

# The Role of the State in Influencing the Environmental Impact of Economic Growth: Some Preliminary Thoughts

By Jason Scott Johnston

Henry L. and Grace Doherty Charitable Foundation  
Professor and

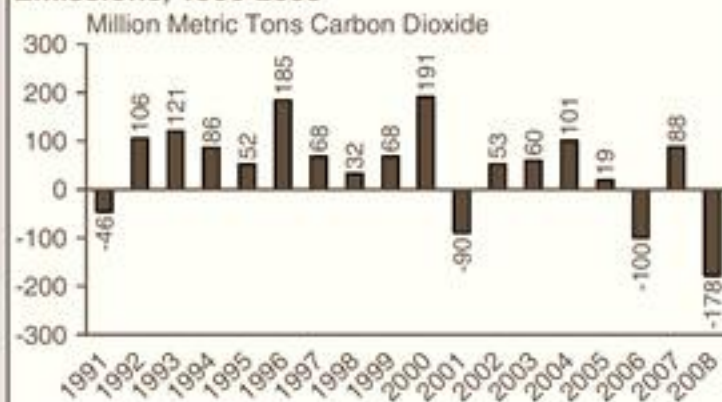
Nicholas Chimicles Research Professor of Business Law  
and Regulation

University of Virginia School of Law

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- Overview: what has been happening with U.S. economic growth and CO<sub>2</sub> emissions
- Policies for the Future
  - Naïve Policies for “Green growth” often backfire
  - Environmental benefits of economic growth likely underestimated
  - Easy, “no regrets” options likely much more limited than bottom-up engineering studies suggest
  - Need to consider economic incentives in a realistic model of government policy choice

**Figure 7. Annual Change in U.S. Carbon Dioxide Emissions, 1990-2008**



Source: EIA estimates.

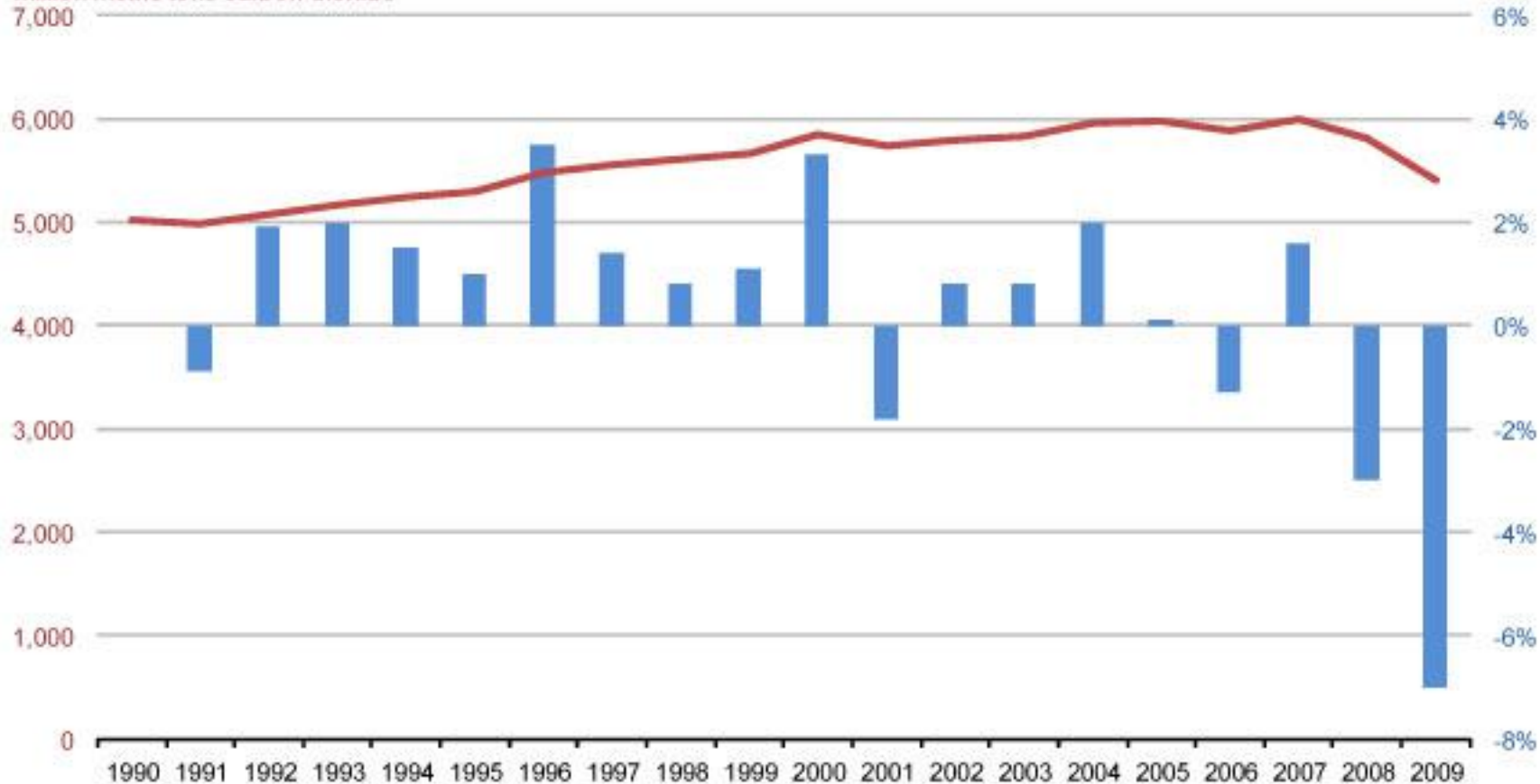
**U.S. Anthropogenic Carbon Dioxide Emissions,  
1990, 2007, and 2008**

	1990	2007	2008
Estimated Emissions (Million Metric Tons) . . . . .	5,022.3	6,017.0	5,839.3
Change from 1990 (Million Metric Tons) . . . . .		994.7	817.0
(Percent) . . . . .		19.8%	16.3%
Average Annual Change from 1990 (Percent) . . . . .		1.1%	0.8%
Change from 2007 (Million Metric Tons) . . . . .			-177.8
(Percent) . . . . .			-3.0%

In 2009, energy-related carbon dioxide emissions in the United States saw their largest absolute and percentage decline (405 million metric tons or 7.0 percent) since the start of EIA's comprehensive record of annual energy data that begins in 1949, more than 60 years ago. Also, emissions have declined in three out of the last four years, and .9 per cent average decline over period 2000-2009.

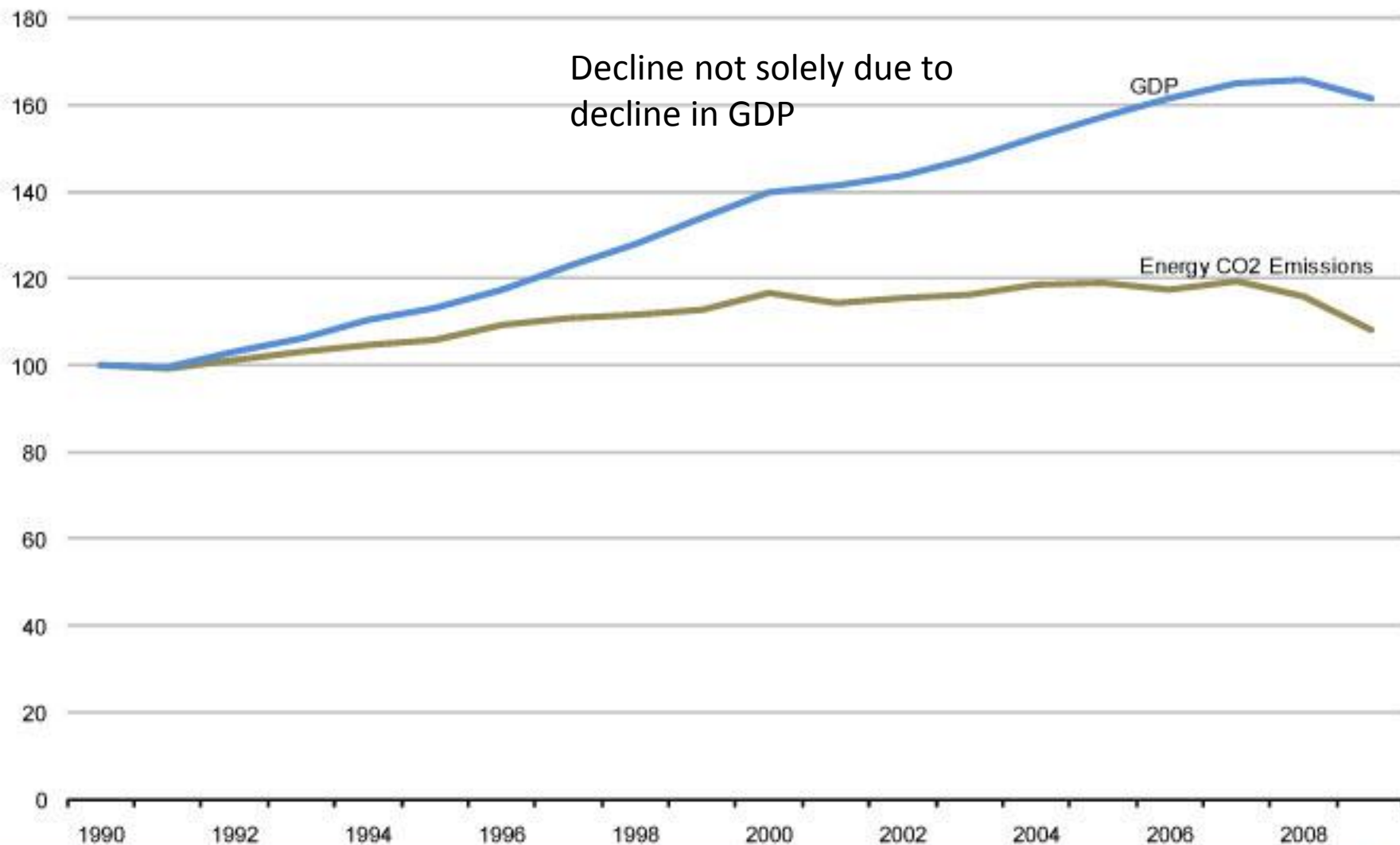
## Energy-related carbon dioxide emissions

million metric tons carbon dioxide

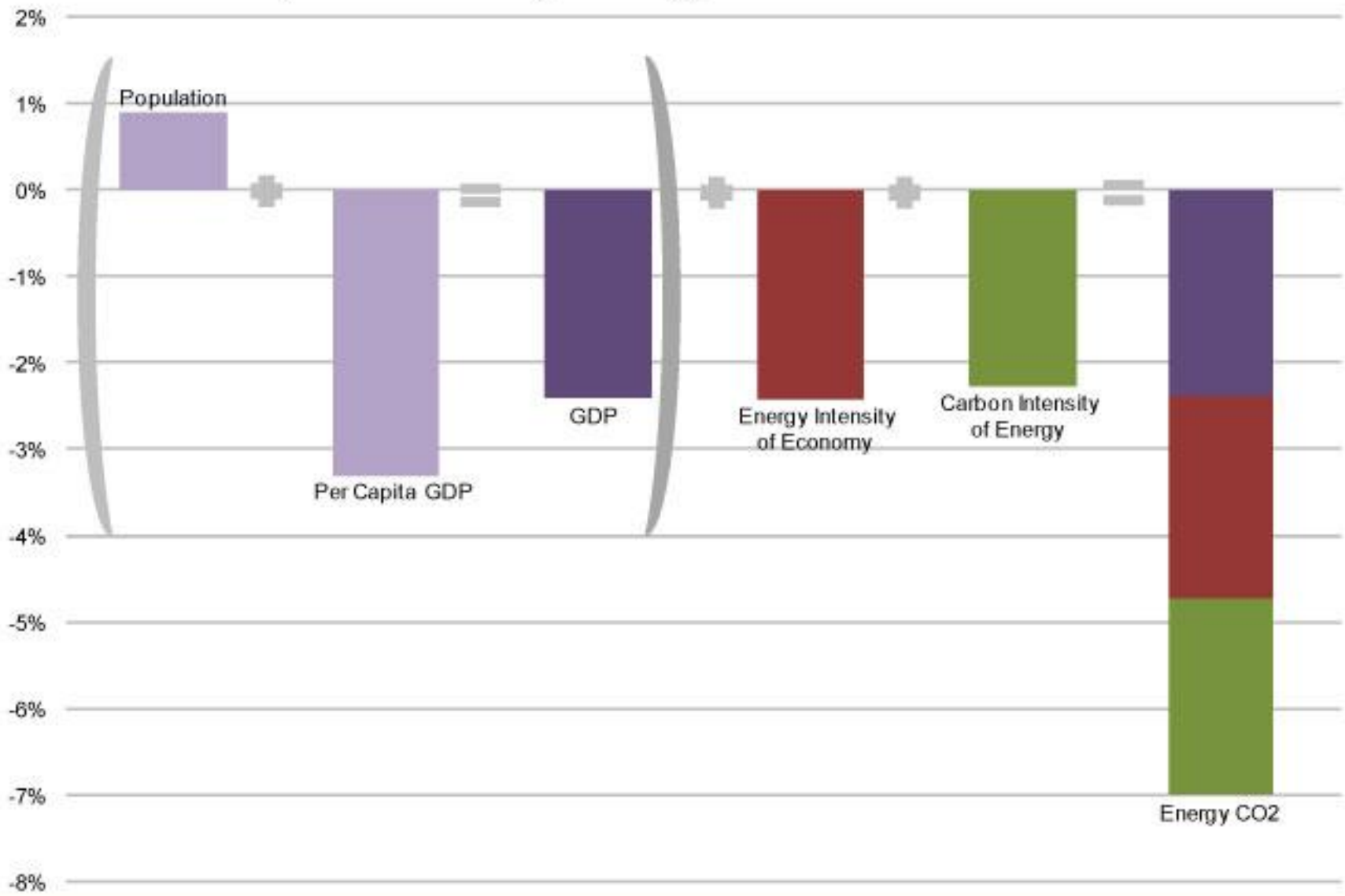


## Energy-related carbon dioxide emissions and GDP

Indexed: 1990 = 100



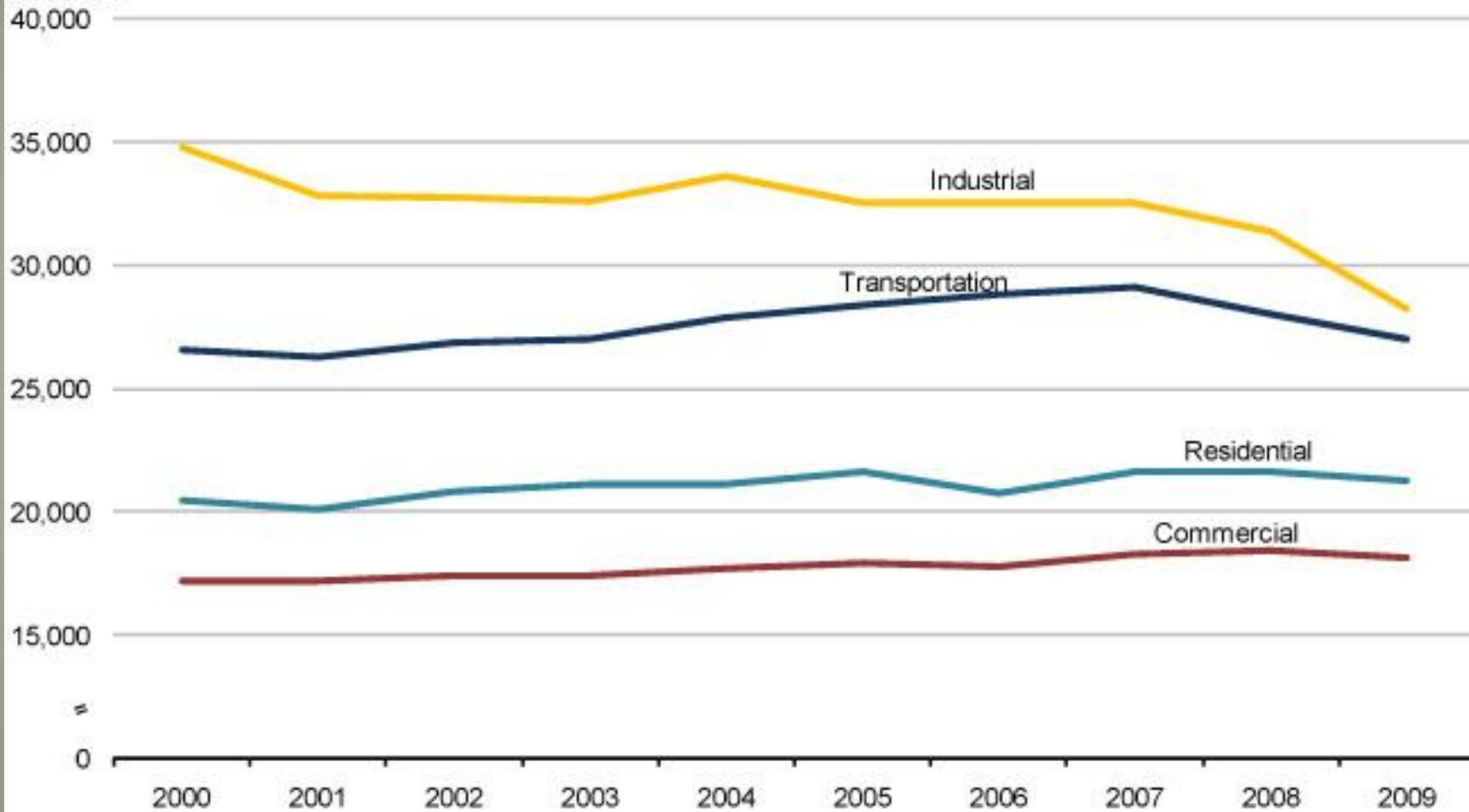
# Factors contributing to the 2009 change in energy-related carbon dioxide emissions





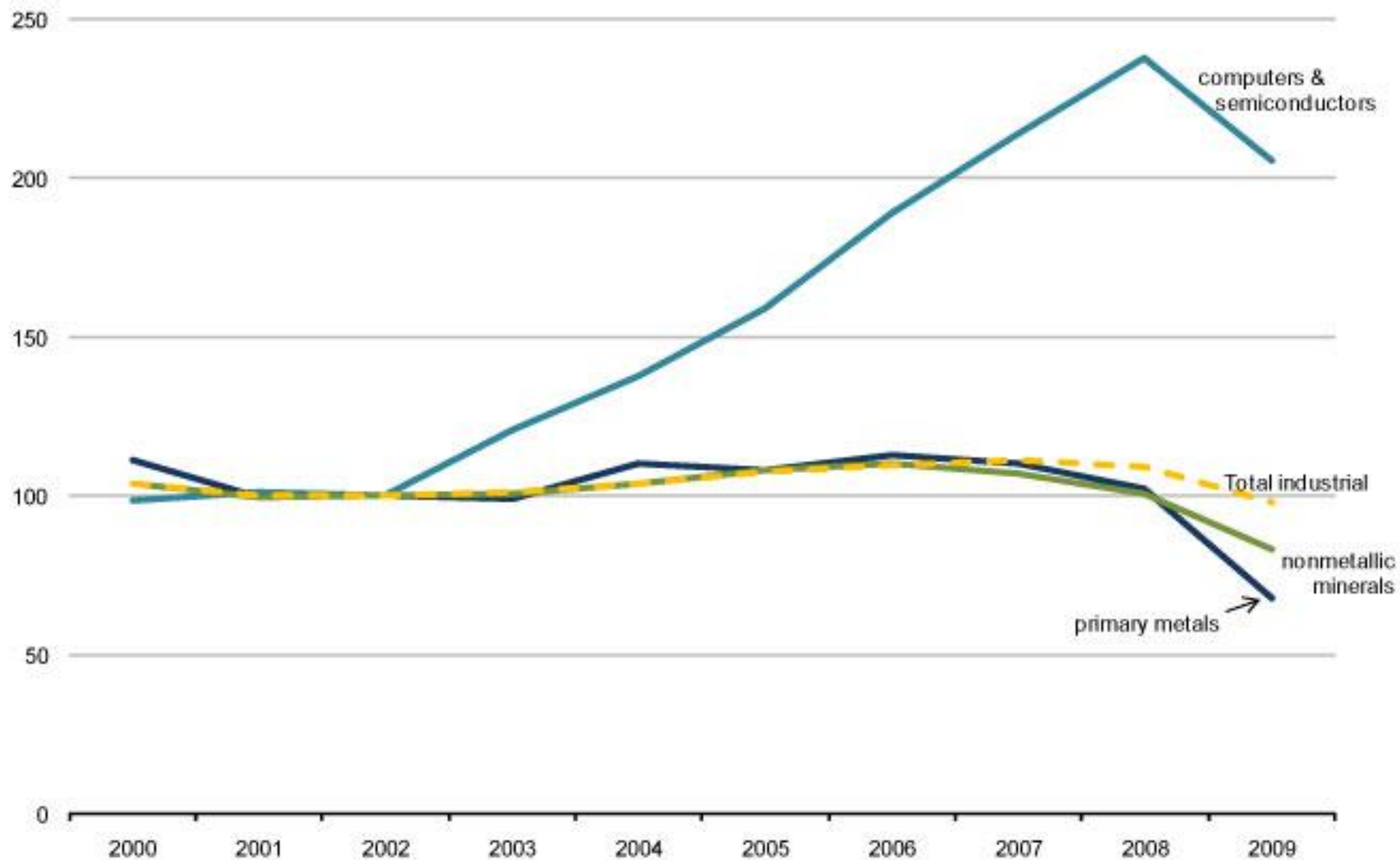
## Total energy consumption by sector

trillion Btu

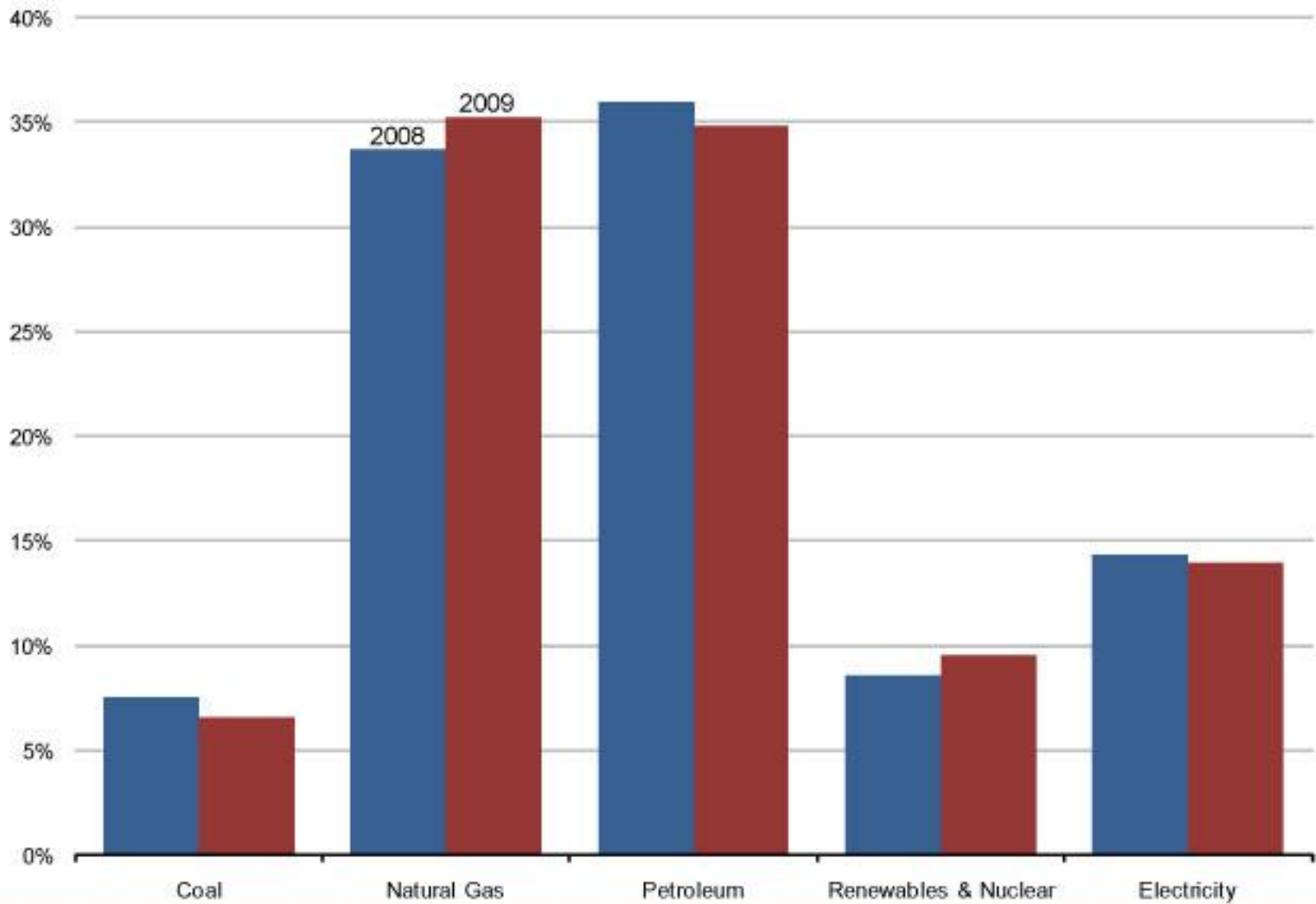


## Total industrial output compared to selected industries

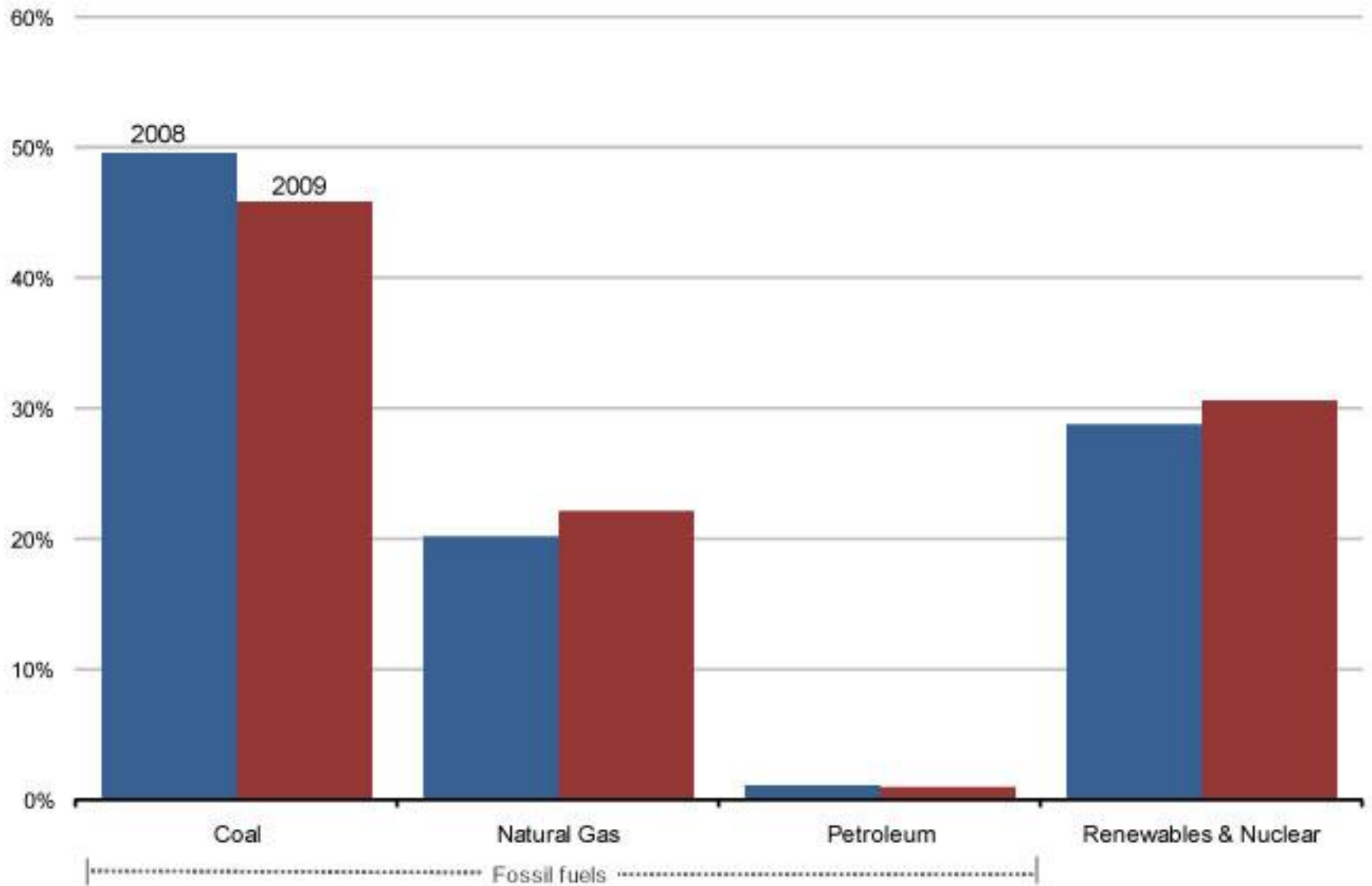
Indexed: 2002 output equals 100



## Industrial sector fuel share changes between 2008 and 2009



## Electric power sector generation shares



# Economic Growth and the Environment: the Future

- All growth projections for developed world have been too high and will continue to be too high
- “Green growth” does not mean just lowering CO<sub>2</sub> emissions, but reducing environmental harm so as to maximize net benefits of growth to the society, while investing in preservation and restoration
- There are indeed potential conflicts between CO<sub>2</sub> emission reduction and preservation/restoration: the environmental costs of wind and solar (Scotland, Wyoming) and hydro
- Moreover, growth often means lower environmental impact: e.g., gains in crop yield since 1961 due to higher yielding varieties, increased pesticide and fertilizer use have preserved forests and continuing increases in crop yields necessary to minimize agriculture’s future impact on ghg emissions (see Burney et al PNAS 2010)

# Policy Choices

- Naïve: subsidize “green” energy because of supposed positive externalities and to equalize playing field with subsidized fossil fuels
  - Subsidies to U.S. oil, coal and natural gas of \$72 billion between 2002 and 2008, but \$54 billion in tax credits, only \$18 billion in cash and R&D subsidies
  - 2009 stimulus, \$100 billion to DOE for renewables
  - Most of renewables subsidy to date has gone to corn-based ethanol
  - Lots of federal stimulus money spent on new roads by States

# Harmonizing Markets and the Environment

- Must consider economic incentives
  - “Bottom-up” engineering approaches revealing ghg emission reduction free lunch/no regrets (McKinsey, 2008) fundamentally flawed: assume away costs of switching energy sources, ignore evidence of high consumer discount rates (20-30%) for energy-saving investments, due to borrowing constraints, uncertainty; choose a few, unrepresentative industries as benchmarks; conservation measures would be part of future status quo
  - Economic freedom Index explains 36 per cent of variation in energy use per dollar of GDP across countries (even among just developing countries), due in part to creating favorable environment for FDI also because econ freedom means fewer price distortions, better property rights protection, less protection of inefficient state-controlled industries
- Smart growth is environmentally friendly growth
  - Increase female education levels, reduce population growth rate, and future population strongest driver of future projected ghg emissions, future deforestation
  - Reduced state role implies less subsidization of “green” sectors, but also less subsidization of polluting sectors, and if some “green” sectors actually not so green (e.g. ethanol), then a win-win
  - In general, outcome of direct state role in encouraging green growth depends upon state’s knowledge and information PLUS the equilibrium impact of interest groups