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Houston's Economy Powered by Oil

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Houston's Economy Rests on Four Major Roles

- Medicine and the Texas Medical Center
- Aerospace and the Johnson Space Center
- *Upstream* oil exploration and production
- *Downstream* oil refining and petrochemical production

A Quick Tour of Houston's Many Links to Upstream Oil

Upstream Production and Oil Services

- Oil producers decide what to drill for, where to drill, finance the exploration, and assume the risk and reward
- May be independents (Apache, Anadarko) or integrated into downstream (Shell, BP, Exxon)
- Oil service companies accompany the producer to the wellhead to carry out the drilling, downhole testing, completion, and all phases of delivering a finished well

How Did Upstream Oil and Gas Exploration Come to Houston?

- Spindletop in 1900 was the first great U.S oil discovery, a salt dome, it brought the age of the gusher
- Texaco, Gulf Oil, Sun Oil all born at Spindletop as refining companies
- Houston was the nearest city with good rail links, telephone and telegraph service
- The trail of salt dome discoveries leads to the Houston area by 1915, with the Humble oil fields and Humble Oil – today's Exxon

Houston Is One of Many Cities Built On an Industrial Cluster of Activity

- New York – financial services
- Detroit – automobiles
- San Jose – tech
- Hollywood – movies
- Houston - oil

Why Do These Clusters Form?

- What economists call “economies of urbanization and agglomeration” lower the cost of doing business for every member of the industry that participates
- Provides a large labor force with highly specialized skills needed for the industry
- Skilled/specialized workers have choices among employers
- Customers of the dominant firms join the cluster, and local financial institutions know the business
- The business “...is in the air.” All the most important knowledge about this industry is found inside the cluster

Three Rules for Clusters

- The bigger you are the more competitive you become. The more competitive you are, the bigger you get ... a virtuous cycle
- Hard times drive consolidation. If outside the cluster, one way to reduce cost is to move inside
- The cluster provides short-term shelter, but cutting-edge knowledge and competitive advantage are still essential for long-term survival

Integrated Oil Companies With Presence in Houston

Company	Number of Local Employees
ExxonMobil	13,200
Shell	12,123
BP	10,000
Chevron	9,000
ConocoPhillips	4,128
Occidental	2,428
Marathon	N.A.

Houston Business Journal, recent issues of *Book of Lists*

Independent Producers in Houston

Company	Local Jobs
ConocoPhillips	4,128
Occidental	2,428
Anadarko	2,460
EOG Resources	ND
Apache	ND
Newfield	ND

Houston Business Journal, recent issues of the *Book of Lists*

Largest U.S. Oil Service Companies

(ranked by 2011 revenue)

Company Business Journal	Houston Jobs	Headquarters
National Oilwell Varco	14,581	Houston
Cameron International	13,000	Houston
Schlumberger	10,000	Houston, Paris, the Hague
Halliburton	8,600	Houston and Dubai
Key Energy Services	8,400	Houston
Baker Hughes	8,000	Houston
Noble Corp	6,000	Switzerland
Weatherford	3,824	Dublin
FMC Technologies	3,776	Houston
Tetra Technologies	3,462	Bermuda
DXP Enterprise	2,863	Houston
Cameron International	ND	Houston
Exterran Holdings	ND	Houston

Houston Business Journal, *Book of Lists, 2014*

Energy Engineering in Houston

Company	Licensed Engineers	Local Jobs
Jacobs	1,310	2,734
KBR	475	ND
Wood Group	454	3,132
Flour Corp	394	2,800
CB&I	269	1,981
Technip	240	3,000

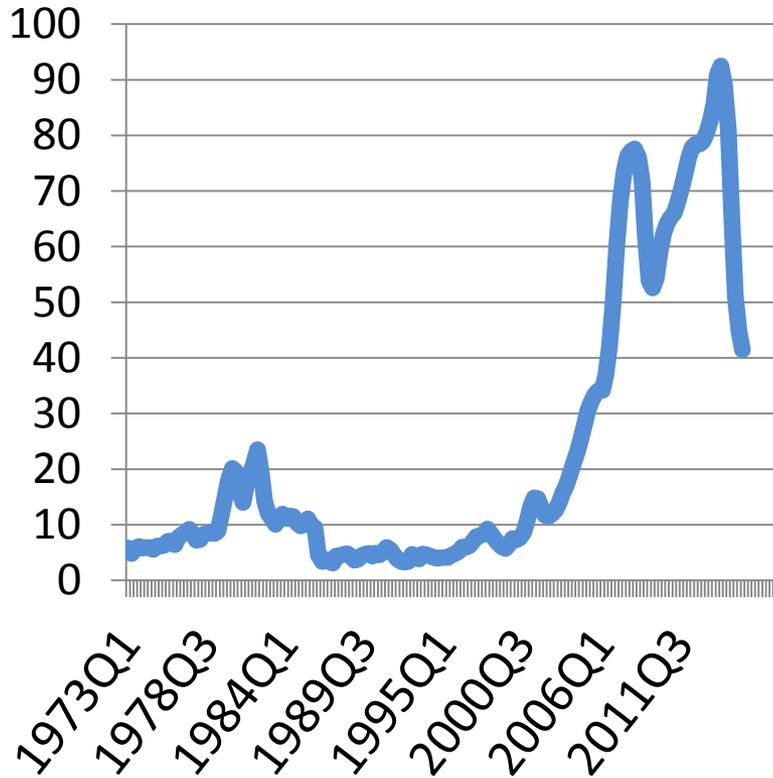
Houston Business Journal, recent issues of Book of Lists

Houston Pipelines/Transmission

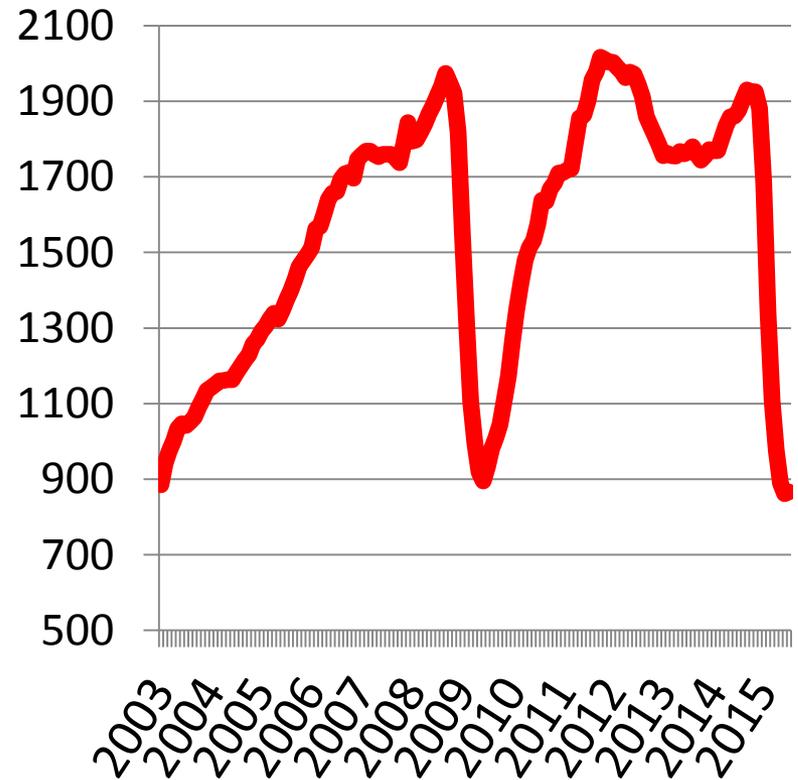
Company	Revenue (\$ billion)
Phillips 66	\$171.6
Enterprise Product Partners	\$47.7
Plains All American Pipeline	\$42,3
Kinder Morgan	\$14.07
Kinder Morgan Energy Partners	\$12.53
Enbridge Energy	\$7.12

The Greatest Oil Boom Is Over for Now

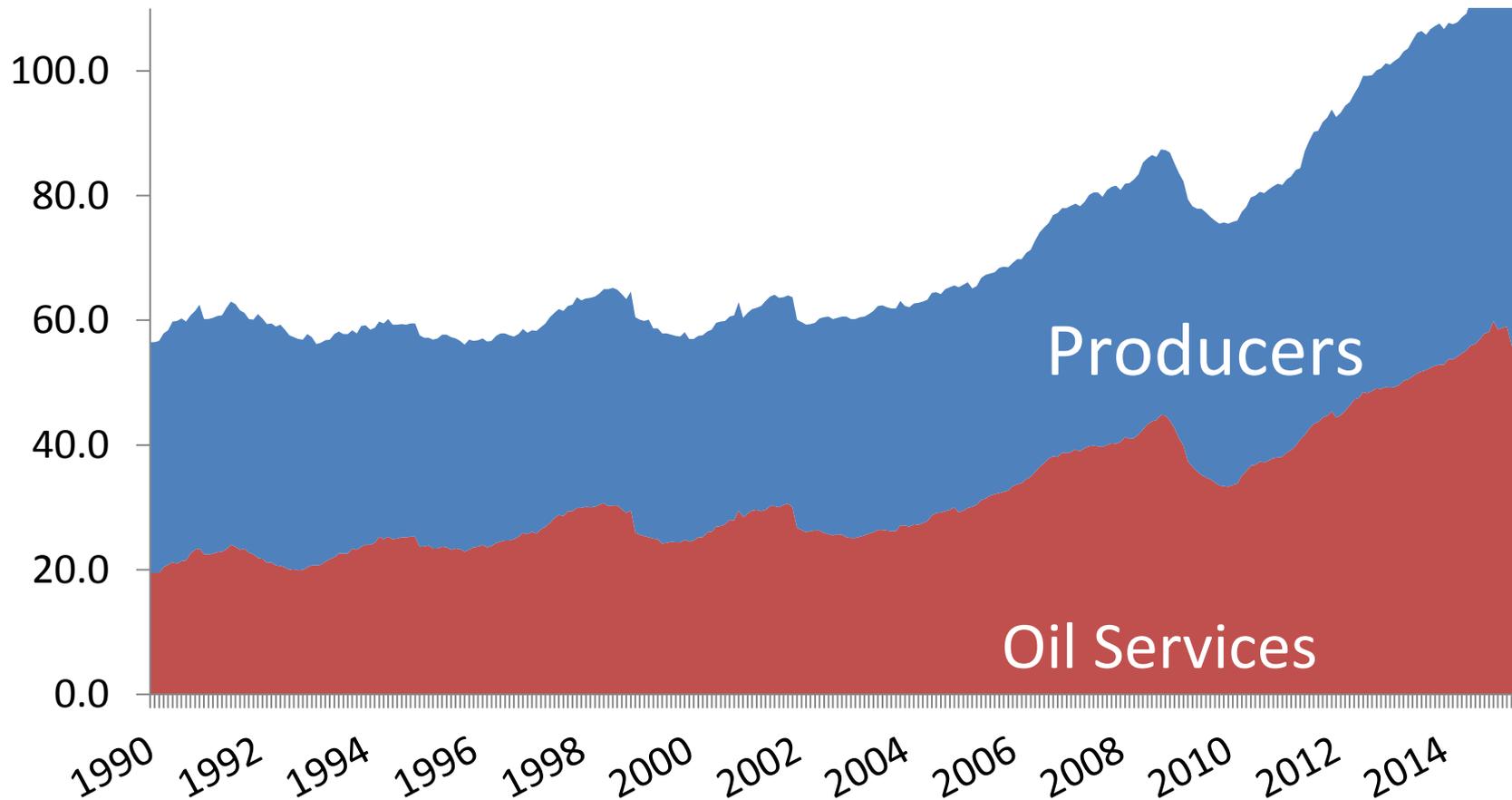
Drilling capital expenditures
(\$ billion per quarter)



Baker Hughes rig count
(working rigs)



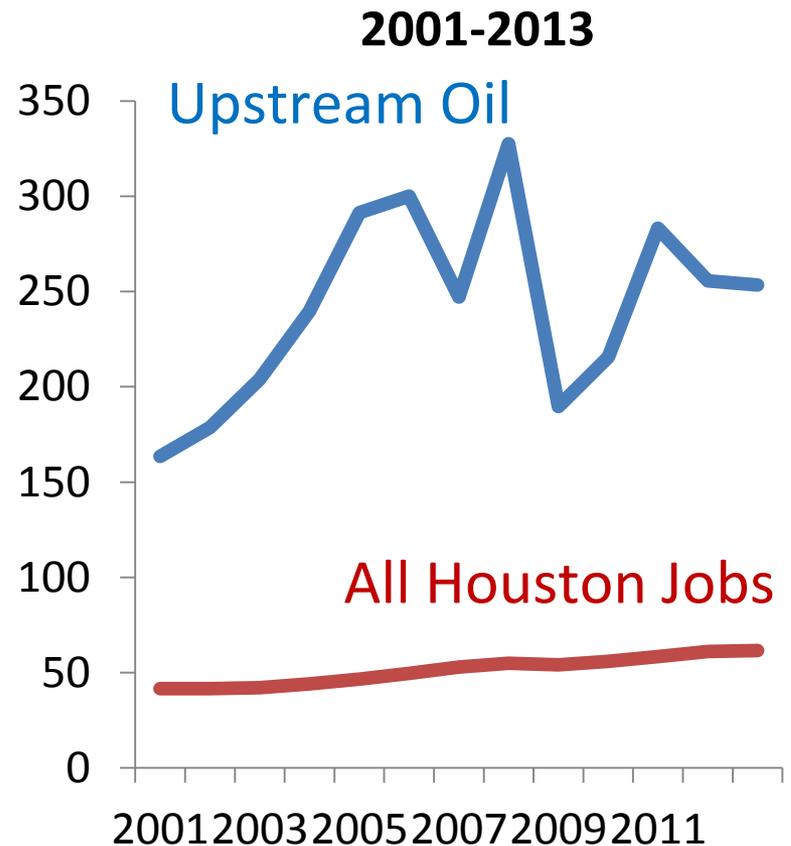
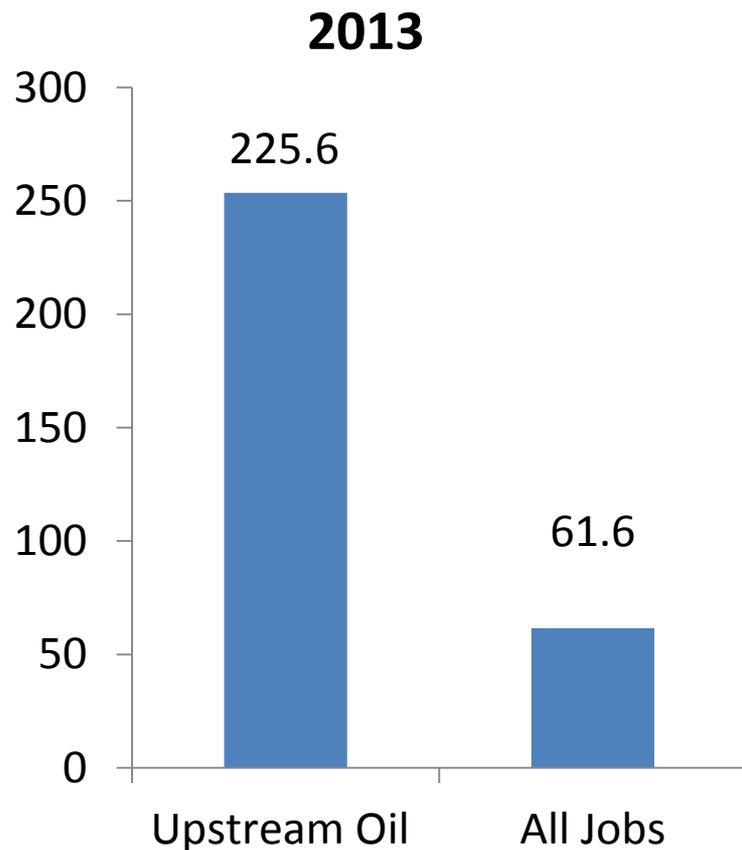
Houston's Upstream Exploration Jobs Peaked at 115,000



Bureau of Labor Statistics

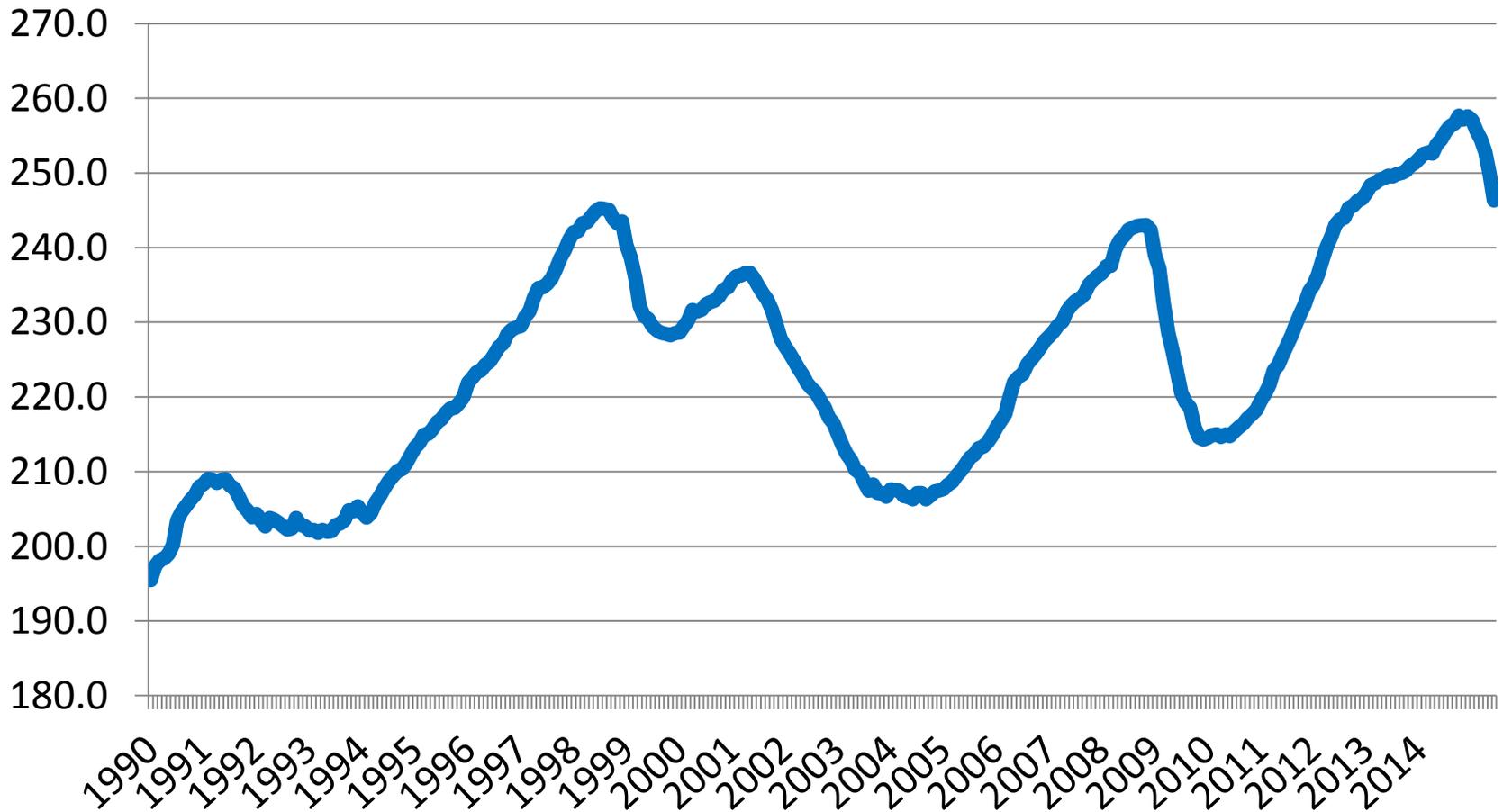
Annual earnings in upstream oil four times the typical Houston job in 2012

(\$000/worker)



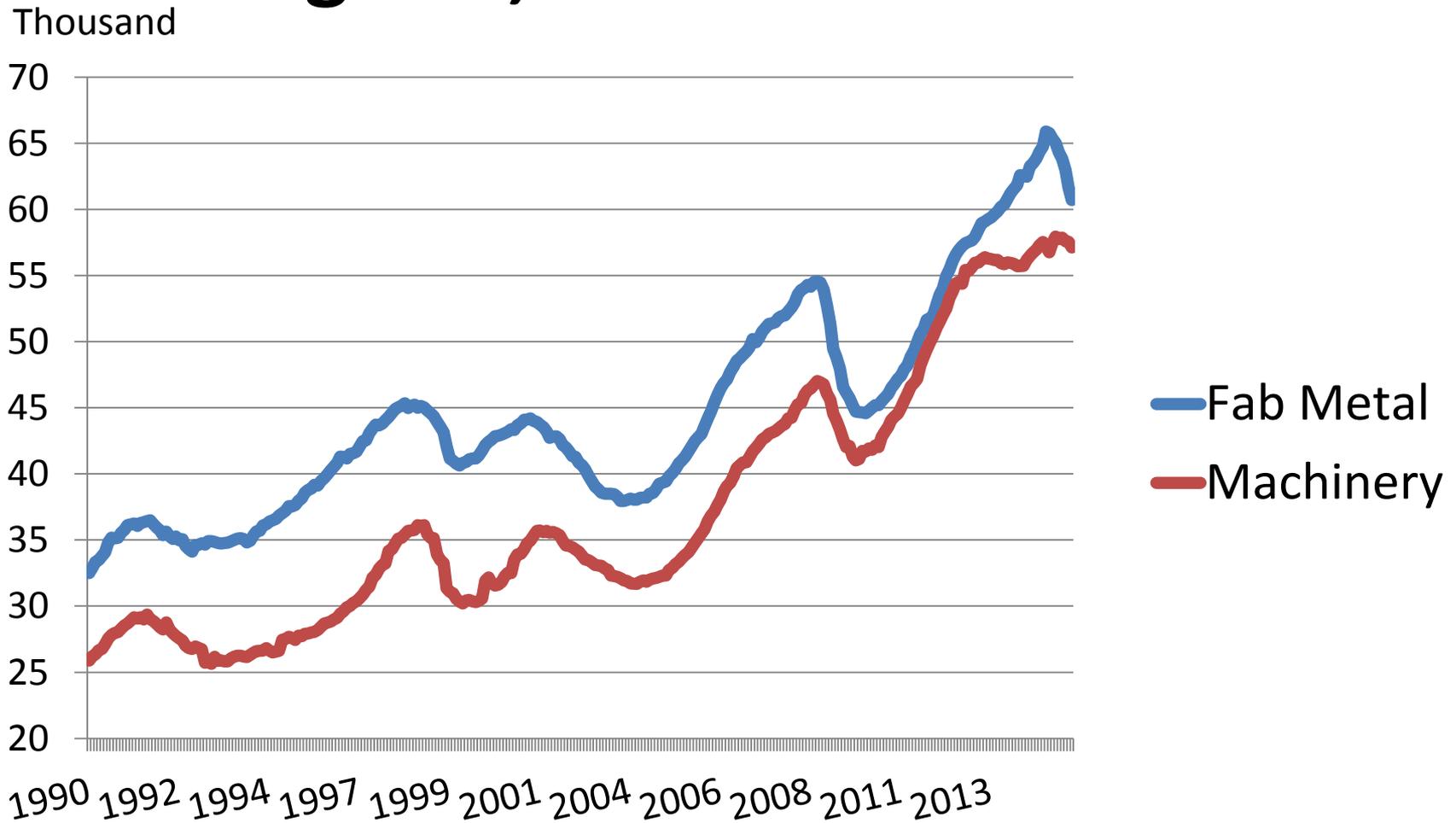
Houston Adds Manufacturing Jobs Since 2003

manufacturing employment (000)



Bureau of Labor Statistics

Machinery and Fabricated Metal Bring 115,000 Jobs to Houston



Bureau of Labor Statistics

Downstream Brings Cyclical Balance to Houston's Energy Sector



GULF OF MEXICO

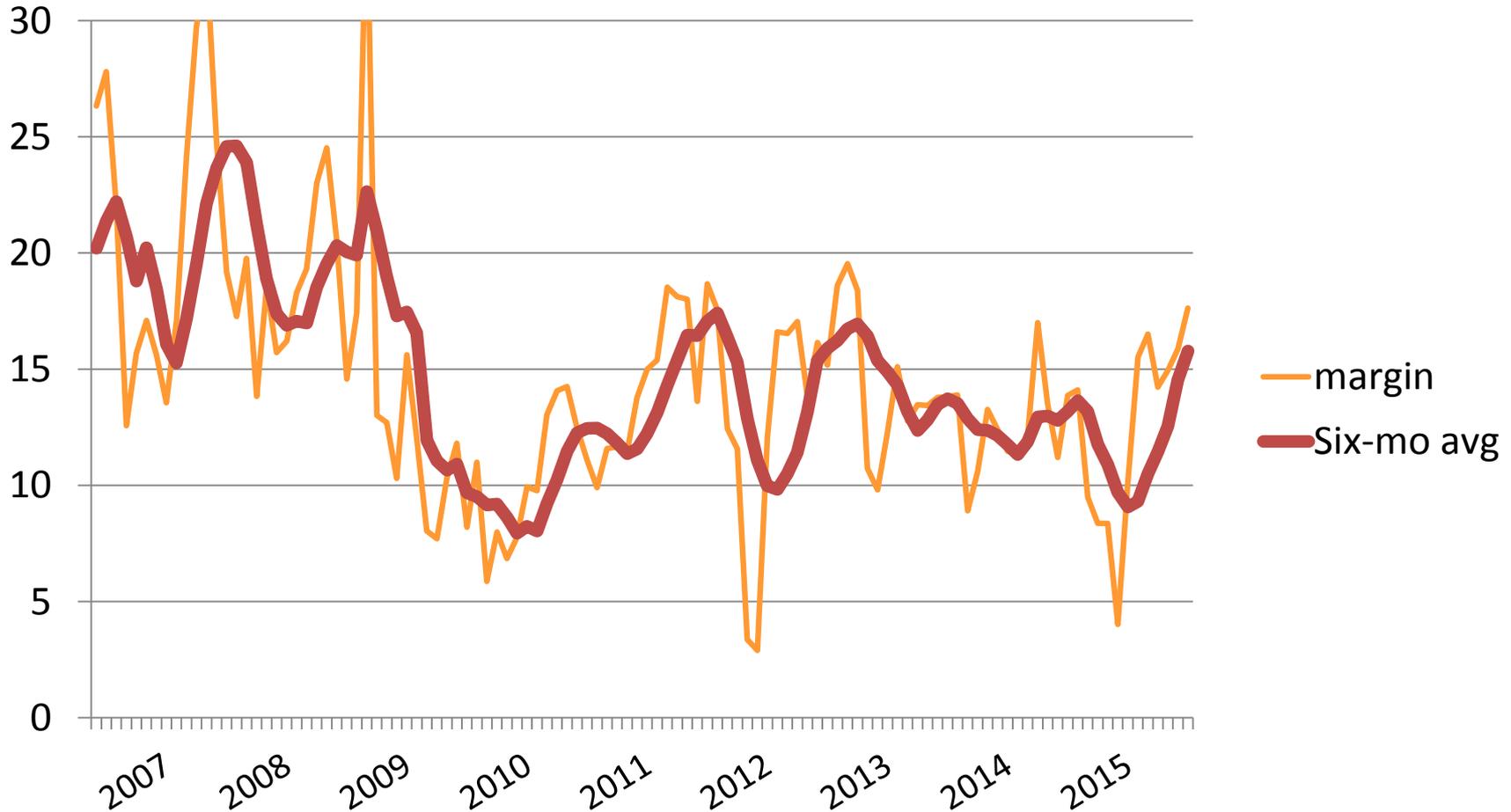
How did downstream oil refining and petrochemicals come to Houston?

- Galveston hurricane of 1900 is still the greatest natural disaster in U.S. history, striking one of the largest city in Texas
- The disaster makes clear the advantages of an inland port, and the Houston Ship Channel is jointly financed with federal and local funds
- Already an important refining region thanks to Spindletop
- Port of Houston tonnage and value of exports is dominated today by refining, petrochemical, and other oil industry activity

Refining Capacity on the Texas and Louisiana Gulf Coast

Region	Number of Refineries	Distillation Capacity (000 b/d)
Houston/Texas City	8	1,900.5
New Orleans	8	2,024.4
Baton Rouge	1	502.5
Beaumont/Lake Charles	6	1,554.9
Corpus Christi	3	647.2
Total	26	6,629.5

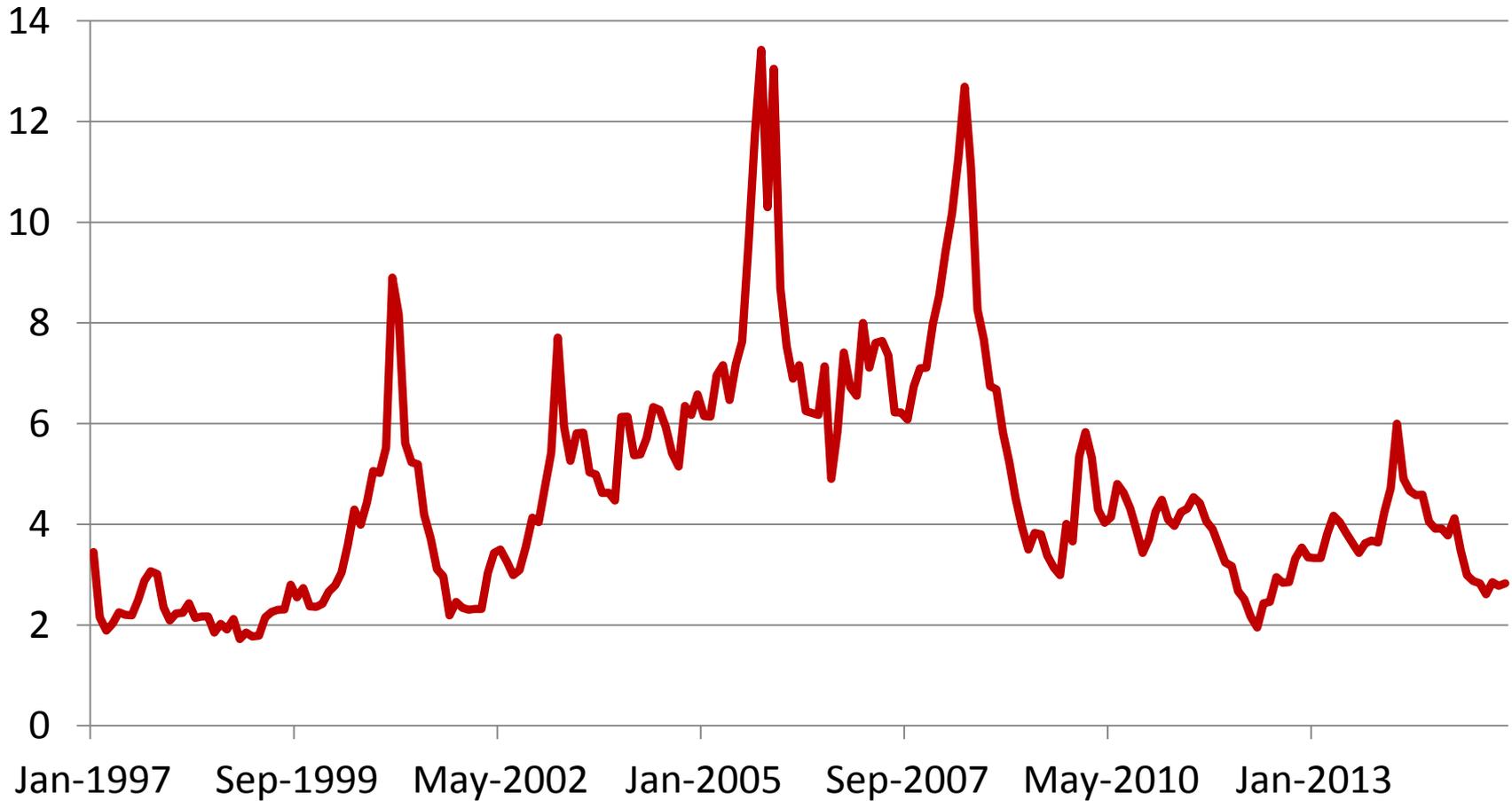
Low Oil Prices Keep Gulf Coast Refining Margins Strong (\$/bbl)



Pace refining margins, *Oil and Gas Journal*

Natural gas prices collapsed in late 2011

(\$/mcf)



DOE/EIA

Chemical/Plastic Products Affected By Hurricane Rita

(Percent N.A. Capacity Shut Down at Peak)

- Ethylene Steam Cracker: 58.5%
- RG Propylene: 30.7%
- Benzene: 68.5%
- Polyethylene: 63.0%
- Styrene: 85.3%
- Butadiene: 95.8%

Data from CMAI, Inc and expressed as percent of North American Capacity

Four of World's Ten Largest Ethylene Complexes Are In Houston

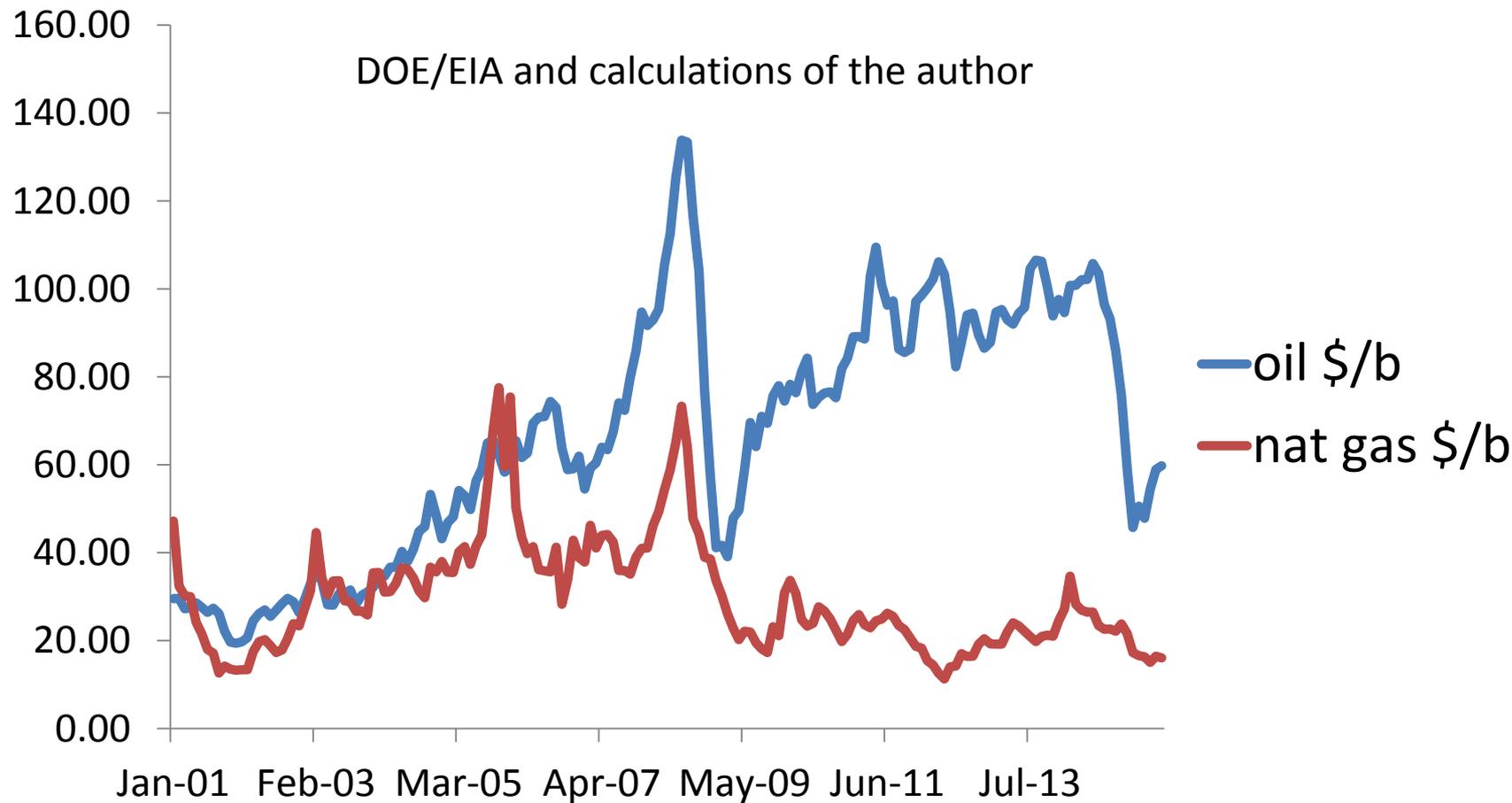
Company	Plant location	Capacity (million tpy)
Formosa	Taiwan	2,935.0
Nova	Alberta	2,811.7
Arabian Petrochem	Saudi Arabia	2,250.0
ExxonMobil	Baytown	2,197.0
ChevronPhillips	Sweeny	1,865.0
ExxonMobil	Jurong Island	1,900.0
Dow	Netherlands	1,800.0
Ineos	Chocolate Bayou	1,752.0
Equistar	Channelview	1,750.0
Yanbu	Saudi Arabia	1,750.0

\$138 Billion U.S. Construction Boom is Based on Cheap Energy and Exports

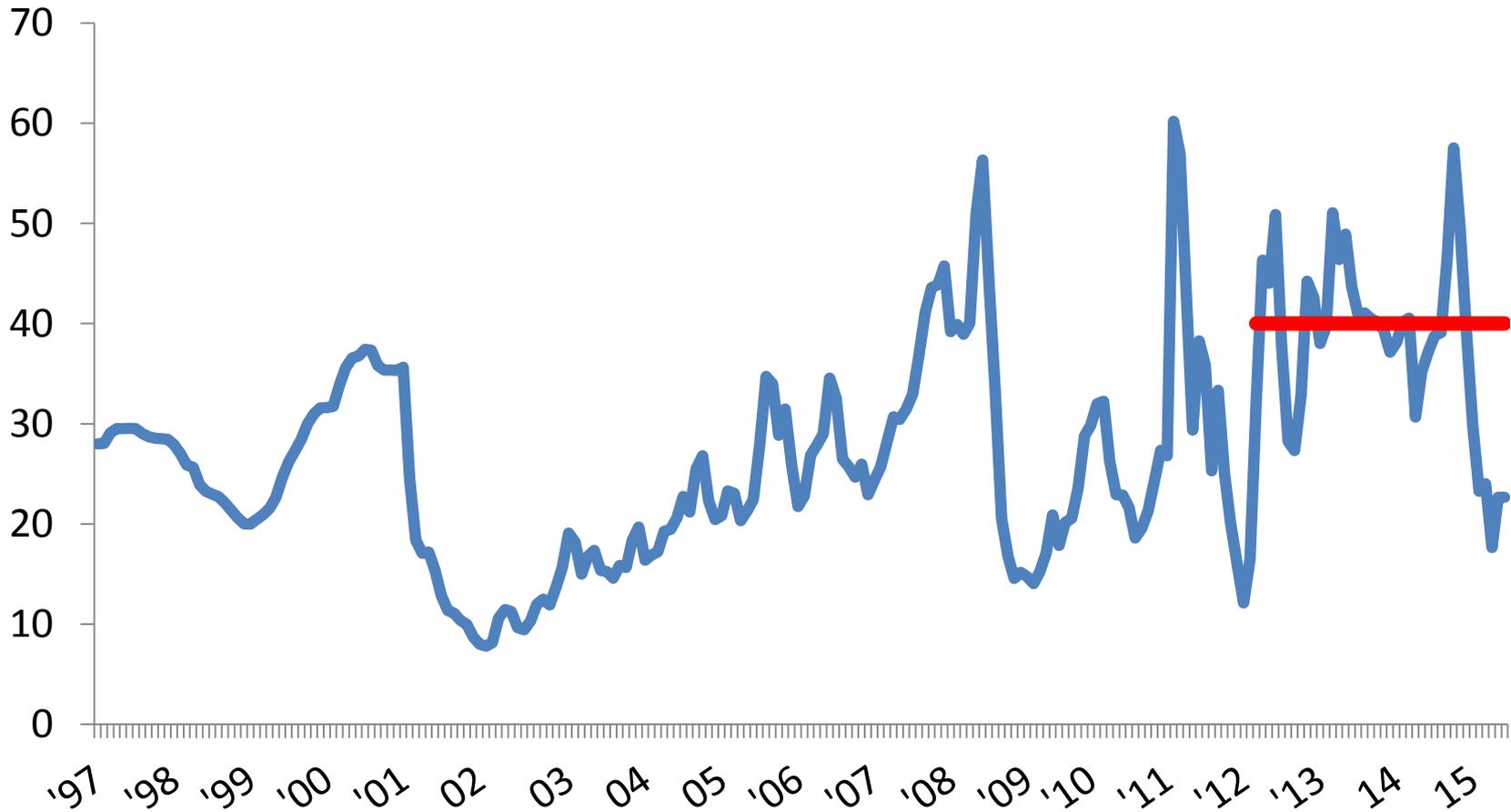
- This \$138 total includes many industries and all of the US
- The primary focus on the Gulf Coast is petrochemicals and natural gas export facilities
- New ethylene crackers, more ethylene-related expansion in PE, PVC and other derivative plants
- LNG export terminals to sell surplus natural gas into global markets

Note: The \$138 billion figure is based on all shale-related expansion, estimated by the American Chemistry Council in March, 2015

Natural Gas Energy Content Equivalent to \$20-\$40 per Barrel for Oil



Ethylene Margins (cents per pound)



Active Petrochemical Projects Underway in Metro Houston

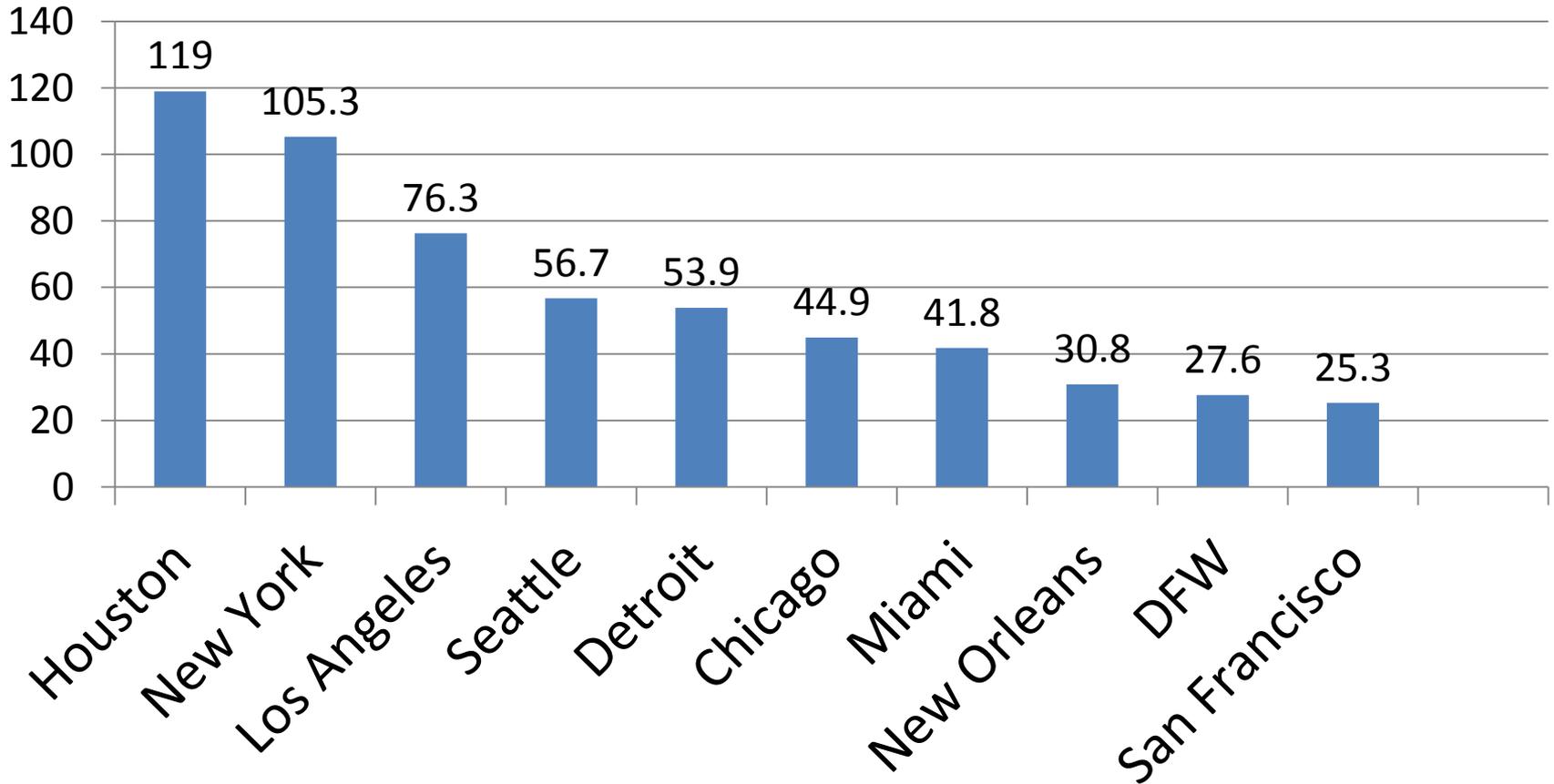
Company	Location of Project	Cost (\$ million)	Completion
Freeport LNG	Freeport	\$9,600	2017
ExxonMobil	Baytown	\$5,000	2017
ChevronPhillips	Baytown	\$4,000	2017
Lyondell	Channelview	\$1,300	2015
C3 Petrochemical	Alvin	\$1,200	2017
BSAF	Freeport	\$1,000	2018
Phillips66	Freeport	\$1,000	2016
Celanese	Clear Lake	\$800	2015
BASF	Freeport	\$600	2016
Ineos	LaPorte	\$500	2016
<i>Total 10 Large Projects</i>		\$25,000	
<i>6 Other Projects known cost</i>		\$1,669	
<i>10 projects unknown cost</i>		?	

Note: Projects have all moved past proposal or study phase; \$4.5 billion methanol plant under study for Texas City; tens of billions more in projects if area extended to include Beaumont-Port Arthur to Victoria

Port of Houston Key Piece of Oil- Industry Infrastructure

Houston in 2014 Was the Number One Exporting Metro

(Billion \$ of Merchandise Exports)



78 Percent of Houston's Int'l Exports Are in Oil-Related Industries

(percent of value)

- Refined products – 29.3%
- Petrochemicals – 25.4%
- Machinery – 12.7%
- Crude Oil – 10.5%
- Computer/Electronics – 6.8%
- Other – 16.1

Are We Diversified Yet?

Basic Jobs Now in Decline

(3-mo percent change at annual rate)



Define the Houston base this way and divide into energy/not energy

	Base	Energy	Not Energy
Oil and Gas Extraction	X	X	O
Producers	X	X	O
Services	X	X	O
Construction	O	O	O
Manufacturing	X	O	O
Fab Metal	X	X	O
Machinery	X	X	O
Computer Eqpt	X	O	X
Refining	X	X	O
Chemicals	X	X	O
Other manufacturing	X	O	X
Wholesale Trade (EX)	X	O	X
Air Transportation (EX)	X	O	X
Pipelines (EX)	X	X	O
Prof/Business Services (EX)	X	O	X

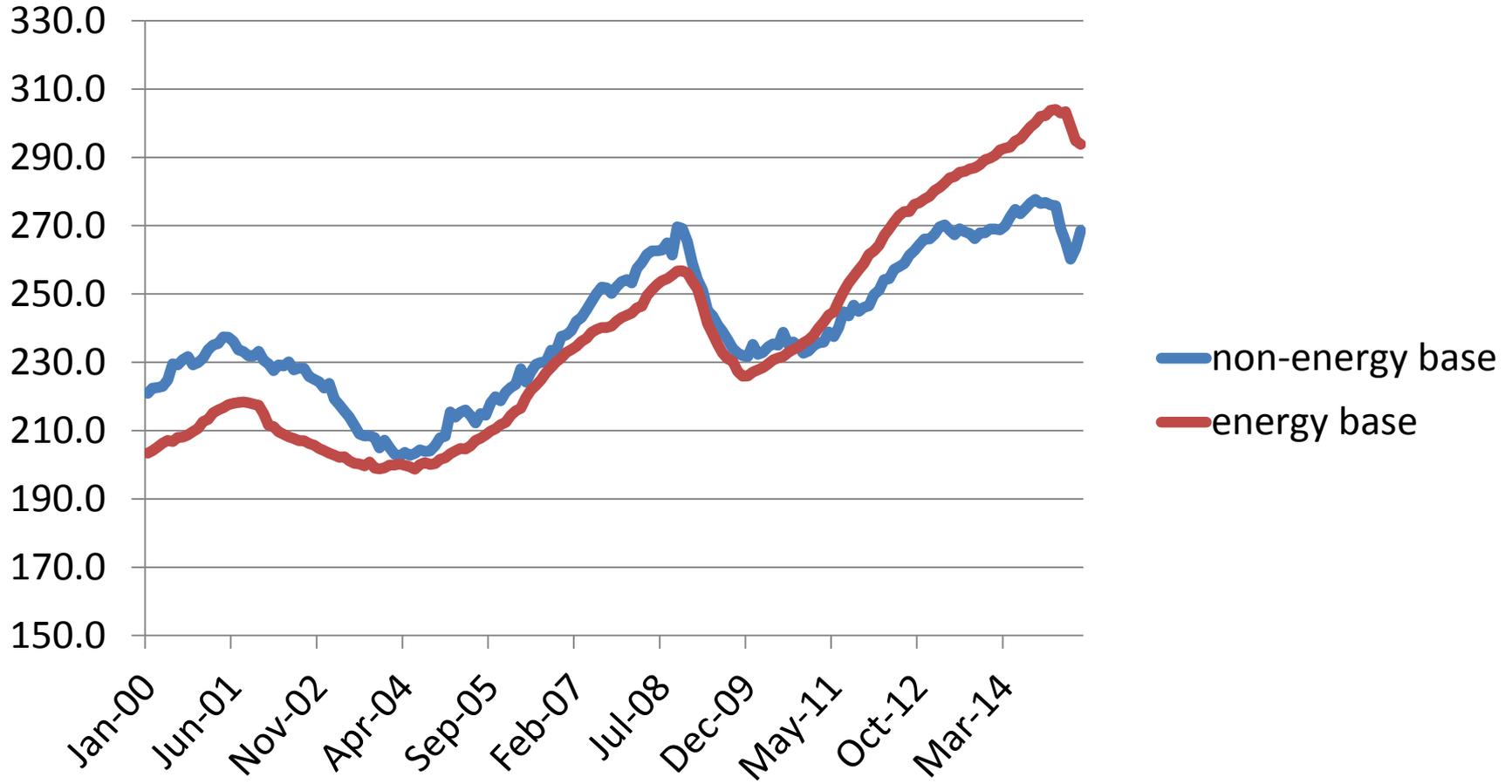
X = Included

O = Not included

EX = measured as excess employment

Energy Jobs Lead Houston's Growth Over the Past Decade

(000 workers)



Diversification Away From Oil?

- Have we diversified? Yes – since the 1980's.
No – probably not so much since 1990
- Count base jobs in energy/not energy in chart above, and roughly 50-50 for many years
- Go at another way, and probably 40 percent of Houston's job growth since 1990 comes from oil, the rest from links to US & global economy
- Anyway, is diversification such a good idea?
This is a VERY successful economy.

Average Annual Income Growth In America's Largest Metros Since 1969

Houston	8.2%
Dallas-Fort Worth	7.8%
Atlanta	7.7%
Miami	7.4%
Seattle	7.0%
Washington	6.9%
San Francisco	6.5%
Boston	6.2%
Los Angeles	6.1%
Philadelphia	5.8%
New York	5.8%
Chicago	5.7%
Detroit	5.0%

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