The Global Energy Market: Comprehensive Strategies to Meet Geopolitical and Financial Risks

Study Overview

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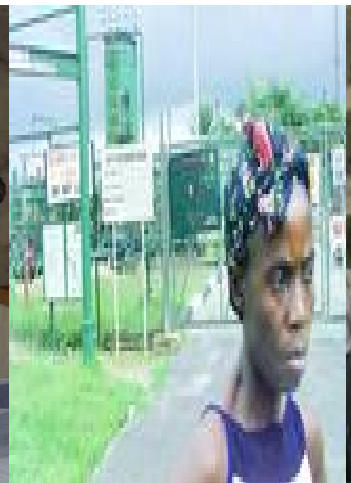


Study Purpose:

To elucidate the ongoing threats to energy markets and to recommend policies that will be needed to safeguard transparent and open markets and ongoing investment in new energy resources

- Explore the potential for failure of the global market in oil and gas
- Identify the various factors might play in triggering an energy market crisis that would disrupt the global economic system
- Assess the geopolitical risks currently facing the international energy market
- Investigate the consequences that such risks could pose to energy security, pricing and supply as well as to the transparent and smooth operation of the global market for oil trade and investment
- Study the possible impact of extreme co-movements of various global economic and financial variables triggered by the large jump in oil prices
- Develop a series of policy frameworks that can be used to fortify the current market system and ensure that it can respond flexibly to the current array of threats that might be encountered in the coming years
- Consider the stable operation of global energy markets within the context of the urgent need to adopt sustainable and forward looking policies regarding global climate change

Key Geopolitical Risks And Threats

- Extreme co-movements in global financial markets could threaten the smooth operation of energy trading and cause extreme volatility in oil prices;
- A politically-motivated cut-off of oil or natural gas supplies by a major exporter (such as Russia to a European country or Venezuela to the United States) or group of exporters;
- A confrontation with Iran over its nuclear aspirations that results in sanctions against Iranian oil exports, an American or Israeli attack on Iranian nuclear facilities or an Iranian and/or terrorist threat to oil shipping through the strategic Strait of Hormuz, through which 16 million b/d to 17 million b/d of Mideast oil passes each day;
- Terrorist attacks on major oil production facilities or export infrastructure;
- The possible spread of conflict or instability from Iraq into other oil producing countries or the escalation of a proxy war involving Saudi Arabia, Syria, Turkey and Iran over the outcomes in Iraq;
- A failure on the part of major energy exporters to make the investments needed to meet rising global energy demand either for geo-economic reasons or through the negative consequences of corruption, bureaucratic inefficiency, or weak government institutions;
- A cutoff of oil or natural gas exports or a delay in resource investment and development due to resource nationalism, domestic unrest, or crises in succession of political leadership;
- A work stoppage or strike by oil workers, possibly motivated by political trends involving power-sharing or human rights issues related to internal instability in a major oil-producing country;
- Destruction of oil production or fuel manufacturing infrastructure following a severe storm or natural disaster.

Many of the risks that were driving the so-called “terror premium” eased in 2008, removing a key psychological support to high prices. (Syrian-Israeli dialogue; Iranian elections; reduction in violence in Iraq; weakening of Al-Qaeda’s international coordination structure; improved emergency hurricane response in US)

Similarly, extreme co-movements in global financial markets remain a key threat to the smooth operation of global energy markets and will drive severe volatility in oil prices for the foreseeable future.

The first effect was a dollar flight-led bubble rally in oil as an asset class in late spring and summer.

Second effect is the bubble liquidation as financial players had to repatriate assets in August and September.

Lasting effect is the impact on oil demand from slowing global economy and U.S. consumer response.

Credit squeeze impacting operation of over-the-counter oil trading markets. Official paper markets still functioning because exchange guarantees counter party risk but market liquidity could emerge as a challenge for off exchange trading.

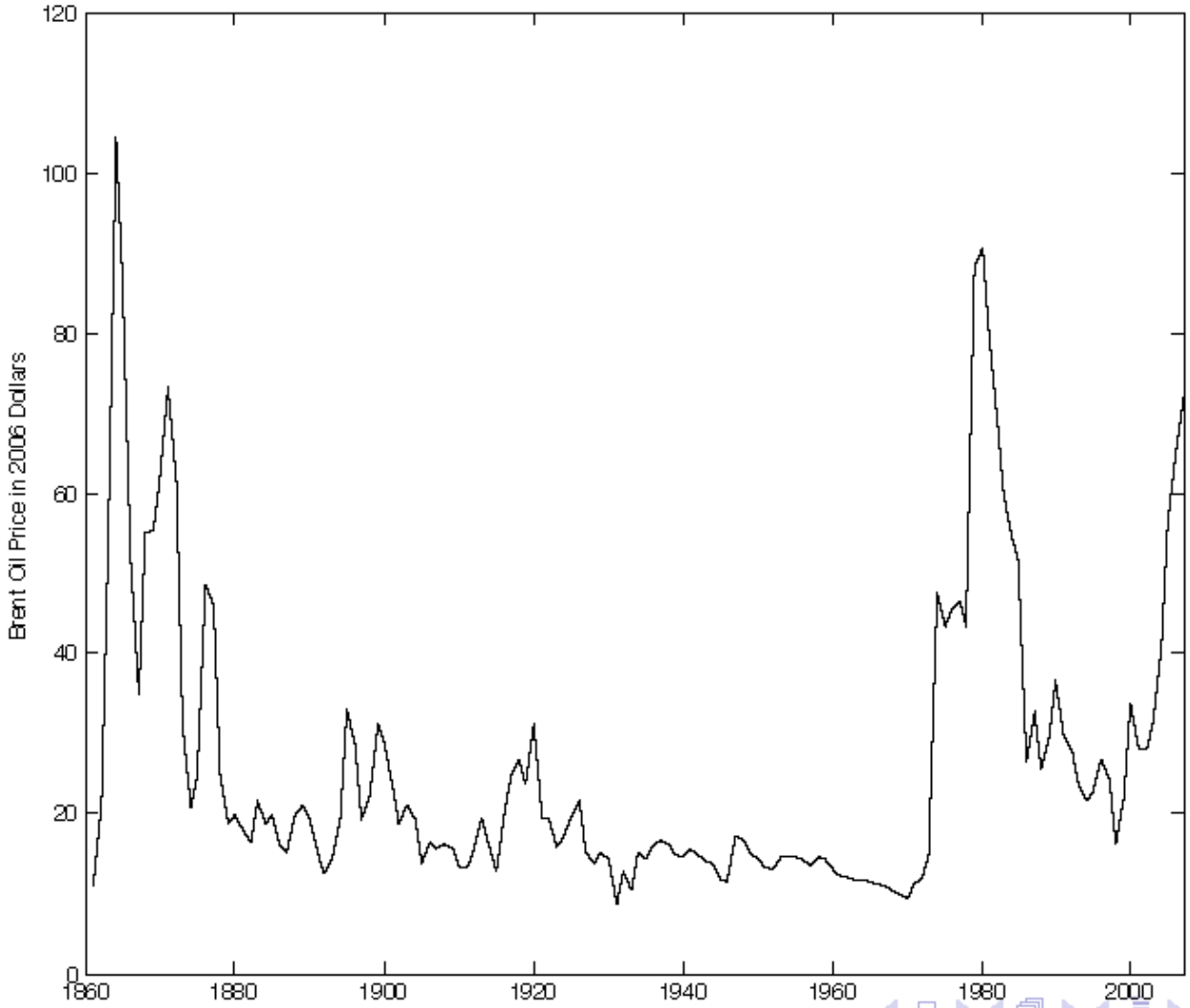
Key myth stories have been plaguing the oil community.

These myths created confusion among key decision makers in promoting sound energy policy.

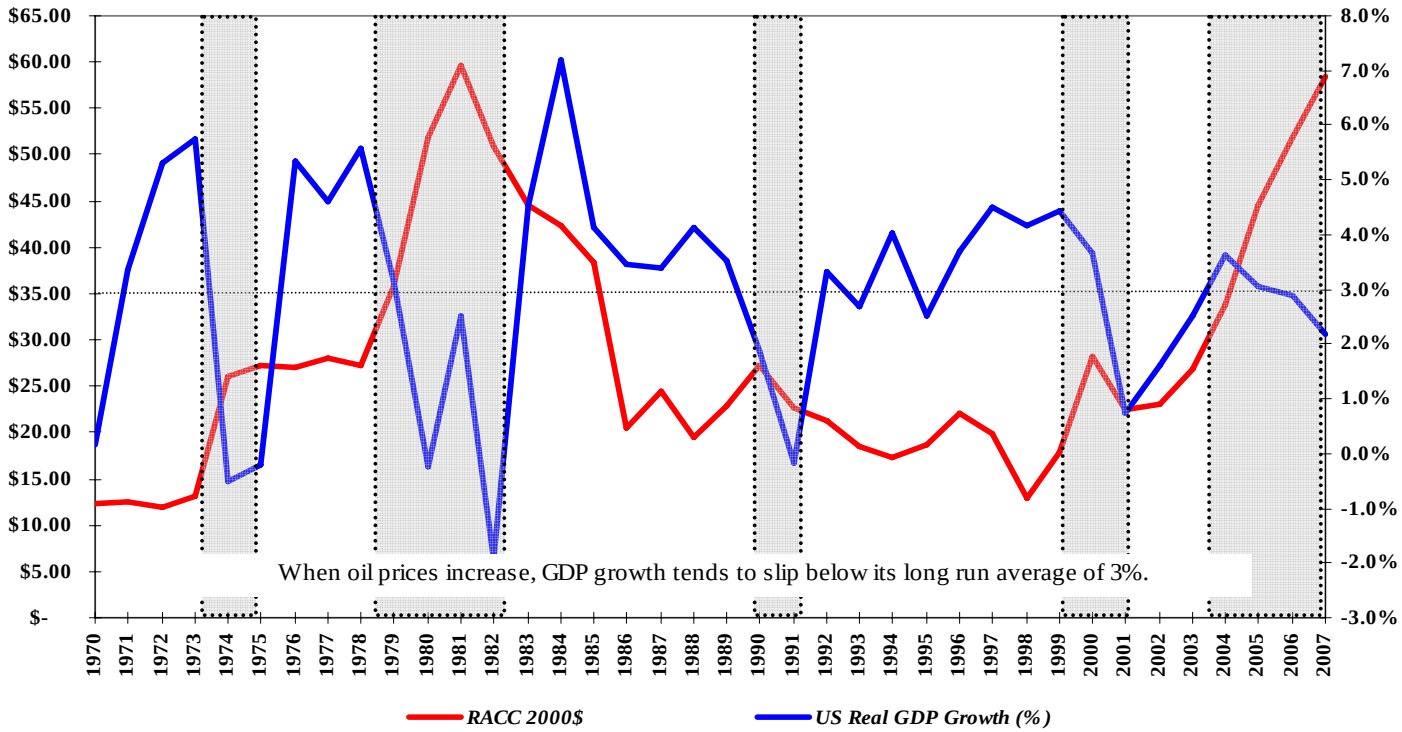
Myth number one was that oil had moved out of its 200 year cycle and prices would remain high forever because of peak oil.

Coincidence of High Oil Prices with Financial Crises

Currency & Banking Crises Severest 1850s-70s, 1970s–

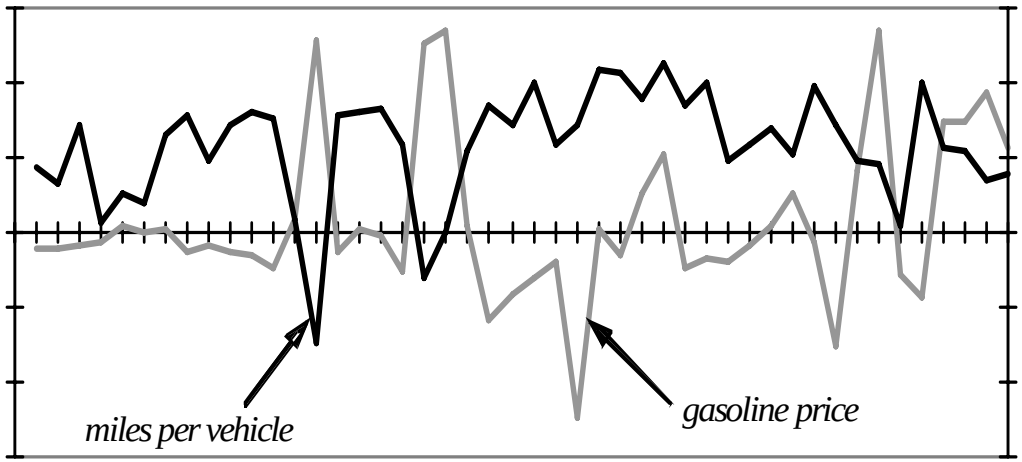


Oil price and the Macroeconomy



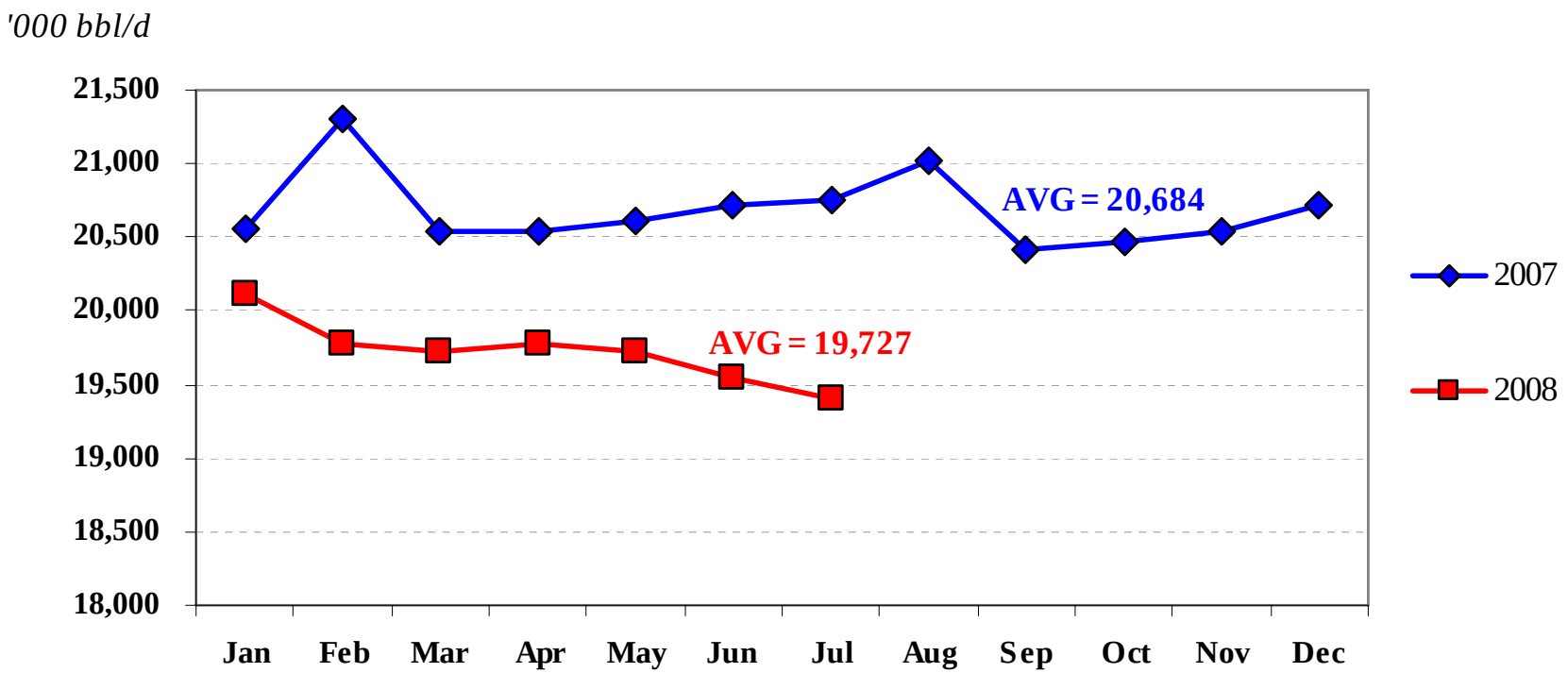
- A number of studies demonstrate a negative correlation in historical data between oil price and economic growth in oil importing countries, including the United States.

- **Myth Number 2: Americans will drive the same amount no matter what the oil price is.**
- **Reality: U.S. Vehicle Miles Traveled is Falling**
- **Annual Percentage change in Miles Per Vehicle 1960-2006**



US Oil Demand

- Summer gasoline demand took a nose dive this year.
  - Demand in July 2008 was down by 6% relative to July 2007, reflecting consumer response to oil prices that were nearly double the prior year. The drop also reflects the economic slowdown.



US Oil Demand

- Demand is influenced by a number of factors.
  - Income, Price, Weather (heating load), Vehicle efficiency
  - Short run elasticities estimated as:
    - Price = -0.0508 ... Thus, a 1% increase in price would result in a decline in demand of 0.05%.
    - Income = 0.3518 ... Thus, a 1% decline in GDP would result in a decline in demand of 0.35%.
    - Fuel Efficiency = -0.7906 ... Thus, a 1% increase in efficiency would result in a decline in demand of 0.79%.
    - HDD = 0.1654 ... Thus, a 1% increase in HDD (colder weather) would result in an increase in demand of 0.17%.
    - Majority of adjustment occurs within a decade (lag coefficient = 0.4567)
- The last four years and what we might expect for 2008-2010...

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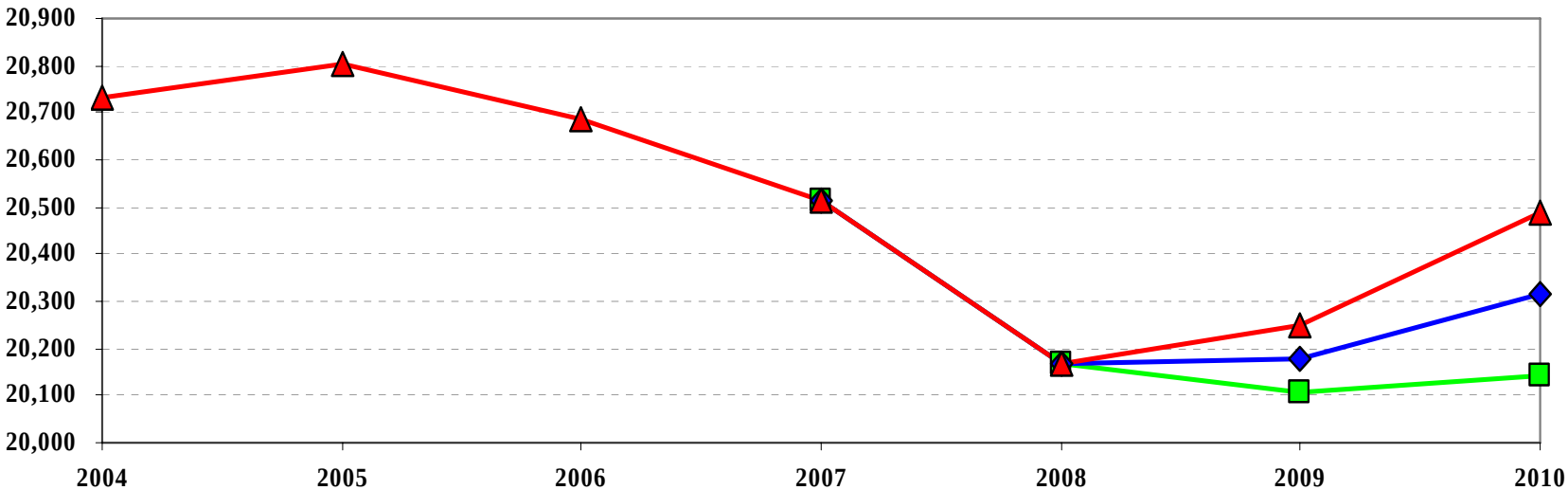


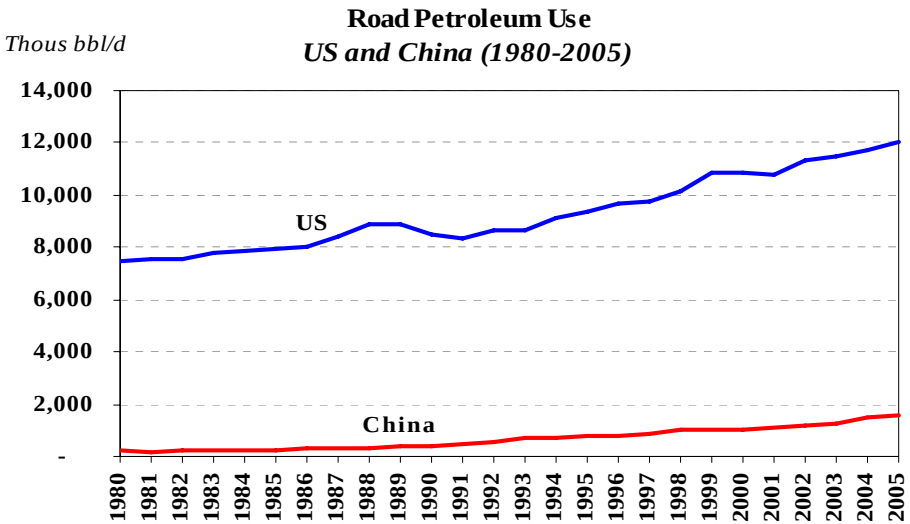
	2004	2005	2006	2007	2008	2009	2010
GDP growth ...	**3.64%**	**2.94%**	**2.78%**	**2.03%**	**0.5%**	**2%, 1%, 0%**	**3%, 2%, 1%**
Price …..……..	$ 33.80	$ 44.56	$ 51.78	$ 56.77	$ 90.79	$ 86.34	$ 83.20
HDD …..……..	4290	4315	3996	4255	4463	4463	4463
Fuel Eff ……...	17.1 mpg	17.1 mpg	17.2 mpg	17.4 mpg	17.5 mpg	17.5 mpg	17.6 mpg

Myth # 3: Only US Demand will be affected because a) US economy is decoupled from rest of world b) price subsidies will shield demand in other countries

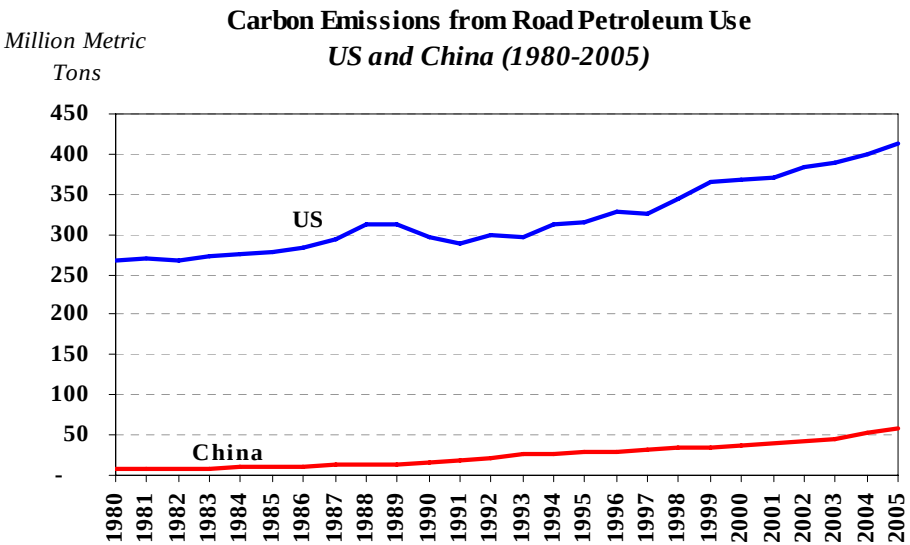
Source: Energy Intelligence

('000 b/d)		Chg. vs.		Chg. vs.		Chg. vs.		Chg. vs.		Chg. vs.
Main Markets	**May '08**	**May '07**	**June '08**	**June '07**	**July '08**	**July '07**	**Aug. '08**	**Aug. '07**	**Q2'08**	**Q2'07**
United States	20,180	-2.66%	20,037	-3.42%	20,052	-3.40%	19,951	-5.10%	19,897	-4.30%
Japan	4,586	4.10%	4,806	4.59%	4,534	-1.30%	4,602	-0.50%	4,792	-11.80%
Europe Big 4	7,498	-2.38%	7,608	-4.00%	7,669	-3.20%	7,788	0.20%	7,645	-2.80%
OECD G-7	34,978	-1.53%	35,169	-2.53%	34,957	-3.10%	35,169	-3.00%	34,977	-5.10%
Other OECD	12,642	1.49%	12,580	-0.99%	12,572	0.90%	12,845	0.16%	12,671	1.70%
Total OECD-30	**47,620**	**-0.75%**	**47,749**	**-2.13%**	**47,529**	**-2.60%**	**48,014**	**-2.20%**	**47,648**	**-4.40%**
Ex-USSR	3,955	-5.54%	4,124	3.20%	3,996	0.00%	4,536	-4.80%	4,141	12.20%
China	8,195	6.77%	8,857	15.49%	8,043	4.90%	7,905	5.50%	8,317	13.40%
Other Non-OECD	26,725	5.49%	26,060	3.90%	26,196	4.20%	25,535	2.07%	26,186	4.30%
Total Non-OECD	**38,875**	**4.50%**	**39,051**	**6.27%**	**38,235**	**4.10%**	**37,976**	**2.40%**	**38,644**	**7.60%**
Total World	**86,495**	**1.55%**	**86,801**	**1.48%**	**85,764**	**0.30%**	**85,990**	**-0.20%**	**86,292**	**0.60%**

- Myth Number Four: China has replaced the US as a “driving” force
- 250 million U.S. vehicles vs China’s 13 million vehicles on the road



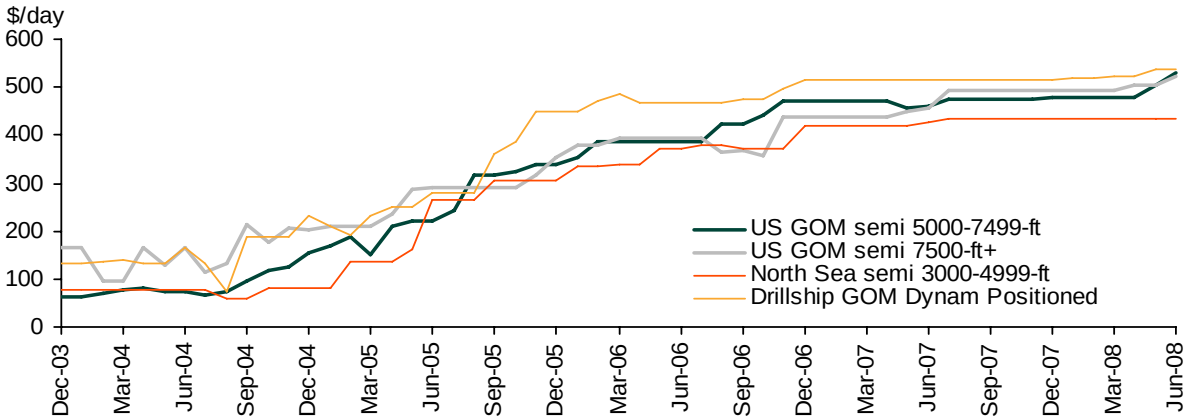
Source: EIA



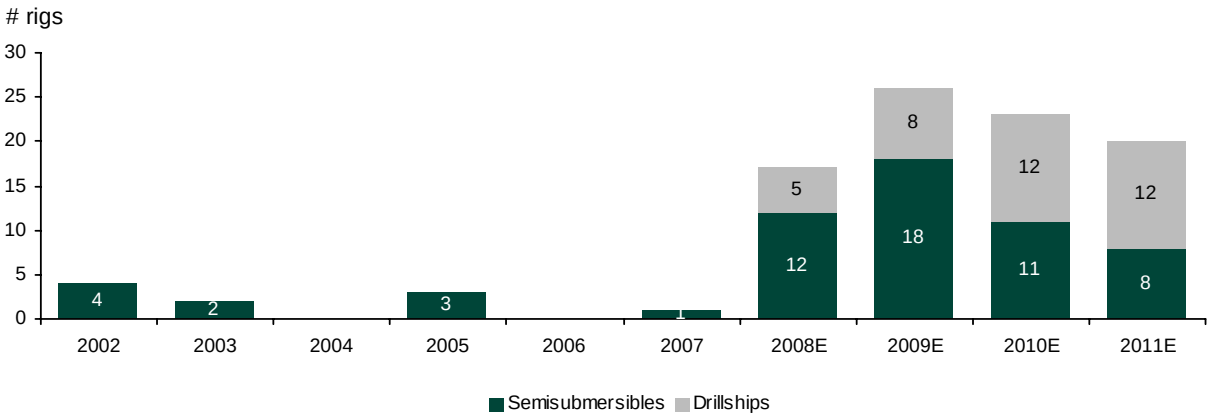
Source: EIA, IEA and own calculations

The number of deepwater drilling rigs is about to increase exponentially

Myth Five: High costs for marginal production will create a floor under oil prices.



Deepwater Rigs under construction – Drilling costs will be coming down.



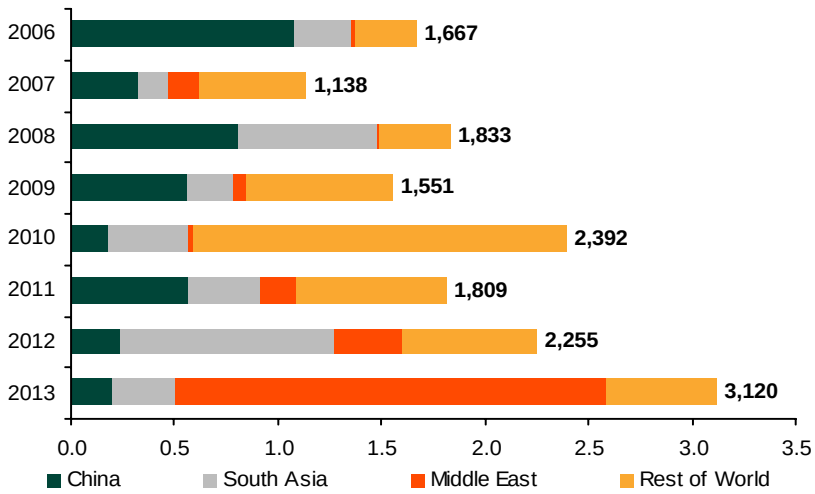
Source: ODS-Petrodata and Lehman Brothers Estimates

Refinery capacity expansion to outpace product demand

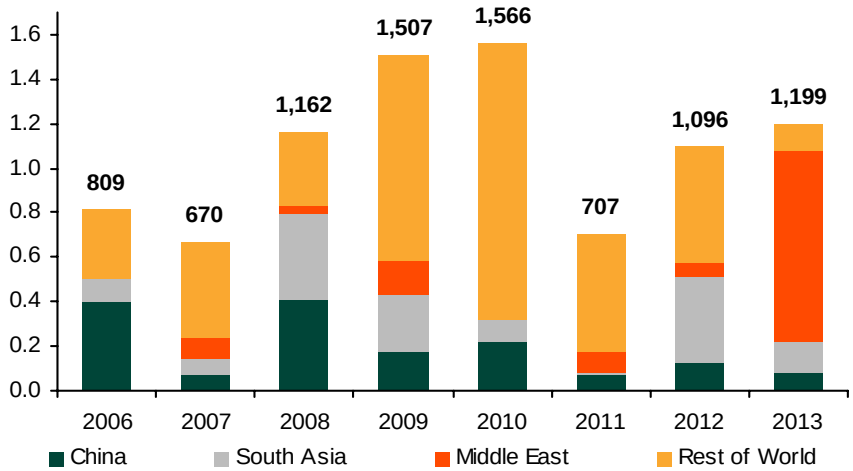
Refinery investment had not kept up with rapid demand growth in recent years, but we are approaching a turning point, especially East of Suez

- Refinery capacity additions could outpace demand growth in 2010 by 2:1, removing a key factor that had been holding up oil prices

Global CDU Capacity Additions (k b/d)



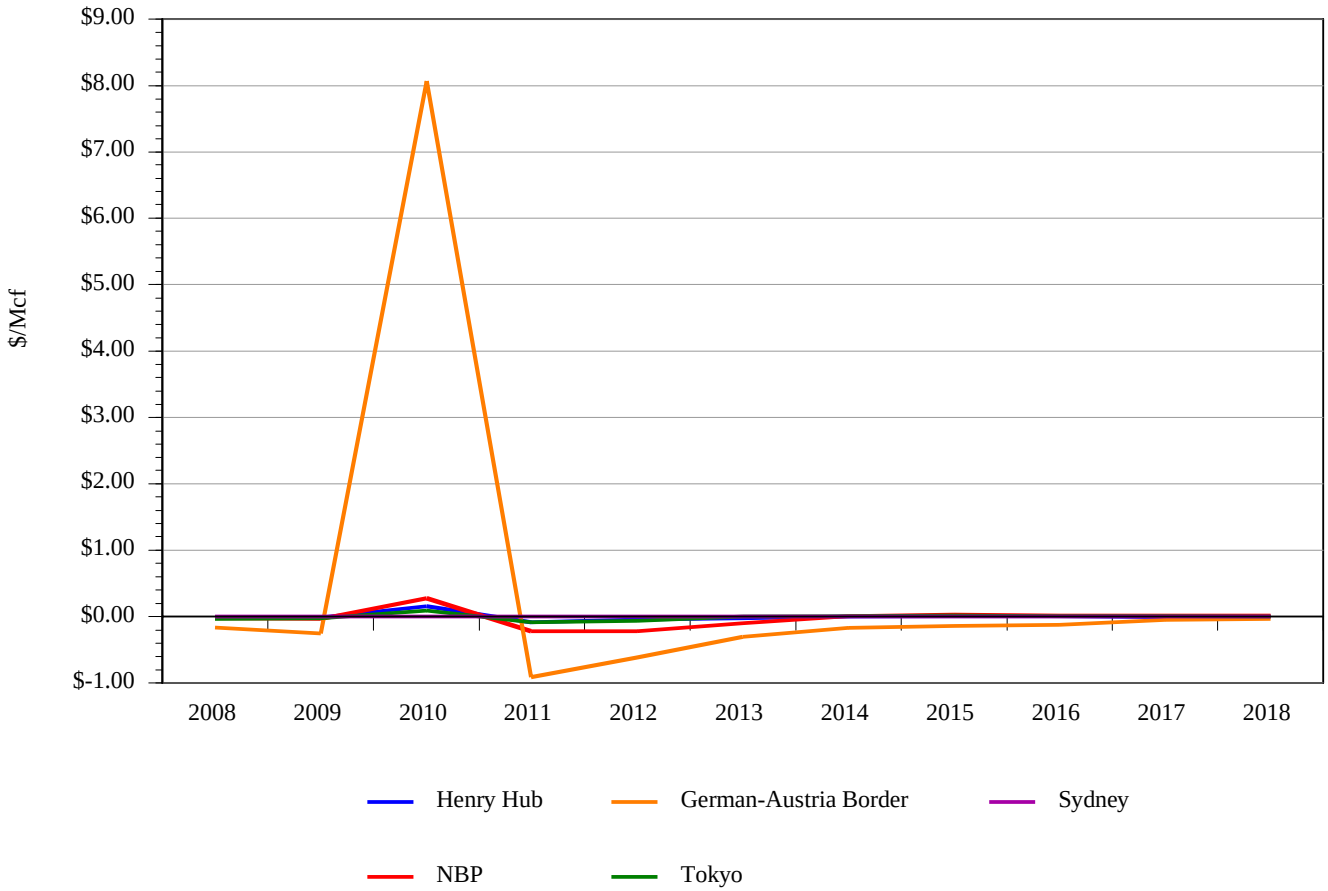
Global Upgrading Capacity Additions (k b/d)(1)



Source: Lehman Brothers Estimates.

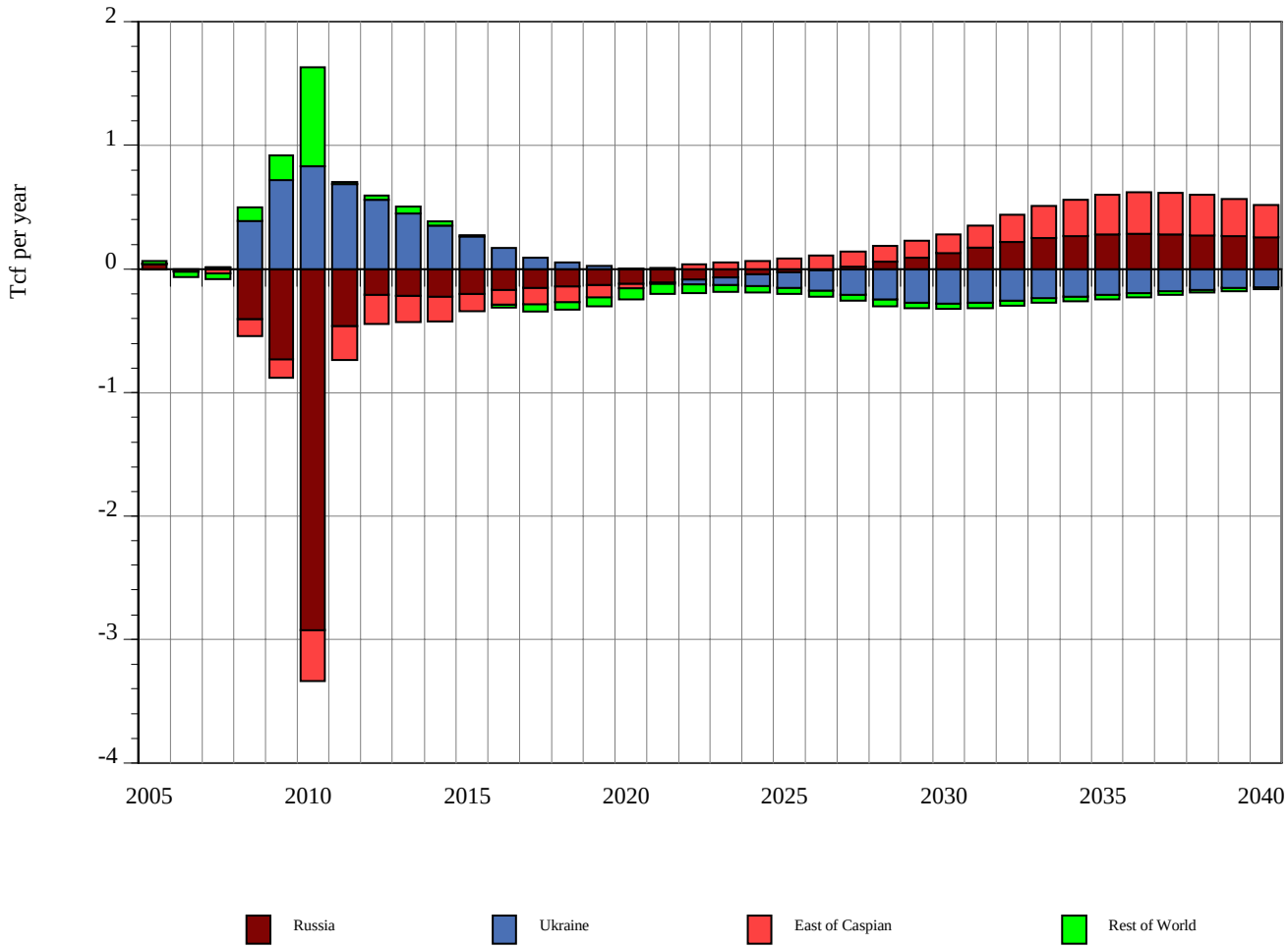
1. *Includes coking, catalytic cracking, and hydrocracking units and expansions.*

Myth Number 6: Russia has long term superior market power
Scenario Analysis: Russian six month cutoff of natural gas supply to Europe



Gazprom: A Pincher Movement to Corner Distribution to Europe?

Scenario: Russian six month cutoff of natural gas supply to Europe—Supply Impacts. LNG impacts mean supply adjustments divided among many players, not just EU



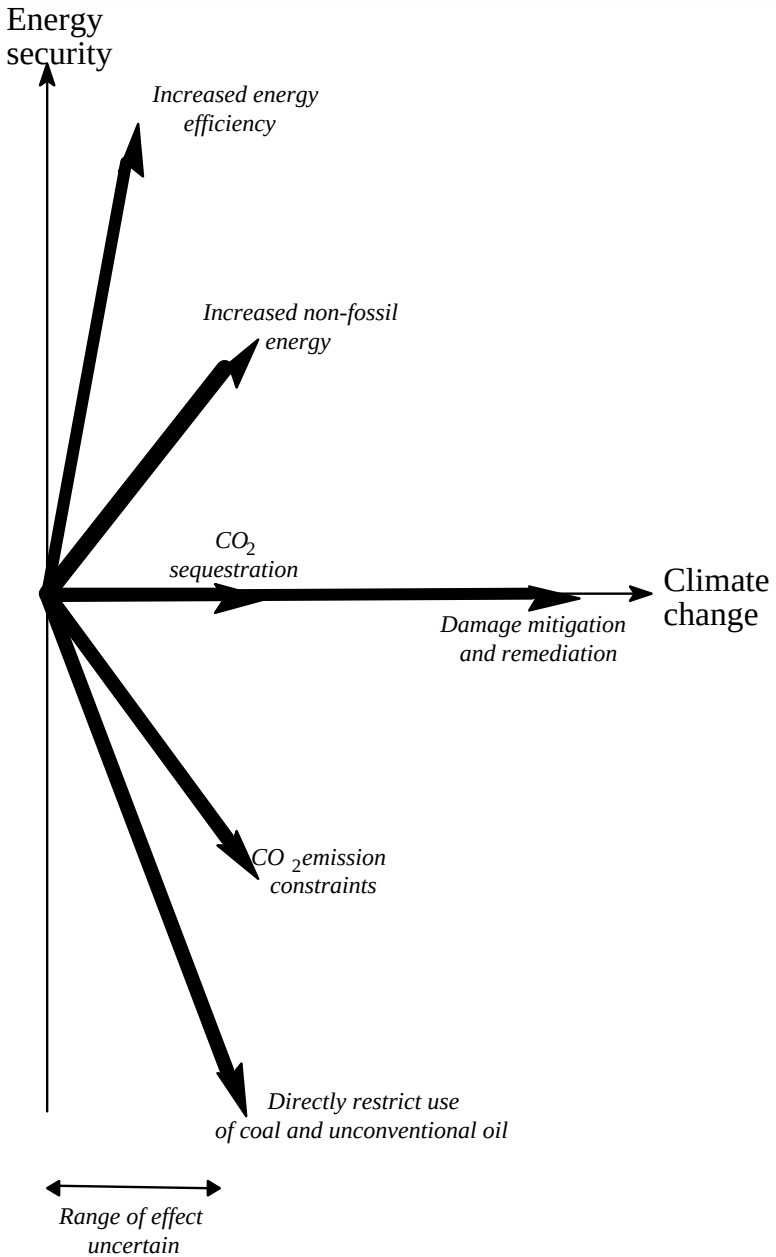
Myth Number 7: Climate policy and energy security are the same thing.

"We must treat energy security and climate security as two sides of the same coin"

--Tony Blair, October 20, 2006

This is a mistaken notion. There is a conflict between the two that will need to be resolved through smart science and good policy.

Instruments and targets



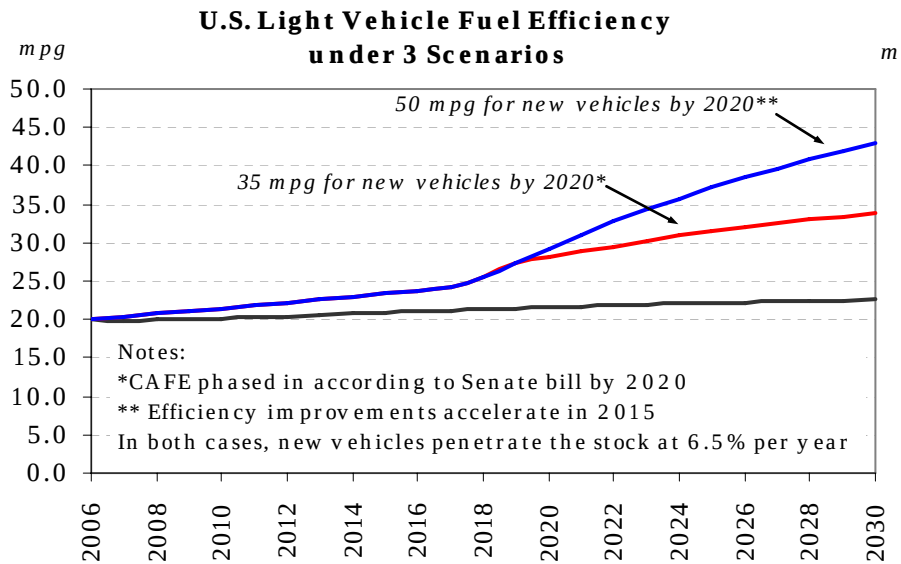
- Some policies can further both goals:
  - Increasing energy efficiency
  - Increasing non-fossil fuel sources
- Some policies have conflicting effects:
  - Directly limiting the use of coal and unconventional oil
  - CO2 emissions constraints, which can artificially increase demand for natural gas
- Climate change policies with no effect on energy security:
  - Increased sequestration
  - Climate damage adaptation and remediation

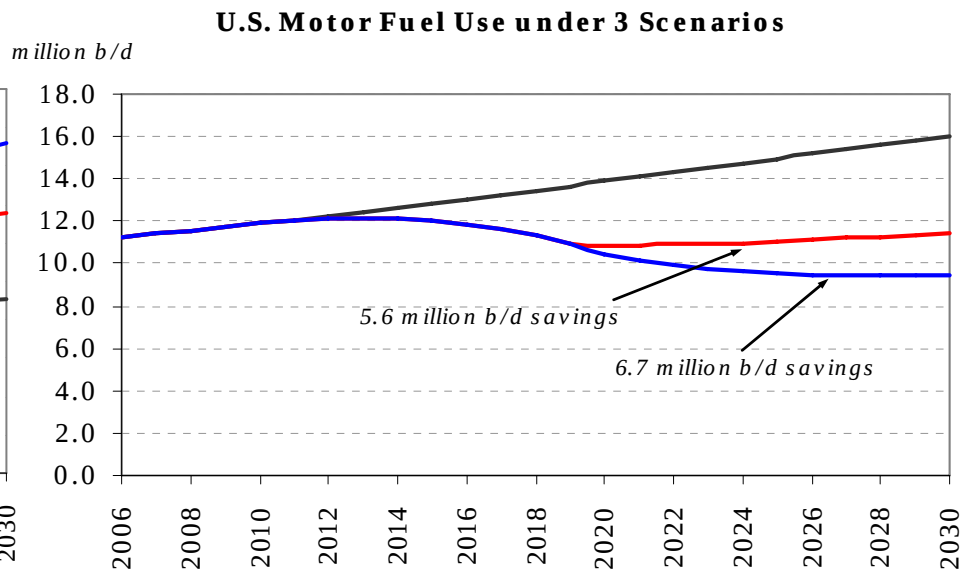
Climate and Energy Security Policy Will Focus Heavily on Promoting or Regulating Automobile Efficiency

- Most forecasts indicate that future growth in global oil demand will come almost entirely in the transportation sector
- Technology and policy, therefore, will be vital to determining the pace of oil demand growth
  - European demand has been flat due to effective policies
  - U.S. is now be following suit
    - California Low Carbon Standard aimed to drive innovation in the efficiency of vehicles and alternative transportation fuel
  - The extent to which China and India, in particular, also get into the act is very important to future demand growth in developing Asia

New U.S. Efficiency Standards Will Reduce U.S. Oil Demand

- Fuel efficiency improvements have significant benefit, but are offset by growth in vehicle stocks and miles driven (income and "rebound" effects)
  - High prices are revealing a demand response as recent U.S. miles driven data are slightly lower
- Similar arguments hold in all countries, with potential for efficiency improvement varying across countries
- Policy is multi-pronged in its approach
  - A technological breakthrough, such as with plug-in hybrid vehicles, could push demand lower into the future. Once these alternatives are adopted, the market is forever changed
  - Biofuels can induce even further reductions in demand





How long before we are back on the same upward price path?

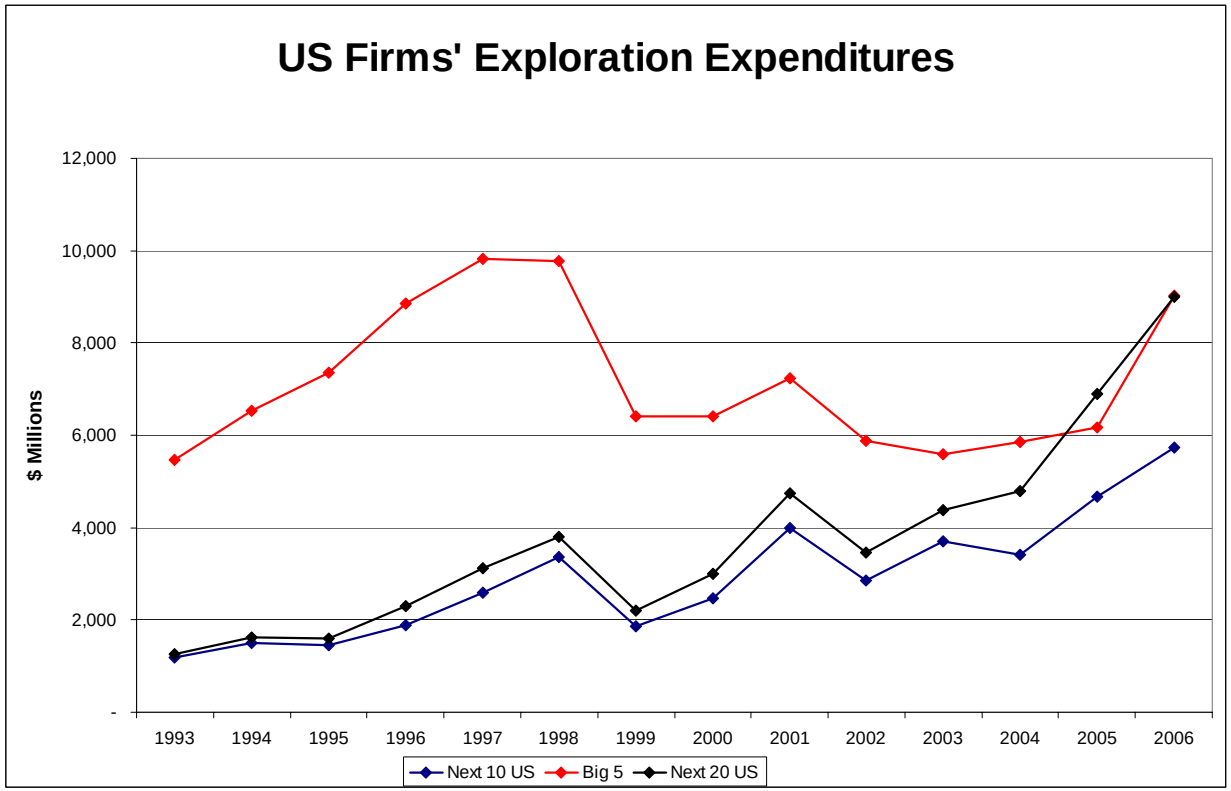
There are many reasons to remain concerned about the long term supply situation.

The restructuring of the oil industry means that we are going to be more dependent on national oil companies to produce future energy supply.

Longer term, given this restructuring, the future oil supply may fail to materialize in the volumes we expect and need, especially now that oil prices are falling.

There still exists a vast pent up demand for automobiles and electricity in the developing world that will be hard to meet long term without a breakthrough change in the status quo.

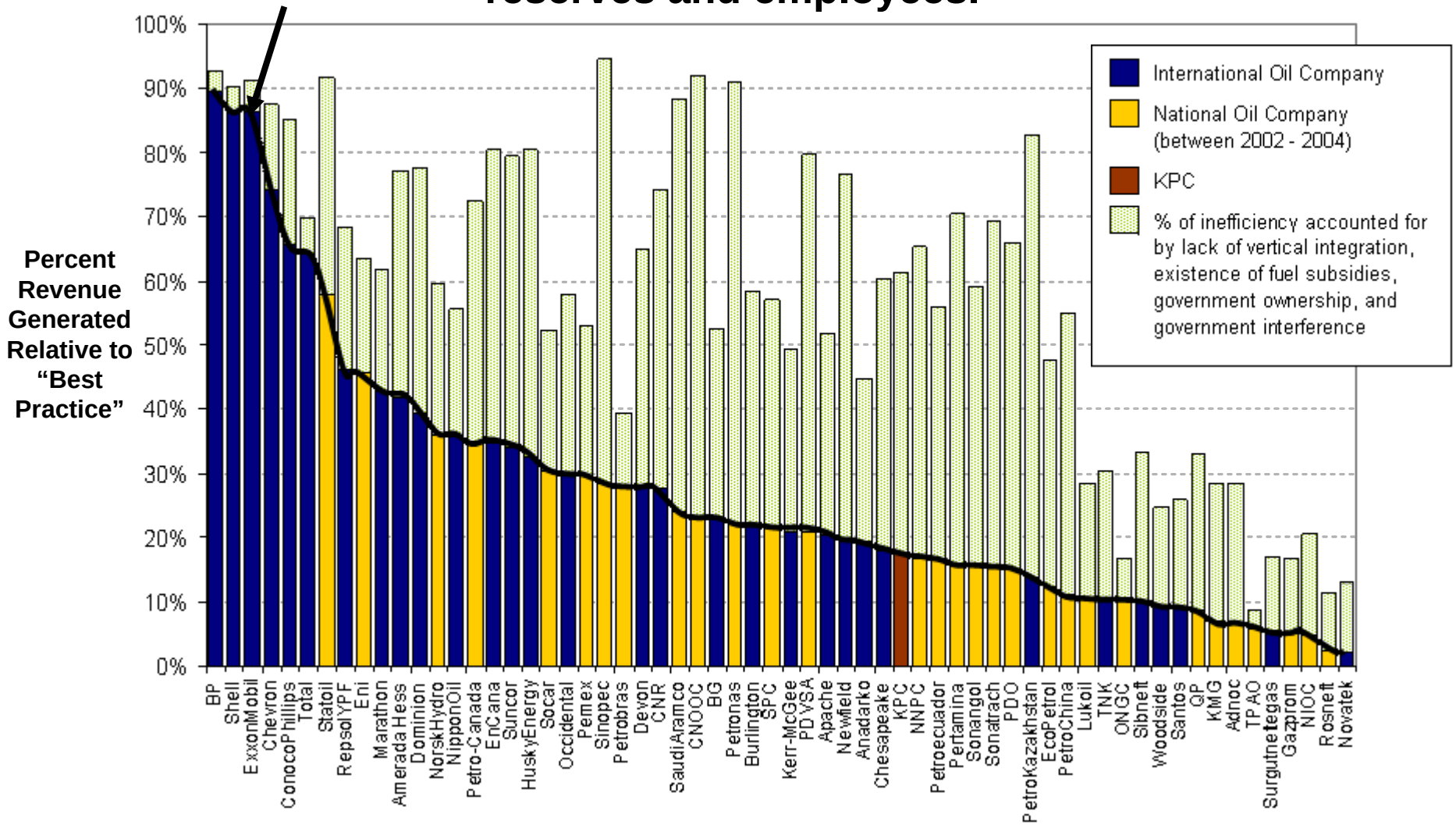
IOCs have been slow to respond with higher exploration spending. The US Independents are spending the same amount on exploration as the Largest Five IOCs.



Source: Baker Institute Working Paper: The International Oil Companies

Efficiency can impact how effective NOCs can be in bringing on new supplies

Revenue efficiency is measured as the percent of revenue a company achieves relative to "best practice" for a given level of reserves and employees.



Gulf investment doing little more than offsetting losses elsewhere in OPEC

- **OPEC Capacity** **1998** **2001** **2003** **2005** **2008**

Saudi Arabia	9.8	9.9	10.15	10.3	11.5
Iran	3.7	3.8	3.8	4.0	4.0
Iraq	2.8	3.05	2.2	1.8	2.5
Kuwait	2.4	2.4	2.5	2.6	2.4
UAE	2.4	2.45	2.5	2.4	2.7
Qatar	0.72	0.75	0.75	0.82	0.85
Venezuela	3.3	3.1	2.5	2.5	2.2
Nigeria	2.05	2.3	2.3	2.3	2.5
Indonesia	1.35	1.3	1.15	0.9	0.83
Libya	1.45	1.45	1.45	1.6	1.75
Algeria	0.88	0.88	1.15	1.35	1.425
Total	**30.85**	**31.38**	**30.45**	**30.57**	**32.65**
Call on OPEC	25.85	28.23	29.2	29.87	31.7
Spare Capacity	**5.0**	**3.15**	**1.25**	**0.7**	**0.95**