil is defined as having an API gravity below 22.3 °API
- Extra heavy oil is defined with API gravity below 10.0 °API

Upstream

- Rig count oil prices relatively stable for 2 years
  - Not a direct driver of growth currently seen in Houston
  - Productivity (wells/rig) increasing
    - Indirect impact through service and input providers to upstream
  - Essentially no longer importing light crude
- Technological revolution (Fracking, Horizontal drilling)
  - New Fields
    - Driving midstream development
  - Increased production of light crude and natural gas
    - Driving downstream development
- Key variables to watch
  - $65-80 barrel WTI, currently ~$90 with futures (2016) ~85
  - $5 million Btu, currently ~$4 with futures ~$4
- Other concerns
  - U.S./World economic growth
  - Foreign Oil
    - International Shale
    - Middle East
    - Saudis
  - Environmental regulations

Midstream



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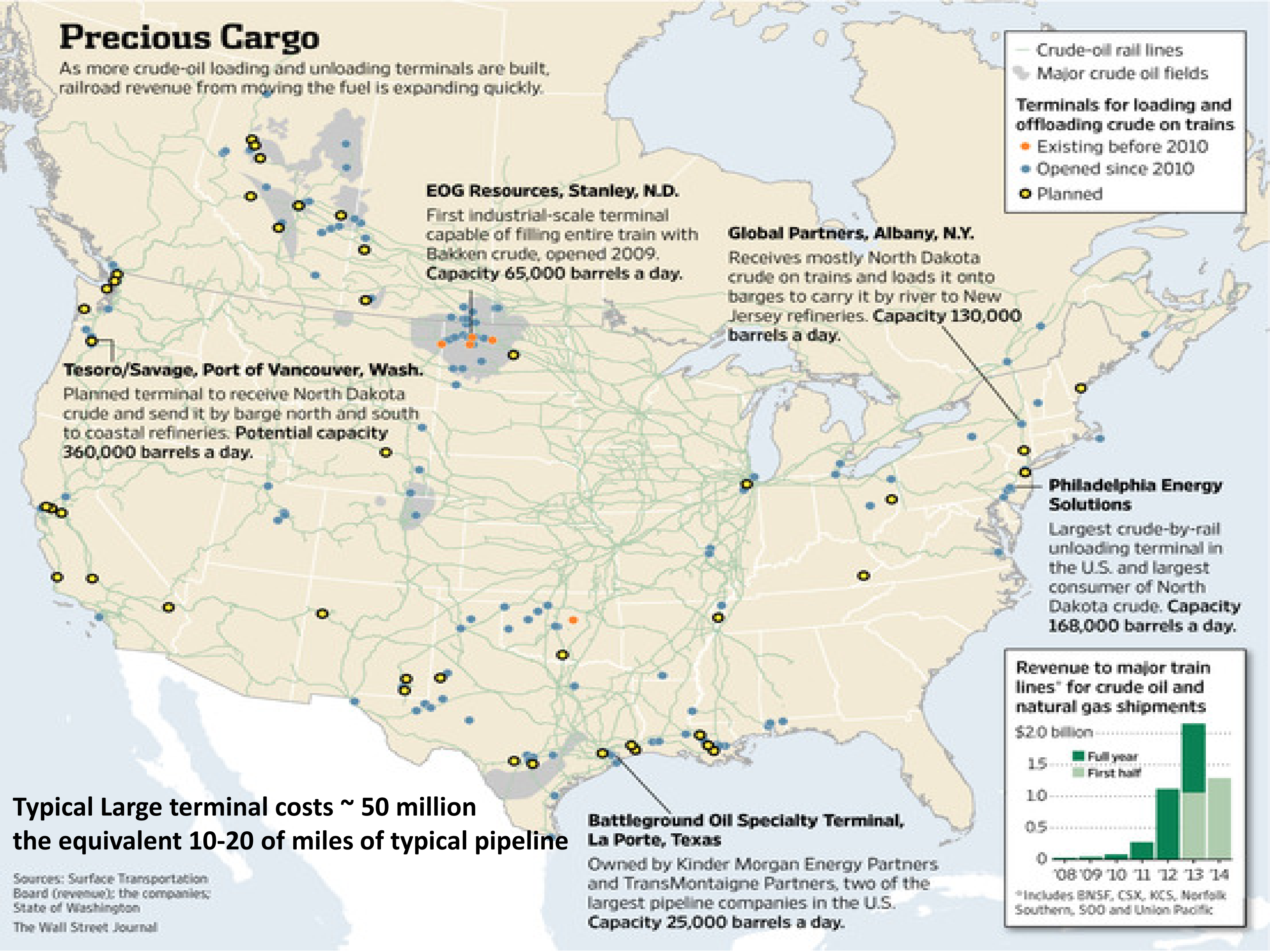
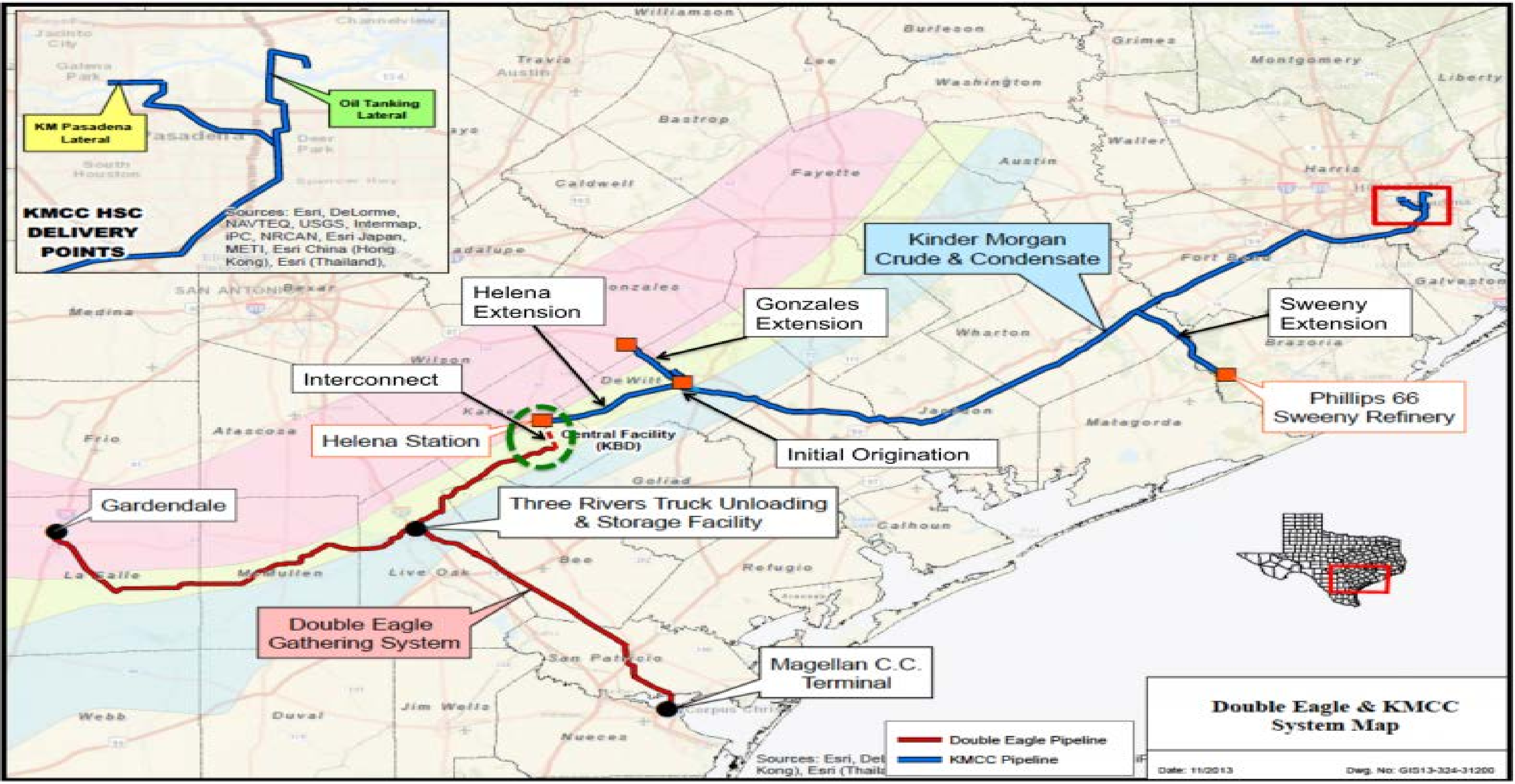


Typical Large terminal costs ~ 50 million the equivalent 10-20 of miles of typical pipeline



Kinder Morgan Presentation
RBN Energy

Double Eagle (2013)
- 140 miles

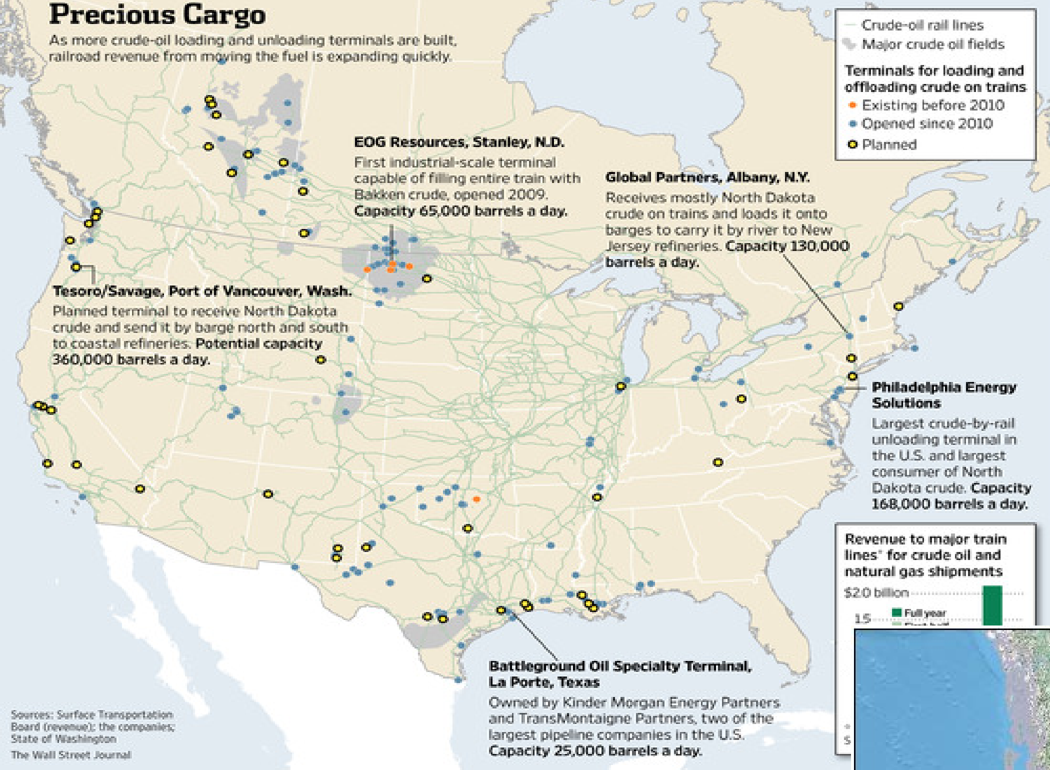
KMCC (2012)
- 70 miles new
- 113 miles conv. NG

Sweeney Lateral (2014)
- 27 miles

Helena Extension (2014-2015)
- 30 miles
- $109 mil
- ConocoPhillips
  - gathering facility

Gonzalez Extension (2015)
- 15 miles
- $74 mil
- +Storage

Interconnect (2015)
- 10 miles
- $43 mil



Pipeline

High upfront Costs
Low Operating costs
Proven/High output field
Proximity to existing pipeline
or final user

Rail Terminal

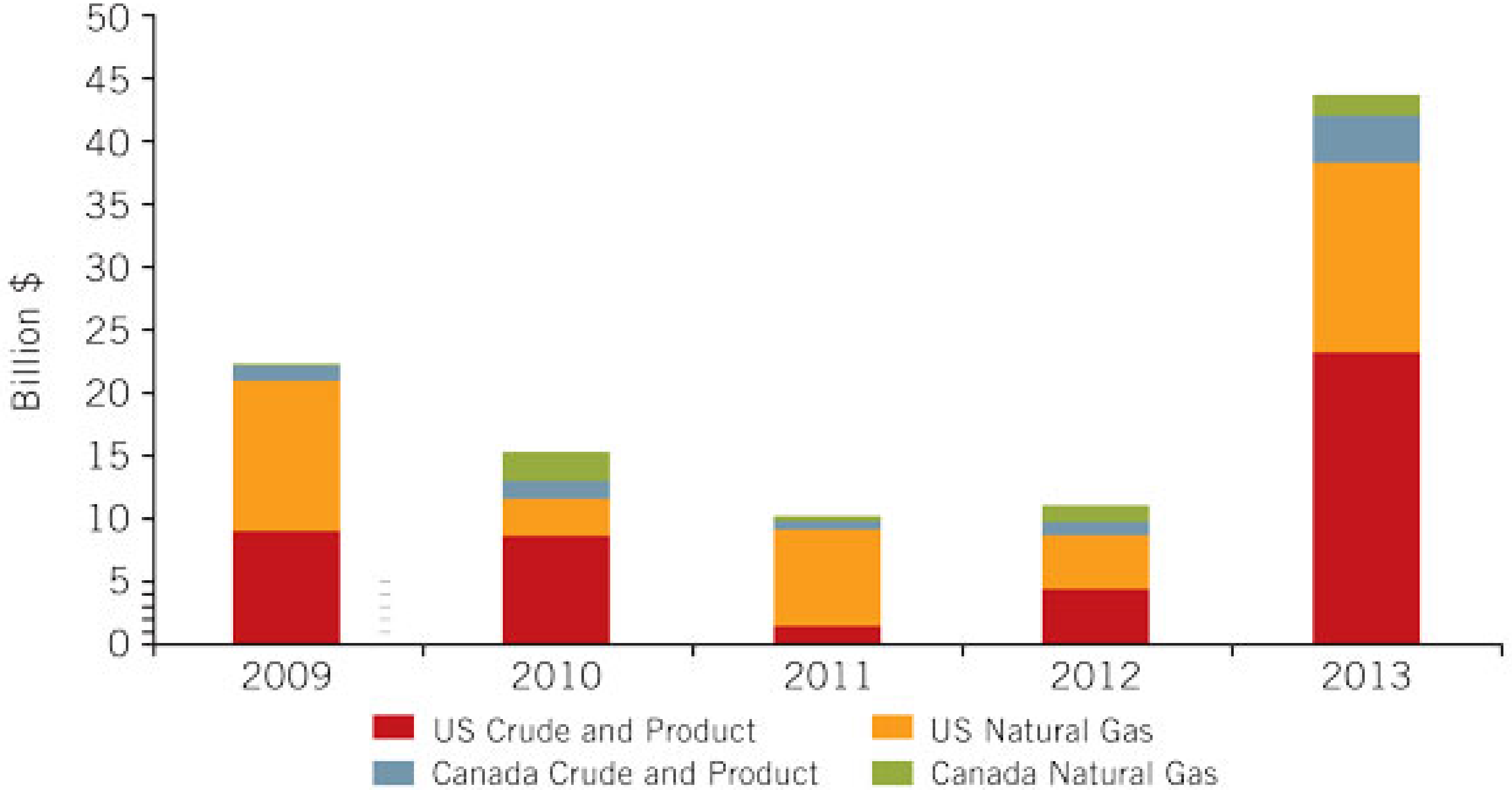
Low upfront Costs
High Operating costs
Unproven/low output field
Stop-Gap/Marginal Measure
Allows Producers to choose their mkt

Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

Midstream

NORTH AMERICA PIPELINE SPENDING

FIG. 3



Source: OGJ analysis

Midstream

WHERE FUNDS WILL GO FOR US PROJECTS Table 1

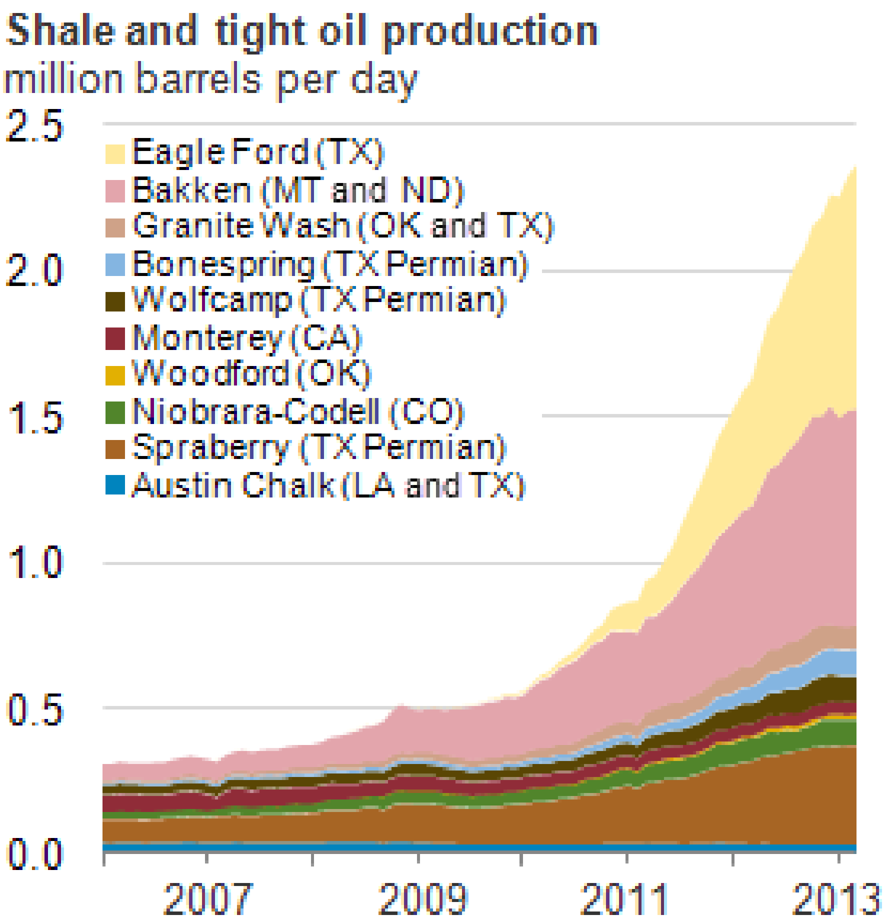
	2014, million $	Change 2014-2013, %	2013, million $	Change 2013-2012, %	2012, million $
Exploration-production					
Drilling-exploration	250,202	9.3	228,948	–4.3	239,205
Production	47,538	9.3	43,500	–4.3	45,449
OCS lease bonus	1,600	23.1	1,300	–28.4	1,815
Subtotal	299,340	9.3	273,748	–4.4	286,469
Other					
Refining and Marketing	12,900	0.8	12,800	–1.5	13,000
Petrochemicals	5,600	51.0	3,709	54.5	2,400
Crude and products pipelines	9,207	–41.7	15,804	421.9	3,028
Natural gas pipelines	3,660	–60.1	9,169	158.0	3,554
Other transportation	2,750	52.8	1,800	50.0	1,200
Miscellaneous	4,800	4.3	4,600	9.5	4,200
Subtotal	**38,917**	**–18.7**	**47,882**	**74.9**	**27,382**
Total	**338,257**	**5.2**	**321,630**	**2.5**	**313,851**

OGJ

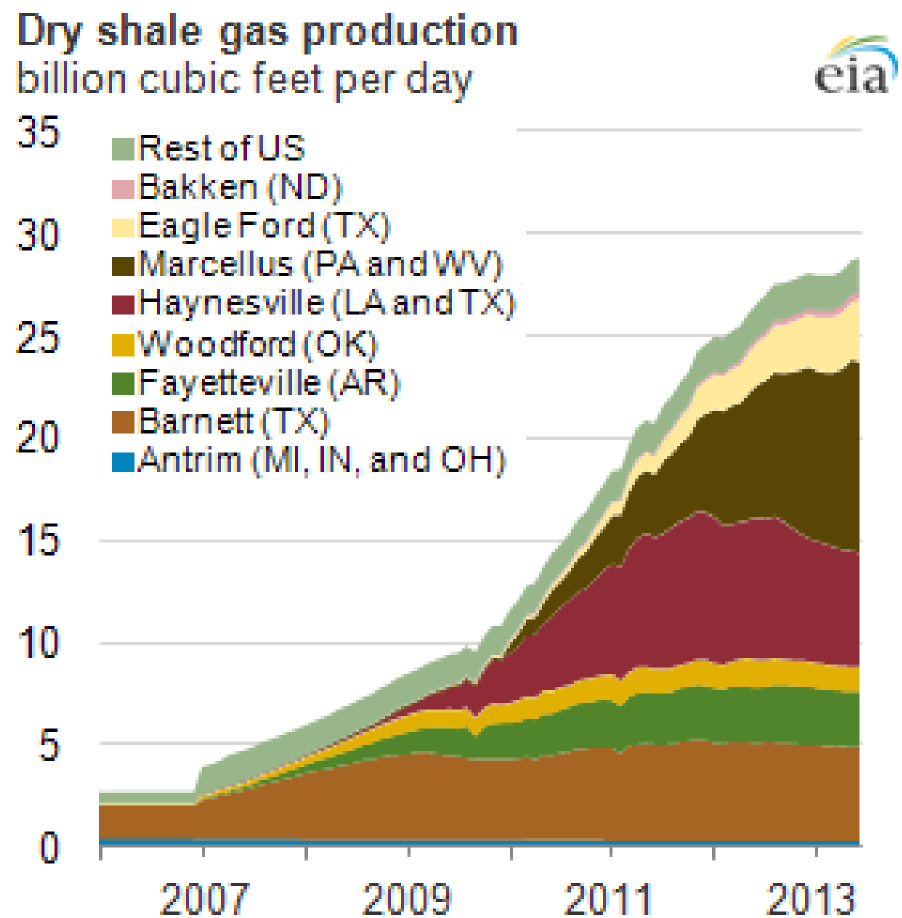
Midstream

- New Midstream investment has already peaked
  - As pipeline construction falls off
    - Some workers will return to Houston construction market
    - Lower the rate of growth of demand for new office, light industrial s.f.

Downstream

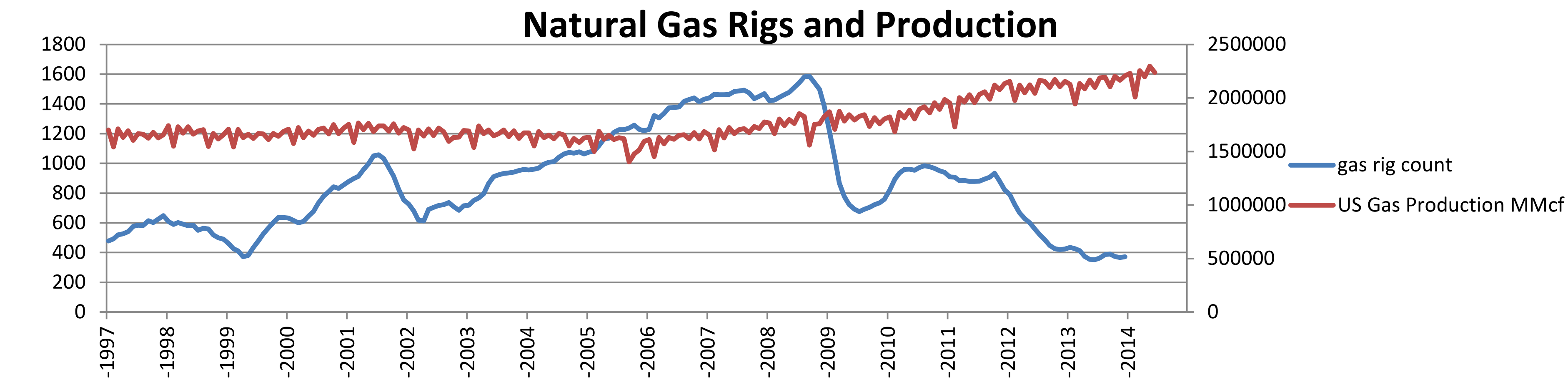


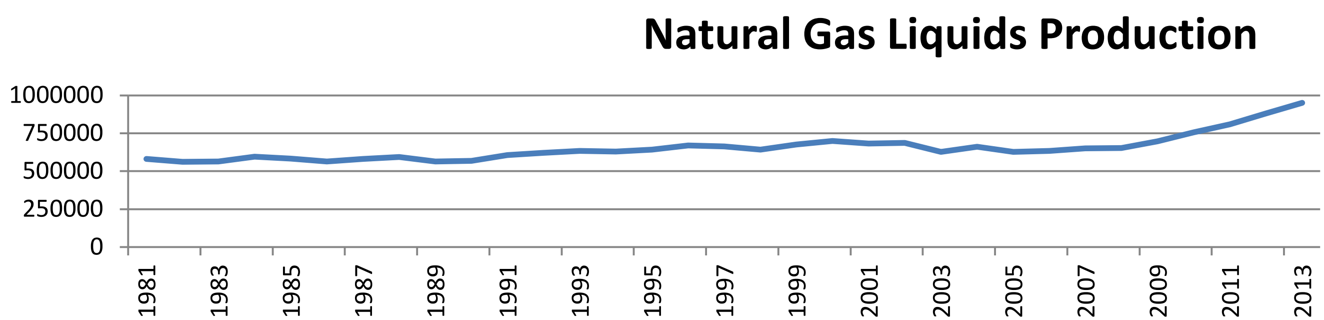
Shale and tight oil production
million barrels per day
2.5
2.0
1.5
1.0
0.5
0.0
Eagle Ford (TX)
Bakken (MT and ND)
Granite Wash (OK and TX)
Bonespring (TX Permian)
Wolfcamp (TX Permian)
Monterey (CA)
Woodford (OK)
Niobrara-Codell (CO)
Spraberry (TX Permian)
Austin Chalk (LA and TX)
2007
2009
2011
2013

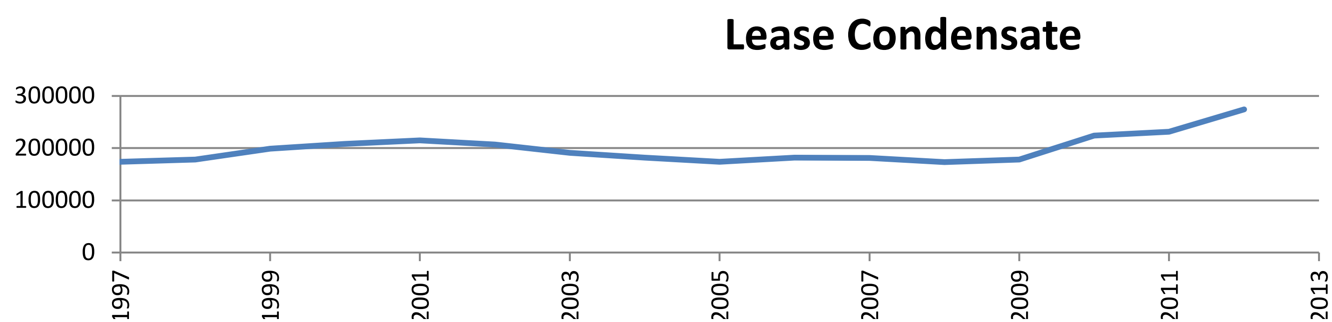


Dry shale gas production
billion cubic feet per day
35
30
25
20
15
10
5
0
Rest of US
Bakken (ND)
Eagle Ford (TX)
Marcellus (PA and WV)
Haynesville (LA and TX)
Woodford (OK)
Fayetteville (AR)
Barnett (TX)
Antrim (MI, IN, and OH)
2007
2009
2011
2013

Downstream







Baker Hughes, EIA

Downstream

- Center for Energy Economics (as of 6/2014)
  - Reported Gas-intensive Construction
    - 103 U.S., $83 billion, projects completed or to-be by 2020
      - 14 Ethylene Crackers
        - » Ethane, Propane->Ethylene, Propylene, (fuel gas)-> plastics
      - 6 Methanol
        - » Natural Gas ->H_2 (syn-gas)-> Methanol-> Chemical Feedstock, Ethylene, Propylene, Heavier hydrocarbons, Formaldehyde
      - 5 Gas to Liquids (none currently under construction, Shell cancelled proposed plant (12/2013)
        - » Natural Gas -> H_2 (syn-gas)-> Diesel, Gasoline, Fuel Gas, Wax

Downstream

- Brazoria County-Houston Business Journal 03/2014
  - $27 billion (announced)
  - 18700 temporary (announced)
  - 3235 permanent (announced)
  - 15465 Difference
  - Tenaris
    - Steel Pipe Plant
    - $1.5 billion
    - 600 permanent
    - 2016
  - Phillips 66
    - Fractionator, Liquefied petroleum gas export terminal
    - $3 billion
    - 1000 temp
    - 50 permanent
    - 2015, 2016
  - Chevron Phillips
    - 2 polyethylene units, Expansion of ethylene capacity
    - $6 billion (Gulf Coast)
    - 10,000 temporary (Gulf Coast)
    - 2017
  - Dow
    - R&D
    - $?
    - 2000 permanent
    - 2016
  - Dow
    - Propylene production facility, ethylene unit
    - $4 billion
    - 4000 temp
    - 400 permanent
    - 2017
  - BASF
    - Emulsion polymers plant
    - $90 million
    - 200 temp
    - 25 permanent
    - 2014 (completion unconfirmed)
  - Free port LNG
    - LNG export
    - $13 billion
    - 3500 temp
    - 160 perm
    - 2018

Downstream

Liquefied Natural Gas			
Non-FTA export (Bcfd)			
DOE applied capacity	DOE approved capacity	FERC approved Capacity	International market (2012)
37.6	11.56	7.26	32
DOE and Ferc approved			
Freeport LNG (2018-2019)			
Sabine Pass Liquefaction (2015-2016)			
Cameron LNG (2019)			
Dominion Cove (2017)			

Brazoria County-Houston Business Journal 03/2014

- $27 billion (announced)
- 18700 temporary (announced)
- 3235 permanent (announced)
- Completion dates
  - 2016
  - 2015, 2016
  - 2017
  - 2016
  - 2017
  - 2014 (completion unconfirmed)
  - 2018

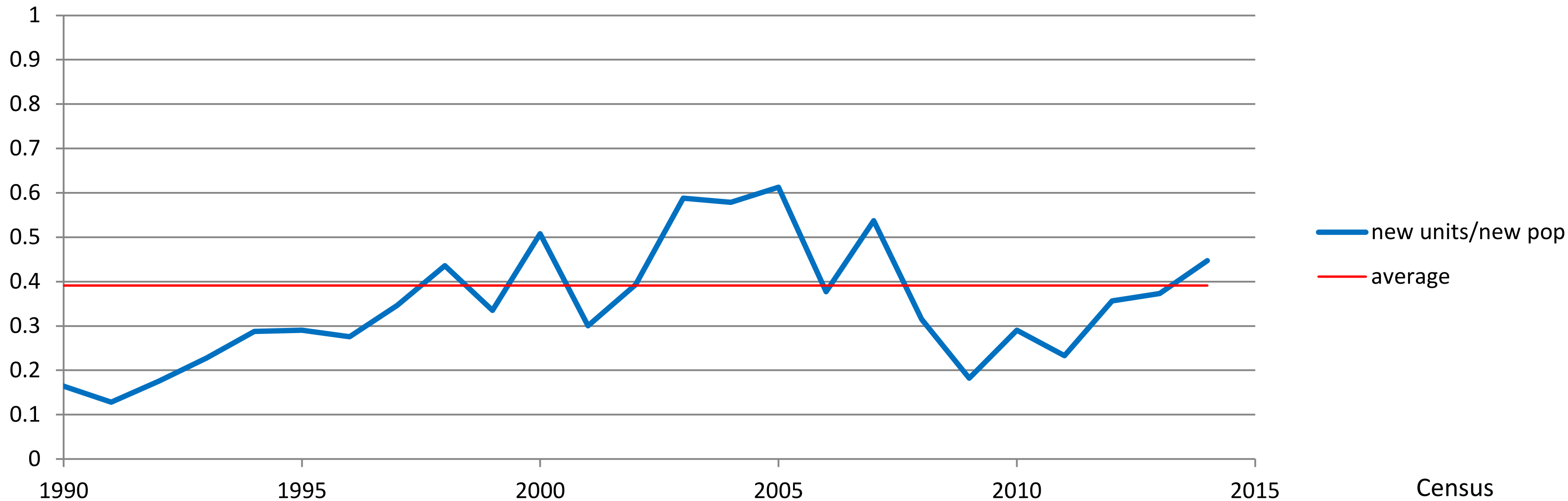
Downstream

- Downstream construction
  - Driven by increase in production of Natural gas and light crude
  - Output is a commodity
    - Race to capture currently available margins
    - Labor shortage
      - Delays, cancellations
  - Significant share comes online by 2016-2017
    - Labor shortage eases (as real estate demand eases?)
    - Possibly large negative employment effect, Permanent jobs = .1-.2 x temporary jobs
    - Changes in prices of inputs, outputs
      - Will current construction be profitable
        - » Elasticity of Supply/Demand for inputs/outputs
      - Gas drilling restarts at around $5

Oil & Gas & Derivatives & Houston's economy

- Upstream stable
  - Not directly contributing to current growth
  - Driving Midstream and Downstream
- Midstream slowing
  - Investment coming down significantly from recent highs
- Downstream strong
  - 2016-2018 will be decisive time period
    - Return to 2% trend from 3-4%
    - Employment bust
      - Permanent jobs = .1-.2 x temporary jobs
- Real Estate
  - Labor Shortage and Real Estate demand growth will both ease with the winding down of midstream and upstream booms
  - Return to 2% trend
    - Movement from 4% to 2% growth might still feel like a bust, especially if current construction rates are predicated on continuous 4%

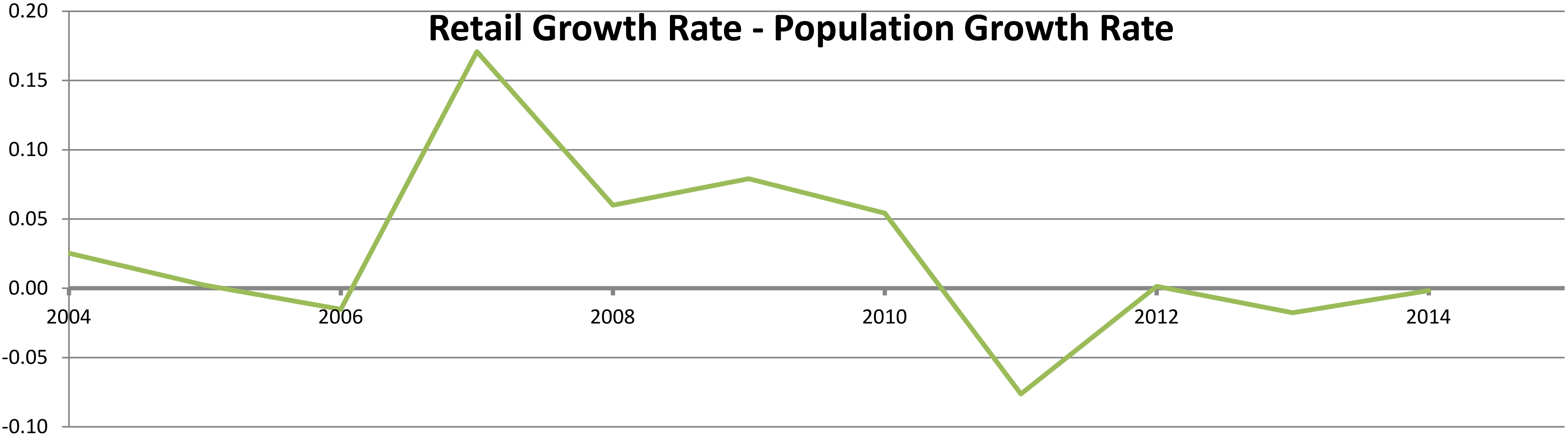
Residential Construction



- 3 months single family inventory down to 3 from 3.3 Aug 2013
- Apartment occupancy up .1% from March 14 and .2% from June 13
- Apartment rents and Home prices are still increasing
- Apartments have made up above historical average proportion of new permits for three years
- Ratio is a leading indicator. Things still look good in the short term (1-2yrs) but bears watching in the longer term. Short term excess growth is likely catch up (2008-2013), which will lead to lower price increases

HAR,CBRE

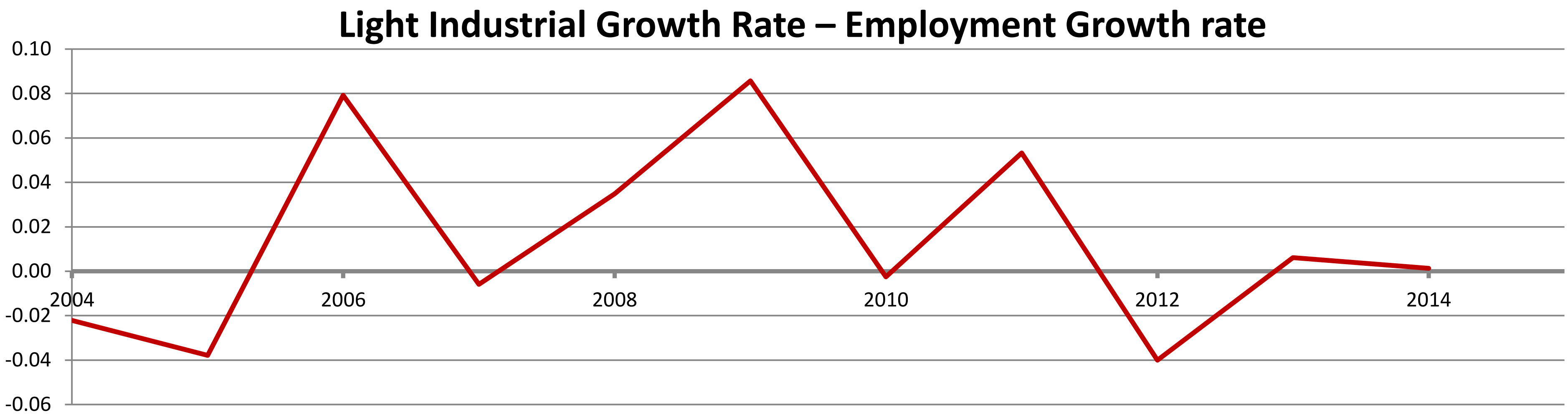
Retail Construction



- Conservative estimate of population growth
- Assumes all s.f. currently under construction is completed this year
- Occupancy, asking rates higher
- Square footage under construction (2.7 million)is increasing quickly. Increased by 40% over Q1 (1.9 million, 284% annualized) and 260% higher than 13Q2 (.7 million)
- Currently retail s.f continues to grow at a rate lower than population.
- If new construction continues to increase over-construction might be a concern in the mid term.

CBRE

Light Industrial Construction

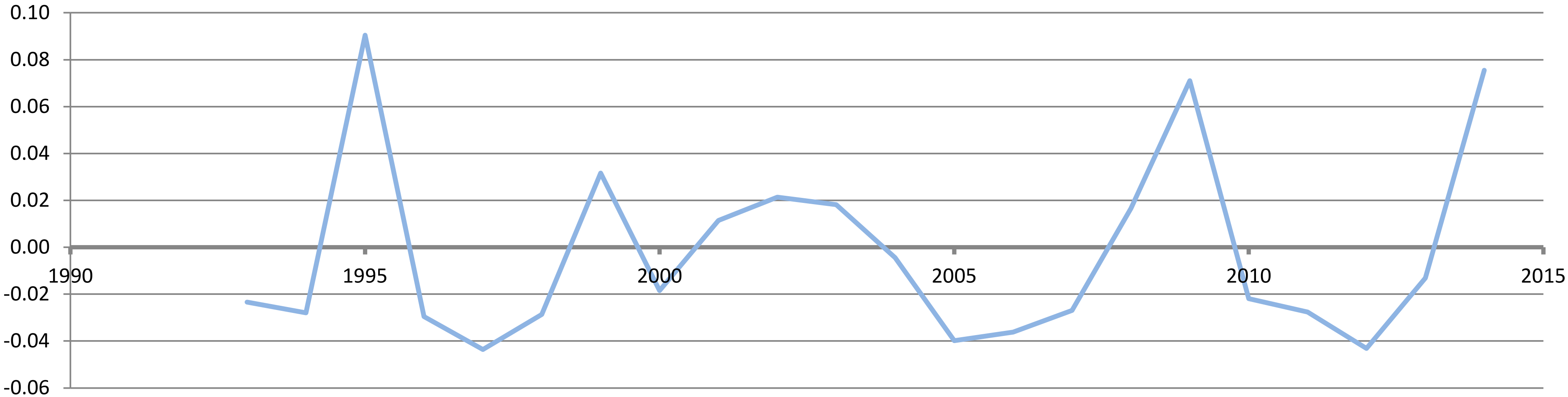


- Conservative estimate of employment growth
- Assumes all s.f. currently under construction is completed this year
- Vacancy rates flat quarter to quarter and slightly higher year to year
- Rental rates up on both quarterly and yearly basis
- Confidence on the continued strength in the industrial market is lower than in residential and retail, in this analysis. There was no apparent, persistent period of under-construction. High year to year variance
- On the other hand light industrial is likely to be the sector most directly influenced by the Oil & Gas & Derivatives boom

CBRE

Office Construction

Office Growth Rate - Employment Growth Rate



- Conservative estimate of employment growth
- Assumes all s.f. currently under construction is completed this year
  - Differentials (scenario construction completed)

Differentials (scenario construction completed)	conservative (75,000)	likely(110,000)
All construction (16,322,252 s.f.) (9% current s.f.)	.0755	.0636
Half construction (8,161,126 s.f.)	.0334	.0215
Current estimates (5,400,000 s.f.)	.0191	.0072
First half year (3,487,352 s.f.)	.0092	-.0027

- Vacancy rates higher over the year
- Rental rates up on both quarterly and yearly basis
- Even remembering the conservative estimates on employment, and construction timelines, it appears that Office construction is the furthest along in the upswing of the typical real estate business cycle
- Key to watch for the future are the changes in s.f. under construction

CBRE, PM Realty

Construction market

- Construction Market
  - s.f. under construction (units permitted) and delivered is growing in Office, Residential, and Retail relative to the increase in employment and population
  - Current “excess” construction in Office and Residential can probably be considered catch-up, and will only slow the growth of prices in the short term
  - Past the short term continued growth in construction and permitting relative to employment and population could be unsustainable

Conclusion

- Economic boom
  - Technological shift associated with Shale Oil & Gas
    - Midstream growth to connect new output to processing facilities
      - Construction investment already winding down
    - Upstream growth to process new supplies of Natural Gas
      - Most of known complete dates 2016-2018
    - Likely leads to permanent (one-time) increase in economic base then return to trend growth rates
- Real Estate boom
  - Competing with Midstream and Downstream construction for workers
  - Labor shortage will ease in tandem with Real Estate demand growth rates
  - Residential and office appear to be approaching or have “excess” current construction. In the short term this is likely catchup from under construction during the financial recession.
  - Light industrial did not have any recent persistent under construction, but it would not be surprising if it was the most positively influenced category by the midstream and upstream booms
- Determinants of Sustainability
  - Price elasticities of Supply/Demand to new Downstream inputs/outputs
  - Fall in employment associated with Downstream construction ->operation
  - Real Estate decisions made based on realistic assumptions about future trends

Is the Boom a Bubble?

Not yet.

And no reason to say, right now, it will be.