Economic implications of changing EROI ratios

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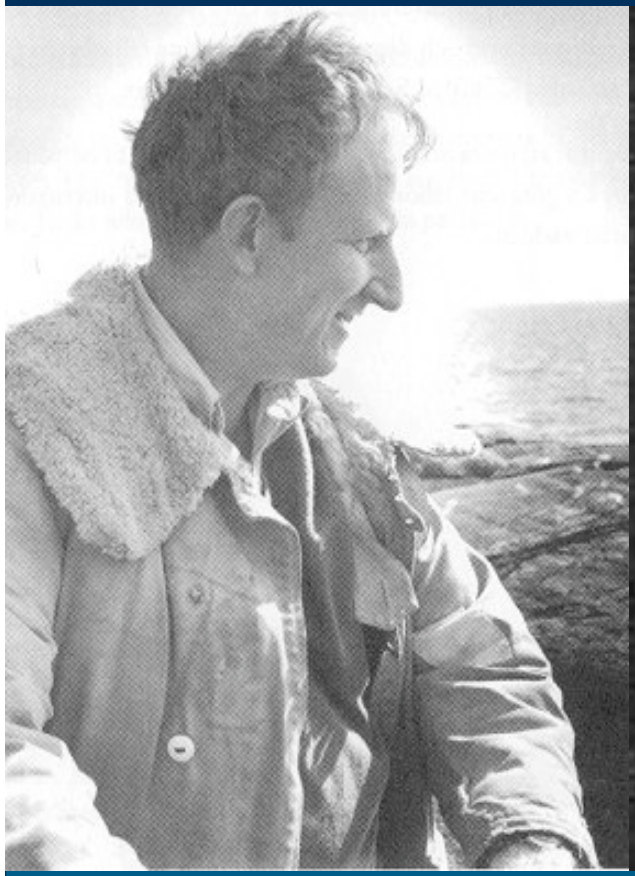
College of Environmental Science and Forestry
Syracuse NY. USA

I. THIS IS REAL

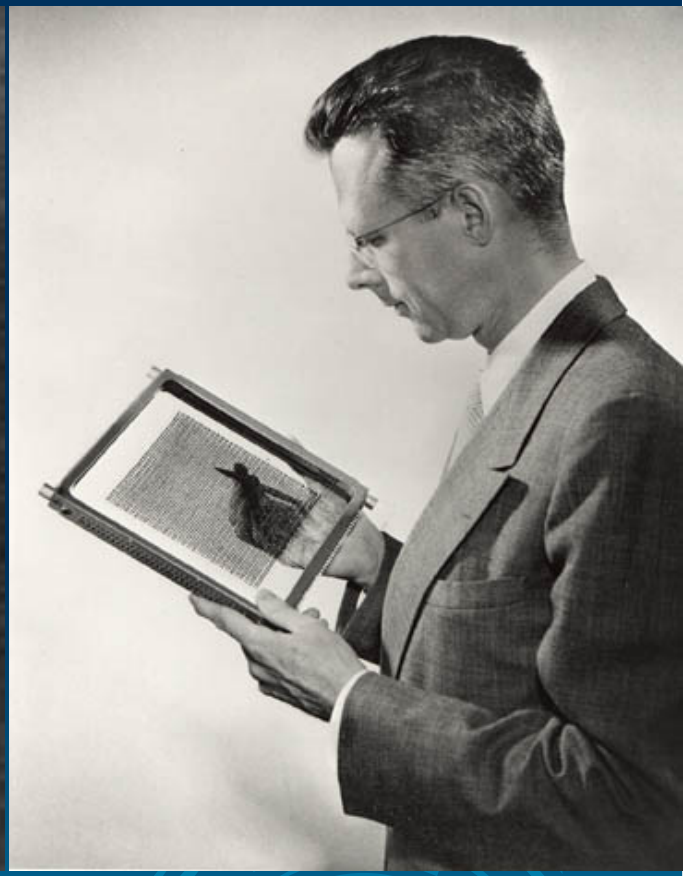
- Go to rest of meeting!
- There has been a huge impact of oil prices/supply on the economy in the past – and in fact it has almost certainly saved us from clear peak oil today

II. WE WERE WARNED

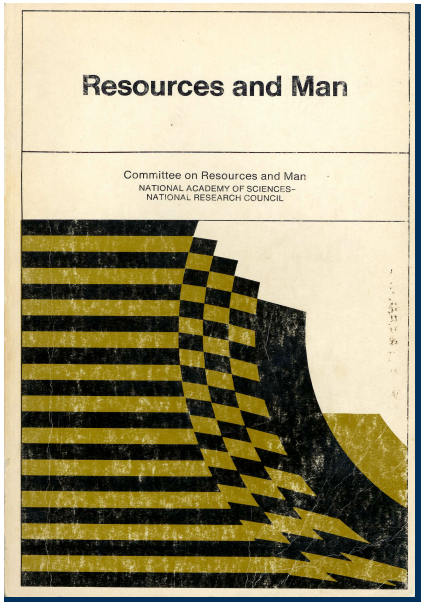


H. T. Odum

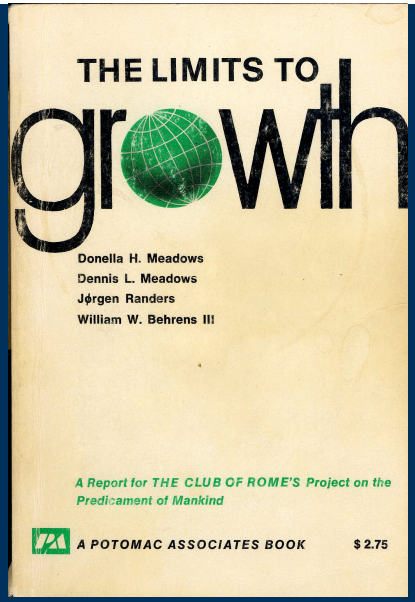
M. King Hubbert



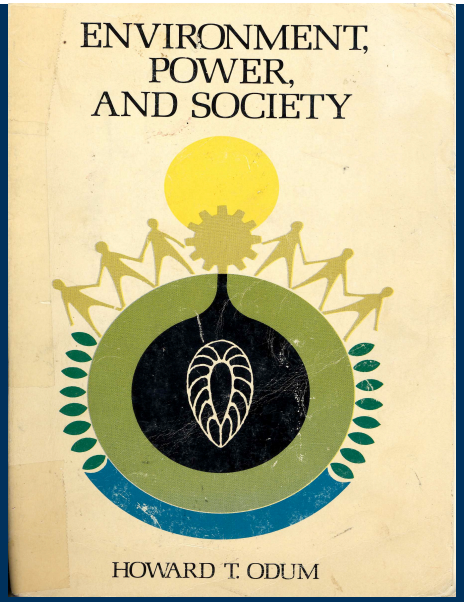
Jay Forrester



1969



1972



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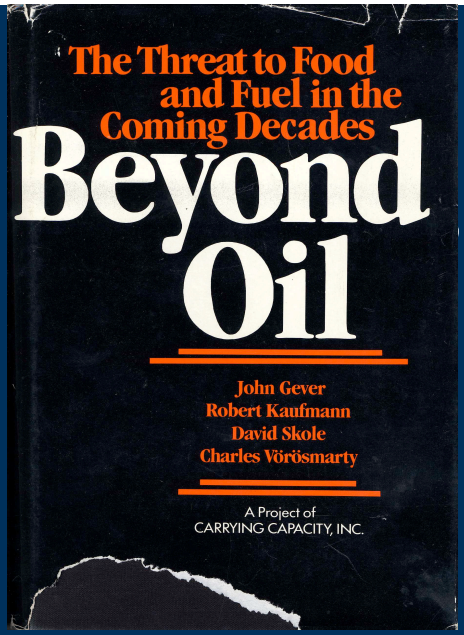
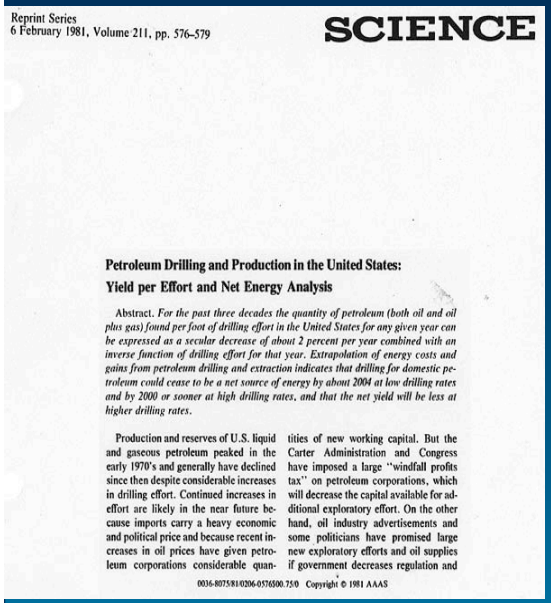


1986


Reprint Series
6 February 1981, Volume 211, pp. 576–579

SCIENCE

Petroleum Drilling and Production in the United States:
Yield per Effort and Net Energy Analysis

Abstract. *For the past three decades the quantity of petroleum (both oil and oil plus gas) found per foot of drilling effort in the United States for any given year can be expressed as a secular decrease of about 2 percent per year combined with an inverse function of drilling effort for that year. Extrapolation of energy costs and gains from petroleum drilling and extraction indicates that drilling for domestic petroleum could cease to be a net source of energy by about 2004 at low drilling rates and by 2000 or sooner at high drilling rates, and that the net yield will be less at higher drilling rates.*

Production and reserves of U.S. liquid and gaseous petroleum peaked in the early 1970's and generally have declined since then despite considerable increases in drilling effort. Continued increases in effort are likely in the near future because imports carry a heavy economic and political price and because recent increases in oil prices have given petroleum corporations considerable quantities of new working capital. But the Carter Administration and Congress have imposed a large "windfall profits tax" on petroleum corporations, which will decrease the capital available for additional exploratory effort. On the other hand, oil industry advertisements and some politicians have promised large new exploratory efforts and oil supplies if government decreases regulation and

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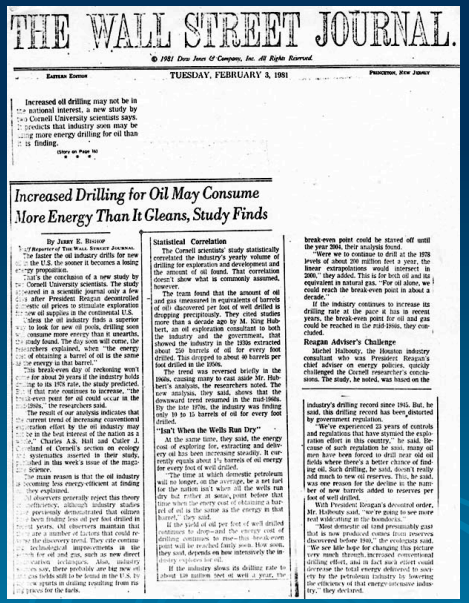
1981


THE WALL STREET JOURNAL.

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EASTERN EDITION — TUESDAY, FEBRUARY 3, 1981 — PRINCETON, NEW JERSEY

Increased oil drilling may not be in the national interest, a new study by two Cornell University scientists says. It predicts that industry soon may be using more energy drilling for oil than it is finding.

(Story on Page 16)

Increased Drilling for Oil May Consume More Energy Than It Gleans, Study Finds

By Janey E. Bishop
Staff Reporter of The Wall Street Journal

The faster the oil industry drills for new oil in the U.S. the sooner it becomes a losing energy proposition.

That's the conclusion of a new study by two Cornell University scientists. The study appeared in a scientific journal only a few days after President Reagan decontrolled domestic oil prices to stimulate exploration for new oil supplies in the continental U.S.

Unless the oil industry finds a superior way to look for new oil pools, drilling soon will consume more energy than it unearths, the study found. The day soon will come, the researchers explained, when "the energy cost of obtaining a barrel of oil is the same as the energy in that barrel."

This break-even day of reckoning won't come for about 20 years if the industry holds drilling to its 1979 rate, the study predicted. But if that rate continues to increase, "the break-even point for oil could occur in the mid-1980s," the researchers said.

The result of our analysis indicates that the current trend of increasing conventional exploration effort by the oil industry may result in the total discovery of the nation as a whole," Charles A.S. Hall and Cutler J. Cleveland of Cornell's section on ecology and systematics asserted in their study, published in this week's issue of the magazine Science.

The main reason is that the oil industry is becoming less energy-efficient at finding the oil they explained.

All observers generally reject this theory of declining efficiency, although industry studies have previously demonstrated that oilmen have been finding less oil per foot drilled in recent years. All observers maintain that there are a number of factors that could reverse the discovery trend. They cite continuing technological improvements in the search for oil and gas, such as new direct exploration techniques. Also, industry officials say, there probably are big new oil and gas fields still to be found in the U.S. Increasing sports in drilling resulting from rising prices for the fuels.

Statistical Correlation

The Cornell scientists' study statistically correlated the industry's yearly volume of drilling for exploration and development and the amount of oil found. That correlation doesn't show what is commonly assumed, however.

The team found that the amount of oil and gas measured in equivalents of barrels of oil discovered per foot of well drilled is dropping precipitously. They cited studies showing that a decade ago by M. King Hubbert, an oil exploration consultant in both the industry and the government, that showed the industry in the 1950s extracted about 250 barrels of oil for every foot drilled. This dropped to about 40 barrels per foot drilled in the 1970s.

The trend was reversed briefly in the 1960s, causing many to cast aside Mr. Hubbert's analysis, the researchers noted. The new analysis, they said, shows that the downward trend resumed in the mid-1960s. By the late 1970s, the industry was finding only 10 to 15 barrels of oil for every foot drilled.

"Isn't When the Wells Run Dry"

At the same time, they said, the energy cost of exploring for, extracting and delivering oil has been increasing steadily. It currently equals about 1% barrels of oil energy for every foot of well drilled.

"The time at which domestic petroleum will no longer, on the average, be a net fuel for the nation isn't when all the wells run dry but rather at some point before that time when the energy cost of obtaining a barrel of oil is the same as the energy in that barrel," they said.

If the yield of oil per foot of well drilled continues to drop—and the energy cost of drilling continues to rise—this break-even point will be reached fairly soon. How soon, they said, depends on how intensively the industry explores for oil.

If the industry slows its drilling rate to about the pattern set in mid-1979, the break-even point could be stayed off until the year 2004, their analysis found.

"Were we to continue to drill at the 1978 levels of about 200 million feet a year, the linear extrapolations would intersect in 2000," they added. This is for both oil and its equivalent in natural gas. "For oil alone, we could reach the break-even point in about a decade."

If the industry continues to increase its drilling rate at the pace it has in recent years, the break-even point for oil and gas could be reached in the mid-1980s, they concluded.

Reagan Adviser's Challenge

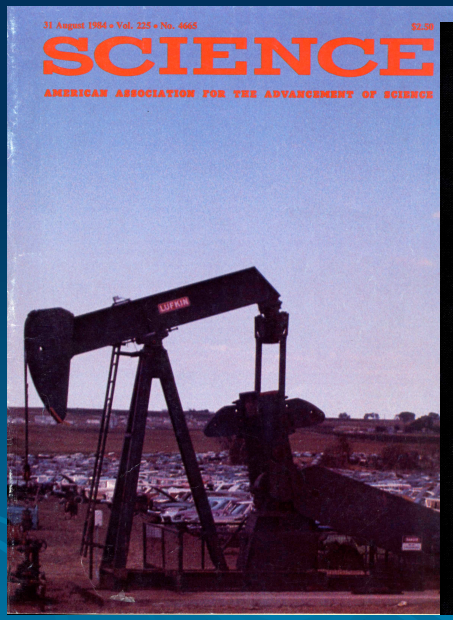
Michel Halbouty, the Houston industry consultant who was President Reagan's chief adviser on energy policies, quickly challenged the Cornell researcher's conclusions. The study, he noted, was based on the industry's drilling record since 1965. But, he said, this drilling record has been distorted by government regulation.

"We've experienced 25 years of controls and regulations that have stymied the exploration effort in this country," he said. Because of Carter's section on ecology many oil men have been forced to drill near old oil fields where there's a better chance of finding oil. Such drilling, he said, doesn't really add much to new oil reserves. This, he said, was one reason for the decline in the number of new barrels added to reserves per foot of well drilled.

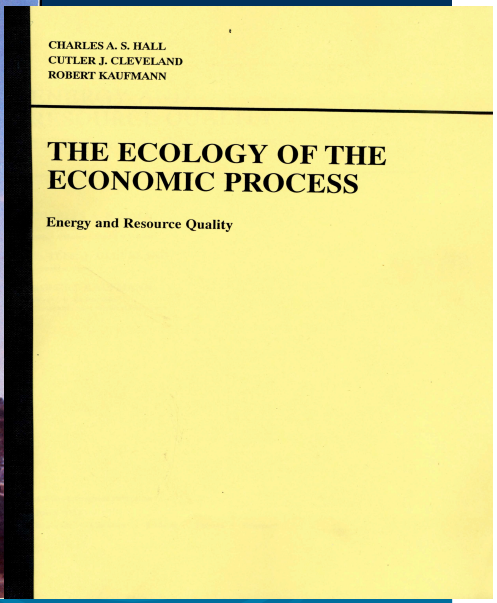
With President Reagan's decontrol order, Mr. Halbouty said, "we're going to see more and more wildcatting in the boondocks."

"Most domestic oil and presumably gas that is now produced comes from reserves discovered before 1965," the geologist said. "We see little hope for changing this picture very much through increased conventional drilling effort, and in fact such effort could decrease the total energy delivered to society by the petroleum industry by lowering the efficiency of that energy-intensive industry," they declared.

1981



1984

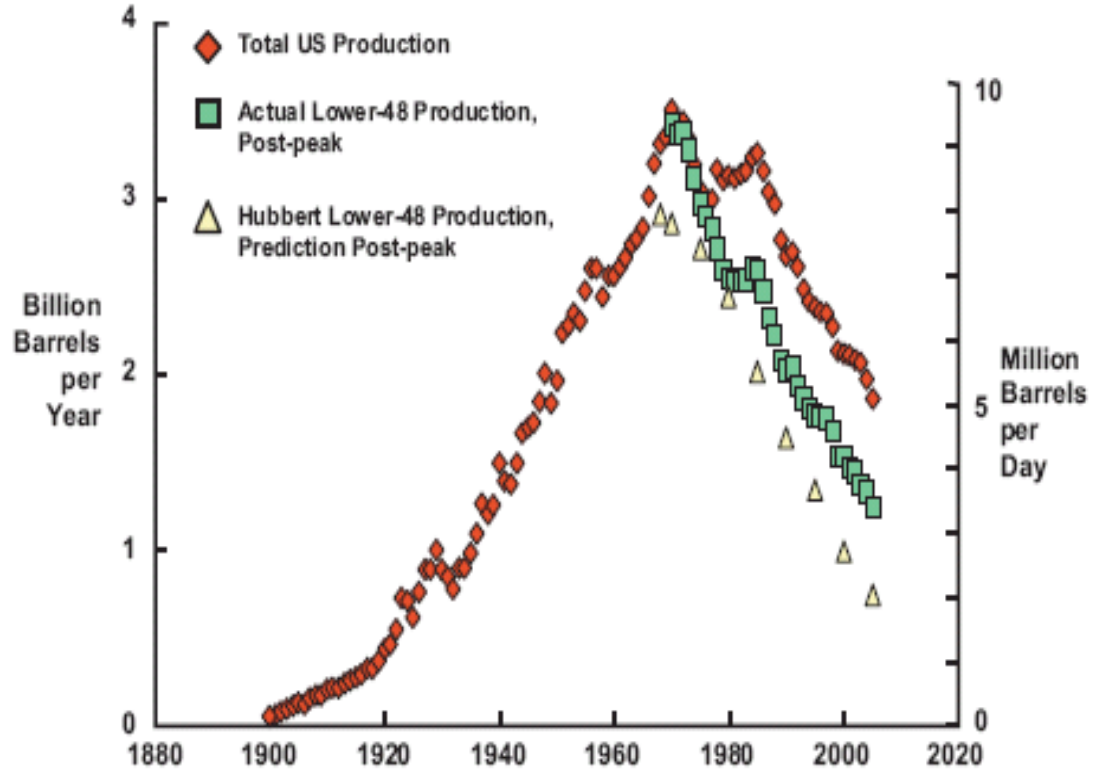

CHARLES A. S. HALL
CUTLER J. CLEVELAND
ROBERT KAUFMANN

THE ECOLOGY OF THE ECONOMIC PROCESS

Energy and Resource Quality

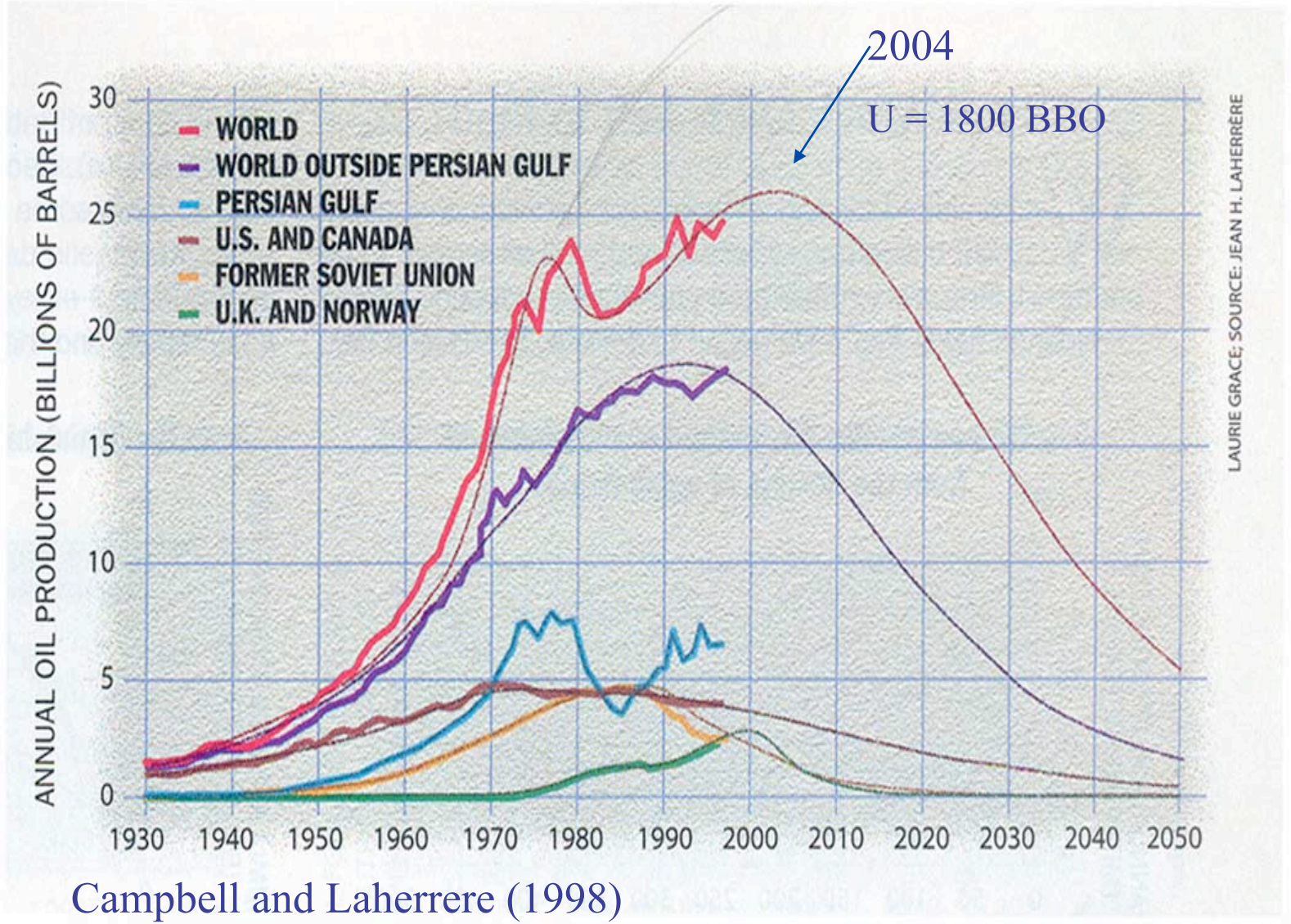
1986

United States Production, Hubbert versus Actual



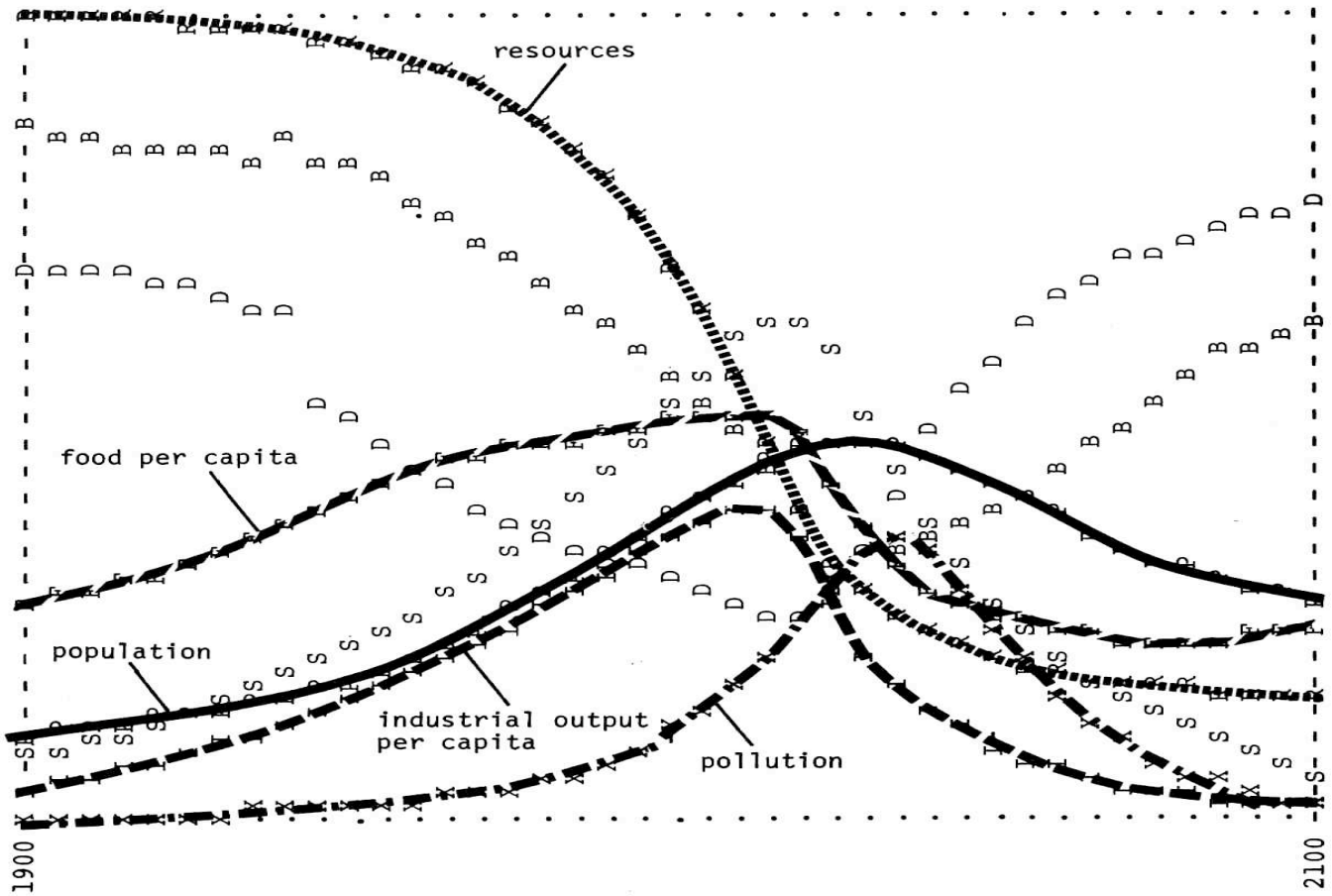
Source: Cambridge Energy Research Associates.
61019-1

Probably we have been saved from the peak by the depression following the 1970s.

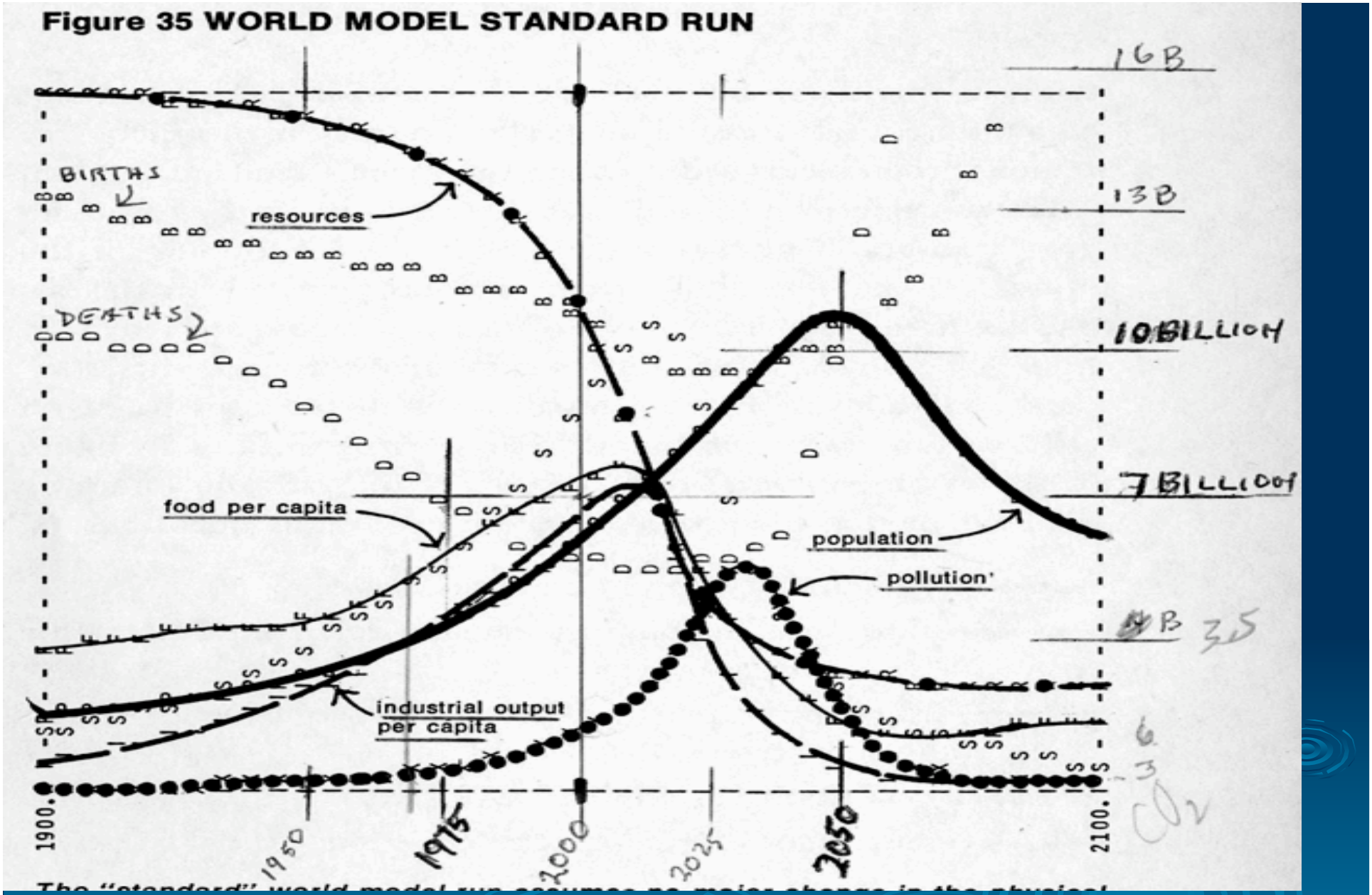


Campbell and Laherrere (1998)

Figure 35 WORLD MODEL STANDARD RUN



The "standard" world model run assumes no major change in the physical, economic, or social relationships that have historically governed the development of the world system. All variables plotted here follow historical values from 1900 to 1970. Food, industrial output, and population grow exponentially until the rapidly diminishing resource base forces a slowdown in industrial growth. Because of natural delays in the system, both population and pollution continue to increase for some time after the peak of industrialization. Population growth is finally halted by a rise in the death



And as of 2007 the limits to growth model is almost exactly correct (give or take some definitions)!

And our own Colin Campbell

- http://uk.youtube.com/watch?v=71Y2yAAHHRw

III. THE ECONOMISTS GOT IT WRONG

- Why?

- Abundant and abundantly increasing oil allowed almost every economic theory to "work" much of the time in the last century
- …even though the basic model was almost absurd

"Tell me the fairy tale about the economy."

OUR FIRST QUESTION:
What is economics?

- **Well we all know the answer:**
- **Economics is the study of the allocation of scarce resources among competing ends.**

In the neoclassical world view:

Wealth comes from Capital

(In the 1970s Solow dropped even labor)

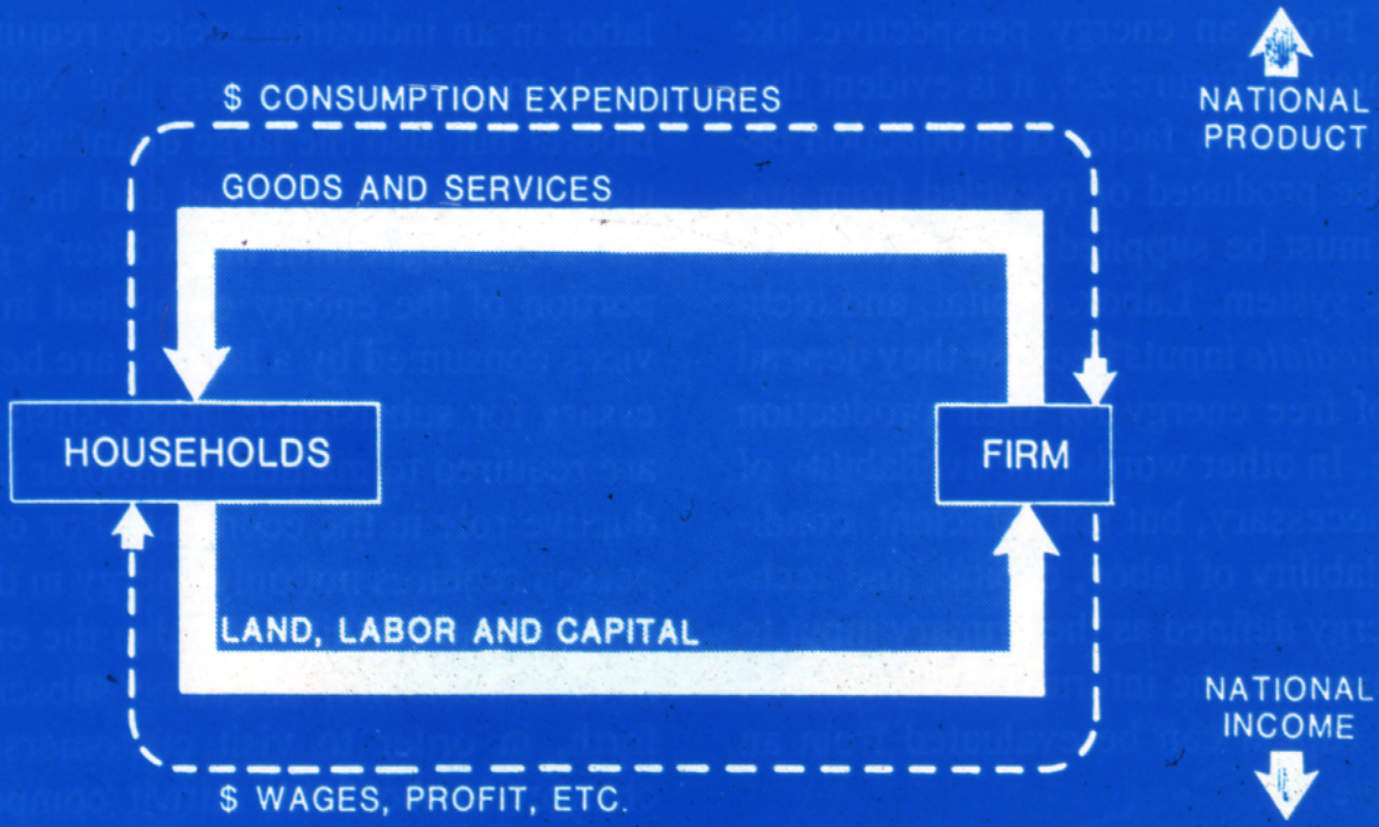


Figure 2.3. Neoclassical circular flow model of economic production. Households sell or rent land, natural resources, labor, a capital to firms in return for rent, wages, and profit (factor payments). Firms combine the factors of production and produce goods a services in return for consumption expenditures, investment, government expenditures, and net exports. (Modified from Heilbro and Thurow, 1981.)

- Our second, quite different, definition of economics comes from the great Hungarian economic anthropologist Karl Polanyi (*Trade and Market in Early Empires) who* provided what he termed a **Substantive** definition of economics:
- **Economics is the study of how people transform nature to meet their needs.**

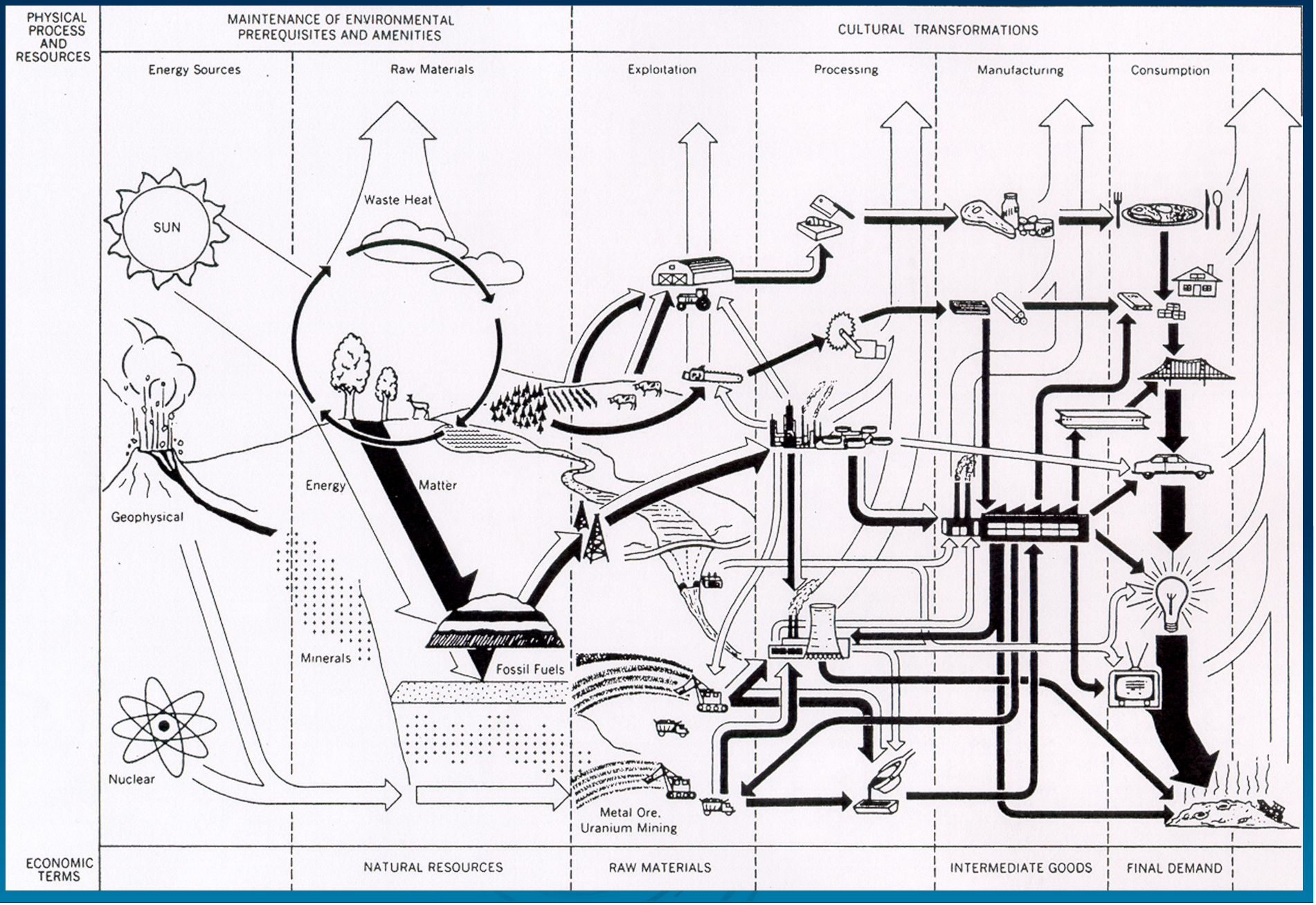
As natural scientists we believe that these models of Neoclassical Economics:

-- Uses incorrect boundaries

-- Is inconsistent with Laws of Thermodynamics

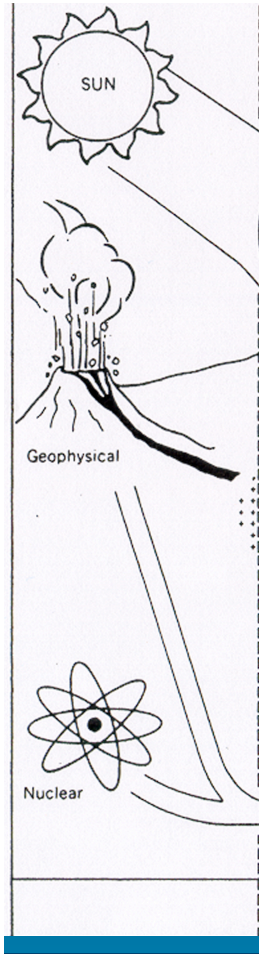
-- is largely based on articles of faith rather than empirically validated science

The biophysical model of the economy



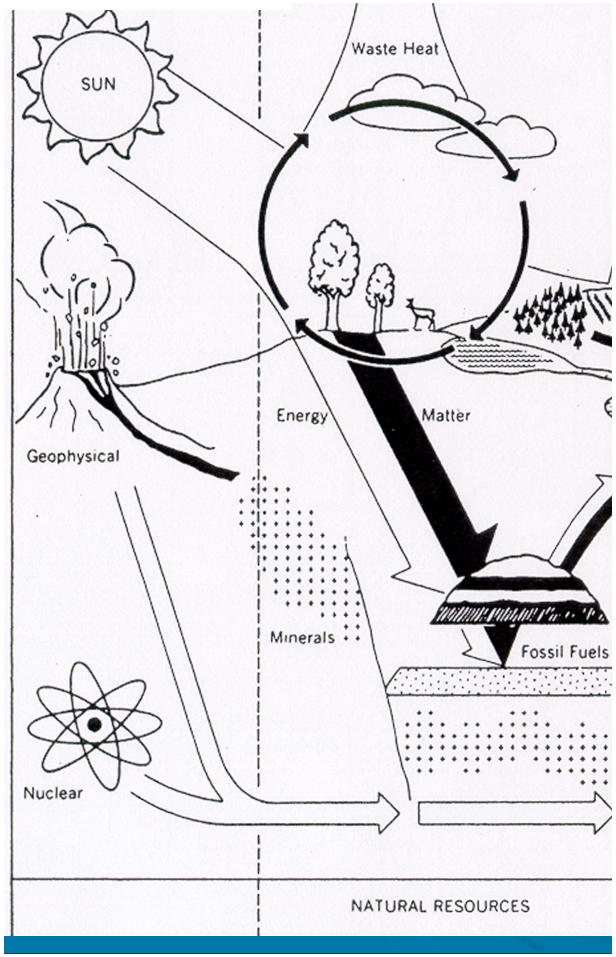
This is how **real** economies work

Energy Sources



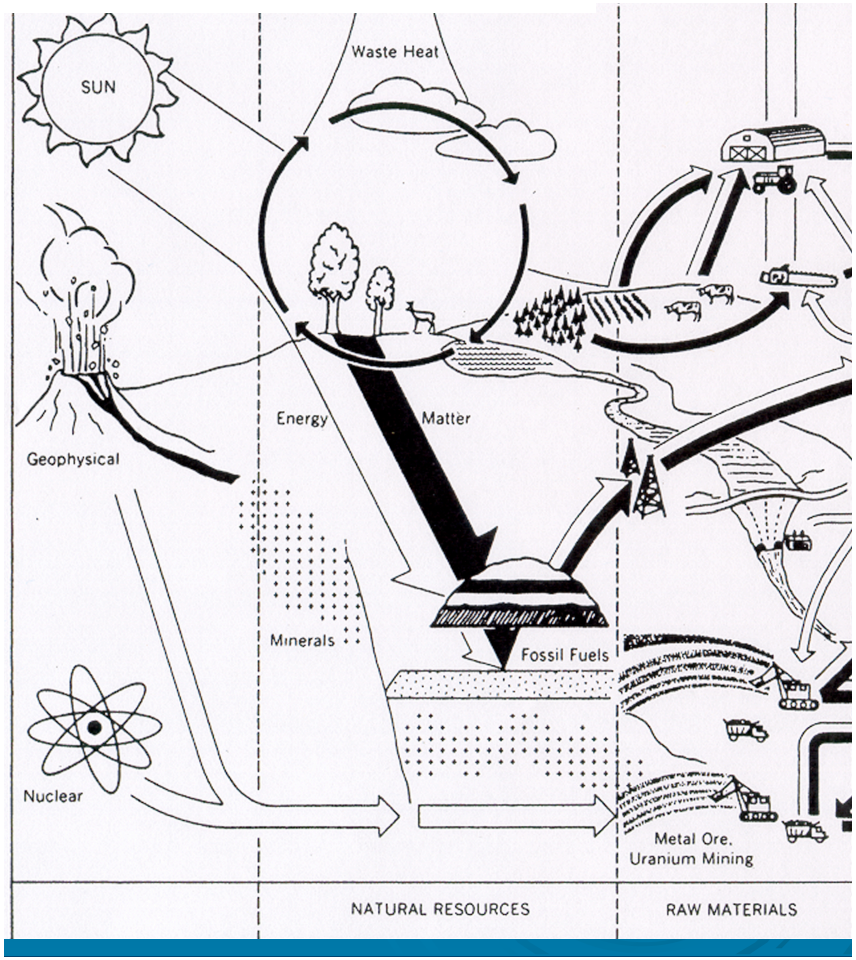
This is how **real** economies work

Raw Materials



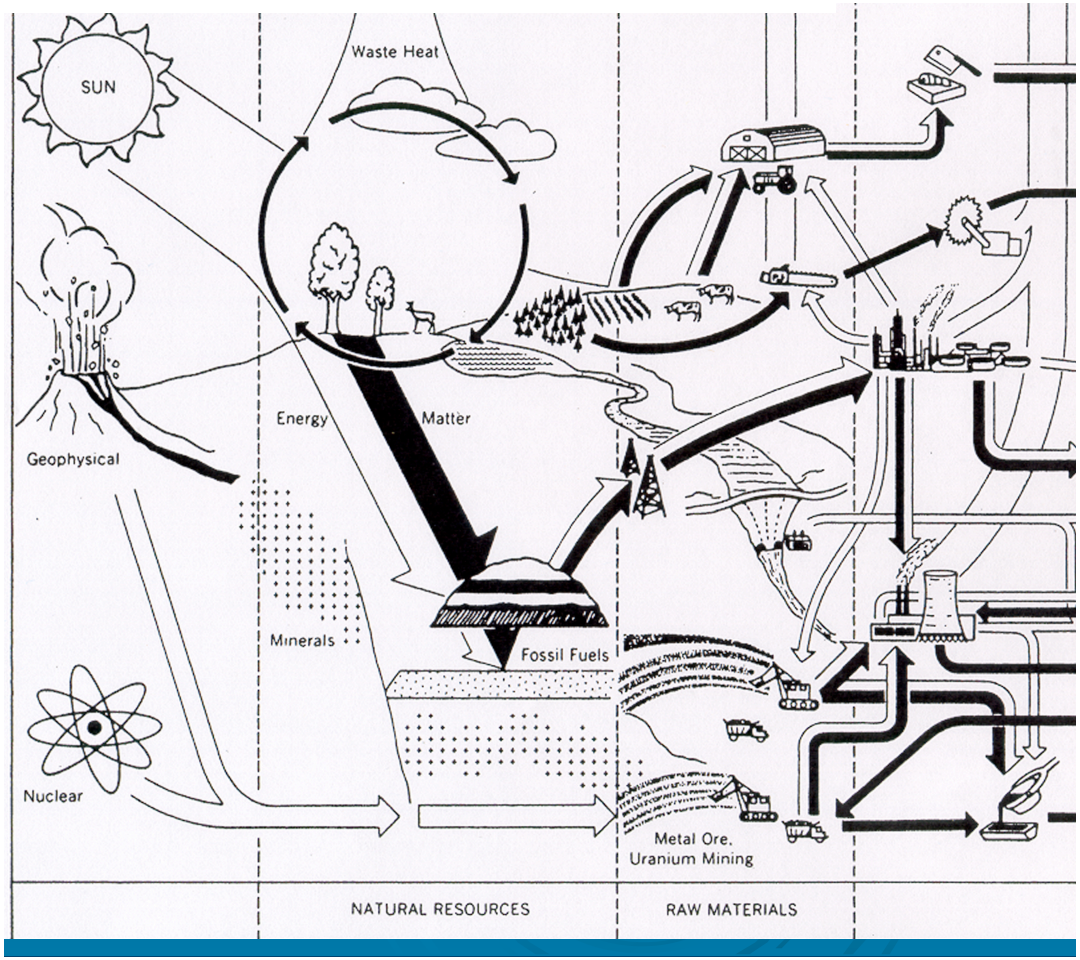
This is how **real** economies work

Exploitation

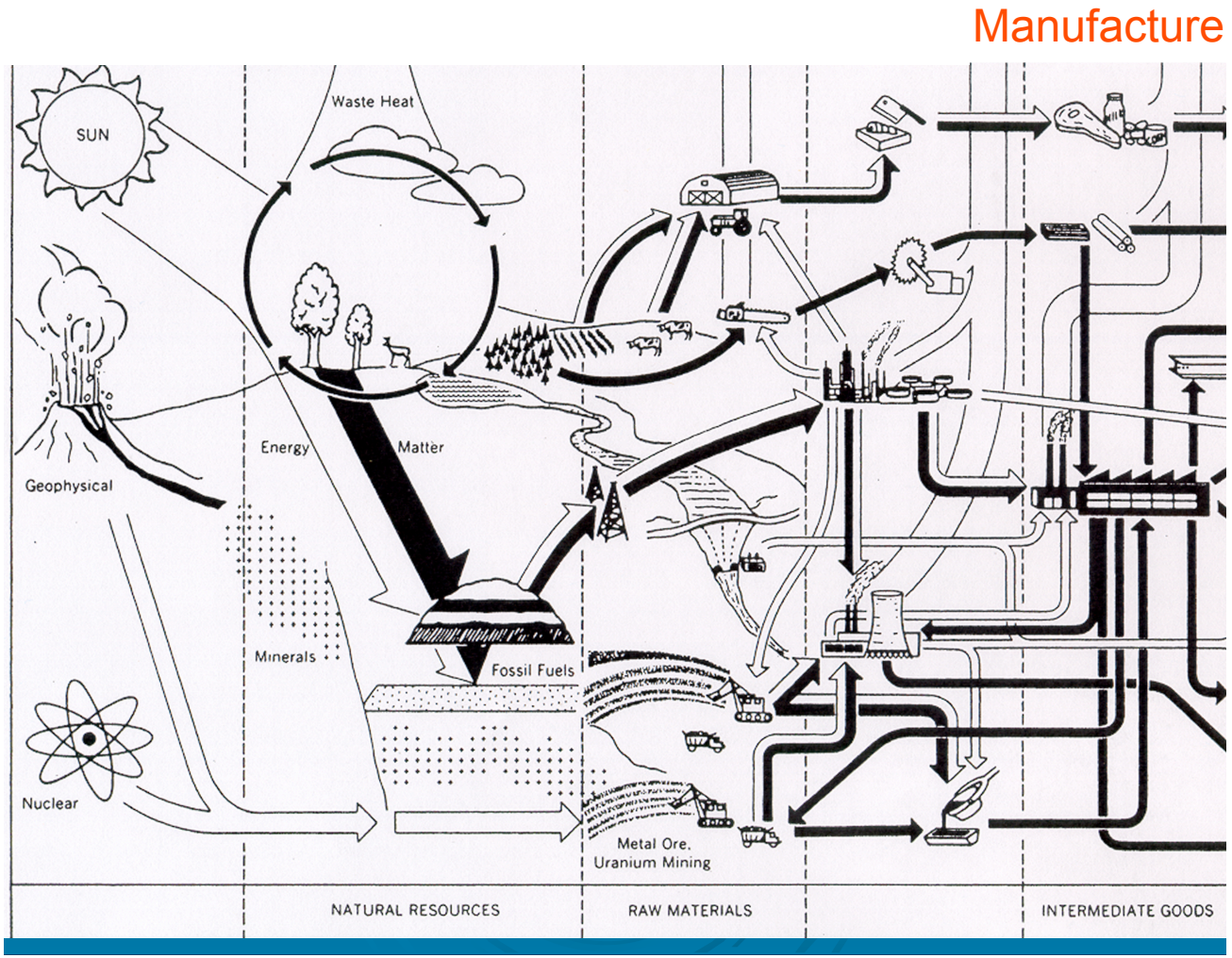


This is how **real** economies work

Processing

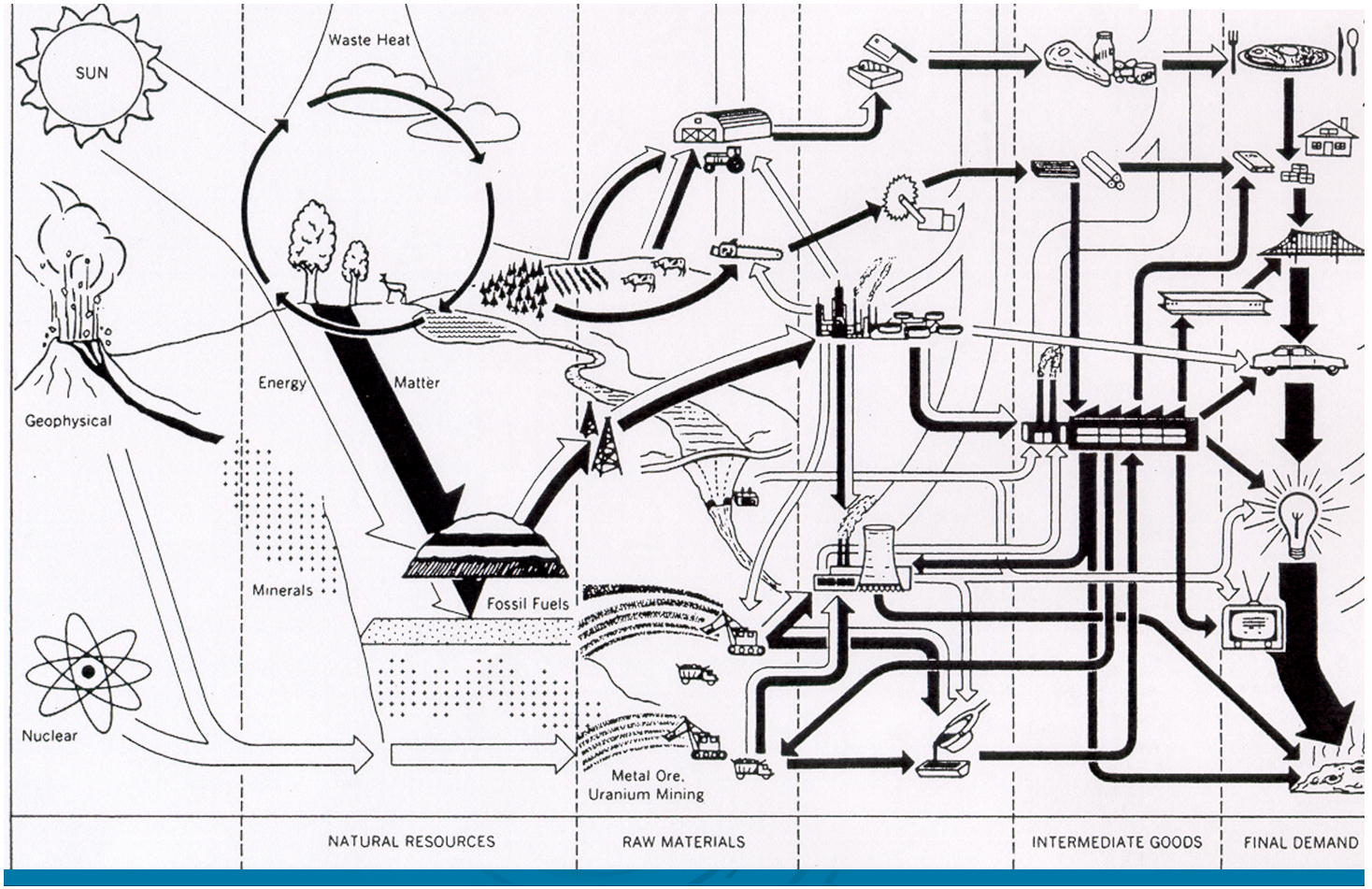


This is how **real** economies work

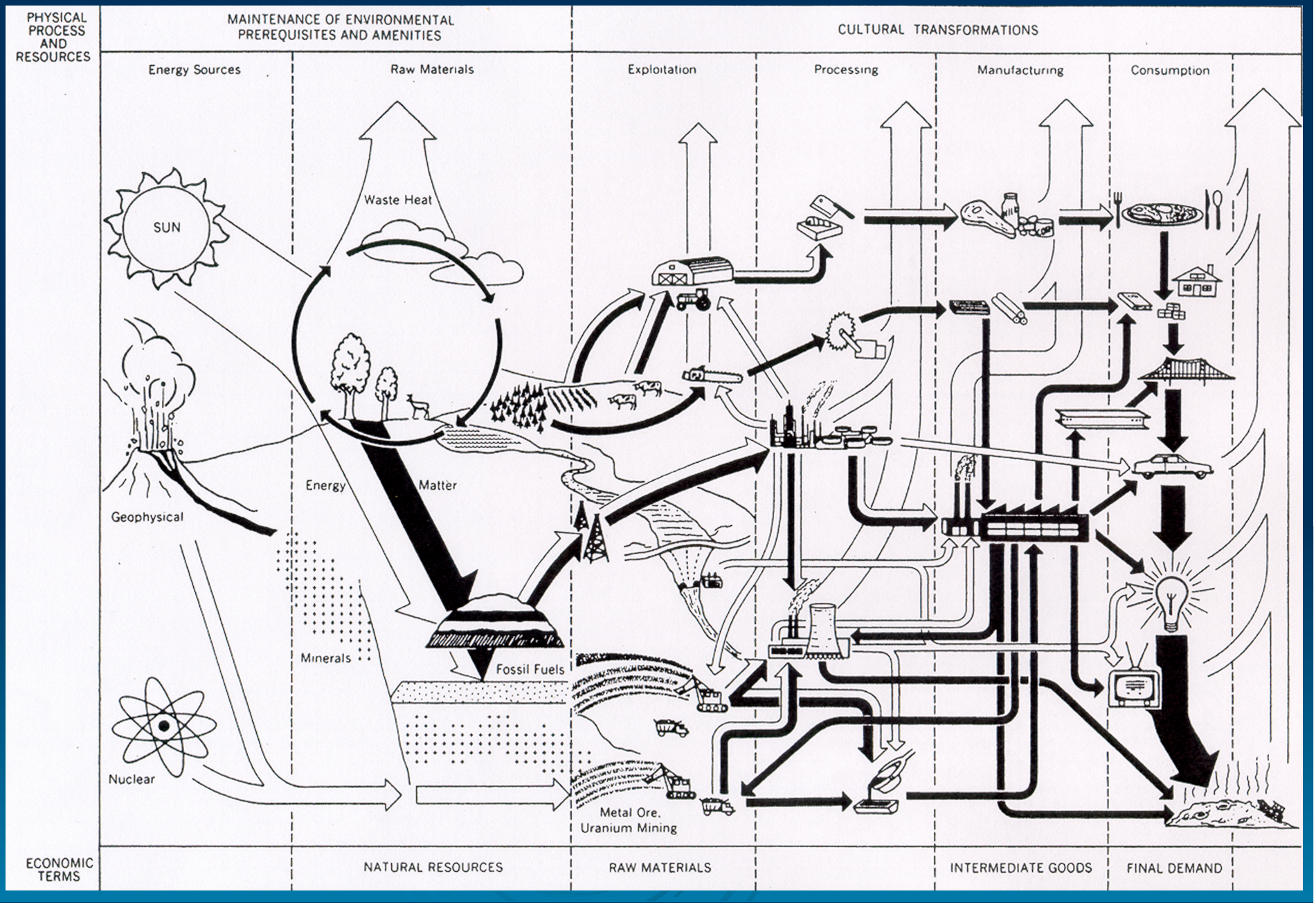


This is how **real** economies work

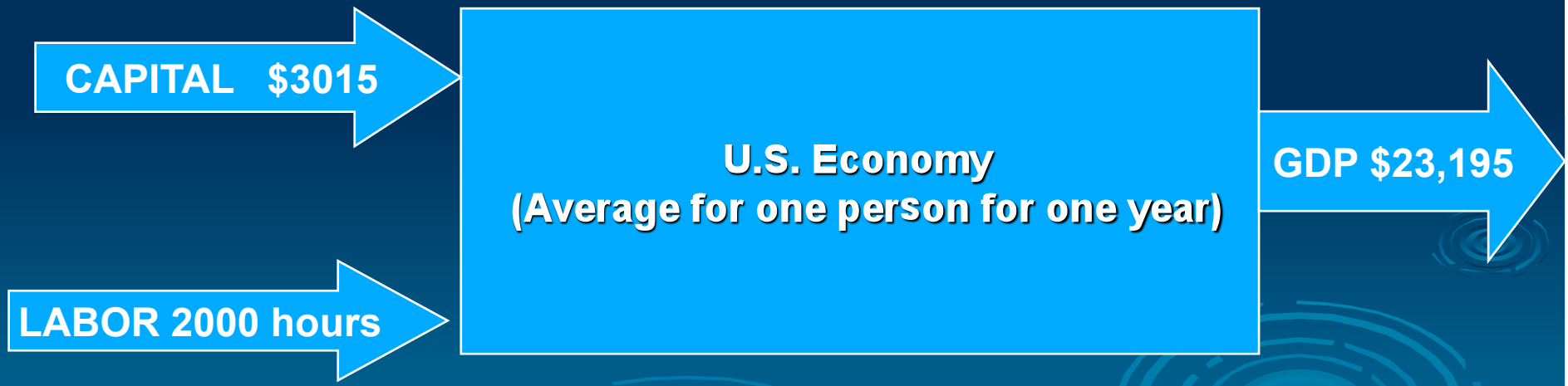
Consumption

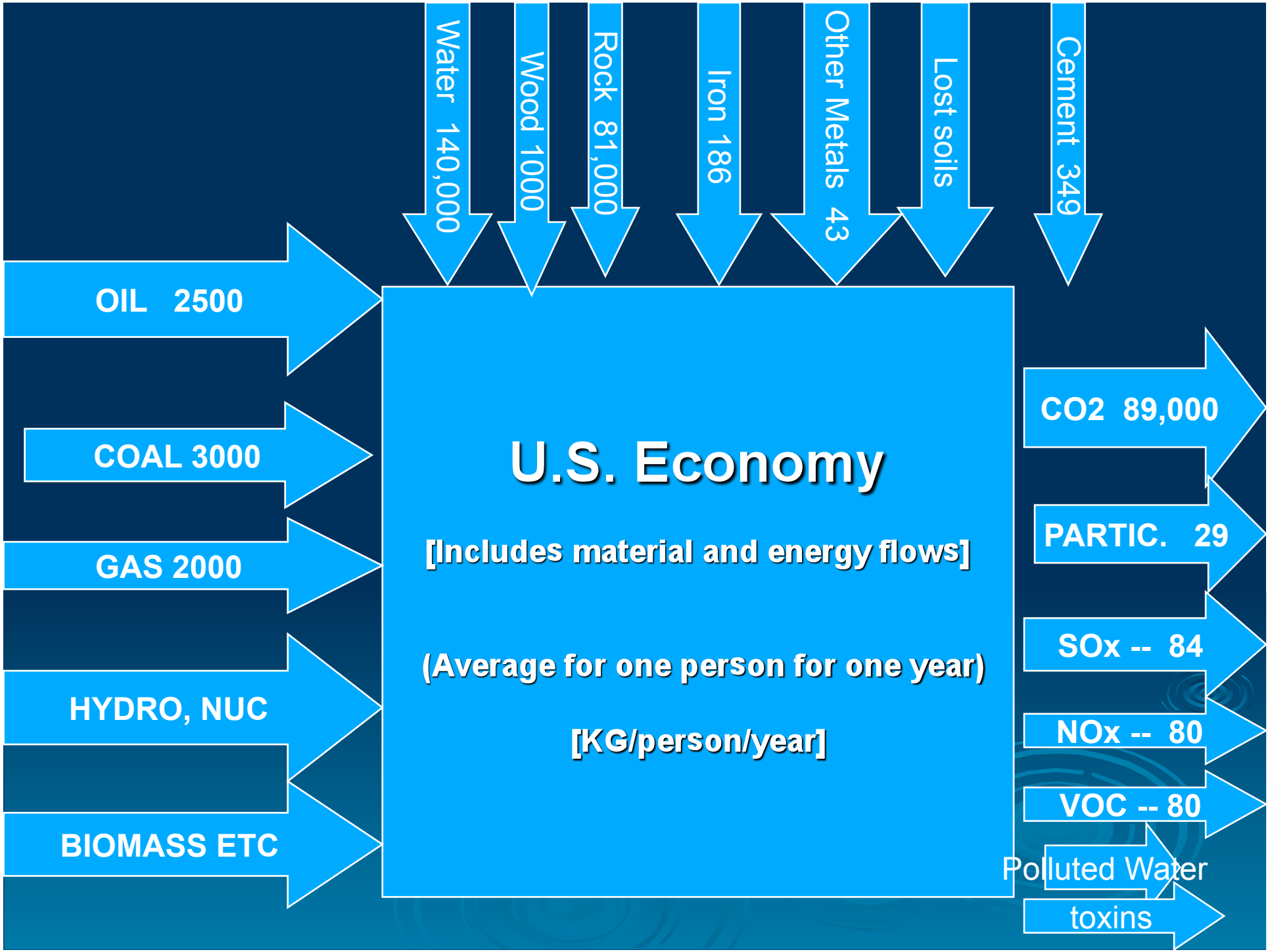


The biophysical model of the economy



Standard view of inputs and outputs to an economy (U.S. in 1990)




Water 140,000
Wood 1000
Rock 81,000
Iron 186
Other Metals 43
Lost soils
Cement 349
OIL 2500
COAL 3000
GAS 2000
HYDRO, NUC
BIOMASS ETC
U.S. Economy
[Includes material and energy flows]
(Average for one person for one year)
[KG/person/year]
CO2 89,000
PARTIC. 29
SOx -- 84
NOx -- 80
VOC -- 80
Polluted Water
toxins

Neoclassical production functions--

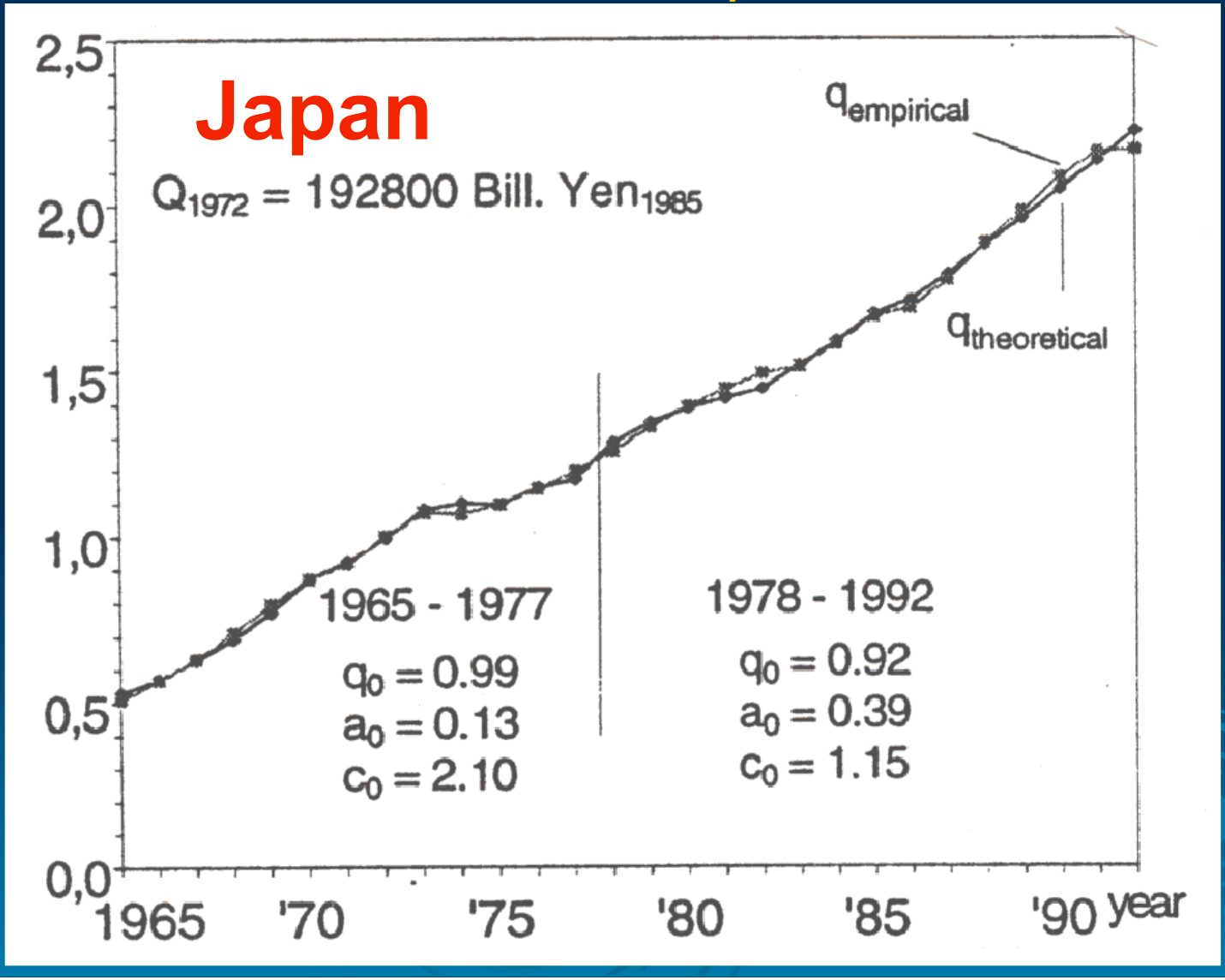
e.g. Cobb- Douglass production function:

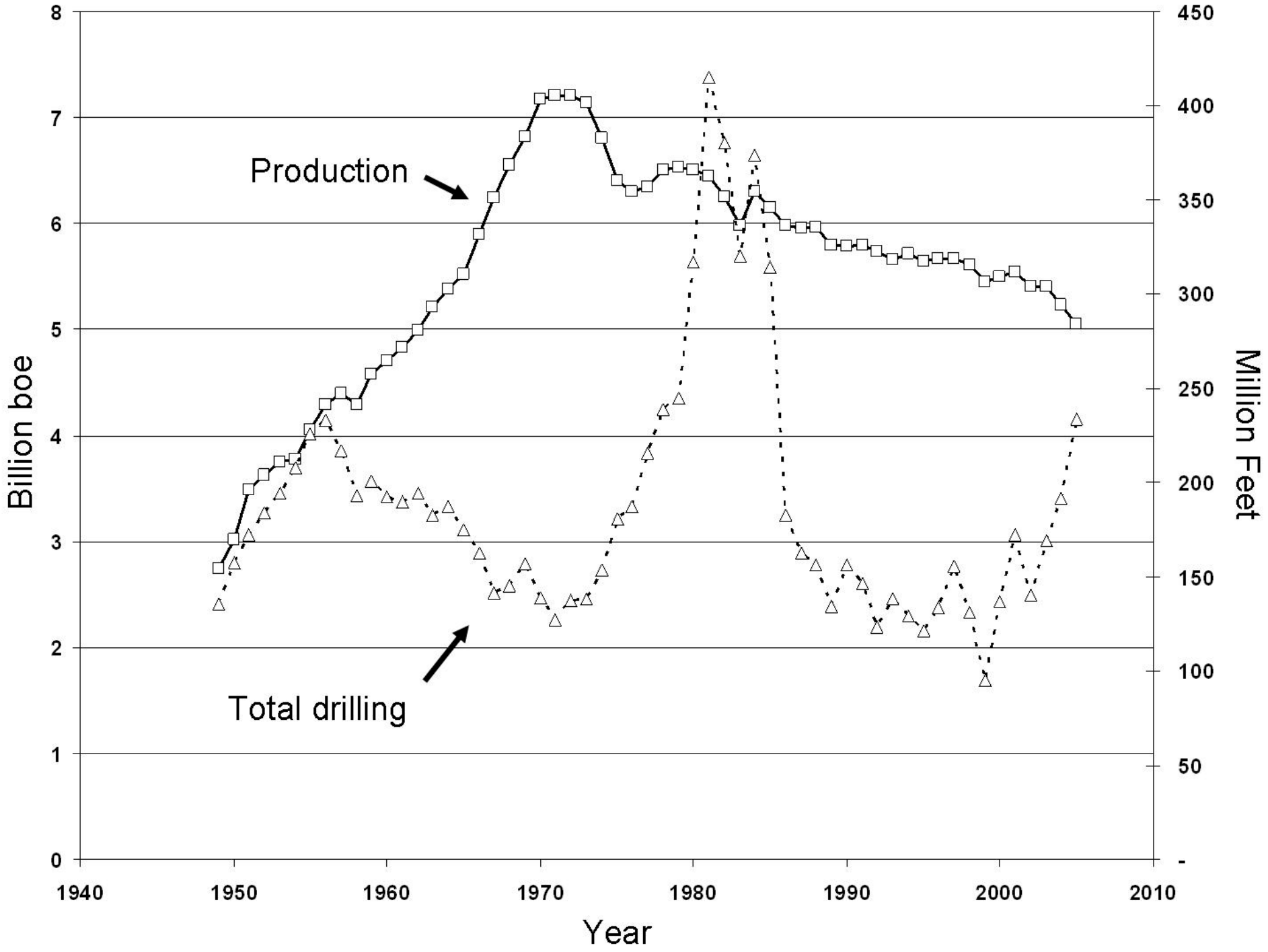
$$P = f(K,L)$$

"residual" assigned to *innovation*

Ignores the most important element!!!

When energy is included in production functions, it explains the observed output with greater power than does **either** capital or labor

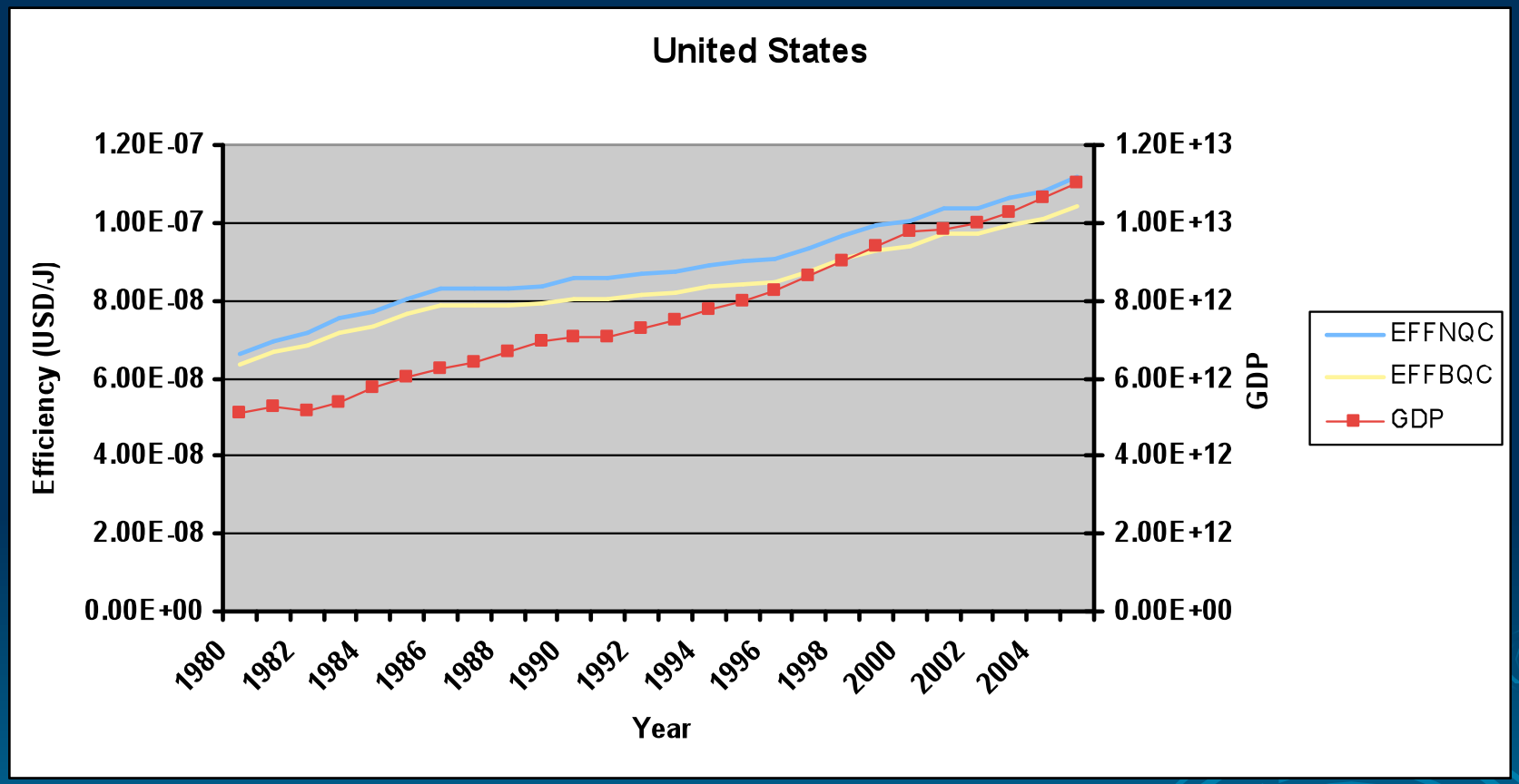



Billion boe
Million Feet
Year
Production
Total drilling
0
1
2
3
4
5
6
7
8
-
50
100
150
200
250
300
350
400
450
1940
1950
1960
1970
1980
1990
2000
2010

- Neoclassical economics promises us that unregulated markets and free trade will bring us efficiency.

- We are testing that empirically on 170 countries

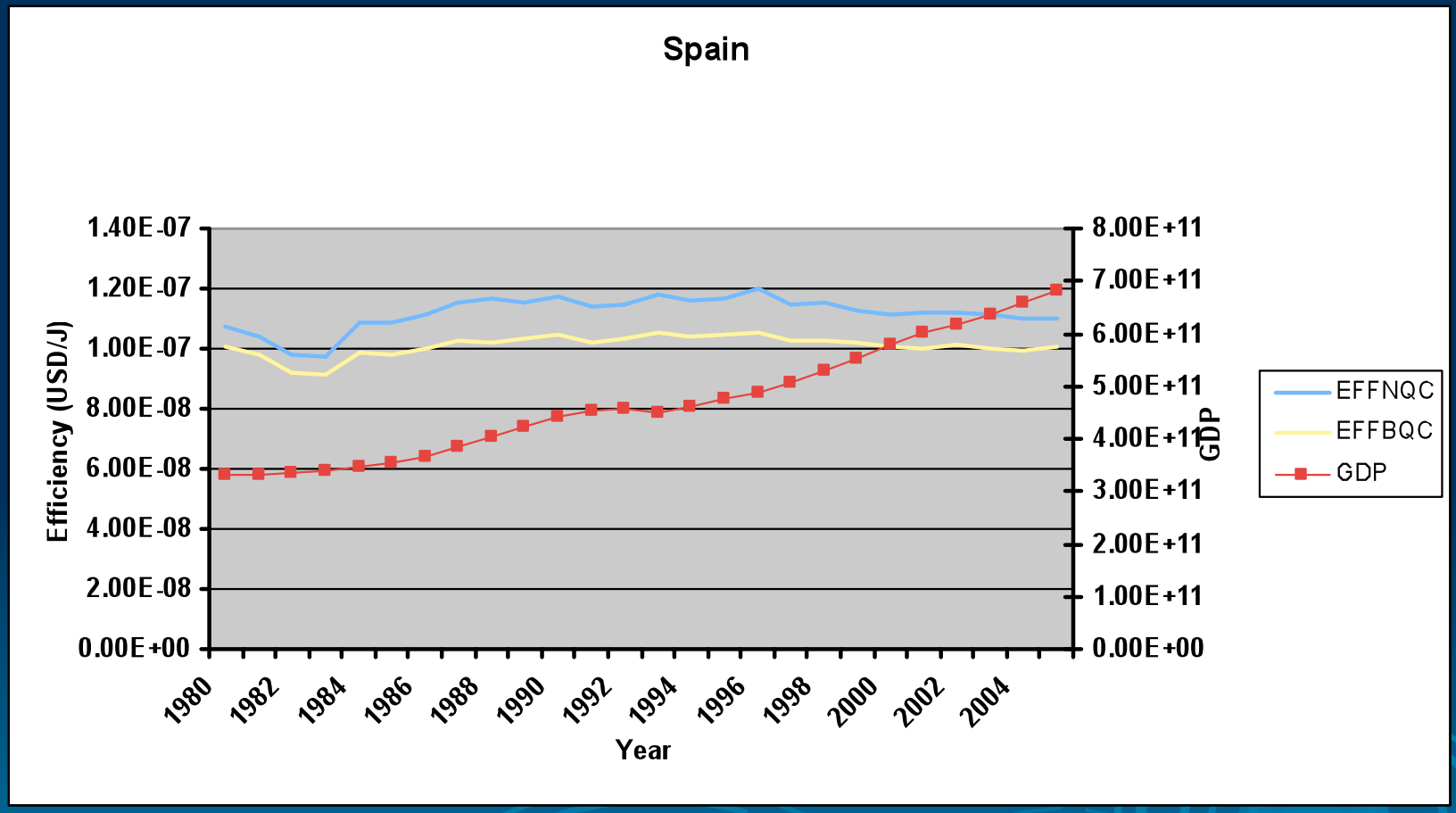
Efficiency results: US



Increasing Efficiency: **35** countries

Canada, US, France, Sweden, Netherlands, UK…

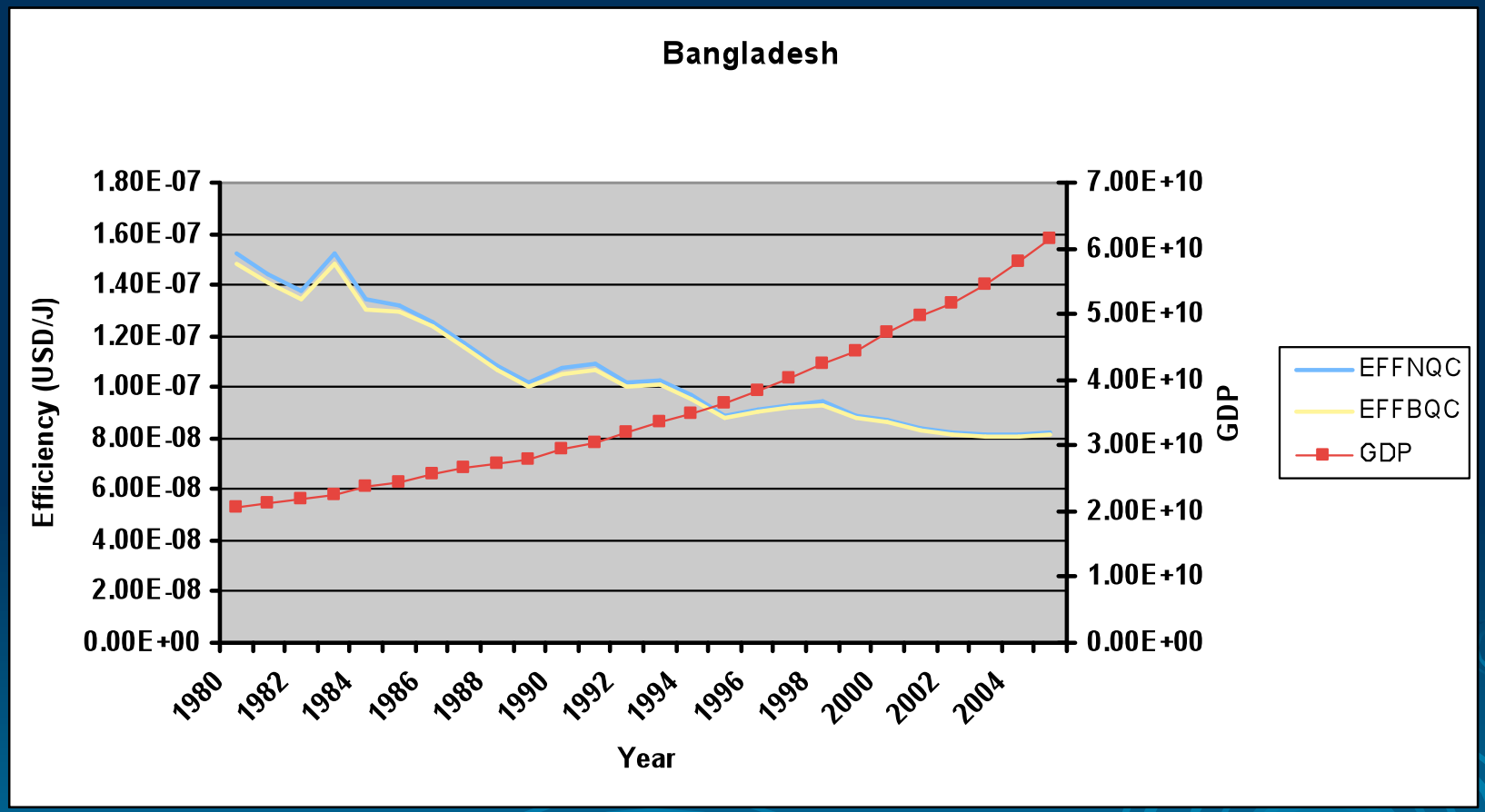
Efficiency results: Spain



Flat Efficiency: **21** countries

Other Efficiency Trend: **33** countries

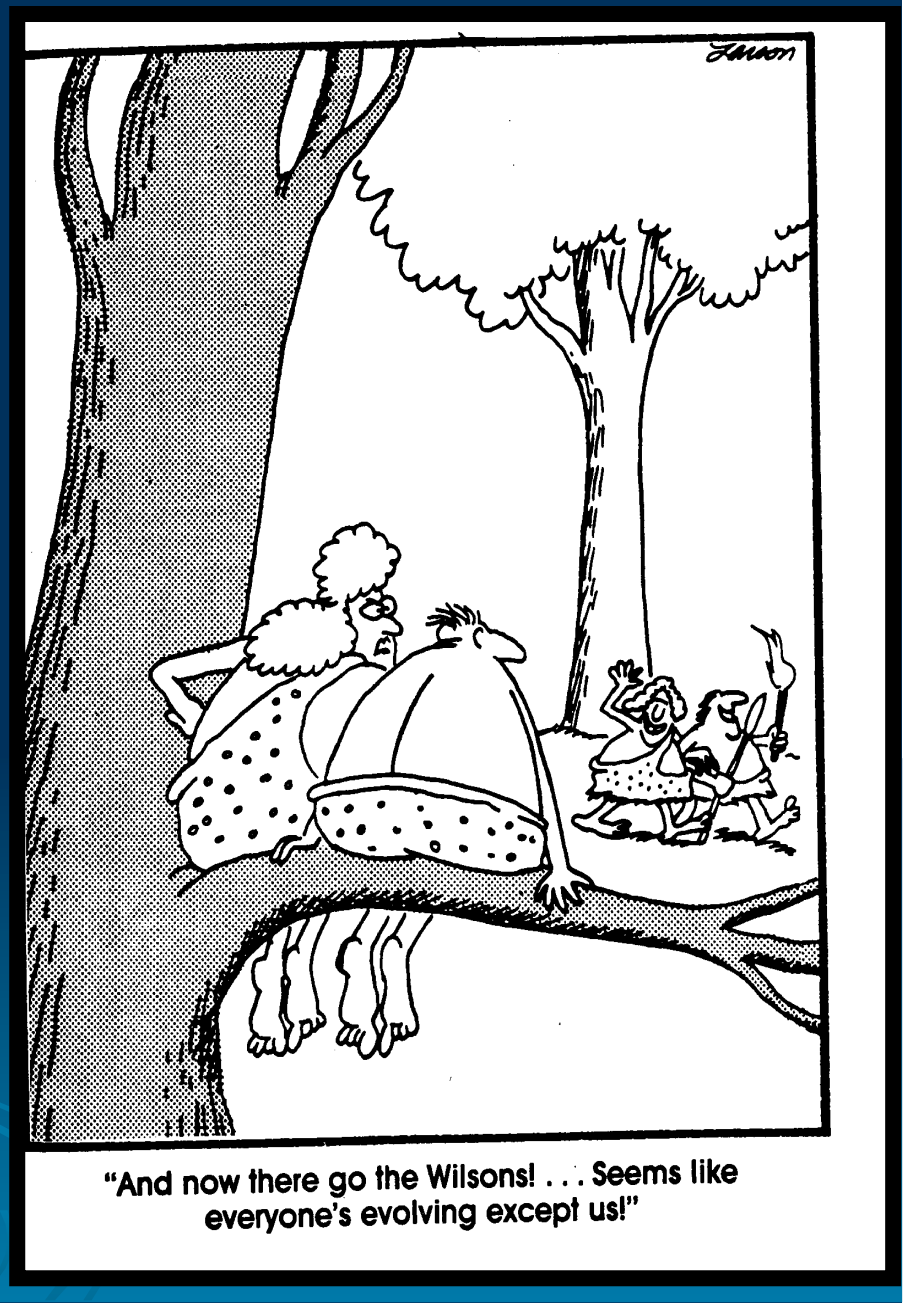
Efficiency results: Bangladesh



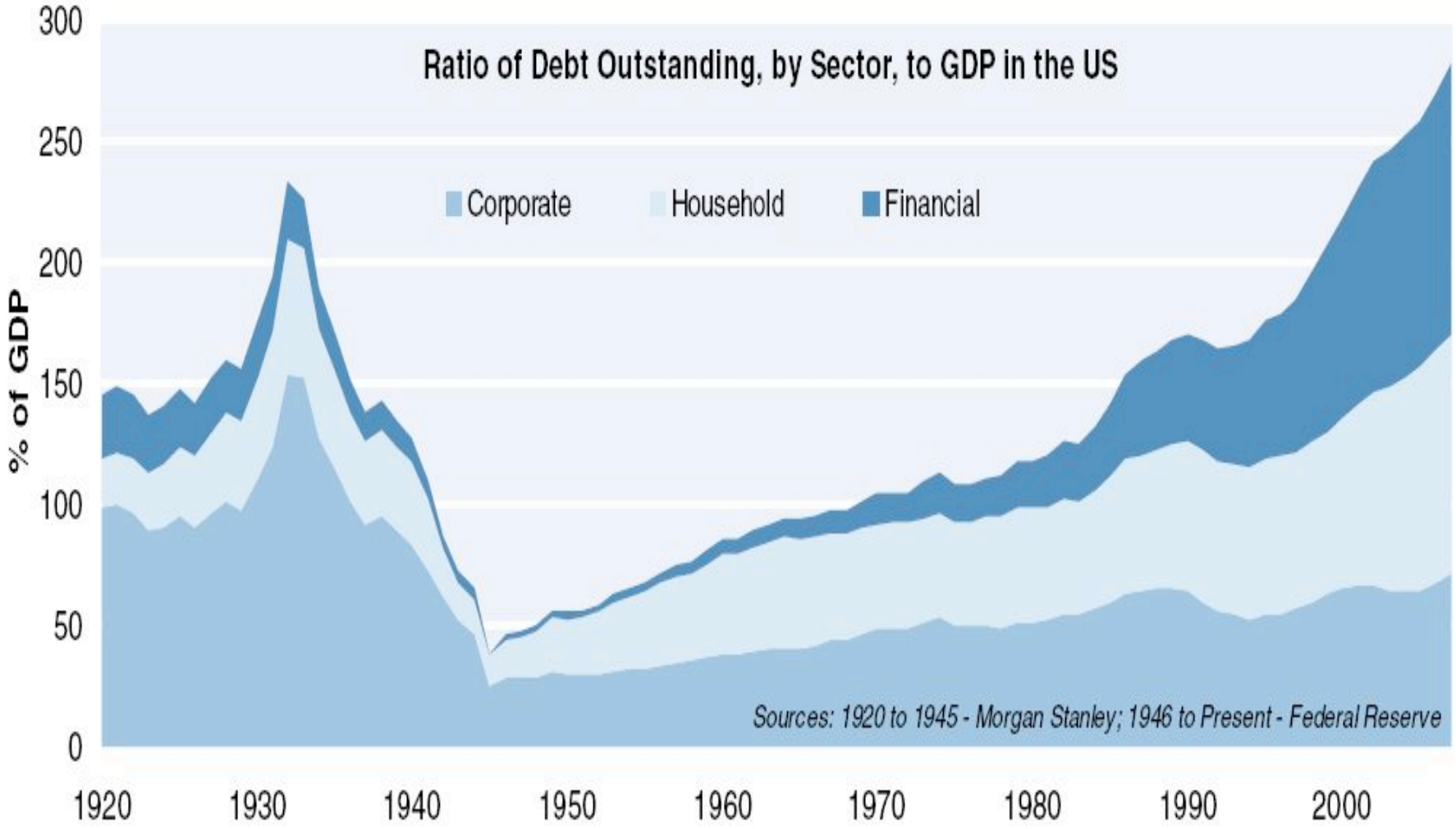
Decreasing Efficiency: **39** Bolivia, El Salvador, Portugal, Iran…

- Why should economics be a social science since it is about biophysical stuff?

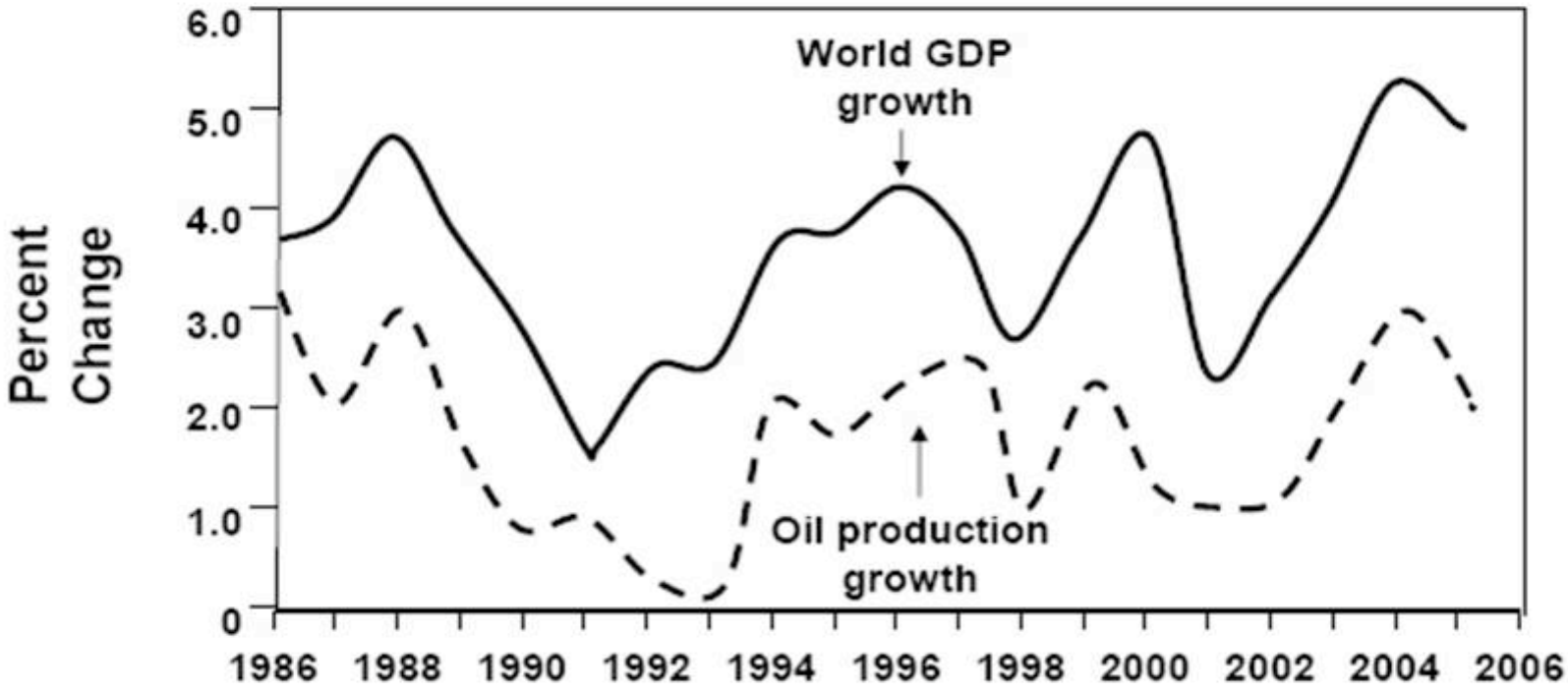
- I became convinced that virtually all development has been done simply by applying more energy:
  - spear points concentrate physical energy
  - fire is of course liberated energy
  - Agriculture is refocusing solar energy (using fossil energy)
  - Today it is all based on fossil fuel
  - Technology is mostly about using more or higher quality energy



"And now there go the Wilsons! . . . Seems like everyone's evolving except us!"


Ratio of Debt Outstanding, by Sector, to GDP in the US
Corporate
Household
Financial
% of GDP
300
250
200
150
100
50
0
1920
1930
1940
1950
1960
1970
1980
1990
2000
Sources: 1920 to 1945 - Morgan Stanley; 1946 to Present - Federal Reserve

World GDP Growth & World Oil Production Growth Have Tracked For Decades.



For 1995-2006, Deutsche Bank calculated:

$$\frac{\%\ \text{Change in World GDP}}{\%\ \text{Change in Oil Supply}} \sim 2.5 \Rightarrow$$

Order of magnitude of 1

IV. WHAT IS GOING ON WITH WALL STREET (ETC)

- Five Hypotheses

Wall Street, R.I.P.

GINA DOMENICO/BLOOMBERG NEWS

Goldman Sachs's headquarters in New York. The company, a golden child of the financial sector, faces a very different future and mission amid seismic changes wrought by the credit crisis.

By JULIE CRESWELL and BEN WHITE

WALL STREET. Two simple words that — like Hollywood and Washington — conjure a world.

A world of big egos. A world where people love to roll the dice with borrowed money. A world of tightwire trading, propelled by computers.

In search of ever-higher returns — and larger yachts, faster cars and pricier art collections for their top executives — Wall Street firms bulked up their trading desks and hired pointy-headed quantum physicists to develop fool-proof programs.

Hedge funds placed markers on red (the Danish krone goes up) or black (the G.D.P. of Thailand falls). And private equity firms amassed giant funds and went on a shopping spree, snapping up companies as if they were second wives buying Jimmy Choo shoes on sale.

That world is largely coming to an end.

The huge bailout package being debated in Congress may succeed in stabilizing the financial markets. But it is too late to help firms like Bear Stearns and Lehman Brothers, which have already disappeared. Merrill Lynch, whose trademark bull symbolized Wall Street to many Americans, is being folded into Bank of America, located hundreds of miles from New York, in Charlotte, N.C.

For most of the financiers who remain, with the exception of a few superstars, the days of easy money and supersized bonuses are behind them. The credit boom that drove Wall Street's explosive growth has dried up. Regulators who sat on the sidelines for too long are now eager to rein in Wall Street's bad boys and the practices that proliferated in recent years.

"The swashbuckling days of Wall Street firms' trading, essentially turning themselves into giant hedge funds, are over. Turns out they weren't that good," said Andrew Kessler, a former hedge fund manager. "You're no longer going to see middle-level folks pulling in seven- and multiple-seven-dollar figures that no one can figure out exactly what they did for that."

The beginning of the end is felt even in the halls of the white-shoe firm Goldman Sachs, which, among its Wall Street peers, epitomized and defined a high-risk, high-return culture.

Goldman is the firm that other Wall Street firms love to hate. It houses some of the world's biggest private equity

Continued on Page 10

INSIDE

ECONOMIC VIEW

PETER L. BERNSTEIN

What's Free About Free Enterprise?

Goodbye To All That

By TIM ARANGO and JULIE CRESWELL

JUST before midnight 10 days ago, as a financial whirlwind tore through Wall Street, someone filched a 75-pound bronze bust of Harry Poulakakos from the vestibule of his landmark saloon on Hanover Square in Manhattan.

Digging into a bowl of beef stroganoff the day after the bust disappeared — it was eventually returned anonymously — Mr. Poulakakos recalled some of the customers who had passed through his doors since he opened his bar, Harry's, 36 years ago.

Ivan Boesky once had a Christmas party there. Michael Milken worked over at 60 Broad. Tom Wolfe immortalized the joint in "The Bonfire of the Vanities." Mr. Poulakakos says he even got to know Henry M. Paulson Jr., the former Goldman Sachs chief executive and now the Treasury secretary.

Mr. Poulakakos, 70, has also seen his share of ups and downs on the Street, including the 1987 stock market crash, when Harry's filled up at 4 p.m. and stayed open all night. But the upheaval he's witnessing now — much of Wall Street evaporating in a swift and brutal reordering — is, he said, the worst in decades.

"I hope this is going to be over," he said. "If Wall Street is not active, nothing is active."

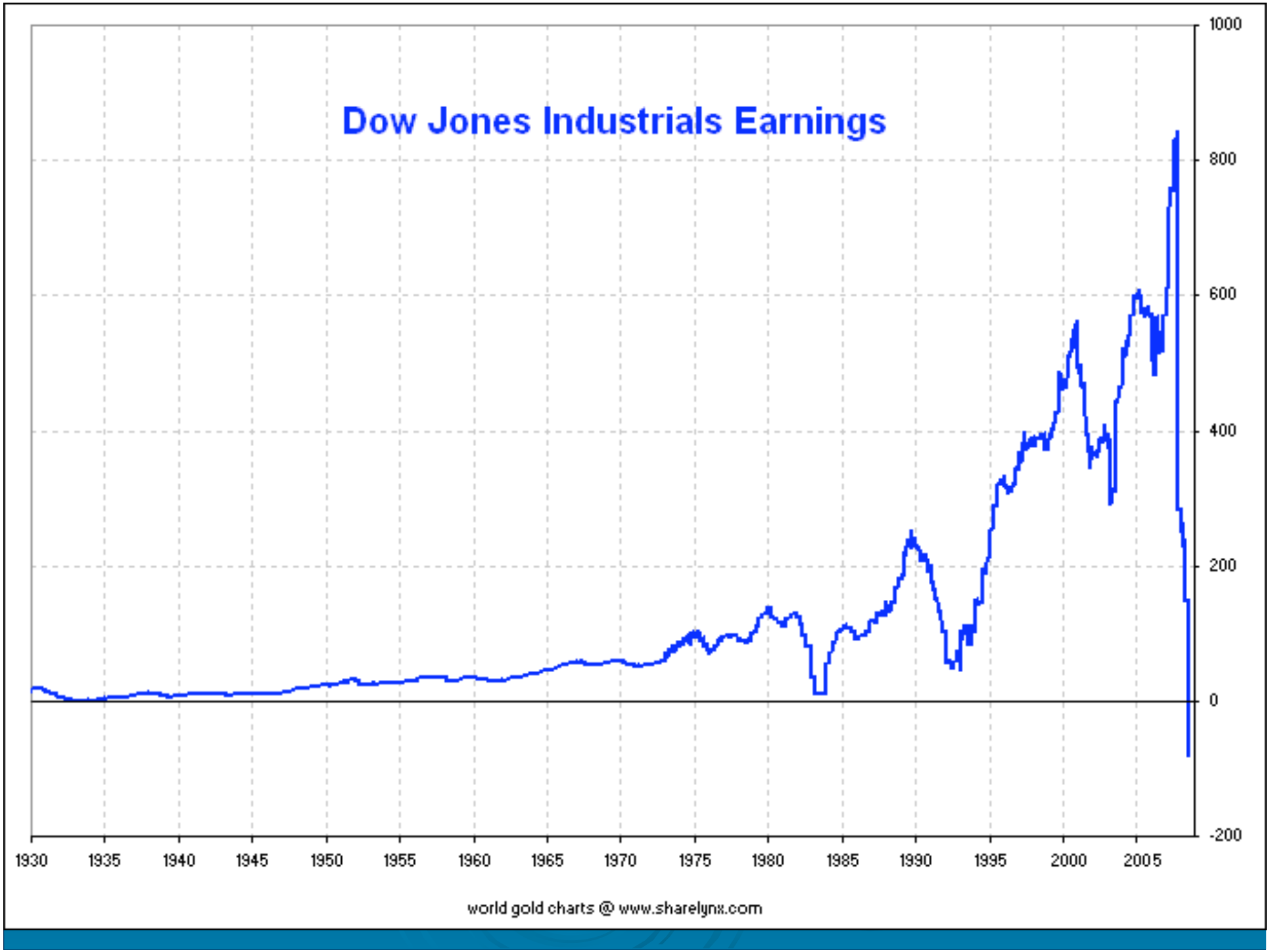
Mr. Poulakakos, rest assured, isn't planning to disappear. But the cultural tableau and the social swirl that once surrounded Harry's are certainly fading.

"It's the beginning of the end of the era of infatuation with the free market," said Steve Fraser, author of "Wall Street: America's Dream Palace," and a historian. "It's the end of the era where Wall Street carries high degrees of po prestige. And it's the end of the era of conspicuous of wealth. We are entering a new chapter in our hist

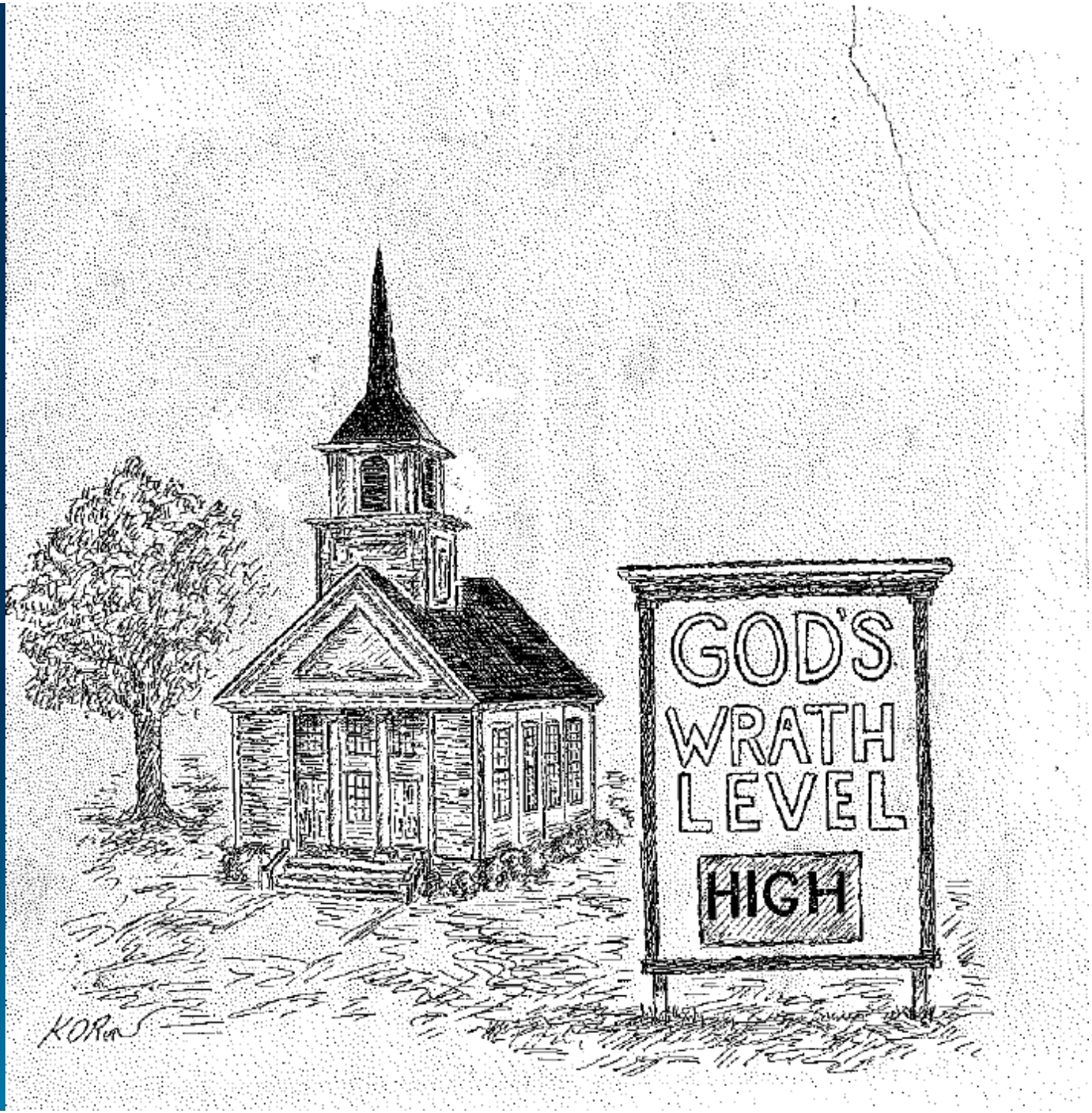
To be sure, living large and flaunting it are unlikel the American stage, infused as they are in the c mojo. But with Congress having approved a $70 banking bailout, historians, economists and pundits busily debating the ways in which Wall Street's der filter into the popular culture.

It's an era that traces its roots back more than ades, when suspendered titans first became fo books and movies. It's an era when eager young wearing khakis and toting laptops became dot-com aires overnight. And it is an era that roared into hy during the credit boom of the last decade, when M.B

Continued on Page 10


Dow Jones Industrials Earnings
1000
800
600
400
200
0
-200
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
world gold charts @ www.sharelynx.com

Hypothesis 1

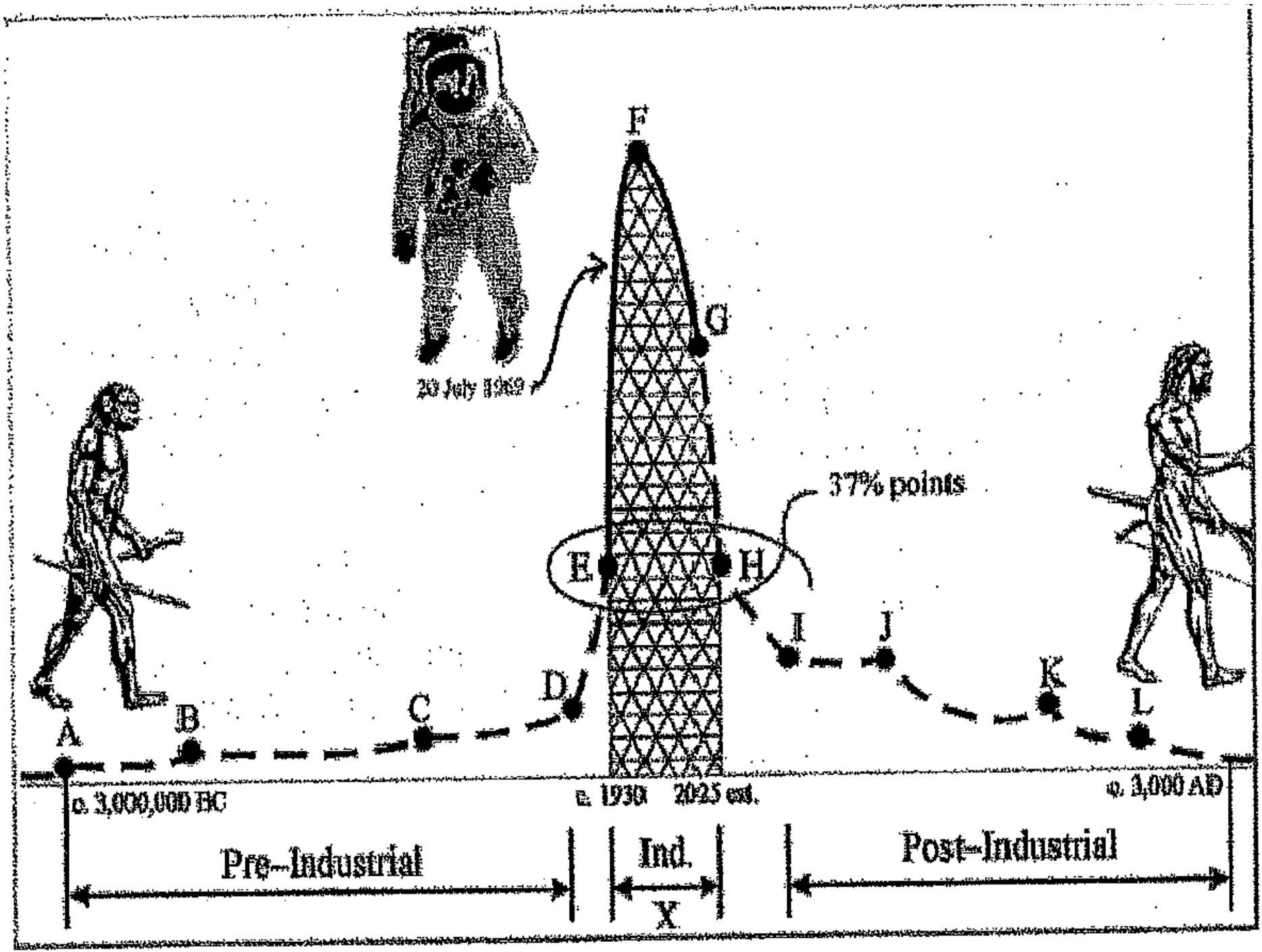


Hypothesis 2. They were just a bunch of greedy, dirty SOB's


JUMP!
YOU F bleep ERS!
ROAD CLOSED
NO
THRU TRAFFIC

HYPOTHESIS 3. Capitalism is/was a giant government-endorsed Ponzi scheme, and we were all complicit.

As the base of the pyramids (i.e. oil production) expanded no one called in the Ponzis, and the guys at the top raked it in for two centuries. When we hit the first whiff of peak oil then what had been growth turned into speculation.


20 July 1969
F
G
37% points
E
H
I
J
K
L
A
B
C
D
c. 3,000,000 BC
c. 1930
2025 est.
c. 3,000 AD
Pre-Industrial
Ind.
X
Post-Industrial

Hypothesis 4. Peak oil

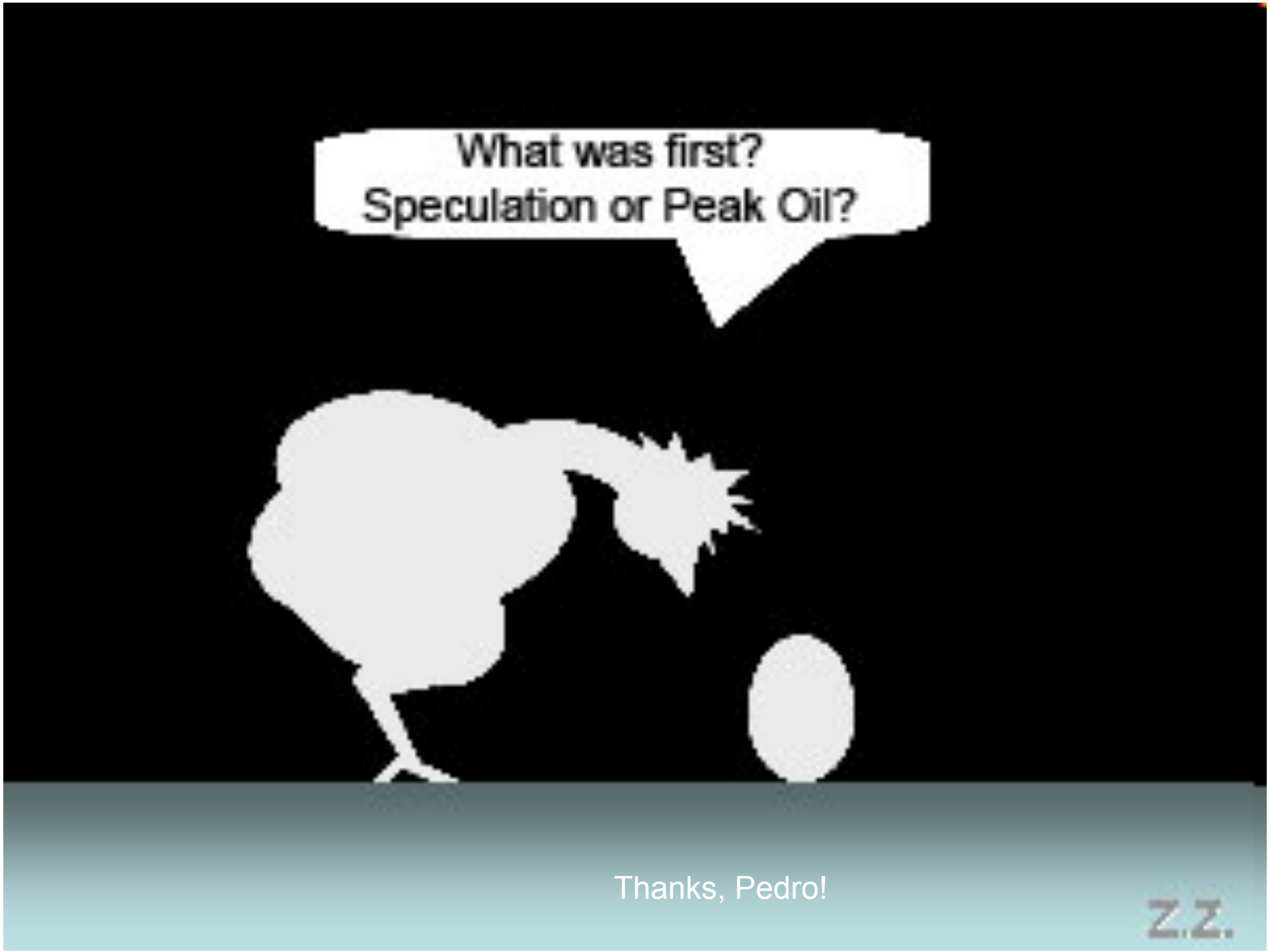
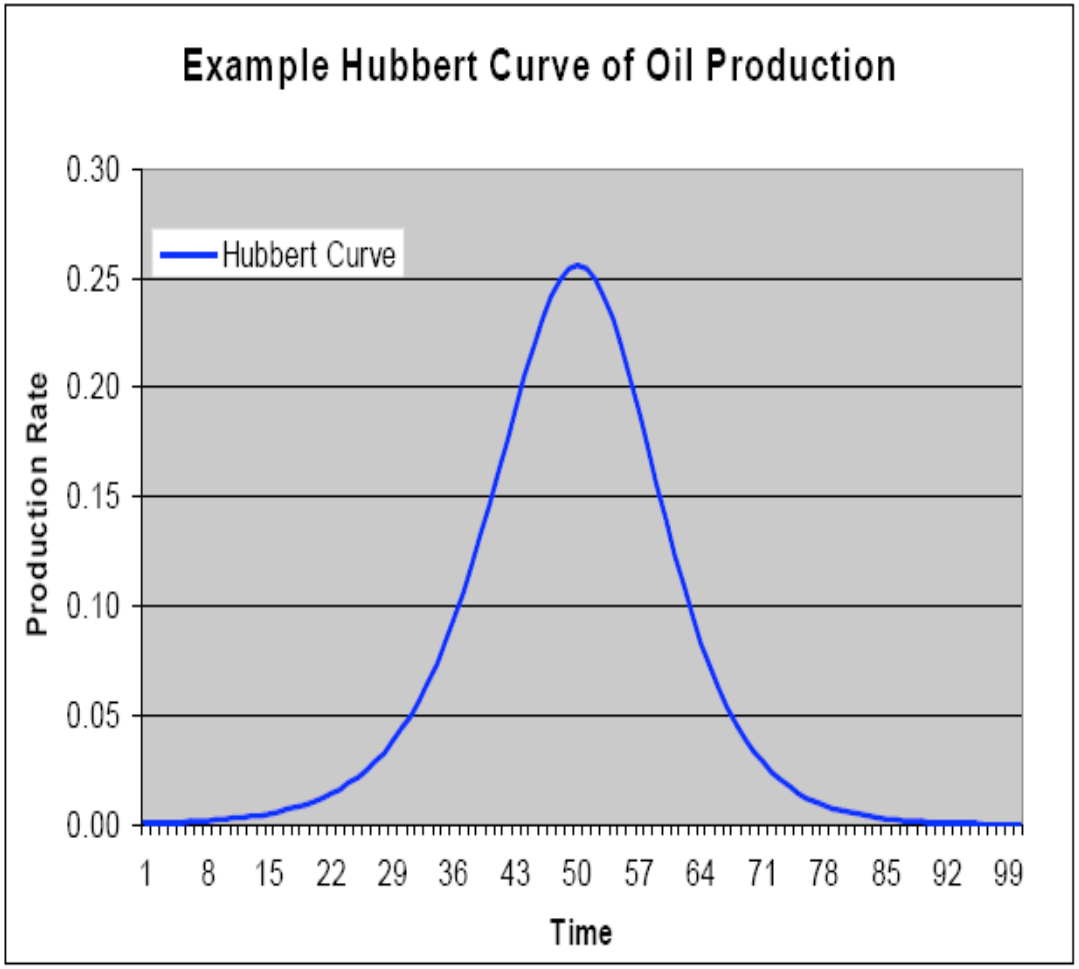
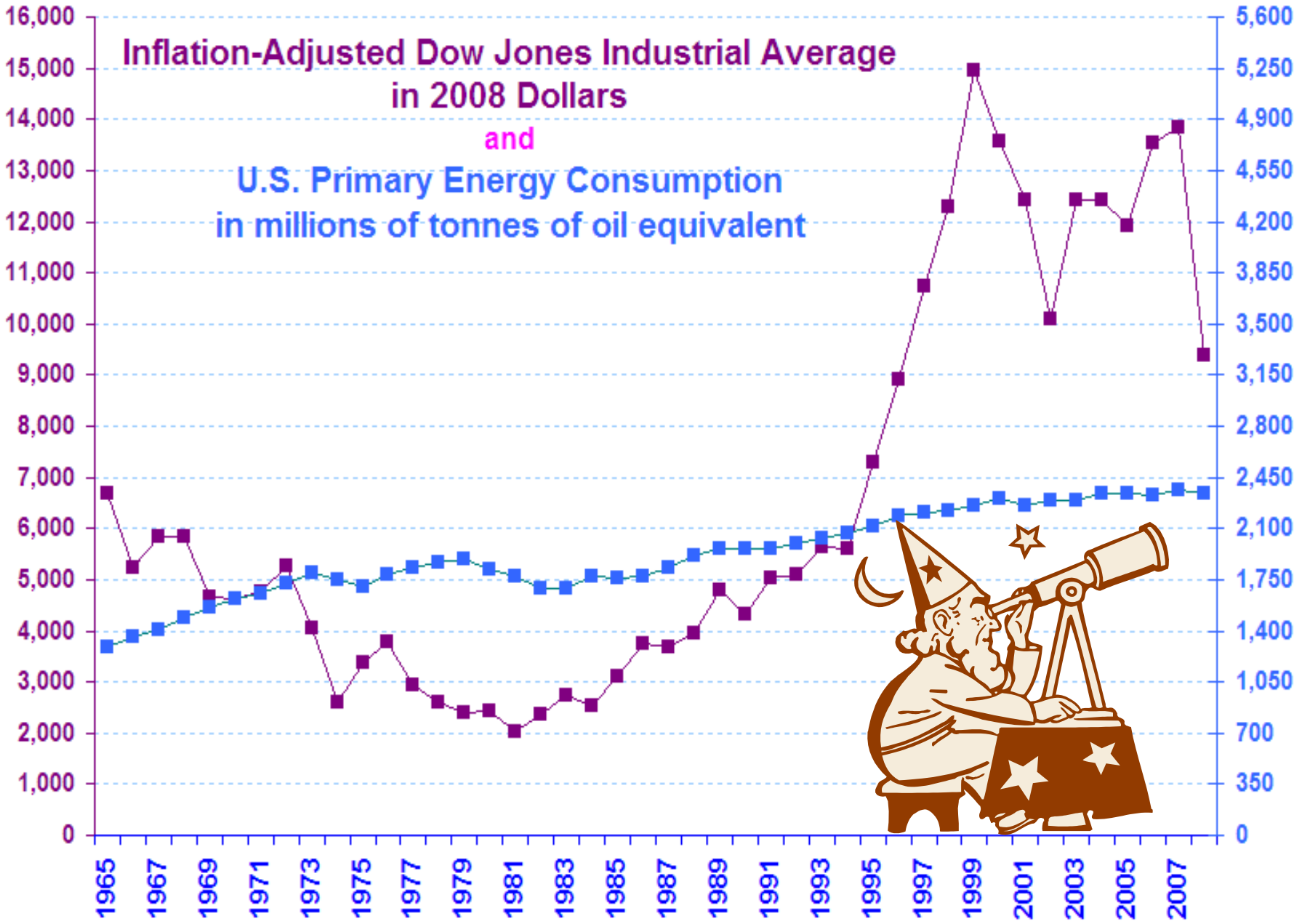

What was first?
Speculation or Peak Oil?
Thanks, Pedro!
Z.Z.

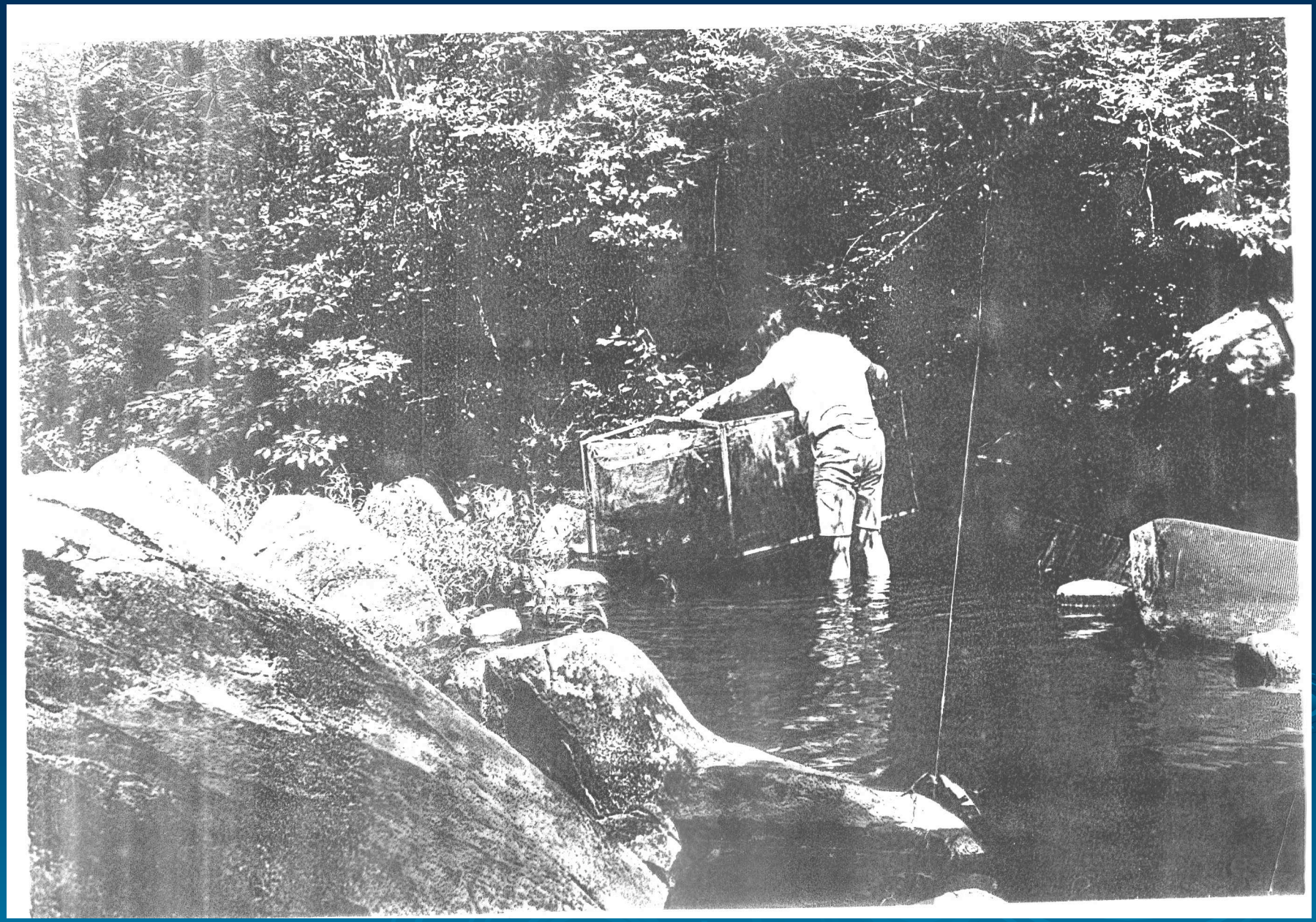
Figure 3-1 Example of Hubbert Curve




Inflation-Adjusted Dow Jones Industrial Average
in 2008 Dollars
and
U.S. Primary Energy Consumption
in millions of tonnes of oil equivalent
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
5,600
5,250
4,900
4,550
4,200
3,850
3,500
3,150
2,800
2,450
2,100
1,750
1,400
1,050
700
350
0
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007

V. THE QUESTION IS NOT HOW MUCH OIL IS IN THE GROUND

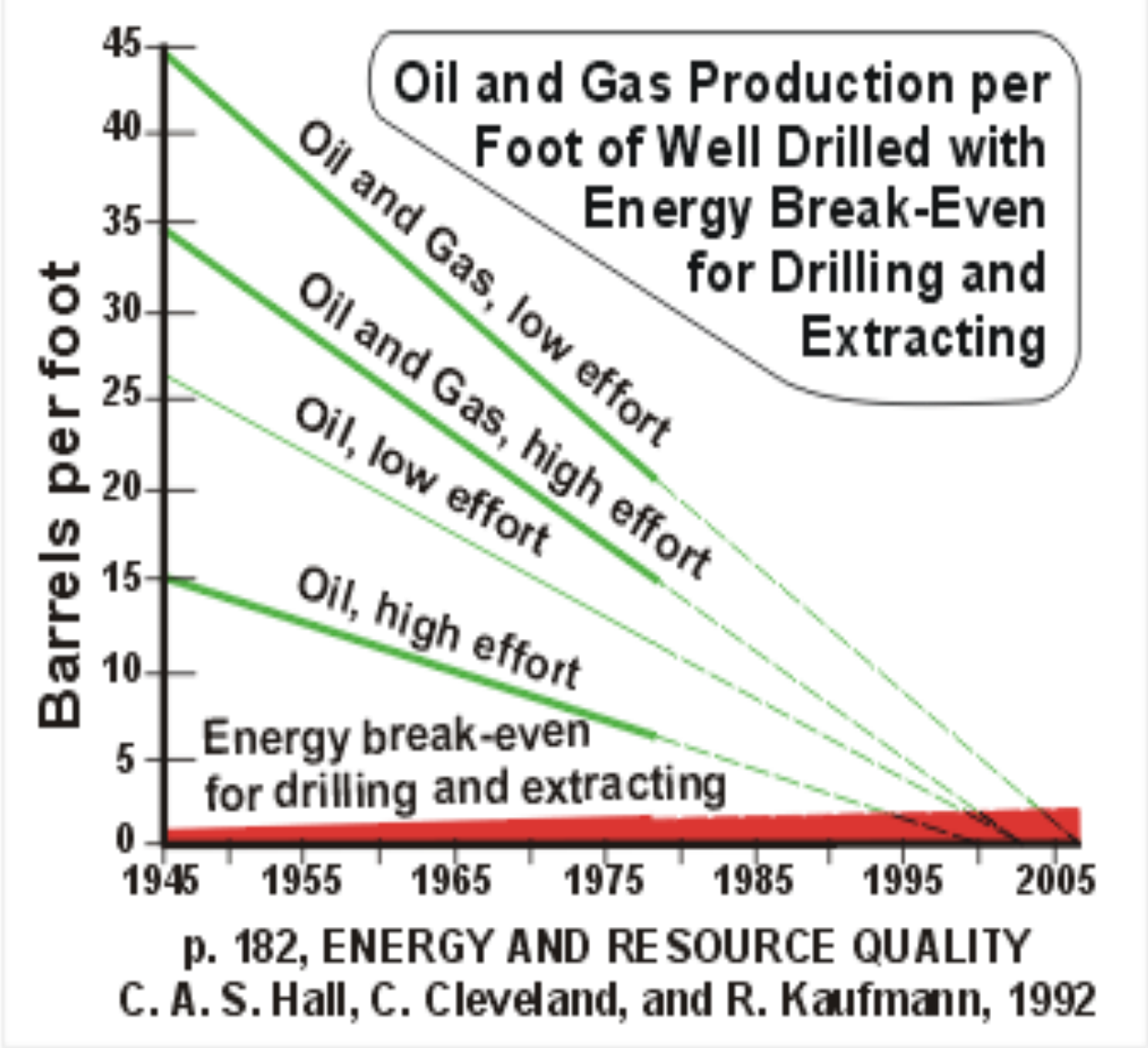
- But rather how much can be gained with a significant energy profit (EROI)
- Drilling more does not solve the problem
- (Drilling more intelligently can help a little)



What interested me the most was the energetics of ecosystems and especially fish migration

- From this I derived EROI,
- The Energy Return on Investment for a migrating fish

For the past three years the expenditures to look for oil have been greater than the dollar returns!

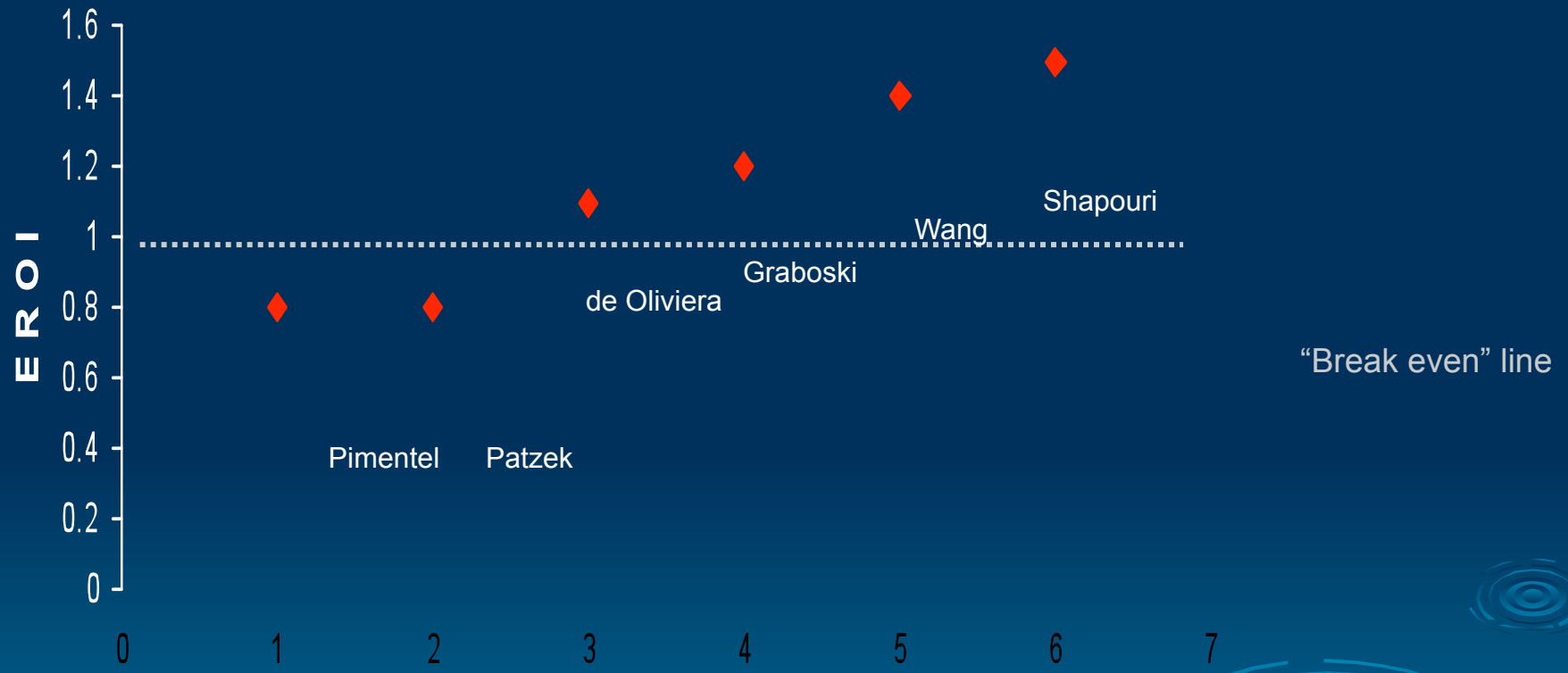


p. 182, ENERGY AND RESOURCE QUALITY
C. A. S. Hall, C. Cleveland, and R. Kaufmann, 1992

NY Times Oct 10, 04

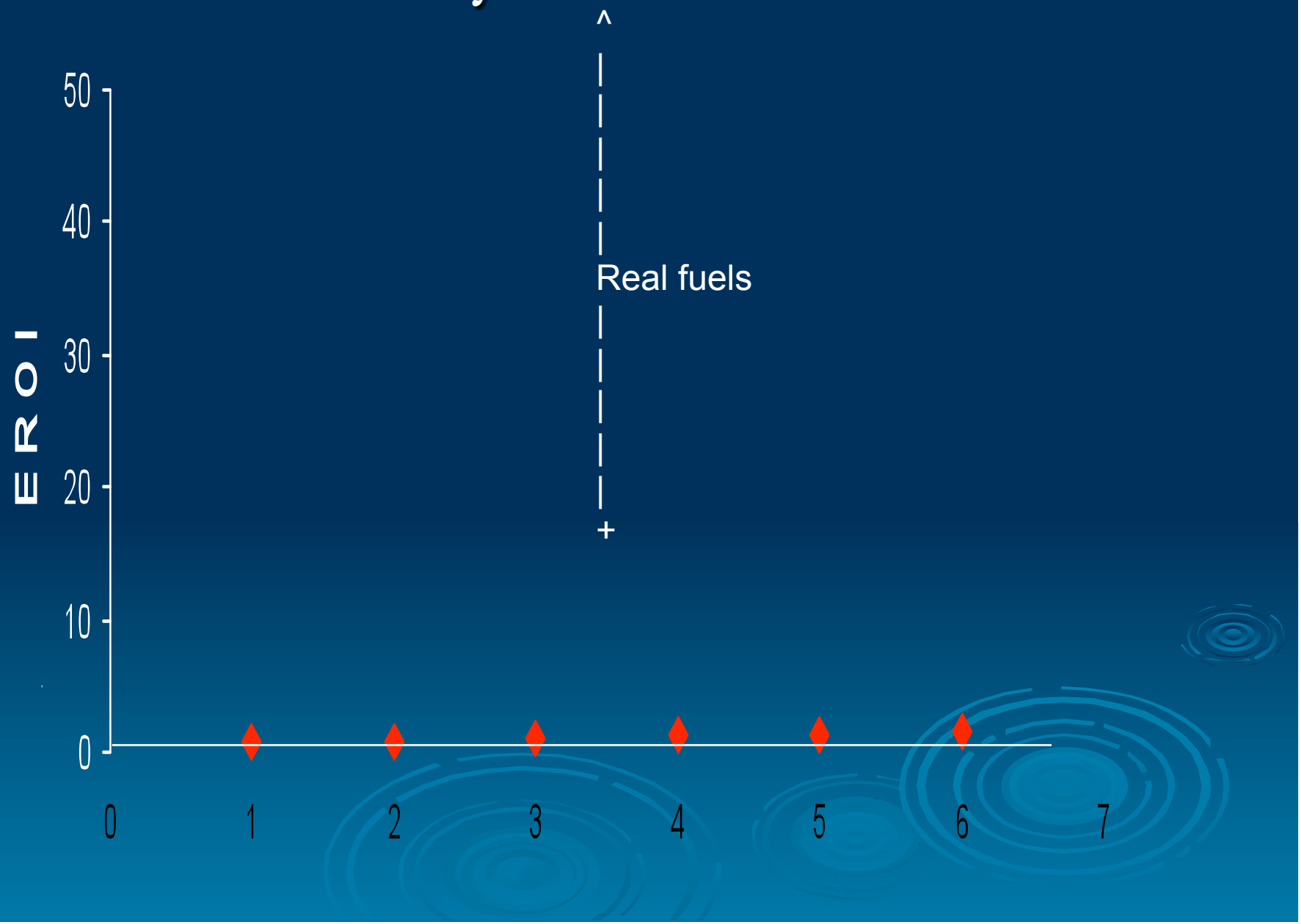
Hall & Cleveland 1981 Science

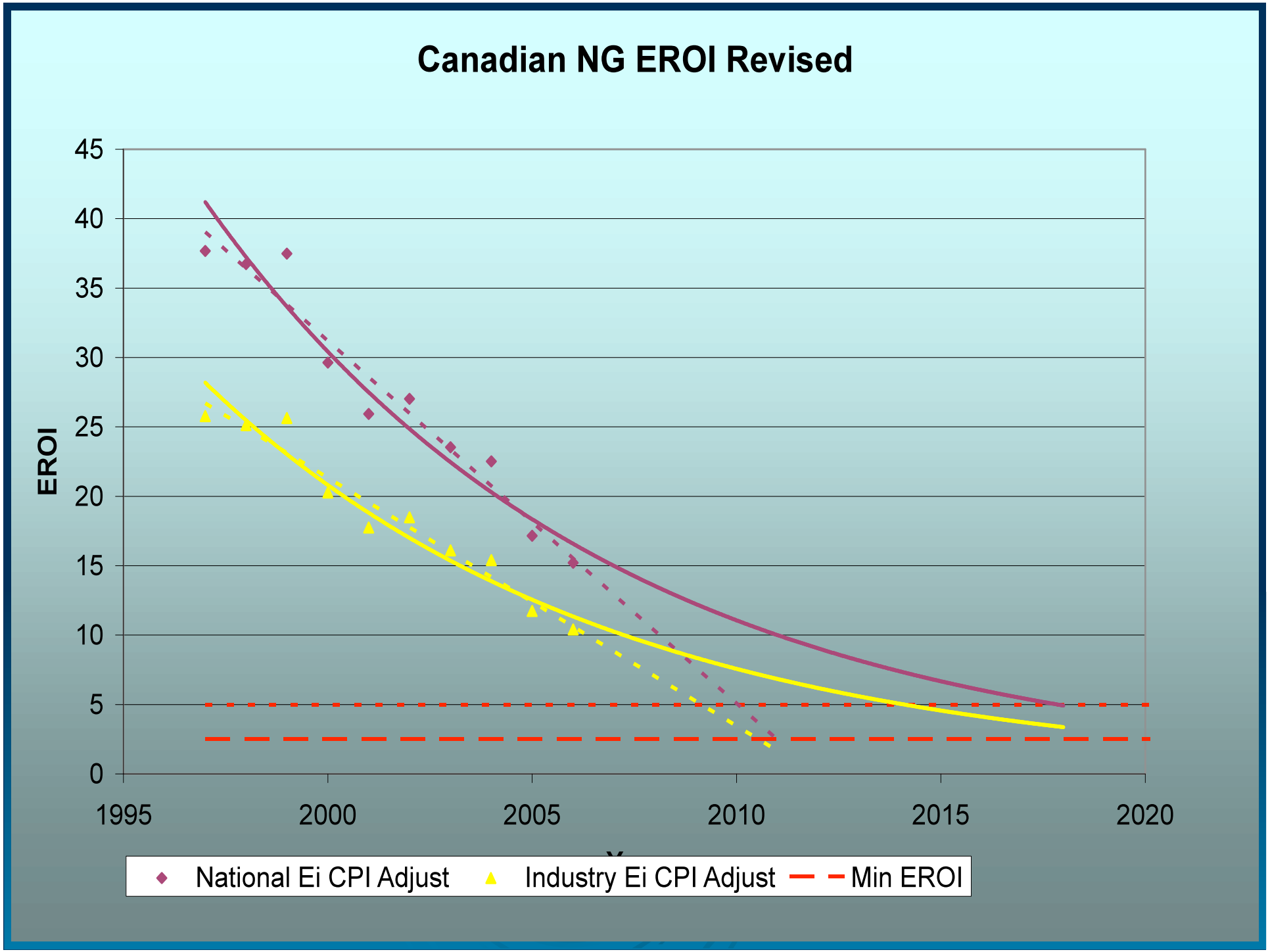
Example: EROI from Corn-based ethanol

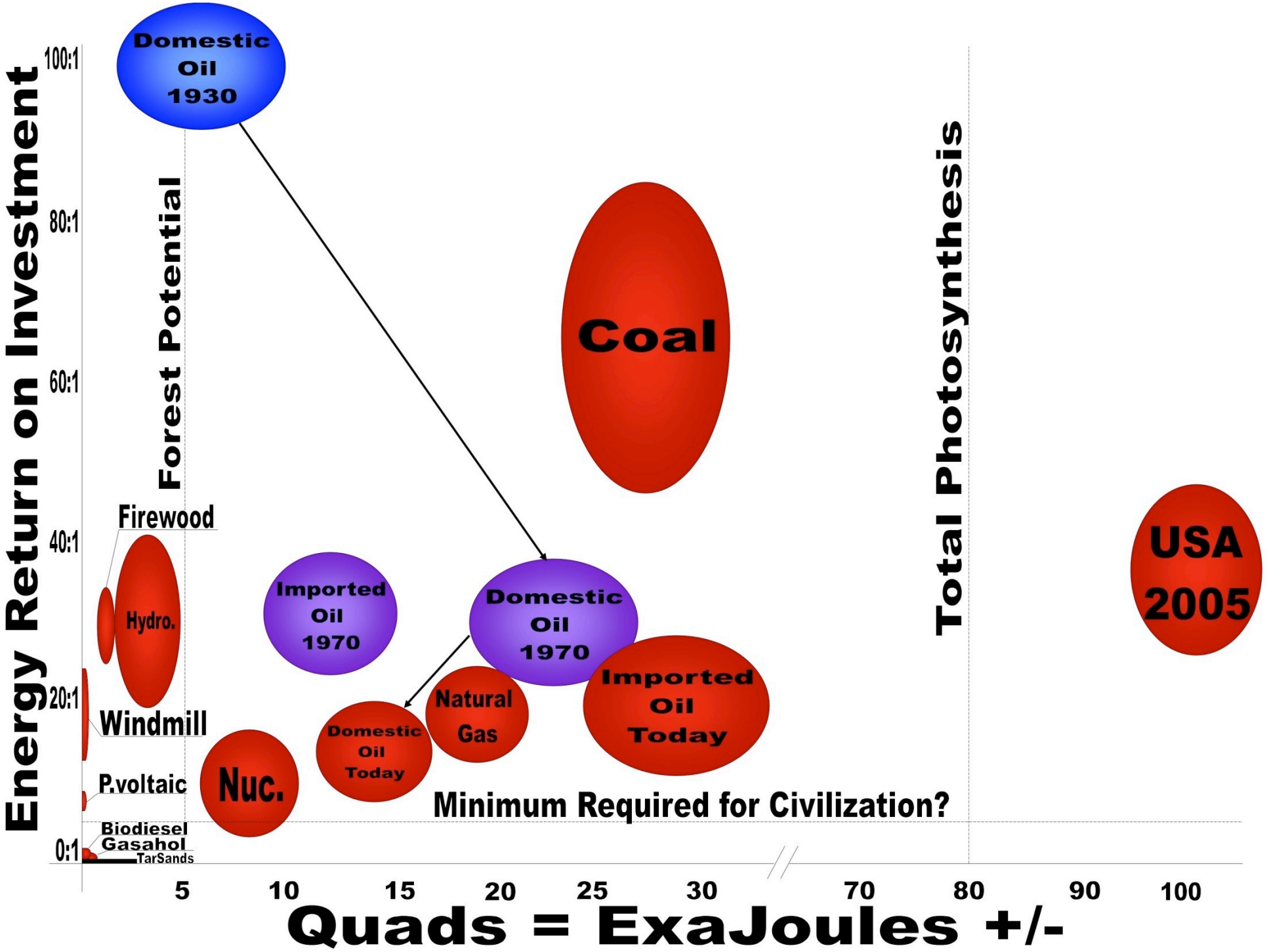


Why are these numbers so different?

…or are they?




Canadian NG EROI Revised
EROI
45
40
35
30
25
20
15
10
5
0
1995
2000
2005
2010
2015
2020
National Ei CPI Adjust
Industry Ei CPI Adjust
Min EROI

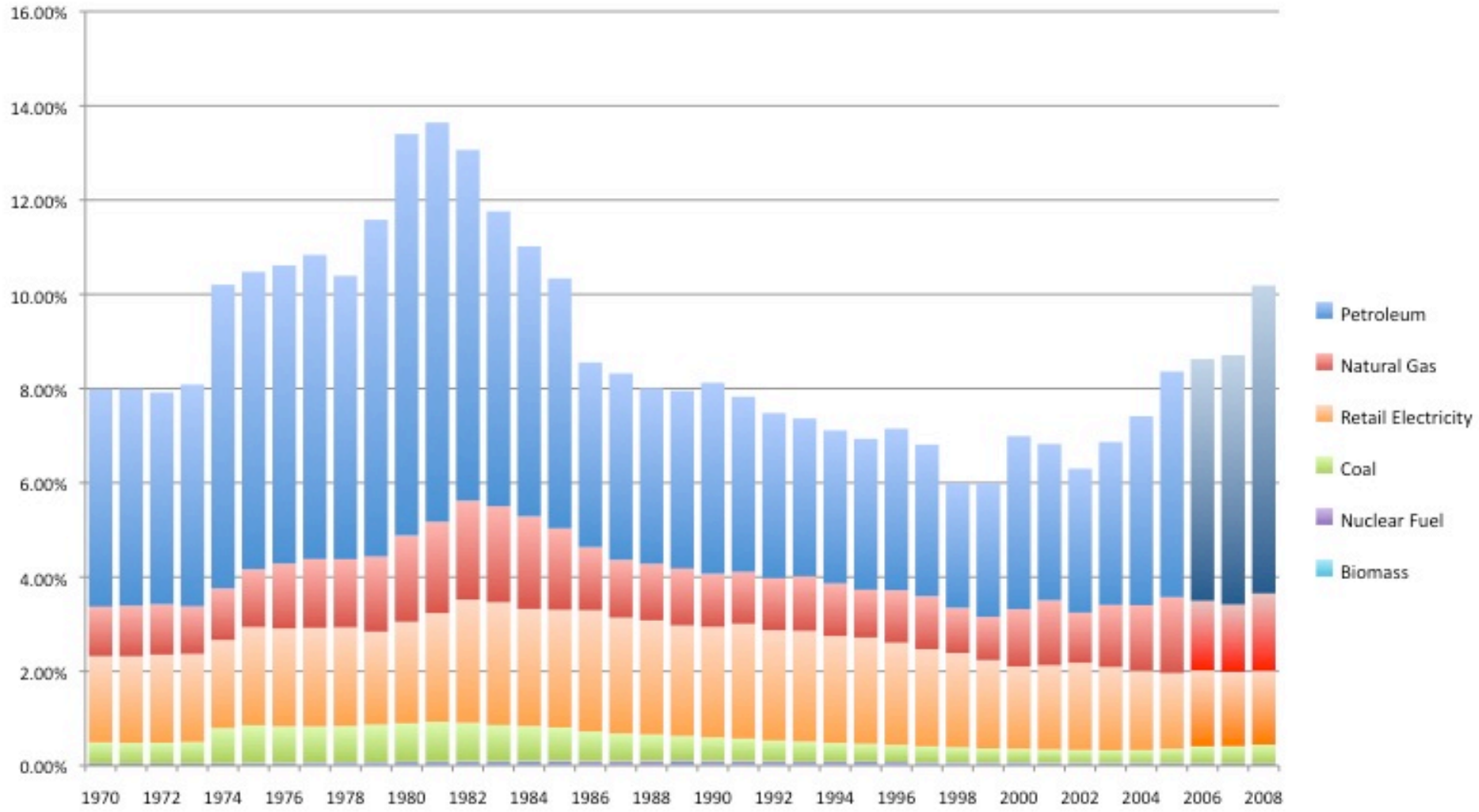

Energy Return on Investment
100:1
80:1
60:1
40:1
20:1
0:1
Domestic Oil 1930
Forest Potential
Coal
Total Photosynthesis
USA 2005
Firewood
Hydro.
Windmill
P.voltaic
Biodiesel
Gasahol
TarSands
Nuc.
Imported Oil 1970
Domestic Oil 1970
Domestic Oil Today
Natural Gas
Imported Oil Today
Minimum Required for Civilization?
5
10
15
20
25
30
70
80
90
100
Quads = ExaJoules +/-

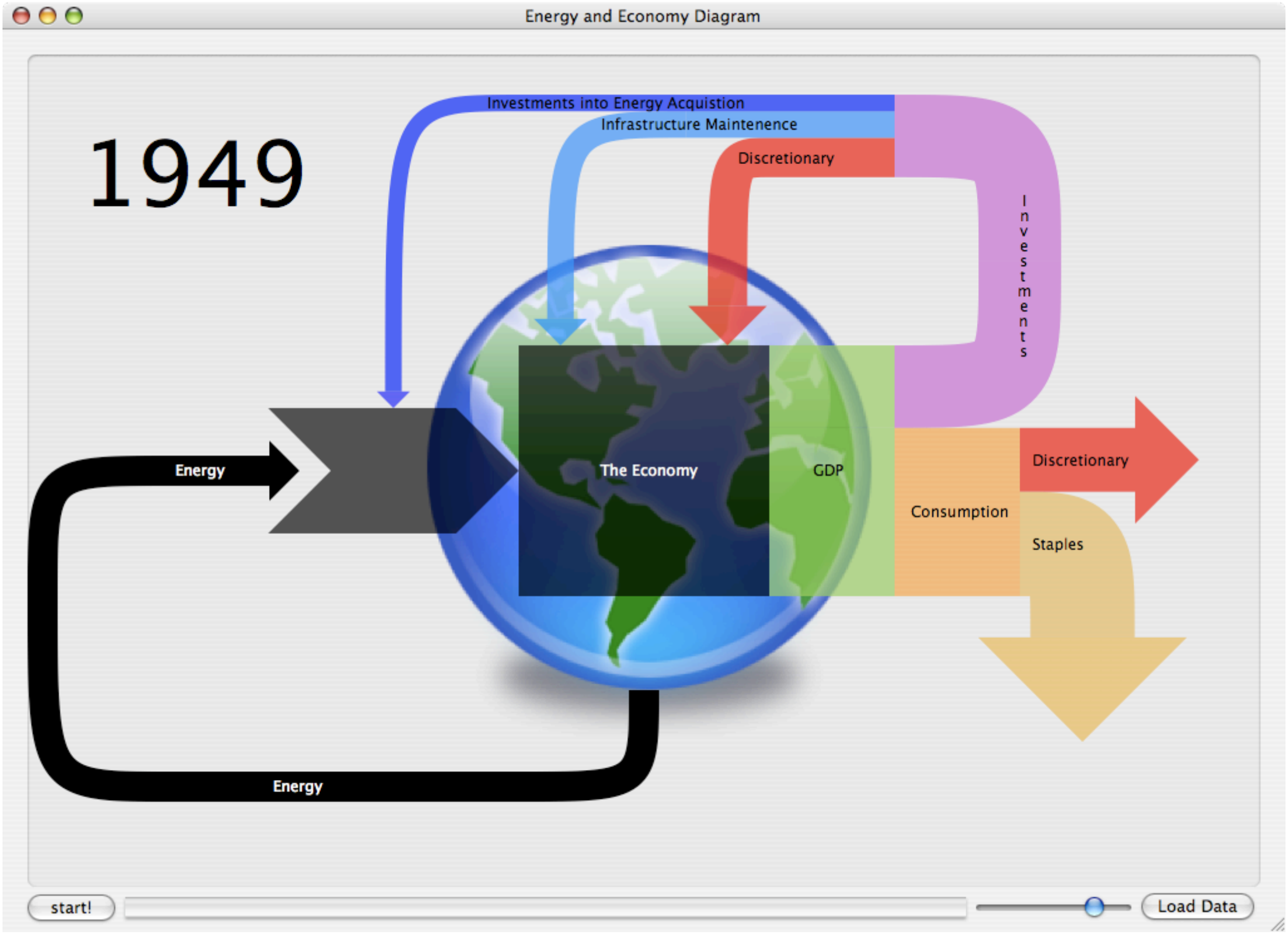
- It is curious that we do not have similar information for the entire world.

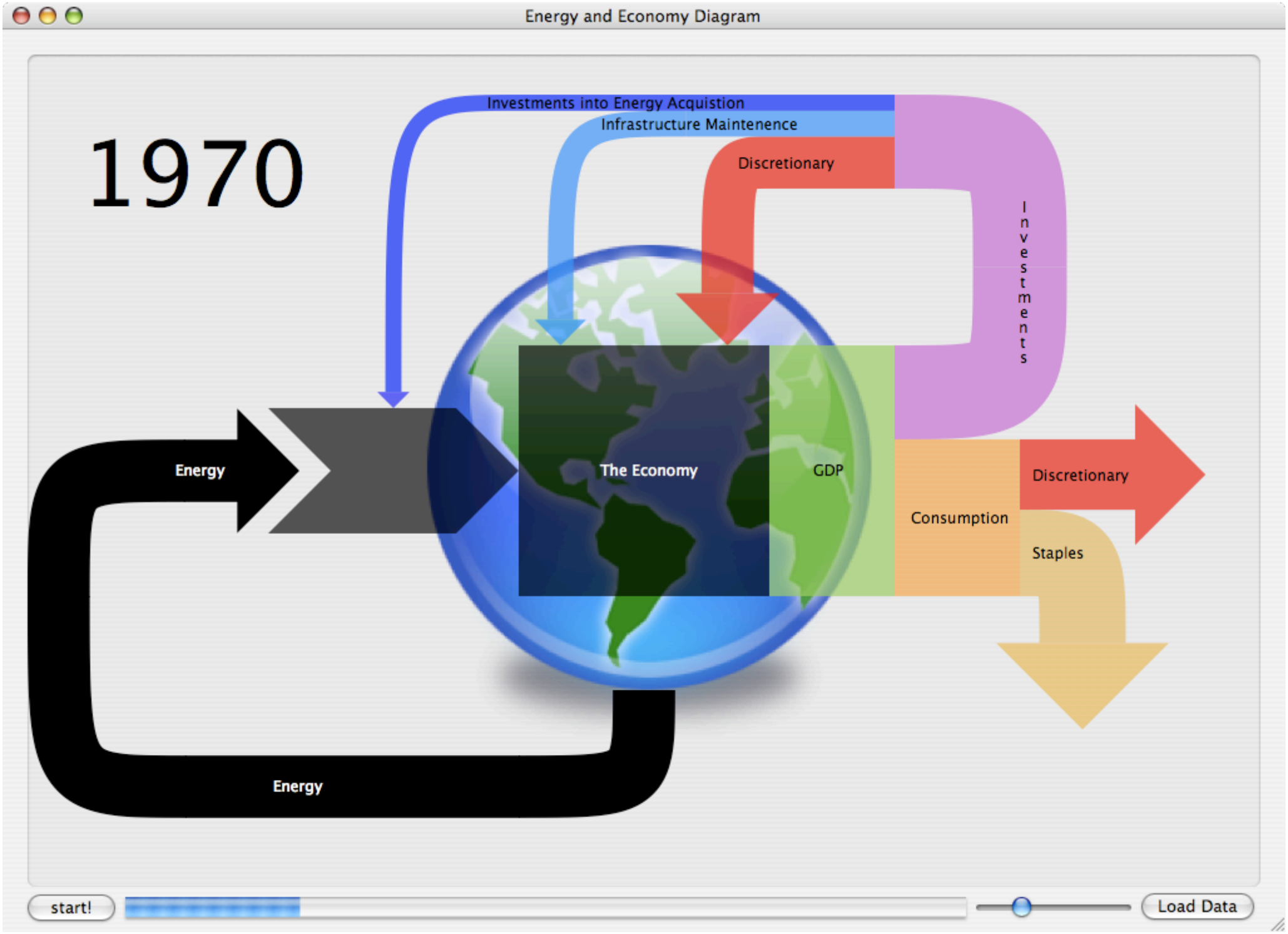
VI. What are main implications of decreasing EROI?

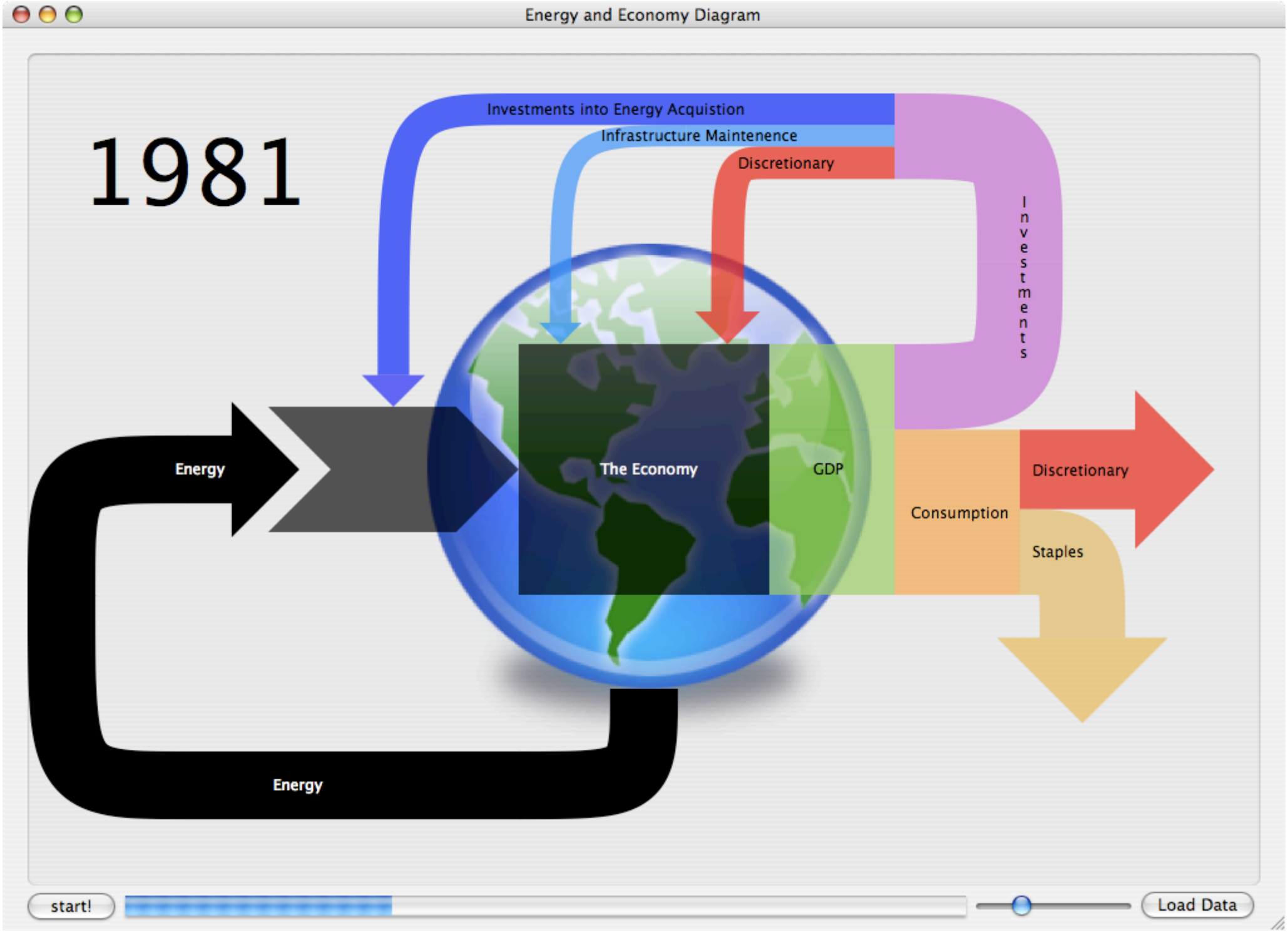
- I think main thing will be a decrease in discretionary spending

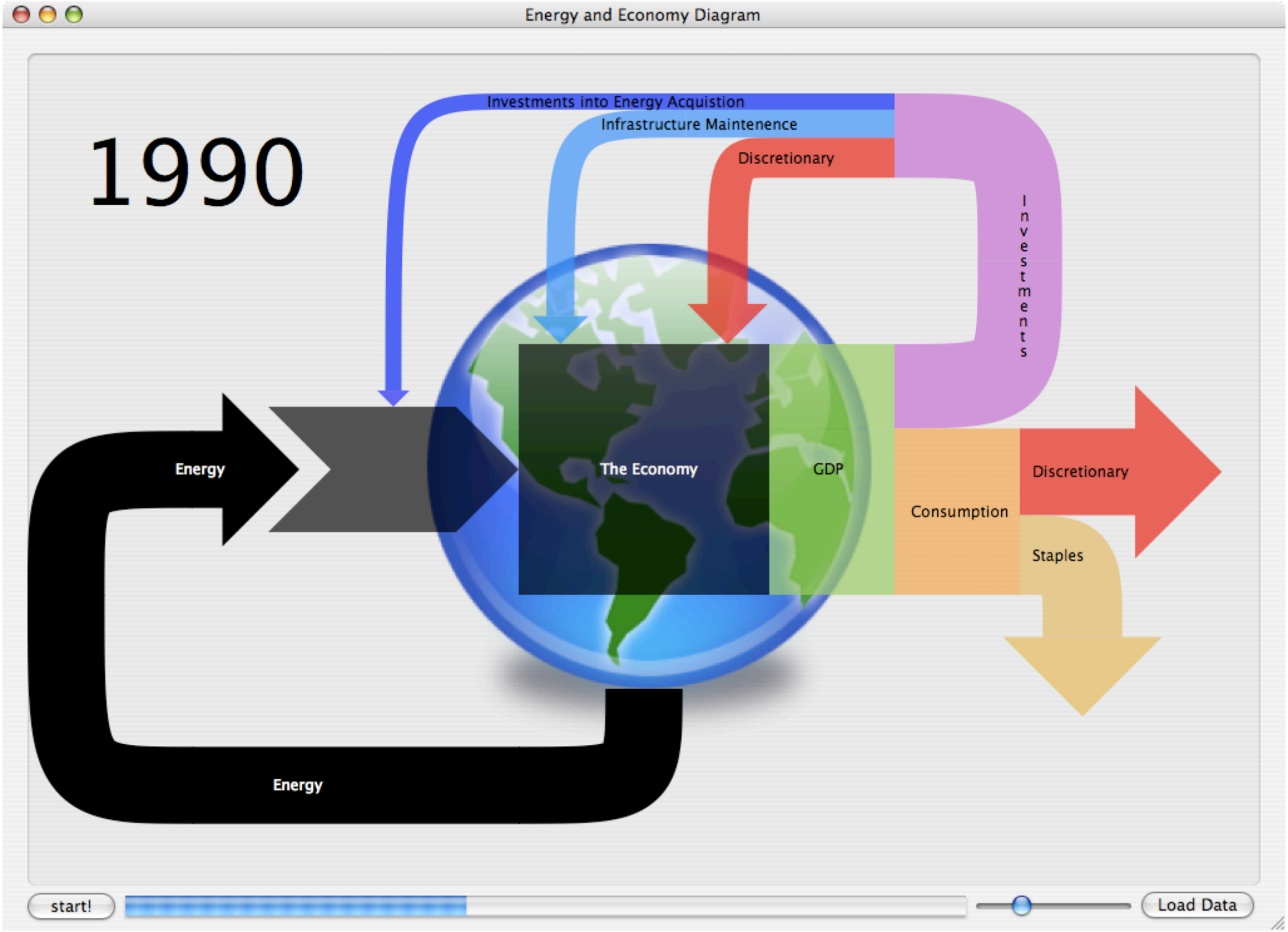
Consumer Expenditure Estimates for Energy by Source (% of GDP)




Energy and Economy Diagram
1949
Investments into Energy Acquistion
Infrastructure Maintenence
Discretionary
Investments
Energy
The Economy
GDP
Consumption
Discretionary
Staples
Energy
start!
Load Data


Energy and Economy Diagram
1970
Investments into Energy Acquistion
Infrastructure Maintenence
Discretionary
Investments
Energy
The Economy
GDP
Consumption
Discretionary
Staples
Energy
start!
Load Data


Energy and Economy Diagram
1981
Investments into Energy Acquistion
Infrastructure Maintenence
Discretionary
Investments
Energy
The Economy
GDP
Consumption
Discretionary
Staples
Energy
start!
Load Data


Energy and Economy Diagram
1990
Investments into Energy Acquistion
Infrastructure Maintenence
Discretionary
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Energy
The Economy
GDP
Consumption
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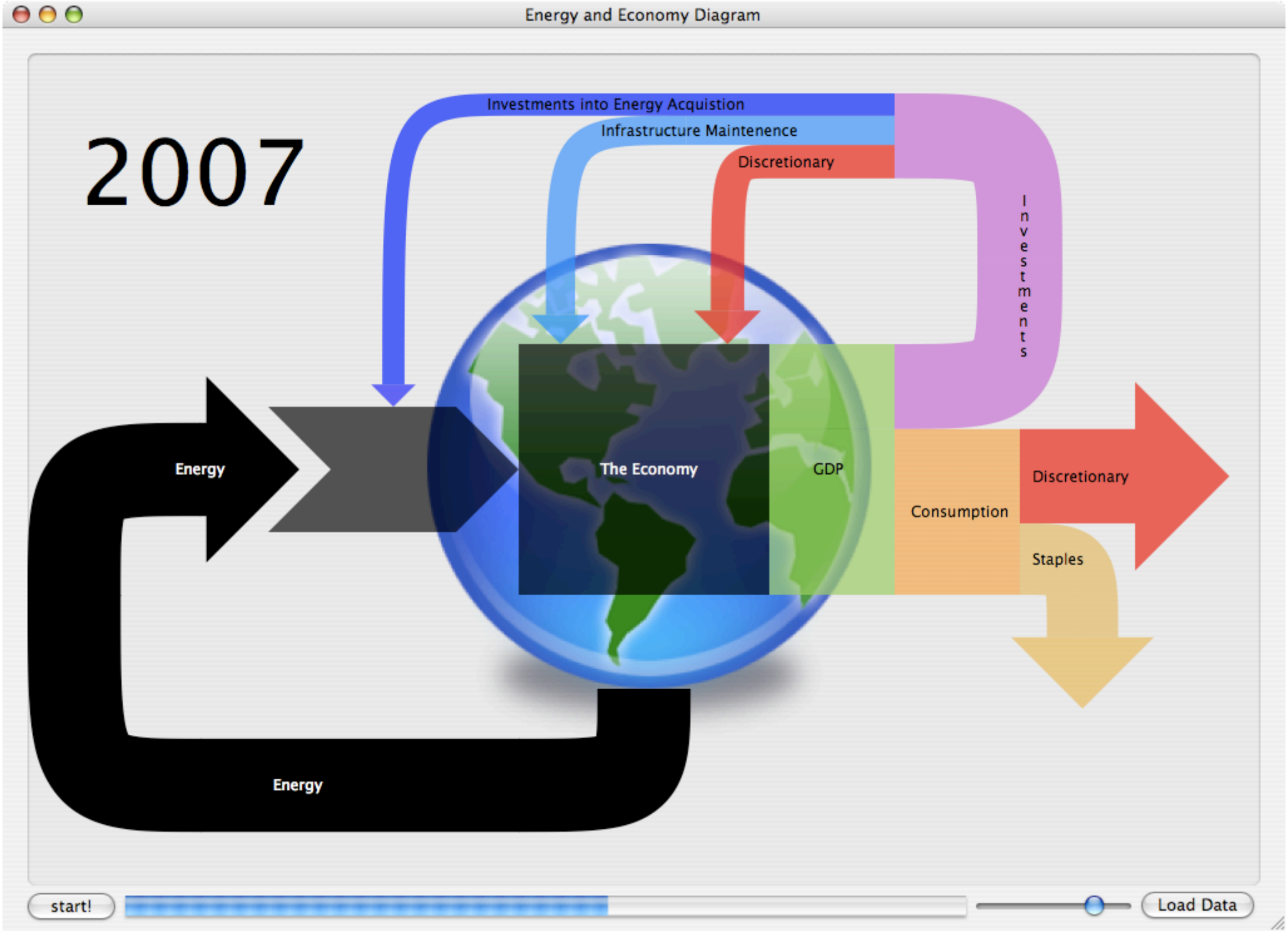
Energy
start!
Load Data


Energy and Economy Diagram
2007
Investments into Energy Acquistion
Infrastructure Maintenence
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Energy
start!
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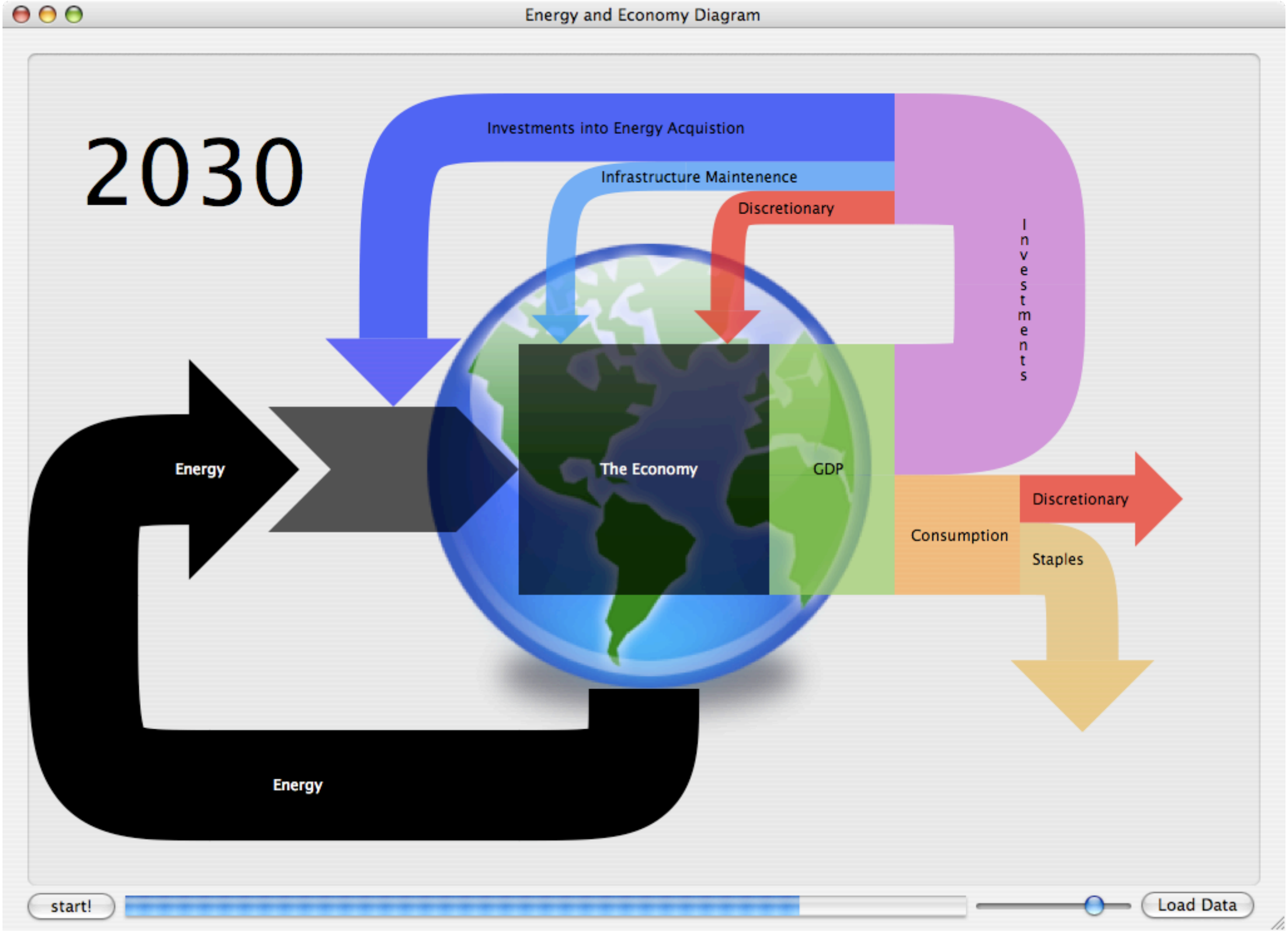
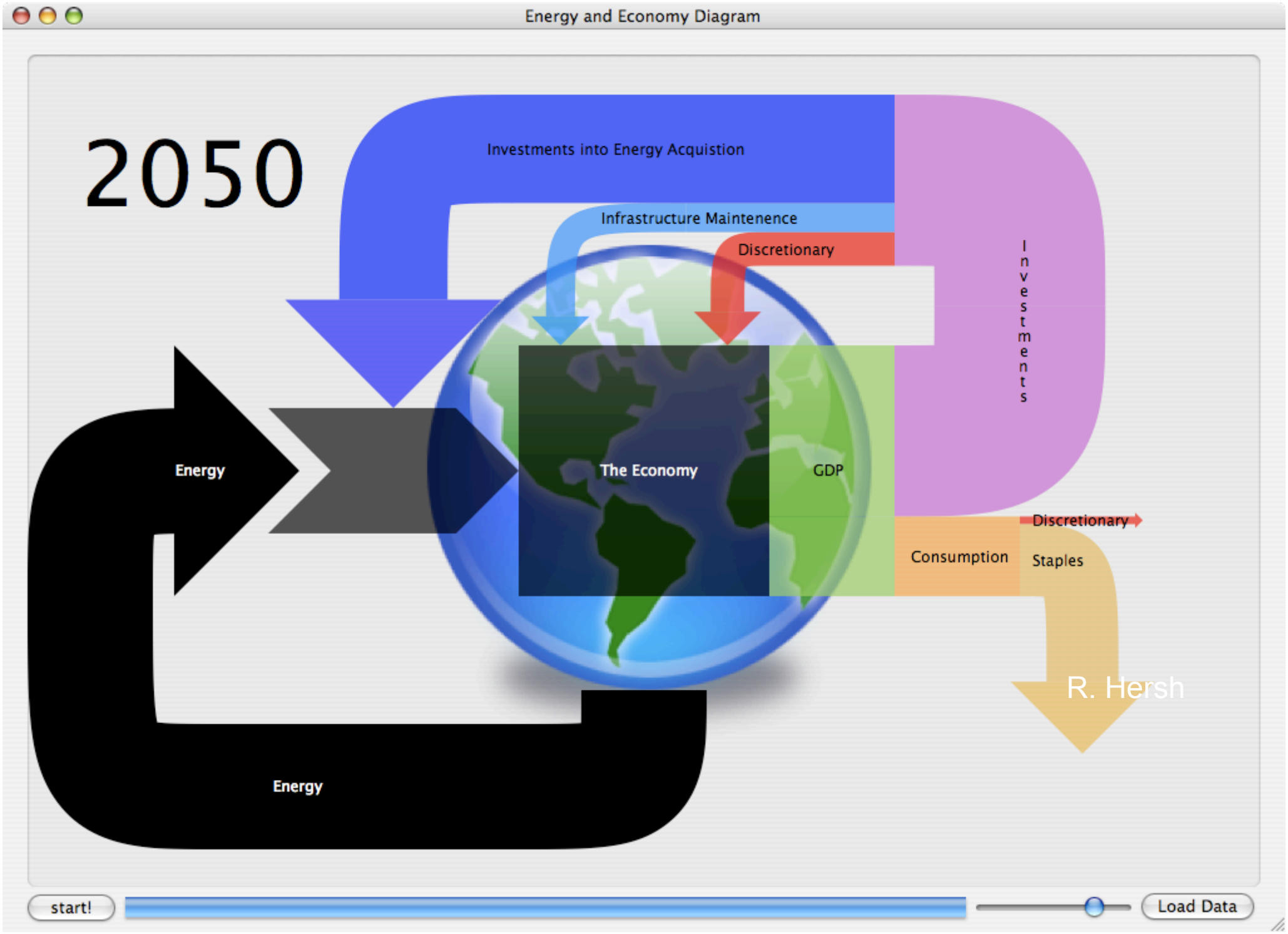

Energy and Economy Diagram
2030
Investments into Energy Acquistion
Infrastructure Maintenence
Discretionary
Investments
Energy
The Economy
GDP
Consumption
Discretionary
Staples
Energy
start!
Load Data


Energy and Economy Diagram
2050
Investments into Energy Acquistion
Infrastructure Maintenence
Discretionary
Investments
Energy
The Economy
GDP
Discretionary
Consumption
Staples
Energy
R. Hersh
start!
Load Data

IV. THIS IS NOT A CYCLE, IT IS A TREND

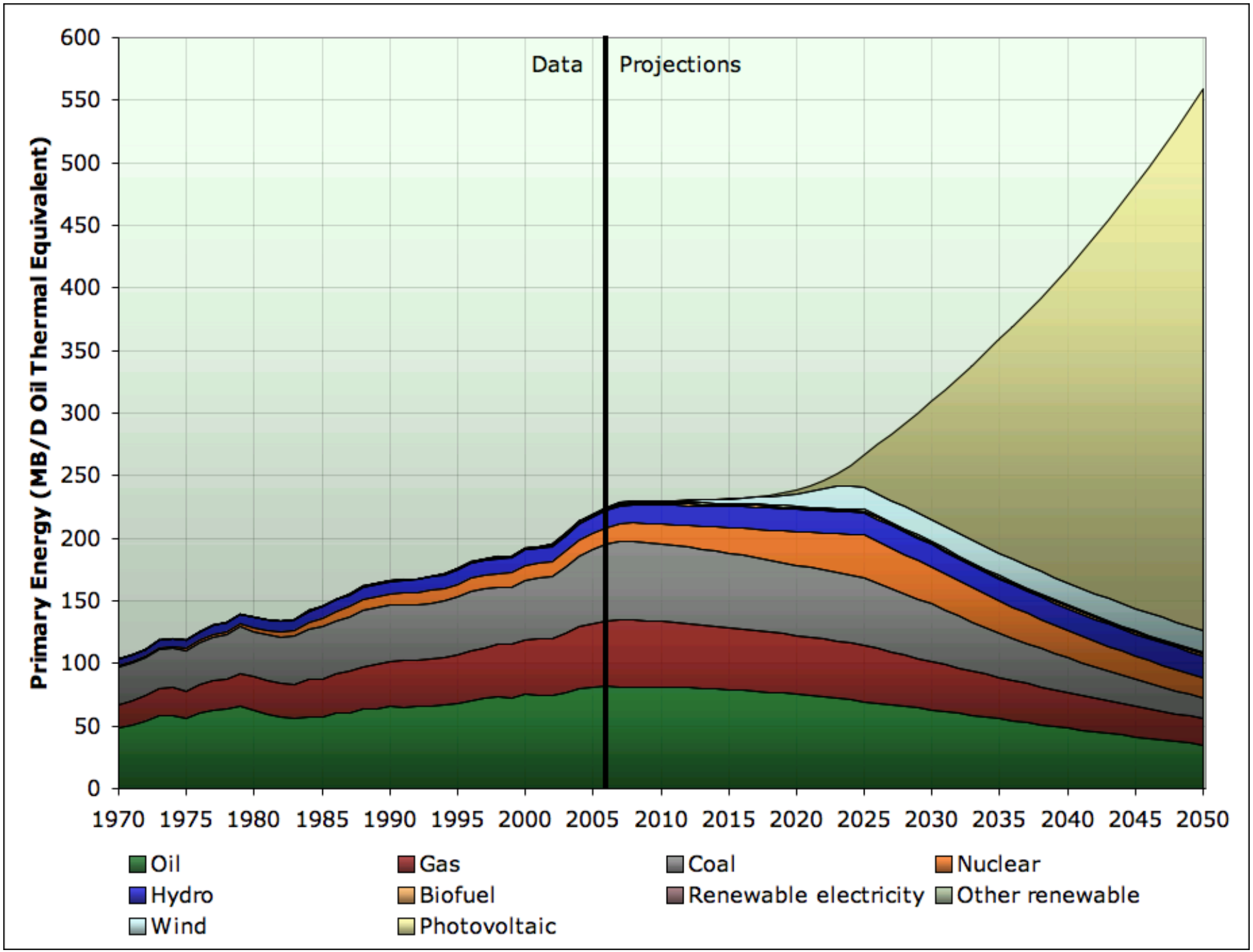
- Not necessarily a bad thing depending upon how we respond to it.
- We can respond to it well or poorly
- Need to live on interest, not capital
- Need to put growth aside for the time being

SOME NEW WAYS WE WILL HAVE TO DO ECONOMICS

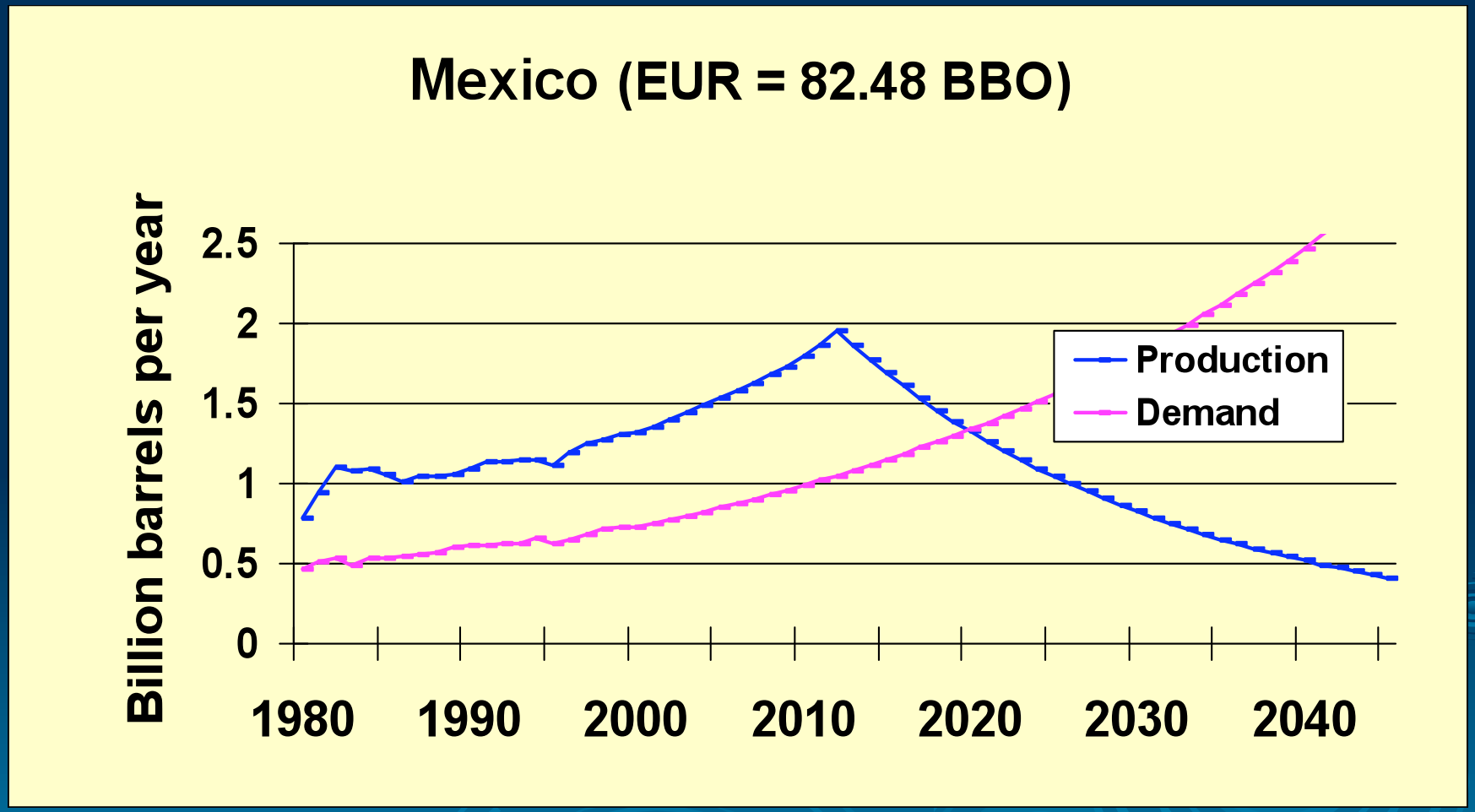
- 1). We will have to *reduce* labor productivity
- 2) We will have to *reduce* wages
- 3) It will impact foreign workers hugely
- 4) We cannot afford market economics
- to guide our future
- 4) It is a great time to think about redistribution

My final professional goal

THE END


Primary Energy (MB/D Oil Thermal Equivalent)
600
550
500
450
400
350
300
250
200
150
100
50
0
Data
Projections
1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050
Oil
Gas
Coal
Nuclear
Hydro
Biofuel
Renewable electricity
Other renewable
Wind
Photovoltaic

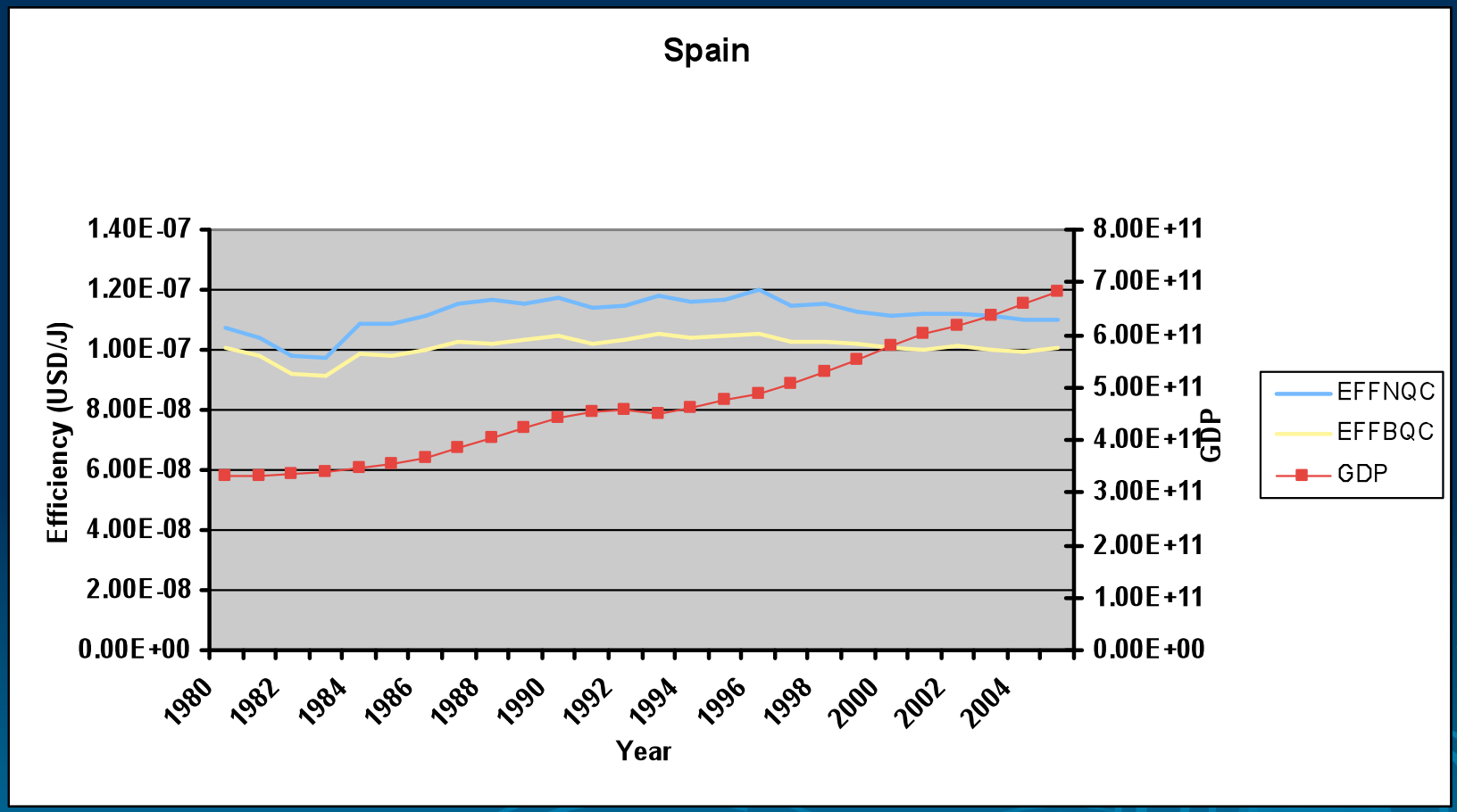
A new twist from our group:



Note even this estimate appears optimistic!


JUMP!
YOU FUCKERS!
ROAD CLOSED
NO
THRU TRAFFIC

Results: Spain Example



- **Recession-Plagued Nation Demands New Bubble To Invest In**
- July 14, 2008
  - **Onion News Network:**
- _ _ Suspicious Package Industry Falls On Hard Times April 9, 2008
- WASHINGTON—A panel of top business leaders testified before Congress about the worsening recession Monday, demanding the government provide Americans with a new irresponsible and largely illusory economic bubble in which to invest.
- "What America needs right now is not more talk and long-term strategy, but a concrete way to create more imaginary wealth in the very immediate future," said Thomas Jenkins, CFO of the Boston-area Jenkins Financial Group, a bubble-based investment firm. "We are in a crisis, and that crisis demands an unviable short-term solution."
- Enlarge Image
- A prominent finance expert asks Congress to help Americans rebuild their ficticious dreams.
- The current economic woes, brought on by the collapse of the so-called "housing bubble," are considered the worst to hit investors since the equally untenable dot-com bubble burst in 2001. According to investment experts, now that the option of making millions of dollars in a short time with imaginary profits from bad real-estate deals has disappeared, the need for another spontaneous make-believe source of wealth has never been more urgent.
- "Perhaps the new bubble could have something to do with watching movies on cell phones," said investment banker Greg Carlisle of the New York firm Carlisle, Shaloe & Graves. "Or, say, medicine, or shipping. Or clouds. The manner of bubble isn't important—just as long as it creates a hugely overvalued market based on nothing more than whimsical fantasy and saddled with the potential for a long-term accrual of debts that will never be paid back, thereby unleashing a ripple effect that will take nearly a decade to correct."
- Enlarge Image
- "The U.S. economy cannot survive on sound investments alone," Carlisle added.