

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

### Study Overview

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**Amy Myers Jaffe**  
**James A. Baker III Institute**  
**for Public Policy,**  
**Rice University**





- 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.

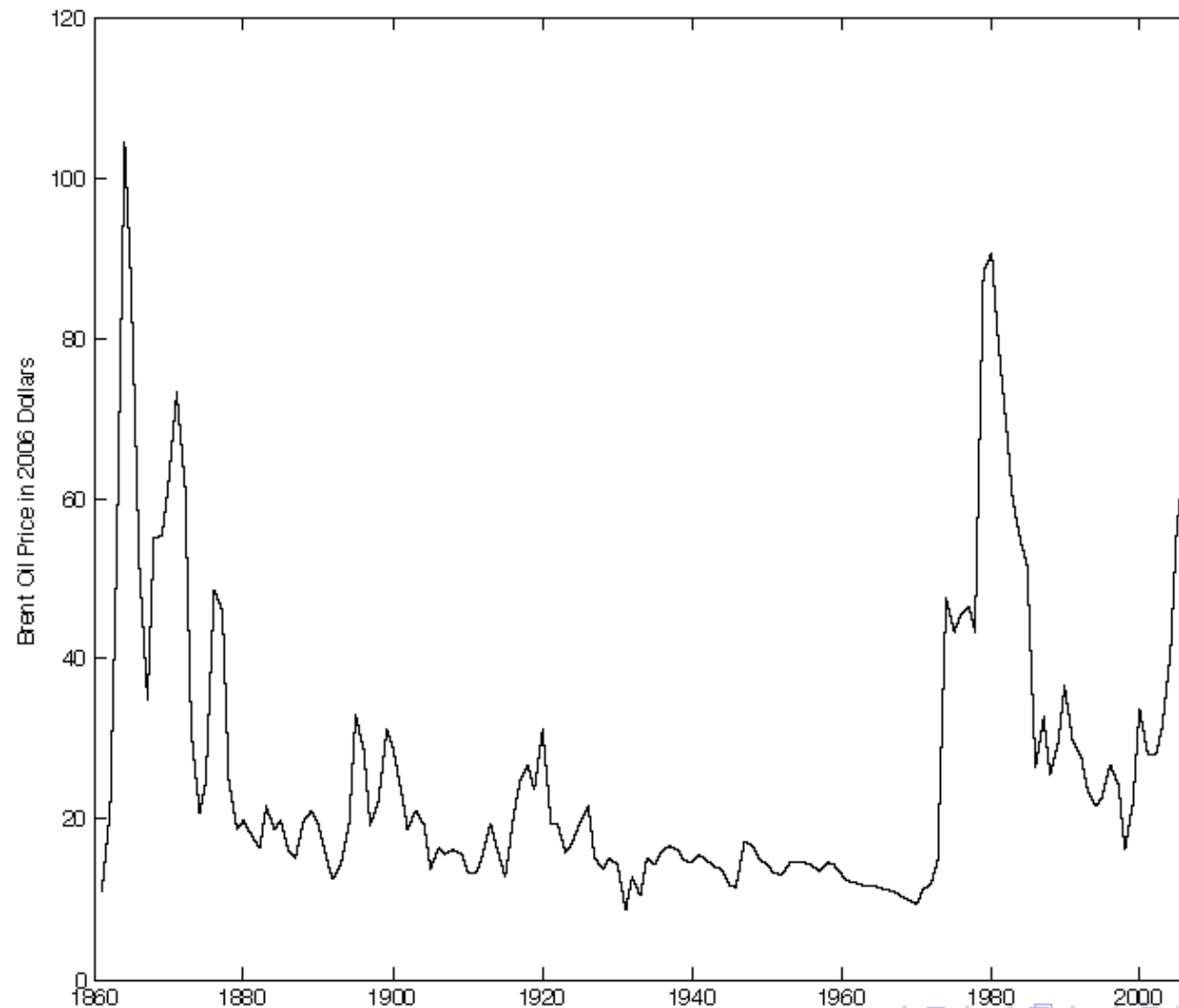
**Key myth stories have been plaguing the oil community.**

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

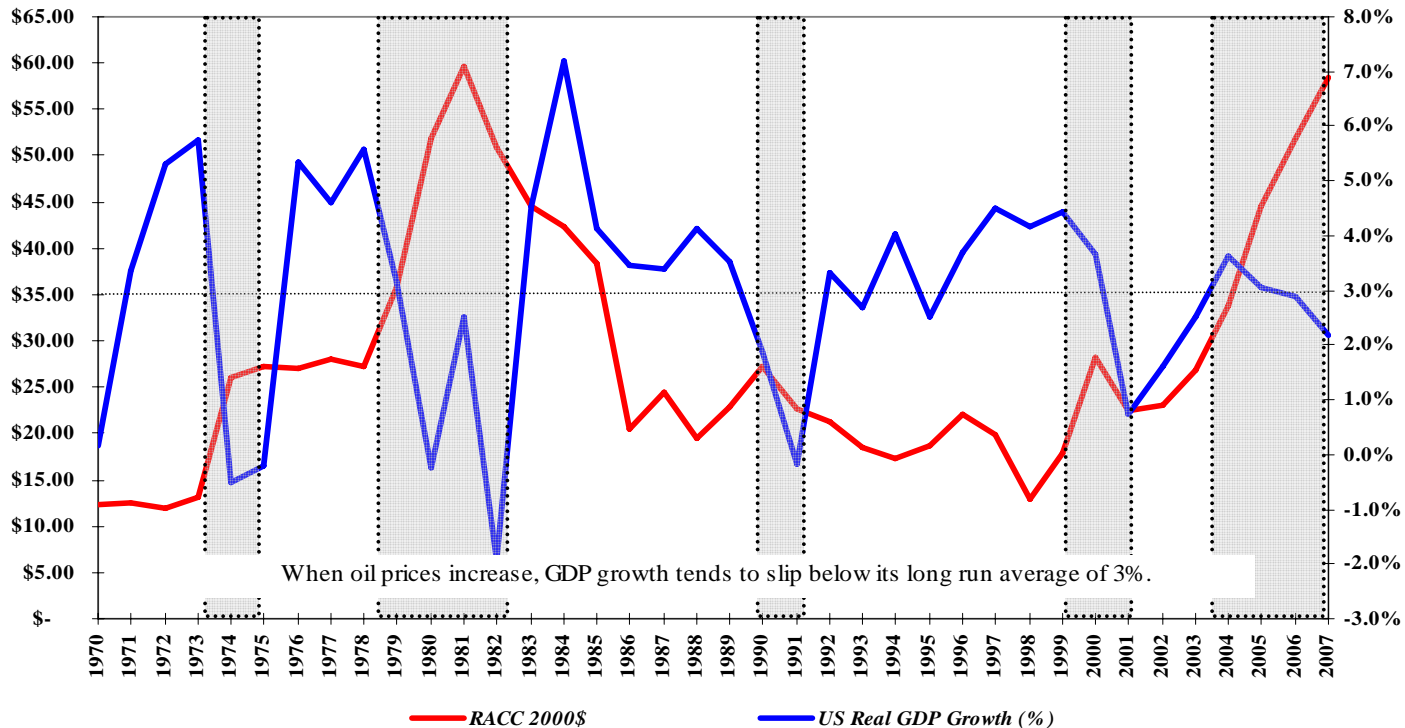
*Myth number one was that oil had moved out of its 200 year cycle and prices would remain high forever because of peak oil.*

# Coincidence of High Oil Prices with Financial Crises

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

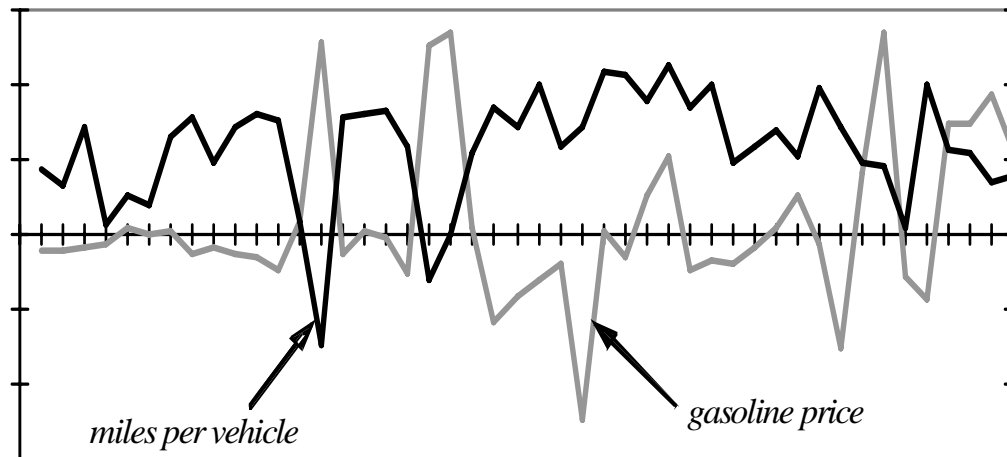


## Oil price and the Macroeconomy



- 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.

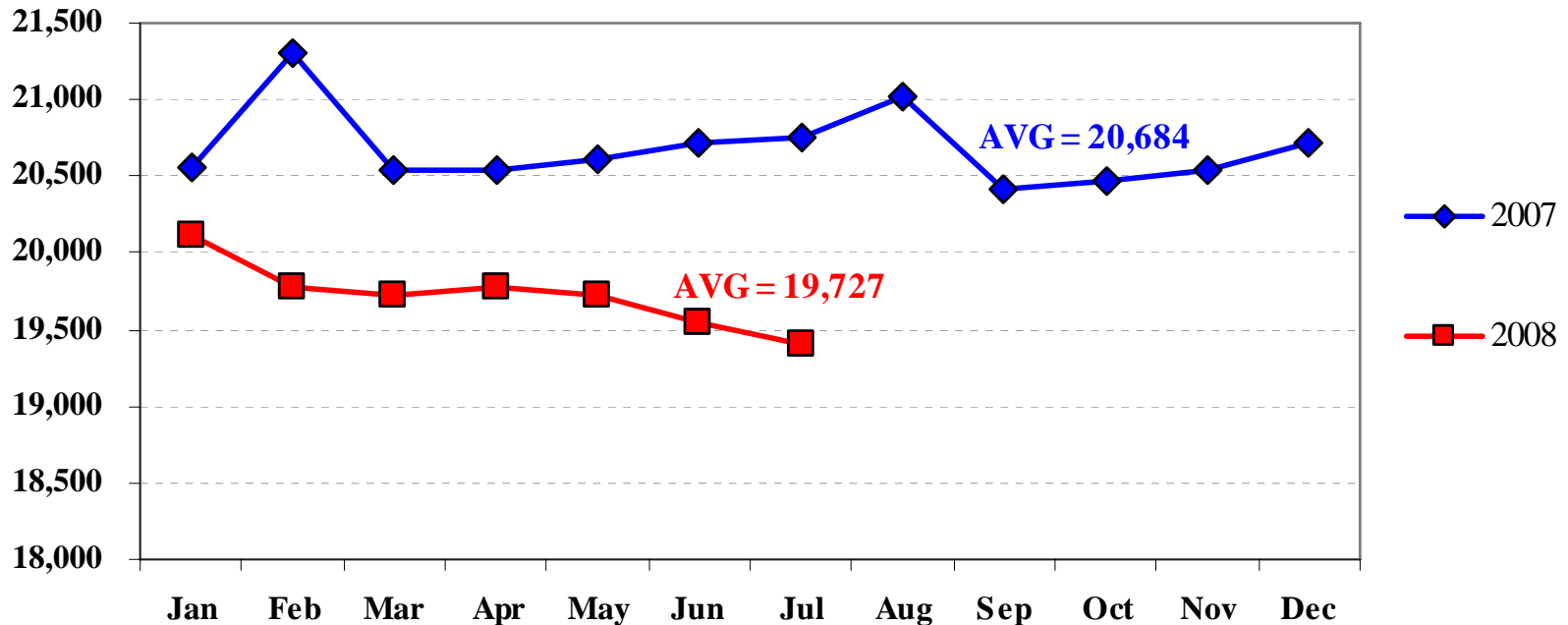
- **Myth Number 2: Americans will drive the same amount no matter what the oil price is.**
- **Reality: U.S. Vehicle Miles Traveled is Falling**
- Annual Percentage change in Miles Per Vehicle 1960-2006



## 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.

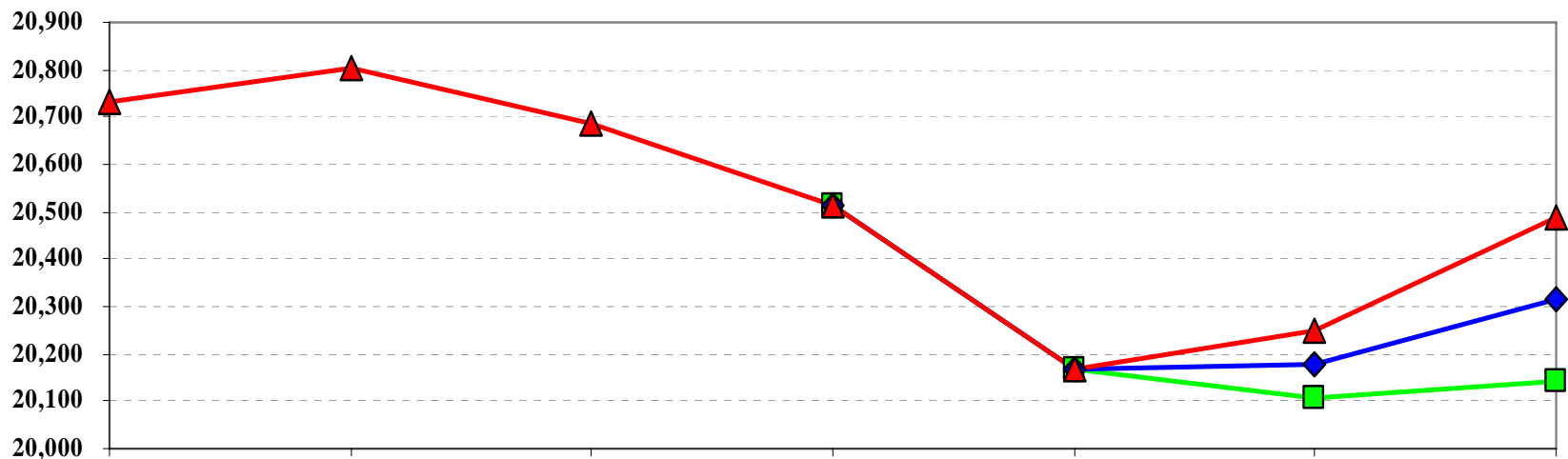
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## US Oil Demand

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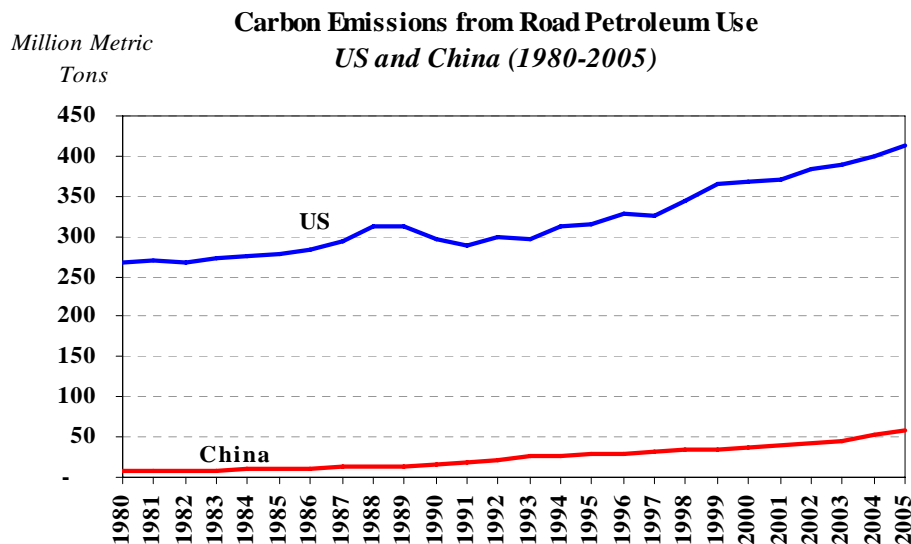
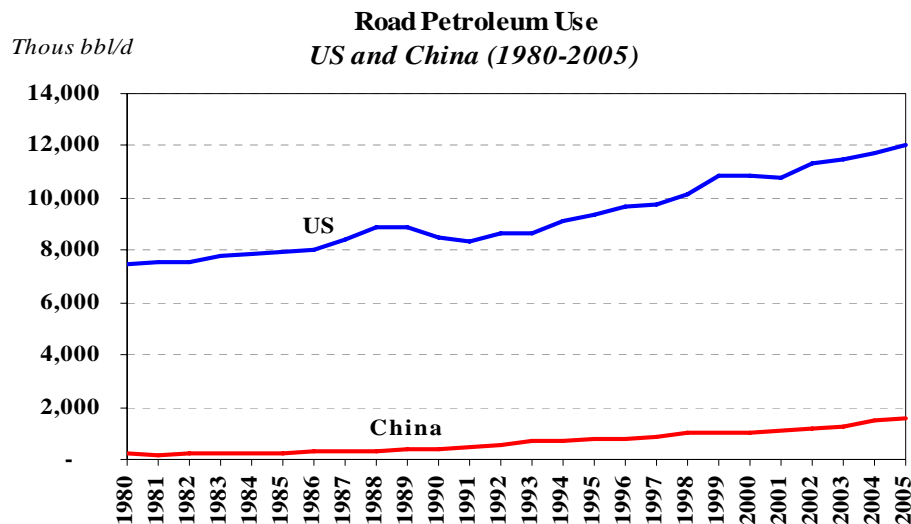
	2004	2005	2006	2007	2008	2009	2010
GDP growth ...	3.64%	2.94%	2.78%	2.03%	0.5%	2%, 1%, 0%	3%, 2%, 1%
Price .....	\$ 33.80	\$ 44.56	\$ 51.78	\$ 56.77	\$ 90.79	\$ 86.34	\$ 83.20
HDD .....	4290	4315	3996	4255	4463	4463	4463
Fuel Eff .....	17.1 mpg	17.1 mpg	17.2 mpg	17.4 mpg	17.5 mpg	17.5 mpg	17.6 mpg

## 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

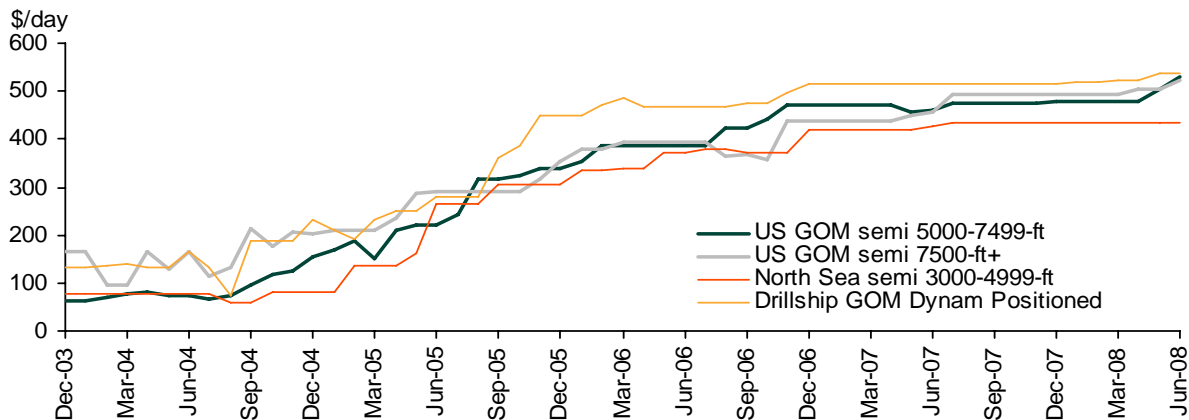
Source: Energy Intelligence

( <i>'000 b/d</i> )		Chg. vs.		Chg. vs.		Chg. vs.		Chg. vs.		Chg. vs.
<b>Main Markets</b>	<b>May '08</b>	<b>May '07</b>	<b>June '08</b>	<b>June '07</b>	<b>July '08</b>	<b>July '07</b>	<b>Aug. '08</b>	<b>Aug. '07</b>	<b>Q2'08</b>	<b>Q2'07</b>
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%
<b>Total OECD-30</b>	<b>47,620</b>	<b>-0.75%</b>	<b>47,749</b>	<b>-2.13%</b>	<b>47,529</b>	<b>-2.60%</b>	<b>48,014</b>	<b>-2.20%</b>	<b>47,648</b>	<b>-4.40%</b>
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%
<b>Total Non-OECD</b>	<b>38,875</b>	<b>4.50%</b>	<b>39,051</b>	<b>6.27%</b>	<b>38,235</b>	<b>4.10%</b>	<b>37,976</b>	<b>2.40%</b>	<b>38,644</b>	<b>7.60%</b>
<b>Total World</b>	<b>86,495</b>	<b>1.55%</b>	<b>86,801</b>	<b>1.48%</b>	<b>85,764</b>	<b>0.30%</b>	<b>85,990</b>	<b>-0.20%</b>	<b>86,292</b>	<b>0.60%</b>

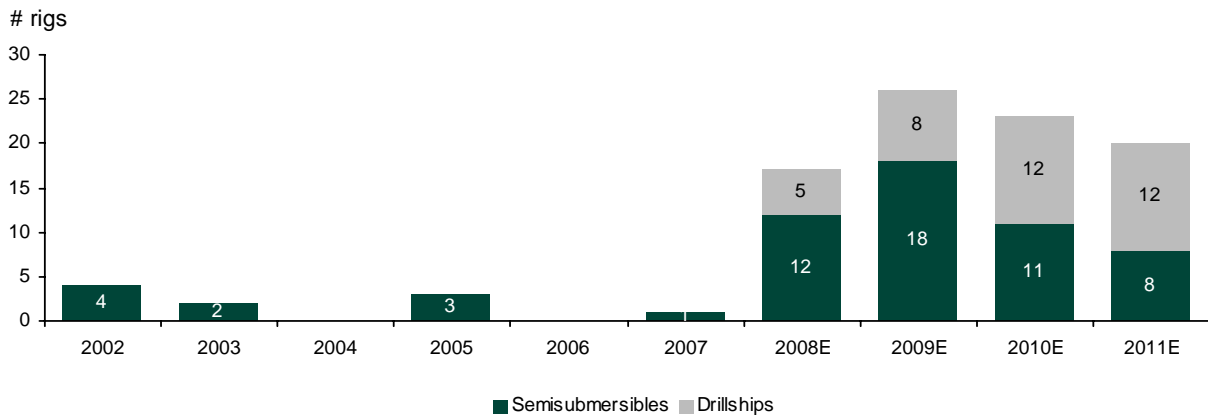
- Myth Number Four: China has replaced the US as a “driving” force
- 250 million U.S. vehicles vs China’s 13 million vehicles on the road



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



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

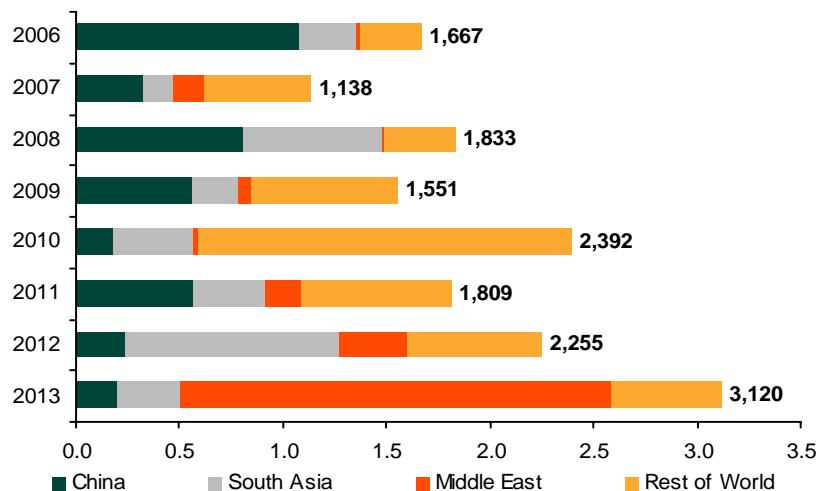


Source: ODS-Petrodata and Lehman Brothers Estimates

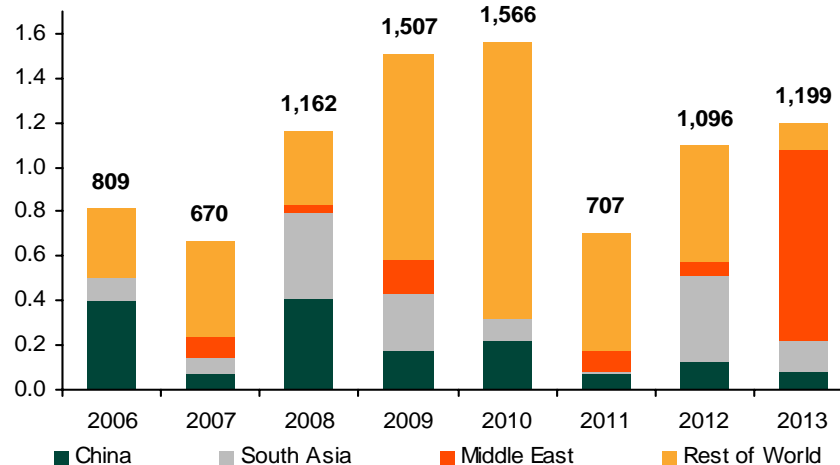
Refinery investment had not kept up with rapid demand growth in recent years, but we are approaching a turning point, especially East of Suez

- 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)

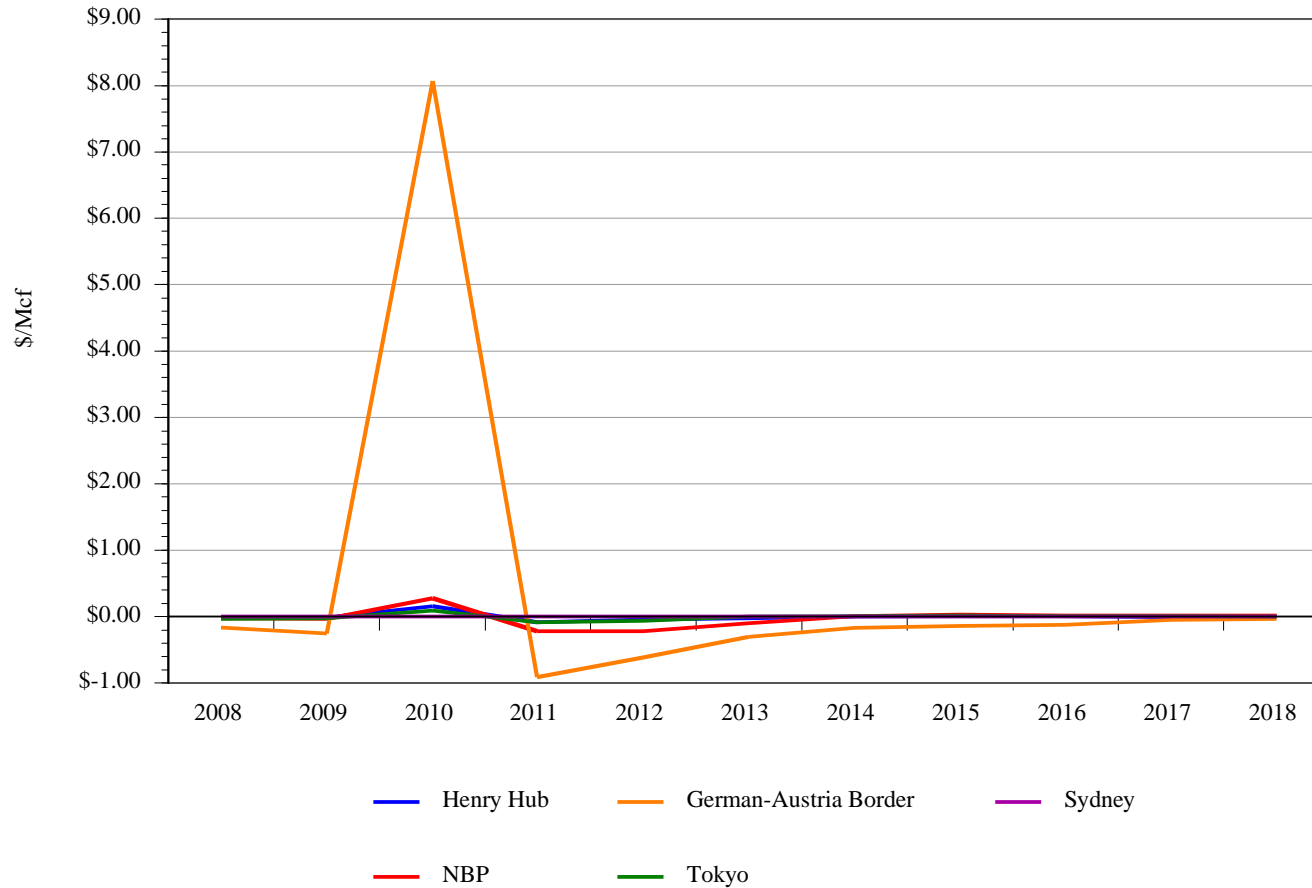


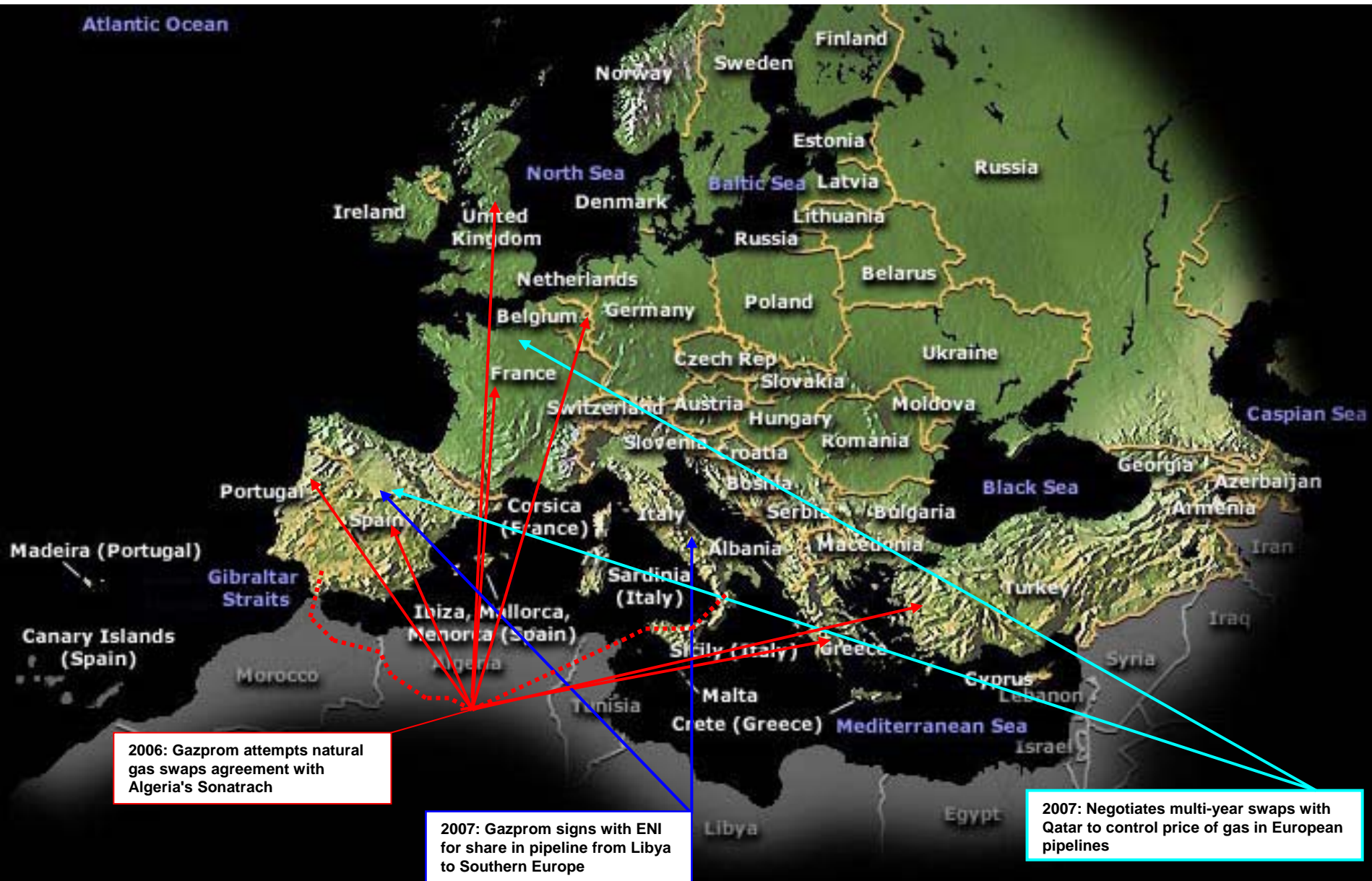
### Global Upgrading Capacity Additions (k b/d)(1)

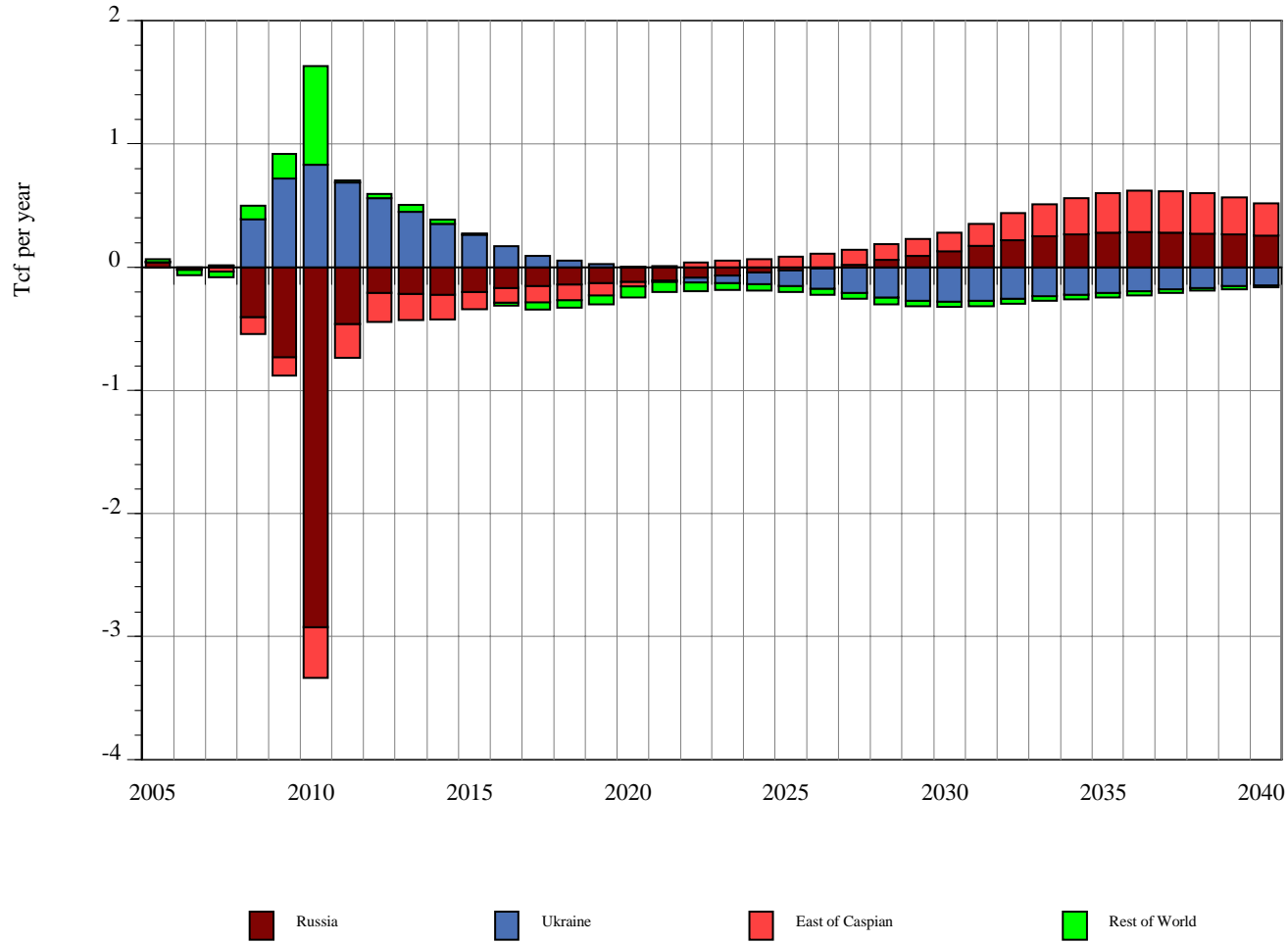


Source: Lehman Brothers Estimates.

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



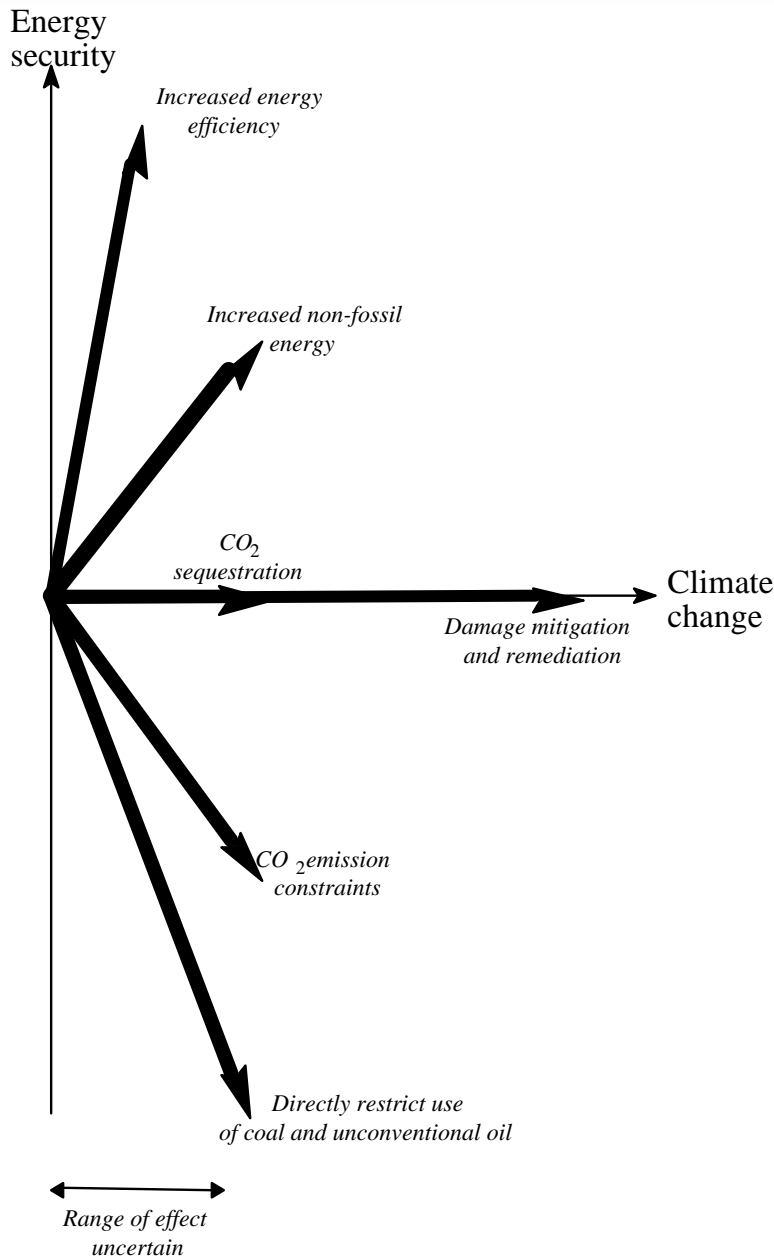




“We must treat energy security and  
climate security as two sides of the  
same coin”

--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.*



- 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
  - CO<sub>2</sub> 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

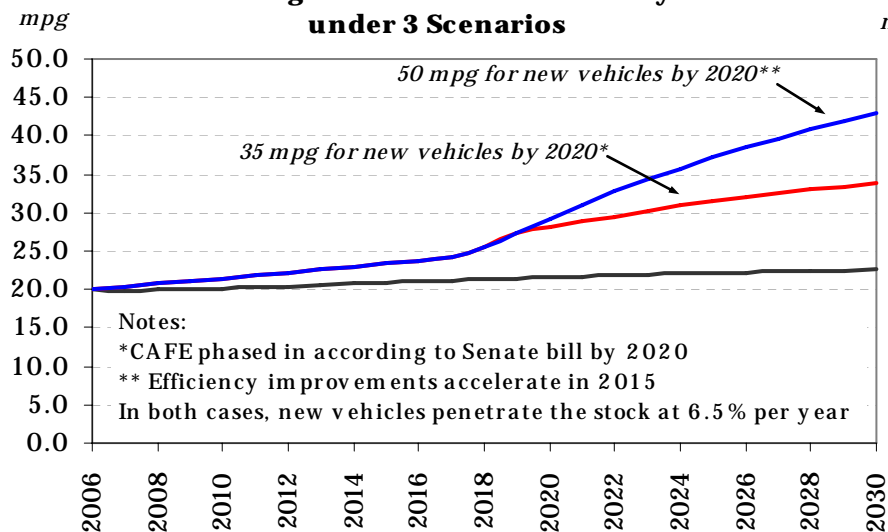
## **Climate and Energy Security Policy Will Focus Heavily on Promoting or Regulating Automobile Efficiency**

- 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 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

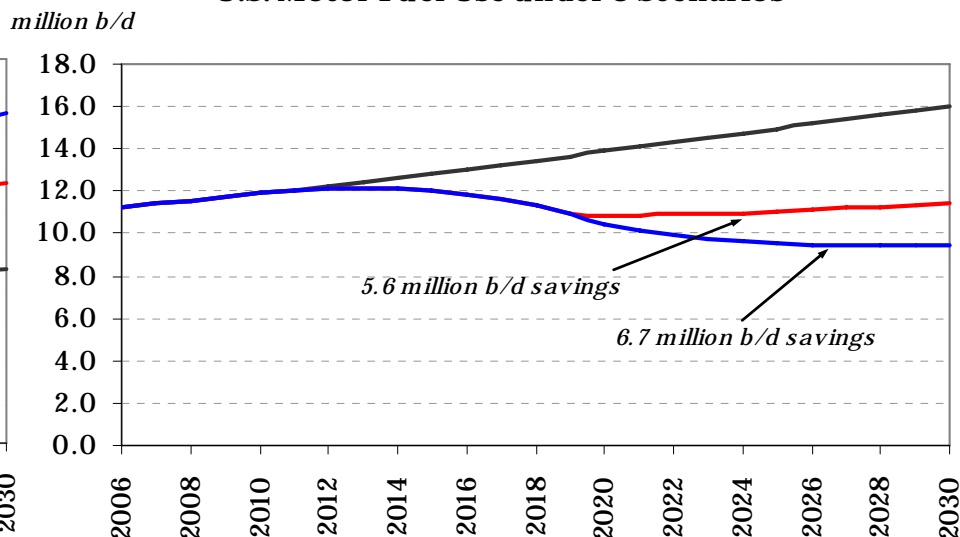
## New U.S. Efficiency Standards Will Reduce U.S. Oil Demand

- 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

**U.S. Light Vehicle Fuel Efficiency under 3 Scenarios**



**U.S. Motor Fuel Use under 3 Scenarios**

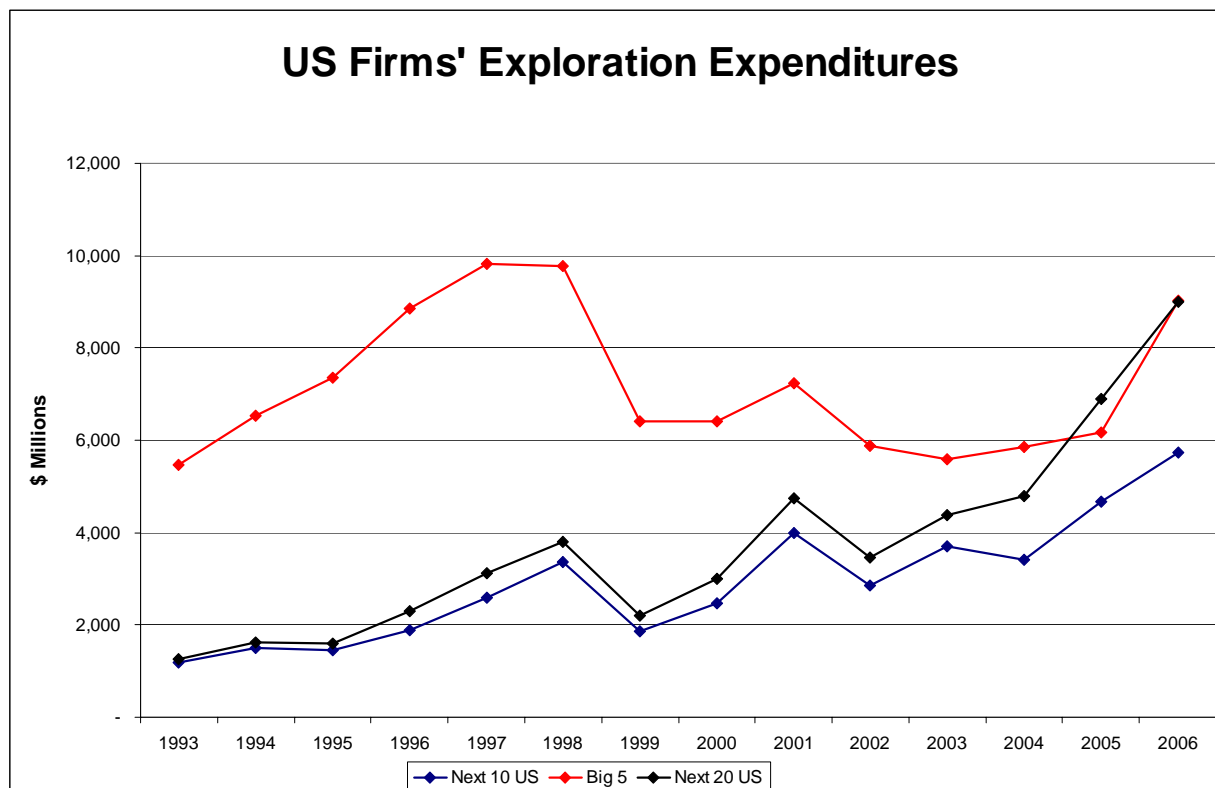


**There are many reasons to remain concerned about the long term supply situation.**

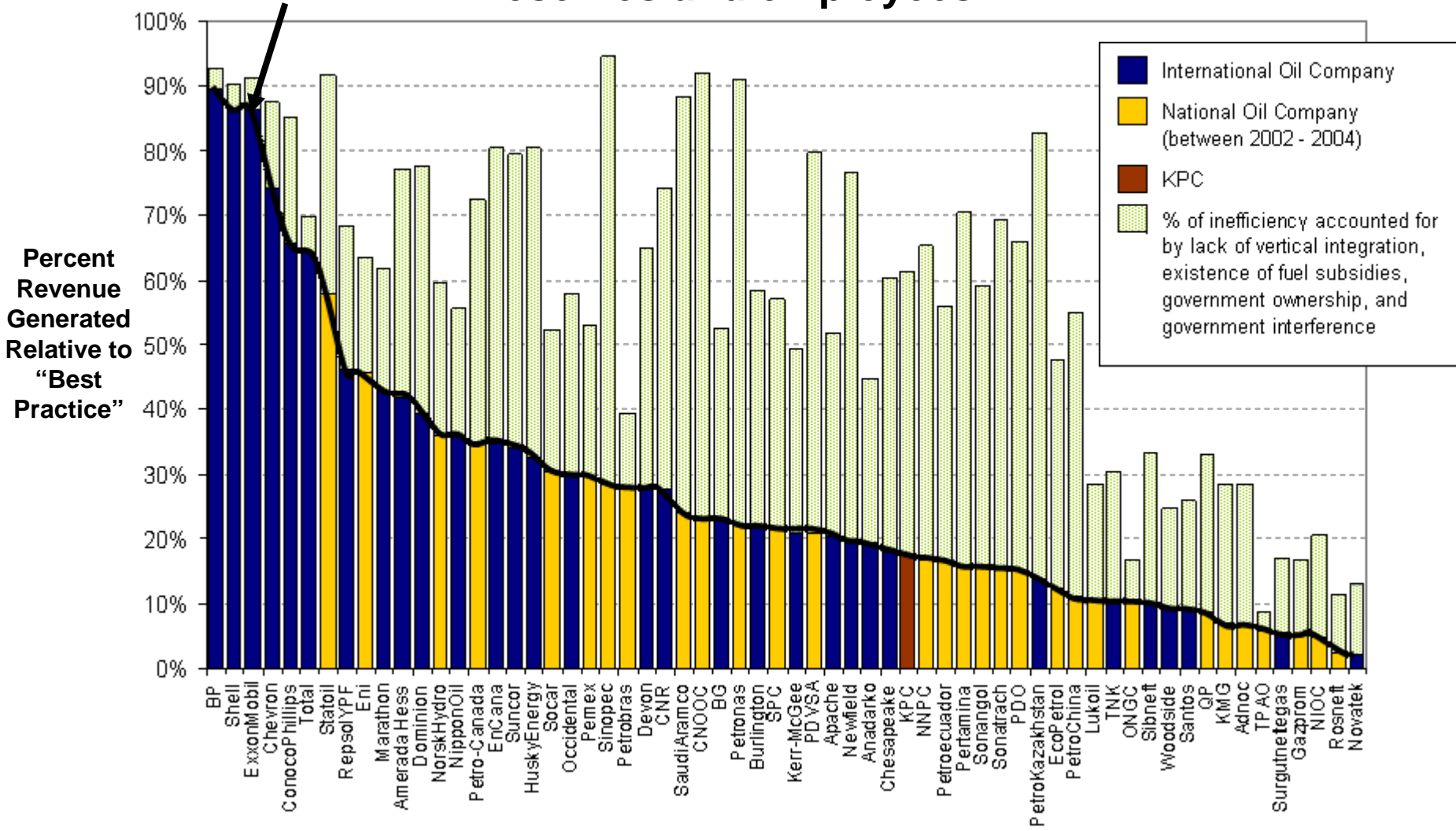
**The restructuring of the oil industry means that we are going to be more dependent on national oil companies to produce future energy supply.**

**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.**



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



- 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
<b>Total</b>	<b>30.85</b>	<b>31.38</b>	<b>30.45</b>	<b>30.57</b>	<b>32.65</b>
<b>Call on OPEC</b>	25.85	28.23	29.2	29.87	31.7
<b>Spare Capacity</b>	<b>5.0</b>	<b>3.15</b>	<b>1.25</b>	<b>0.7</b>	<b>0.95</b>