

# Recession Likely: Expect a Bend in Trend Lines

Casualty Actuarial Society Annual Meeting  
Sessions C41 and C41B - Honolulu, HI  
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1

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2

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## Discussion Questions

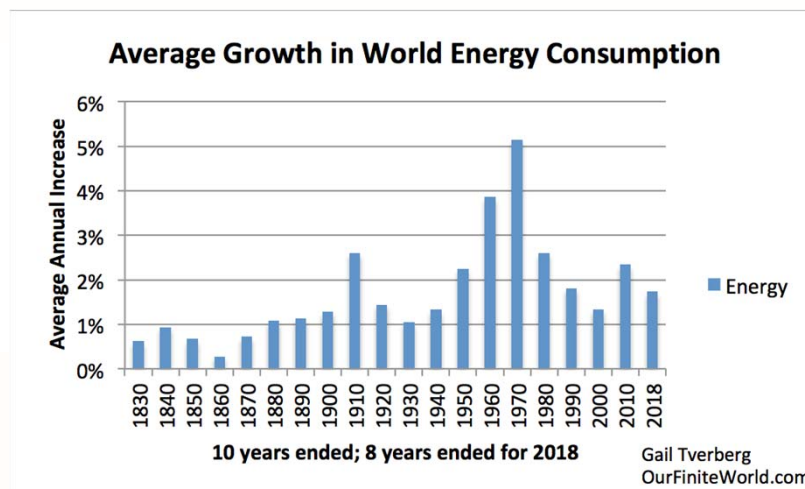
- 1. What is the role of food with respect to the human body?
- 2. What is the role of energy with respect to the economy?
  - Examples: Coal, oil, natural gas, wood pellets, electricity



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## Energy consumption growth is surprisingly important

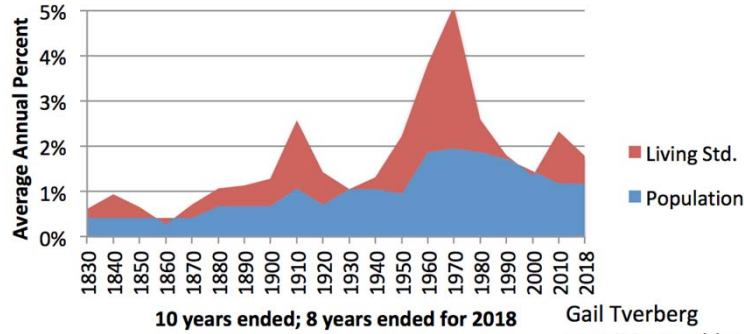


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## The economic story I am telling is an updated one

**Growth Rate in World Energy Consumption Divided Between Population & Living Standards**



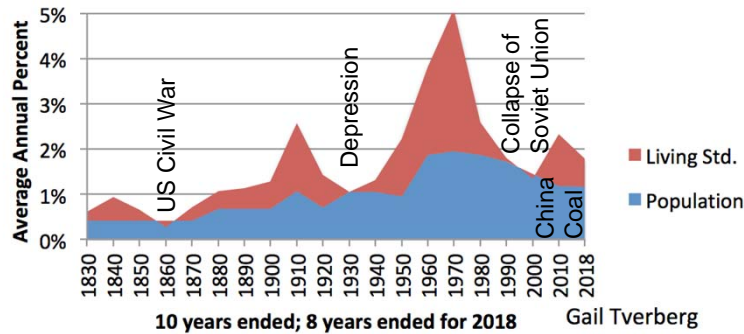
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## Economy operates under laws of physics in unexpected ways

**Growth Rate in World Energy Consumption Divided Between Population & Living Standards**

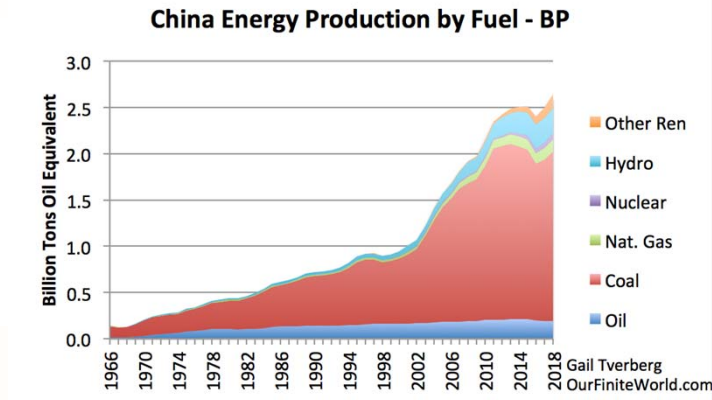


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## Low coal prices and depletion have led to a flattening of China's coal

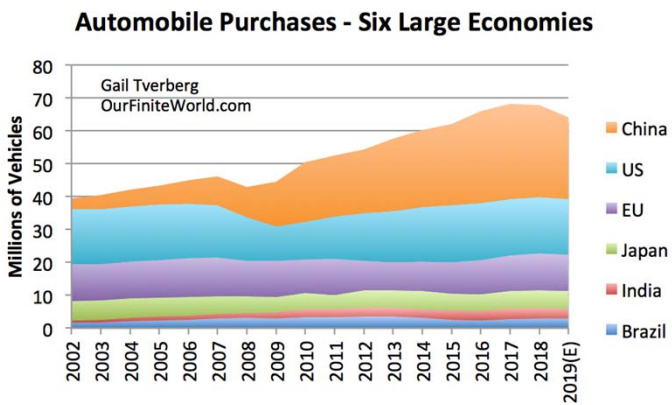


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## China is being forced to cut back on heavy industrialization


- Leading world economy into recession



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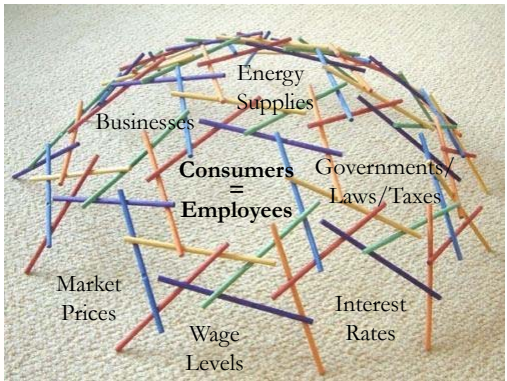
**#1 ENERGY CONSUMPTION  
ALLOWS THE ECONOMY TO GROW**




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**Economy and humans are both  
self-organizing systems that grow**



Leonardo Sticks Toy  
<http://www.rinusroelofs.nl/structure/davinci-sticks/gallery/gallery-01.html>



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10

## Physics of “open systems” is a new field of study

- Ilya Prigogine received Nobel Prize in 1977
  - Study of systems that “grow”
- Widely applied outside of economics
- Economics – results are disturbing
  - Many past economies have collapsed
  - Likely in the future, too



11

11

## Many types of self-organizing systems that grow

- Energy “dissipation” is required
  - Physics name: Dissipative Structures
- Other examples
  - Plants and animals
  - Stars
  - Hurricanes
  - Governments
  - The Internet



12

12

## Energy is required for every part of GDP

- Modern agriculture
- Transportation
- Heat for any process
- Electricity for any usage
- Human energy is used, too
  - Teaching
  - Singing



13

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**#2 THE ECONOMY CONSISTS OF  
TODAY'S GOODS + FUTURE PROMISES**



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14

## Today's goods and services are easy to see

- Food
- Homes
- Vehicles
- Education
- Pixels on computer screen
- Computer programs
- Anything real thing we buy or make



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## Promises of future goods and services are harder to see

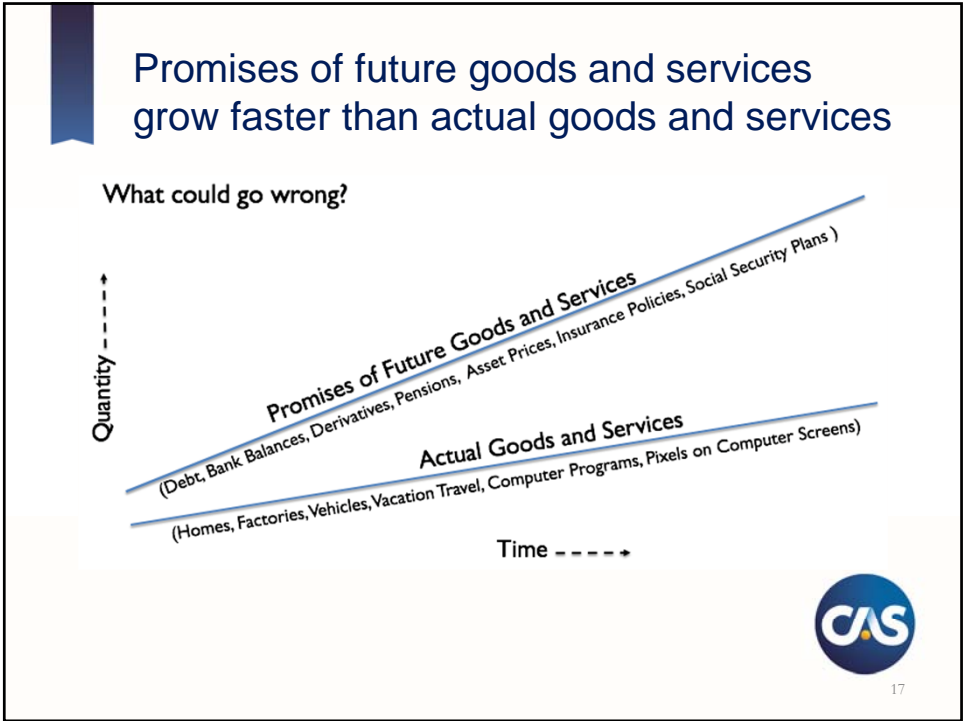
- Debt
- Money
- Prices of shares of stock or homes
- Government programs, like Social Security
- Insurance policies
  
- Indirectly, act like promises of future energy supplies



16

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### #3 ENERGY PRICES ACT STRANGELY: CUSTOMERS BUY FINISHED GOODS



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## Commodity prices behave peculiarly

- Bounce around a lot
  - Not much storage
- Short term – influenced by buyers needing commodity to use *now*
- Longer term – influenced by consumers' ability to afford of finished products
  - Like cars, homes, cell phones

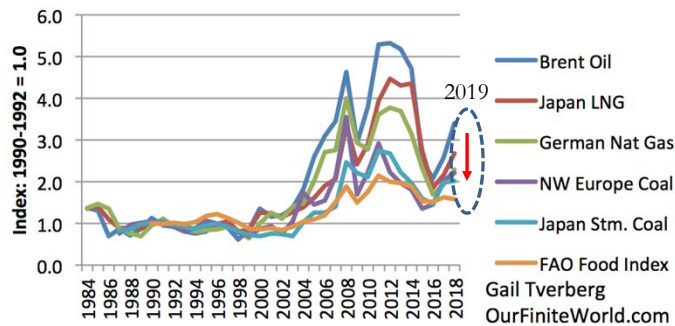


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## Energy prices fluctuate together; affordability of finished goods is key

Comparison of Changes in Oil Prices with Changes in Other Energy Prices



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## # 4 QUANTITY AND PRICE ARE DETERMINED BY PHYSICS



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*Producers* believe that they can extract huge amounts of oil

- If price rises high enough, say \$300+ barrel



22

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## The question is: How high will oil prices rise?

- Market prices are determined by physics
- Producers and consumers have opposite needs
  - Consumers want low prices, for affordable finished products
  - Producers tend to need higher prices, because of depletion
    - Can afford to use high-tech approaches if prices are high enough

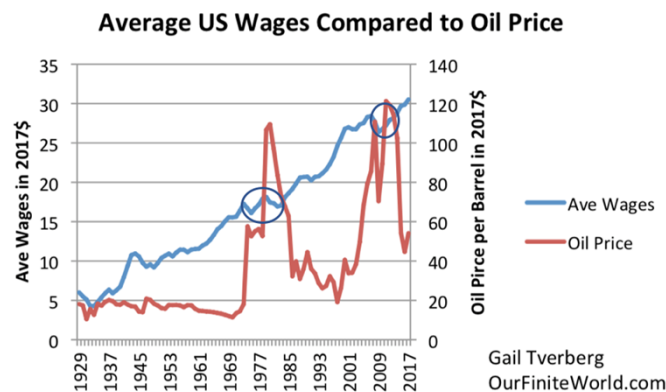


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## Wages of *consumers* don't rise in response to oil price spikes

- Recession sets in; average wages fall

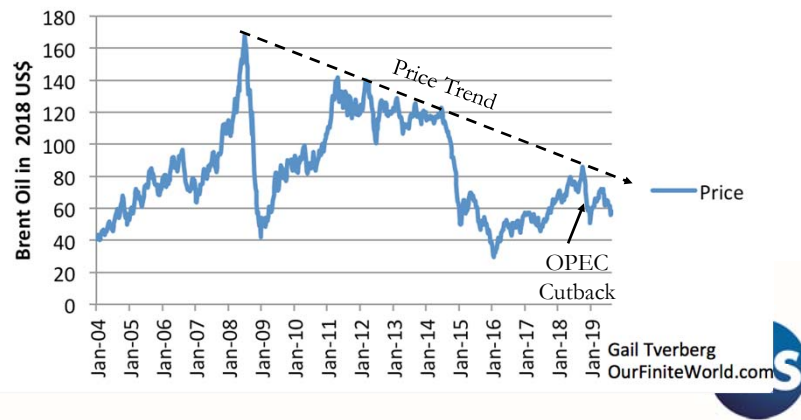


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Current problem is falling energy prices,  
due to inadequate affordability

### Inflation-Adjusted Oil Price



25

Low prices are a huge  
problem

- Lead energy producers to cut back on production
  - China coal
  - OPEC oil
  - US natural gas and oil from shale
- Makes reserves “disappear”



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**#5 SPIKING ENERGY PRICES  
LEAD TO RECESSION QUICKLY**




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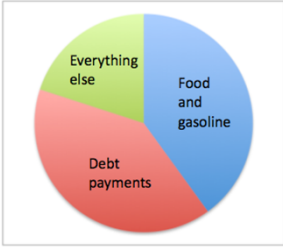
**Spiking energy prices lead to a  
need to cut back spending**

Theory says oil price can increase—  
but our pocketbooks disagree

Low oil price budget



High oil price budget



28

28

## Central banks push back against high oil prices, too

- Raise interest rates
  - Cars, homes, factories become less affordable
- Oil and other energy prices drop
  - Pushes the problem back over to the *energy producers*
- Adjusting interest rates and debt levels become the primary financial tools



29

29

**#6 LOW ENERGY PRICES  
LEAD TO COLLAPSE, SLOWLY**



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## Central government of Soviet Union collapsed in 1991 with huge impact

Extraction of Eastern Europe, Caucasus and Central Asia, 1970-2017

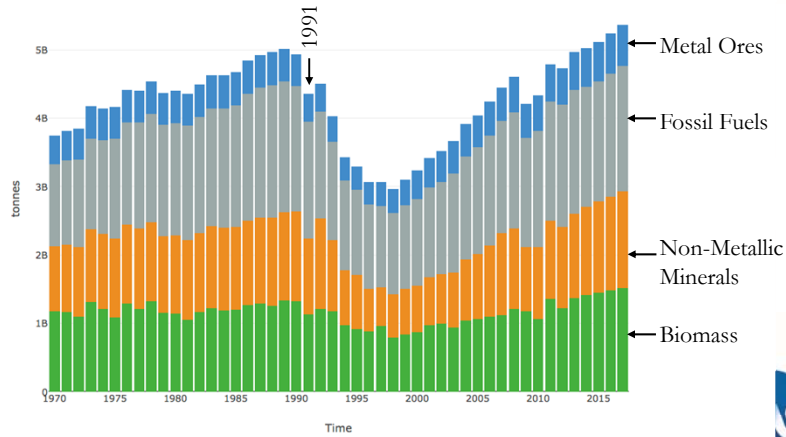


Chart by MaterialFlows.net based on UN database

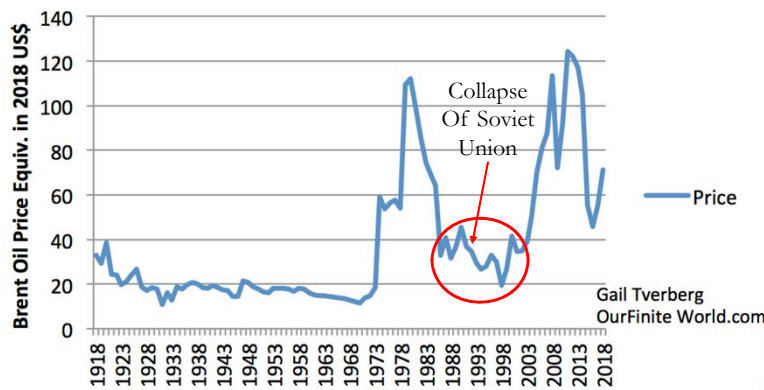


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31

## Prices too low for *producers* were a problem after 1981

Inflation-Adjusted Oil Price Since 1918



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32

32



## Producers can tolerate low oil prices for a few years

- Exporters get their energy indirectly from tax revenue
  - Able to substitute borrowing for a while
- Eventually collapse, if prices too low
- Collapse of central government of Soviet Union occurred in 1991
  - Ten years after spike in interest rates



33

33

## World has experienced low oil prices since 2014

- World can expect some collapses again
- Governments of oil exporters at risk
  - Venezuela
  - Nigeria, Congo, South Sudan
  - Saudi Arabia and other Middle Eastern exporters
- US shale oil companies at risk



34

34

## #7 ECONOMY “MAKES A SMALLER BATCH,” IF ENERGY IS TOO LOW



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35

## Commodity producers extract less in response to low prices

- Economy responds by “making a smaller batch”
  - Like making a cake
  - Can substitute almond if vanilla is missing
  - But if flour is in short supply, need to make a smaller batch



36

36

## OPEC has already cut back oil production

- China has also flattened coal production
- We should expect world economic growth to slow
- May lead to collapses of some central governments
  - Oil exporters and umbrella organizations especially at risk
- Wars also are possible



37

37

## #8 TECHNOLOGY AND GLOBALIZATION CAN'T SAVE US



38

38

## Affordability of finished goods is key to keeping prices up

- Highly paid workers can always afford goods they want
  - Examples: homes, cars, air conditioning
- Need to keep wages of non-elite workers from falling
  - Those without special training
  - Those who aren't managers

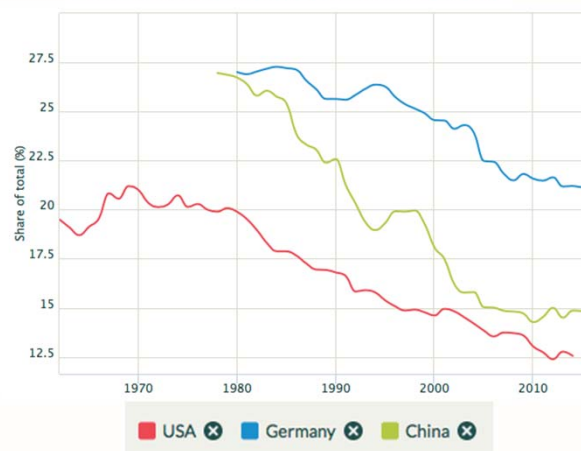


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## Income shares of bottom 50% falling in key countries

**Bottom 50% national income share**



Source: World Inequality Database. Wid.com



40

40

## Growing use of technology works against affordability

- Improved technology requires that some people have special training
  - Highly skilled get more pay
  - Less left for other workers
- Robots replace some workers
- Highly paid employees often own the factories, machines
  - Leads to wealth disparity, besides wage disparity



41

41

## Globalization works against affordability

- Some jobs move to China or India
- Wages for some jobs fall because of competition from low wage countries

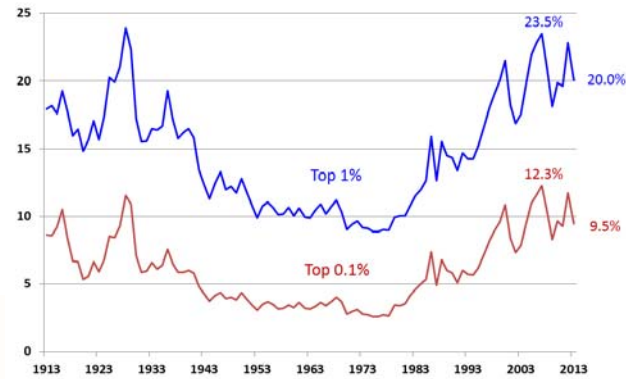


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## Income disparity back at level of the Depression of 1930s

U.S. Income Shares of Top 1% and Top 0.1% Households – Incl. Capital Gains (1913-2013)



Source: Piketty & Saez - January 2015

Wikipedia



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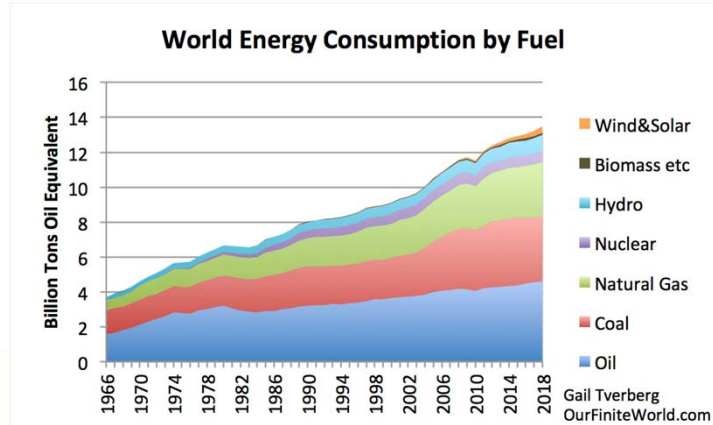
**#9 WE MAY SOON ENTER A PERIOD OF ECONOMIC CONTRACTION**



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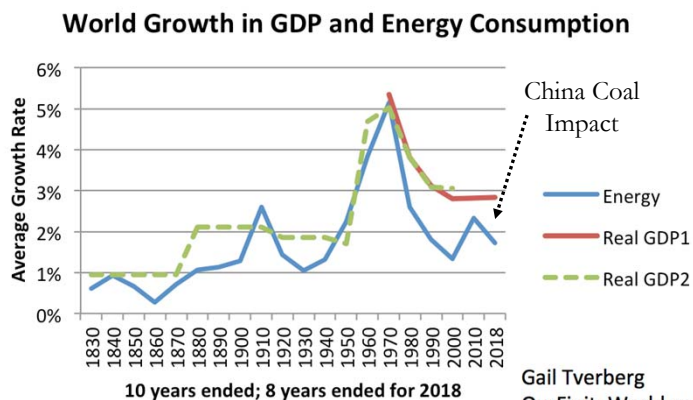
## Small dip in 2008-2009 corresponds to Great Recession



45

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## China has pulled the world economy forward, but it is losing this ability



46

46

## We may be hitting another very low energy growth period

- Or even a period of energy contraction
- Situation is unprecedented in modern times
  - Closest analogy is Depression of 1930s
- Major financial problems likely
  - Banks; pension plans; 2008 on steroids
- Already seeing reduced cooperation amongst nations
  - Also tariffs; radical politics



47

47

## What seems likely for the economy

- Recession problems
  - Job layoffs (overseas first)
  - Debt defaults; derivative problems
- Decrease in globalization
  - Broken supply chains
- More conflict within and between countries
  - Possible governmental collapse
    - Especially exporters; agencies like EU



48

48



## A few things insurance companies can expect

- More vacant properties
- Replacement parts not available
- More intentional damage to other's property
- More businesses in distress financially
- Balance sheets of insurers adversely affected
  - Rating by A. M. Best may drop



49

49


## A few things insurance companies can expect (Cont.)

- More frequent electricity outages
  - Some outages intentionally caused by power companies
- Governments don't get around to fixing storm damages
  - US becomes more like Puerto Rico




50

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**#10 HOW MIGHT YOUR  
COMPANY BE AFFECTED?**



51

51

**Questions and  
Discussion**

52