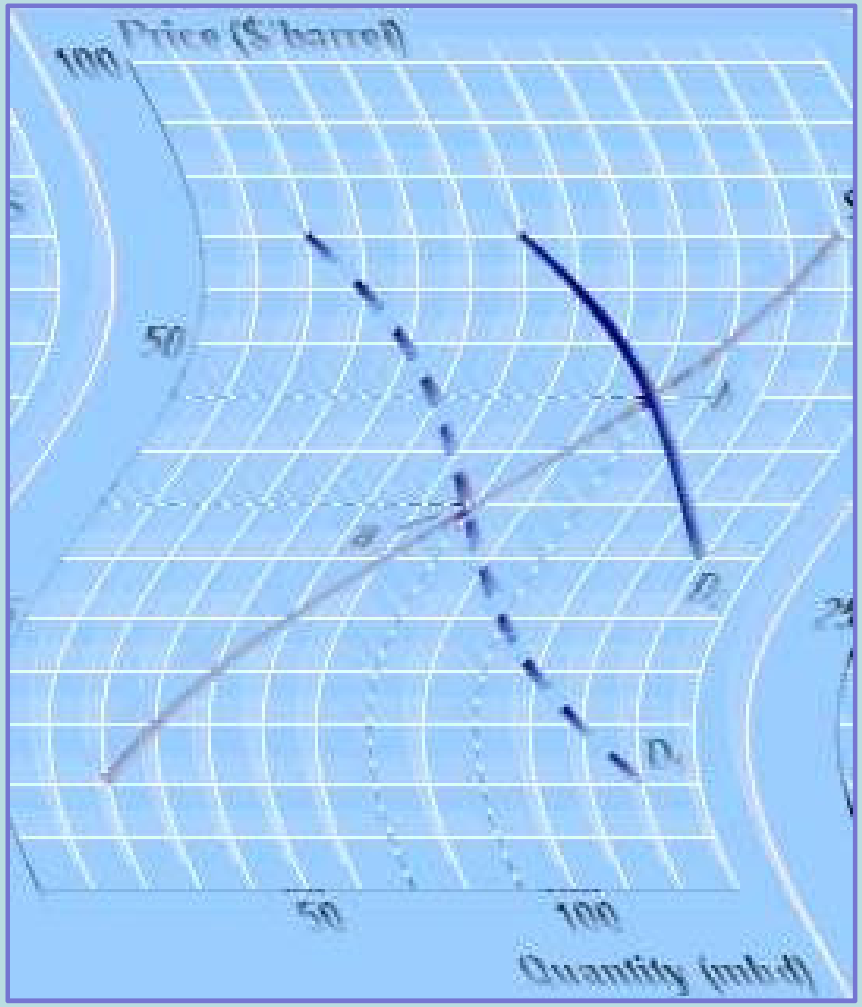
Free Slides from
Ed Dolan's Econ Blog
http://dolanecon.blogspot.com/

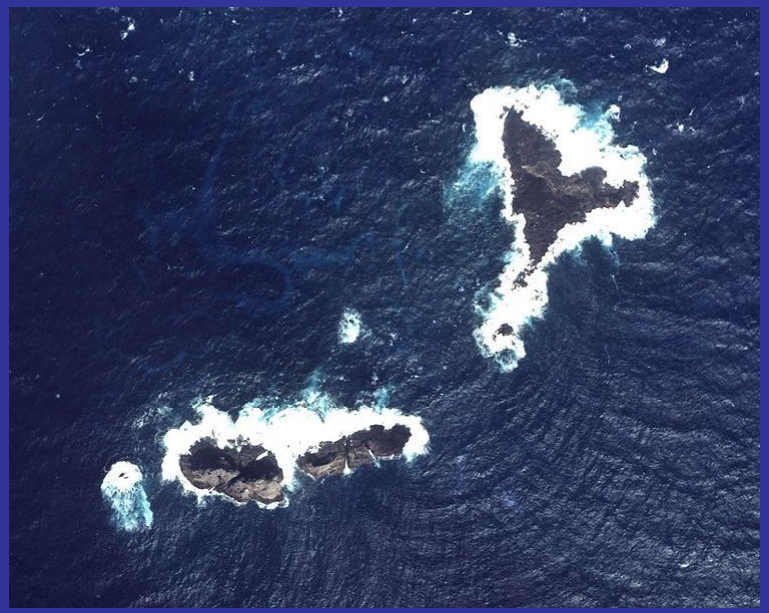
China's Fragile Rare Earth Monopoly

Post prepared October 23, 2010



A Collision Jars the High-tech World

- On September 7, 2010 a Chinese fishing boat collided with a Japanese Coast Guard vessel near a disputed chain of uninhabited islands in the East China Sea
- The collisions sparked a diplomatic row and led to an apparent cutoff of China's shipments to Japan of rare earth elements, used in many high-tech products
- Suddenly the world became aware that China, home to some 95 percent of rare earth production, had an alarming strategic monopoly

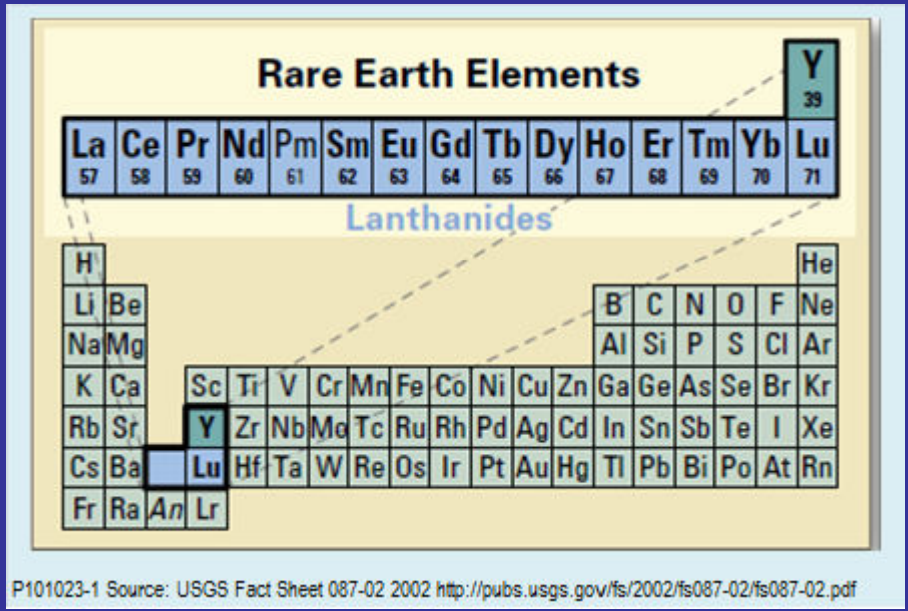


Senkaku (Diaoyu) Islands

Photo source: Ministry of Land, Infrastructure, Transport and Tourism (Japan), National Land Image Information
http://commons.wikimedia.org/wiki/File:Okinokitaiwa_of_Senkaku_Islands.jpg

What Are Rare Earths?

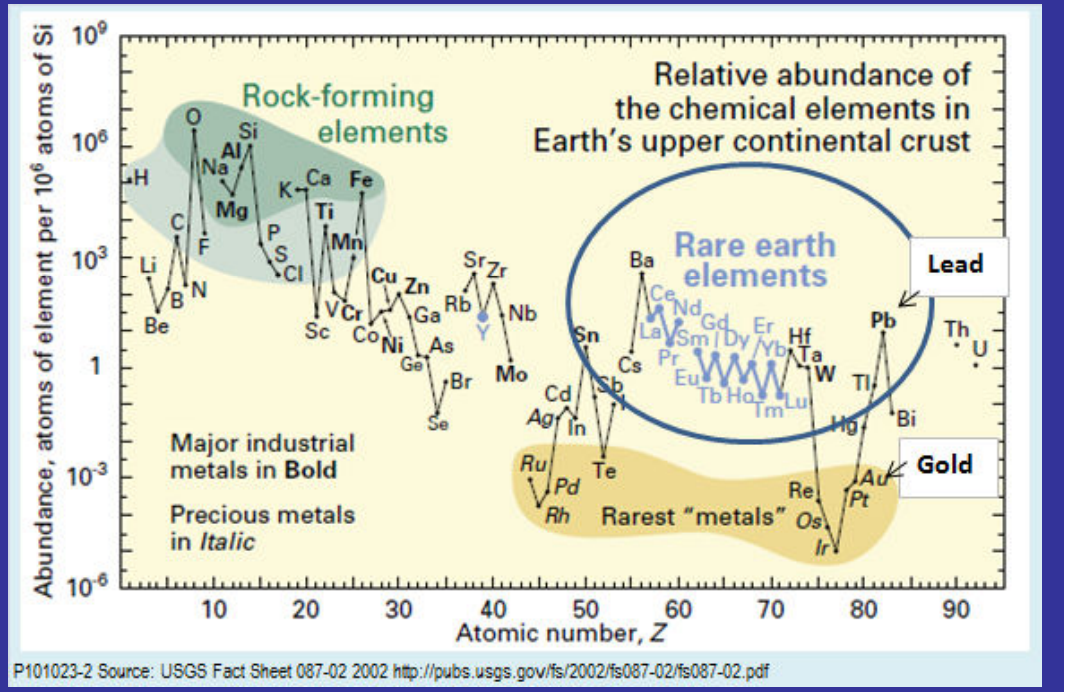
- Rare earth elements (REEs) are a group of 17 related elements near the middle of the periodic table of elements
- They have many important applications in the high-tech world:
  - Magnets for electric car motors
  - Computer memories
  - Lasers
  - Superconductors
  - Catalysts
  - Lenses
  - and more . . .



P101023-1 Source: USGS Fact Sheet 087-02 2002 http://pubs.usgs.gov/fs/2002/fs087-02/fs087-02.pdf

Rare Earths are Not Really Rare

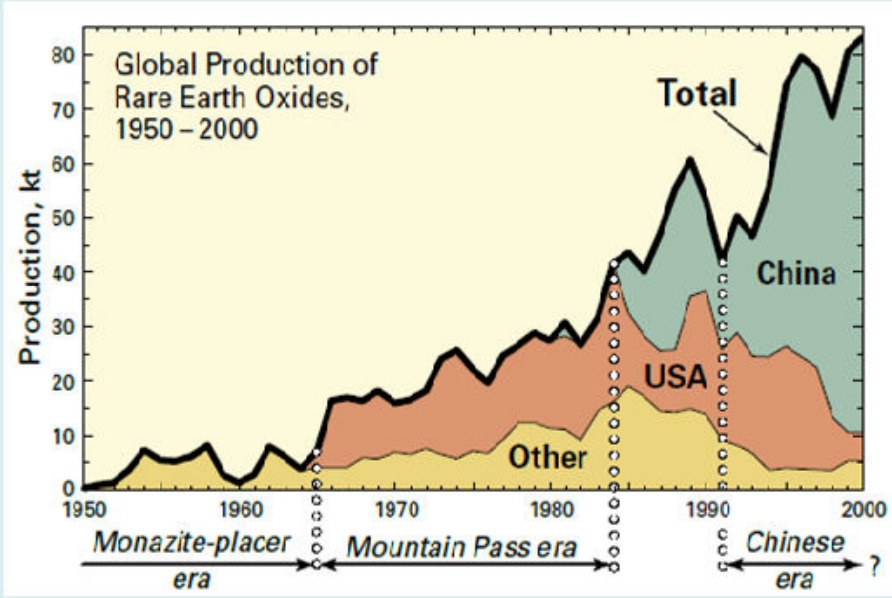
- Despite the name, rare earths are not really all that rare
- All of them are more common in the earth's crust than gold, and some are as common as lead
- However, they are hard to mine, because unlike gold or lead, they are never found in highly concentrated deposits



Post P101023 from Ed Dolan's Econ Blog *http://dolanecon.blogspot.com/*

China's Dominance of REEs is Relatively Recent

- Until the 1960s, most REEs came from "placer sands" in India, Brazil, and South Africa
- In the 1964, the rich Mountain Pass Mine in California became the dominant producer
- China's dominance is relatively recent, dating from the 1990s when US production declined and world demand grew



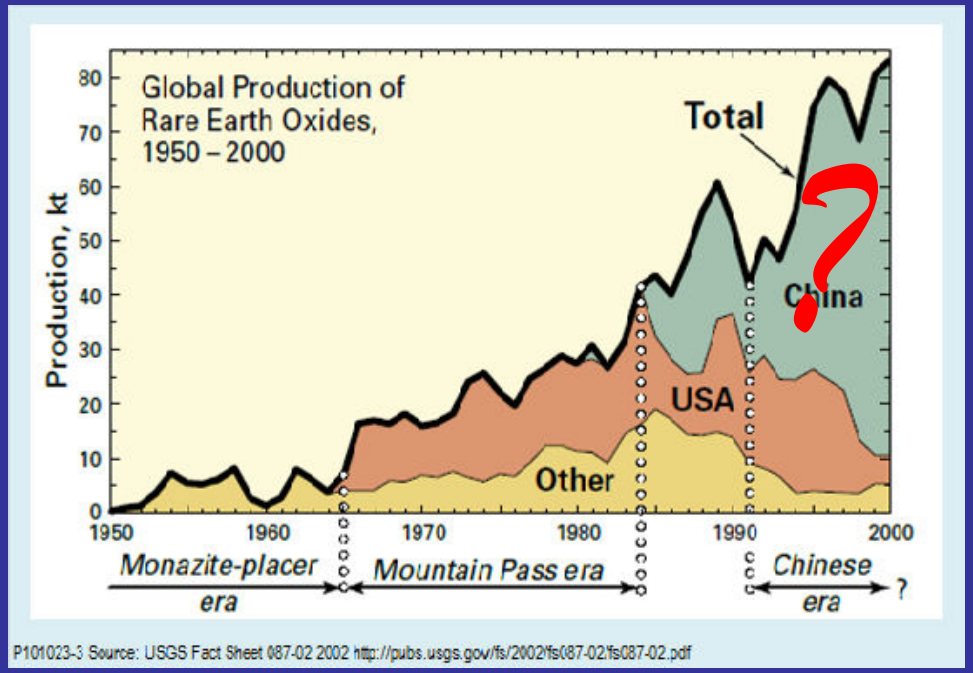
P101023-3 Source: USGS Fact Sheet 087-02 2002 http://pubs.usgs.gov/fs/2002/fs087-02/fs087-02.pdf

Post P101023 from Ed Dolan's Econ Blog *http://dolanecon.blogspot.com/*

Why China?

Questions—

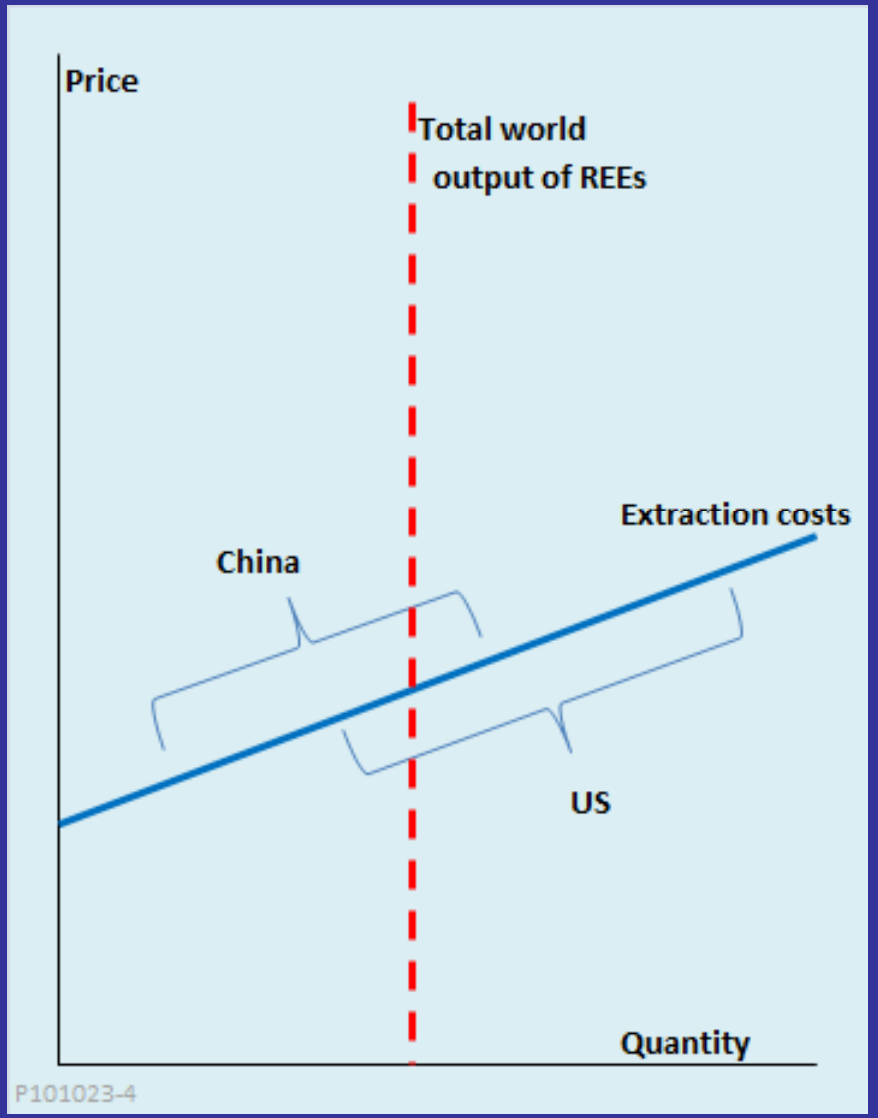
- What economic forces allowed China to become the world's leading producer?
- Does China's current 95 percent share of the global market represent a true natural monopoly?
- What factors could undermine China's REE dominance?



P101023-3 Source: USGS Fact Sheet 087-02 2002 http://pubs.usgs.gov/fs/2002/fs087-02/fs087-02.pdf

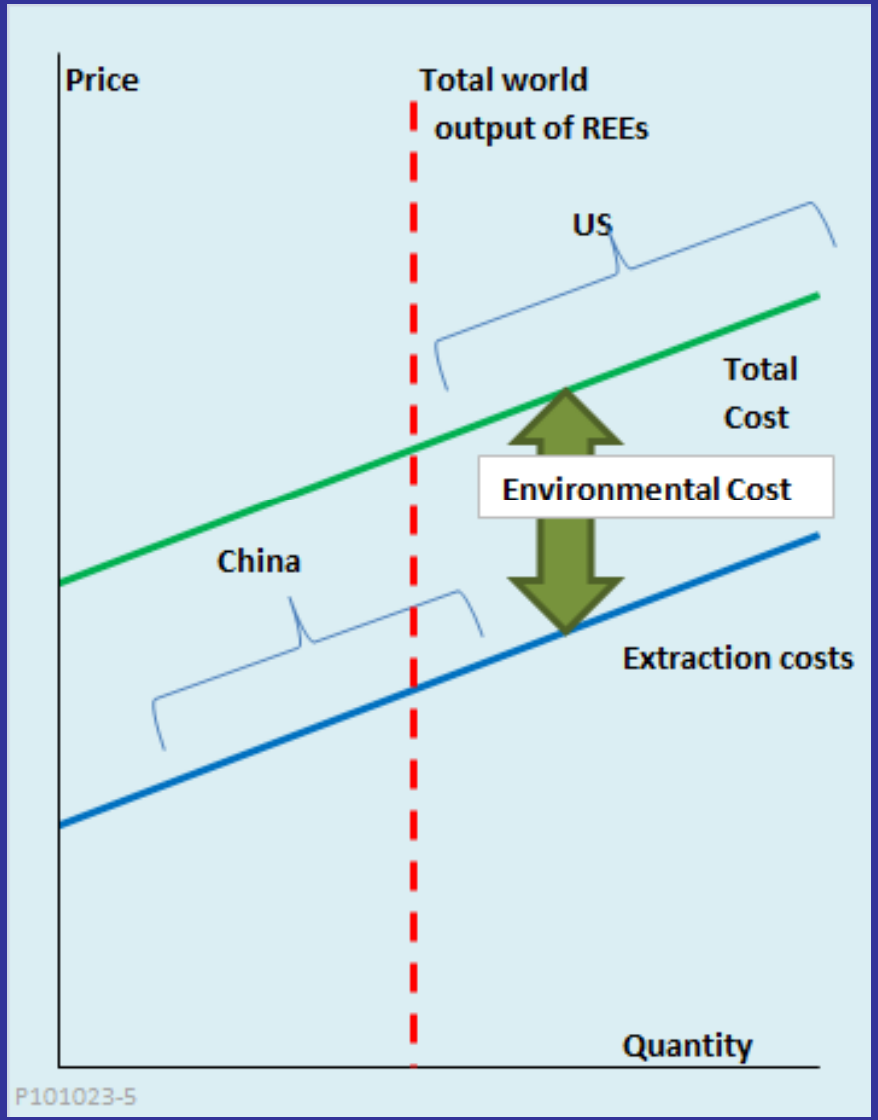
The Role of Extraction Costs

- In part, China's dominance of REEs comes from lower extraction costs
- At any given level of output, producers naturally draw from the lowest-cost sources first
- With good quality ores and low labor costs, extraction costs alone can explain why China's producers have taken market share away from US sources



Tolerance of Environmental Damage Adds to China's Edge

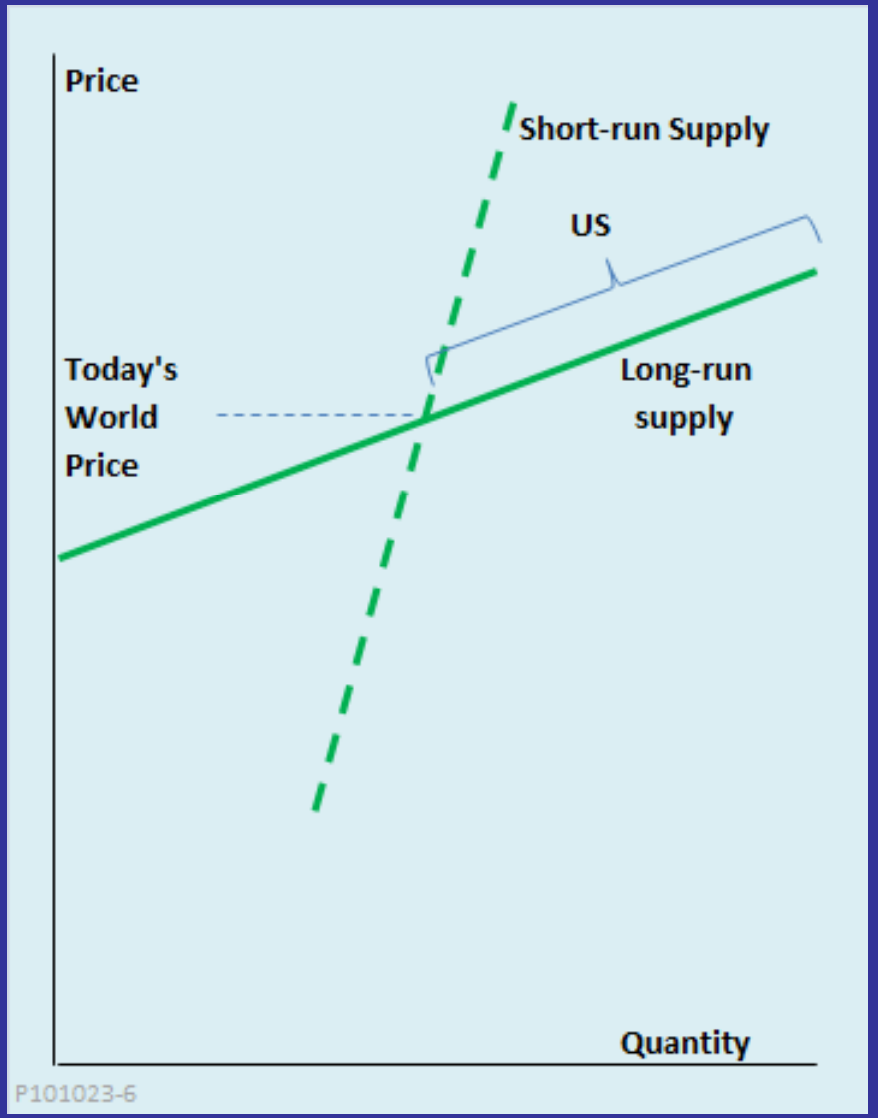
- Mining REEs can cause serious environmental damage
- Measures to protect or clean up the environment add greatly to the cost of production
- Radioactive spills and costly pollution control regulations contributed to closing California's Mountain Pass mine
- Until recently, China has tolerated severe pollution from primitive, low-cost, often illegal mining operations
- Willingness to turn a blind eye to environmental damage has contributed to China's REE dominance



Post P101023 from Ed Dolan's Econ Blog *http://dolanecon.blogspot.com/*

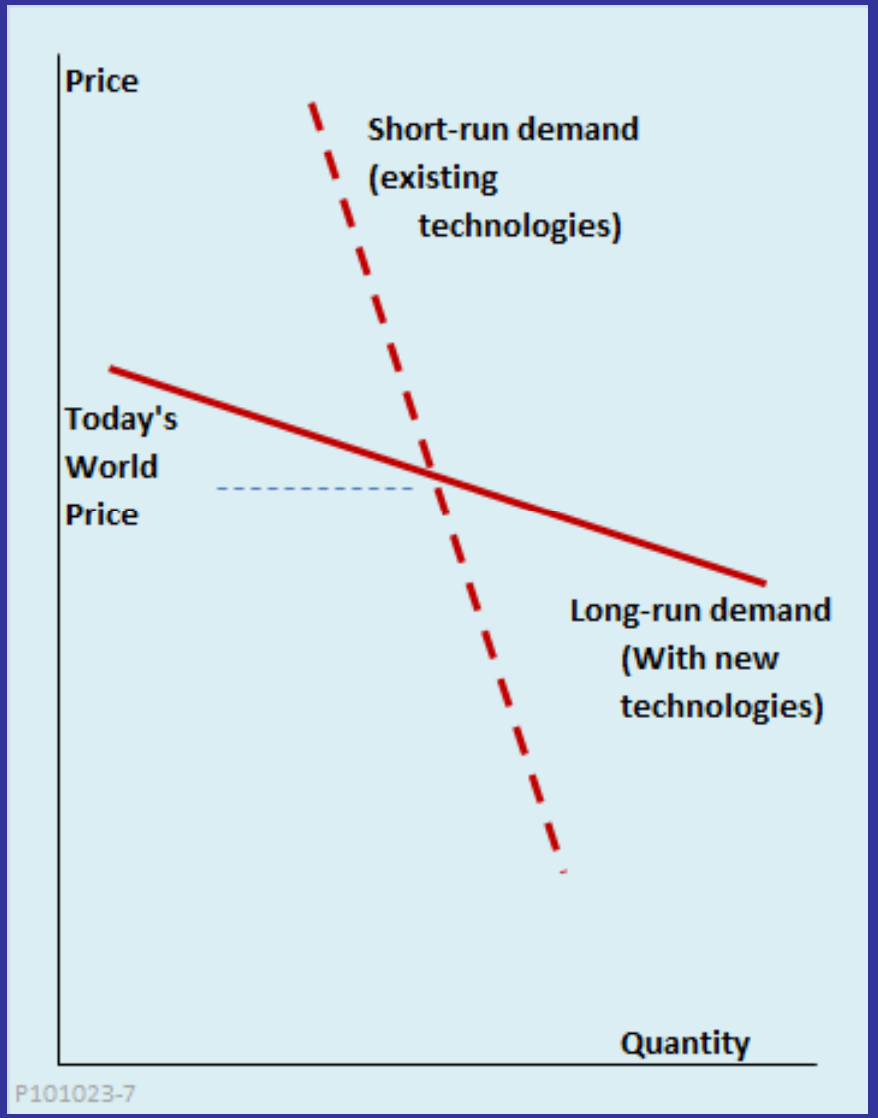
Short-run vs. Long-run Supply

- Short-run supply of REEs is much less elastic than long-run supply
- In the short run, the only source of increased supply would be more output from already opened Chinese mines
- In the long run, a higher price would lead to opening of new sources
  - California's Mountain Pass Mine is expected to reopen in 2011
  - A Canadian company is working to open a mine in Wyoming by 2015 or 2016
  - Another Canadian company has rights to rich REE deposits in Tanzania that would be worth developing at higher prices



Short-run vs. Long-run Demand

- Similarly, short-run demand is much less elastic than long-run demand
- In the short run, existing technology severely limits substitutes for REEs
- In the long run, higher prices and concern about China's reliability as a supplier are accelerating research on new technologies
  - Better flash drives and graphene storage can substitute for REE-using hard drives
  - Japanese researchers report success in building electric-car motors without REE-based magnets
  - Korea is subsidizing research into REE substitutes



Low Short-run Elasticities Mean Volatile Prices

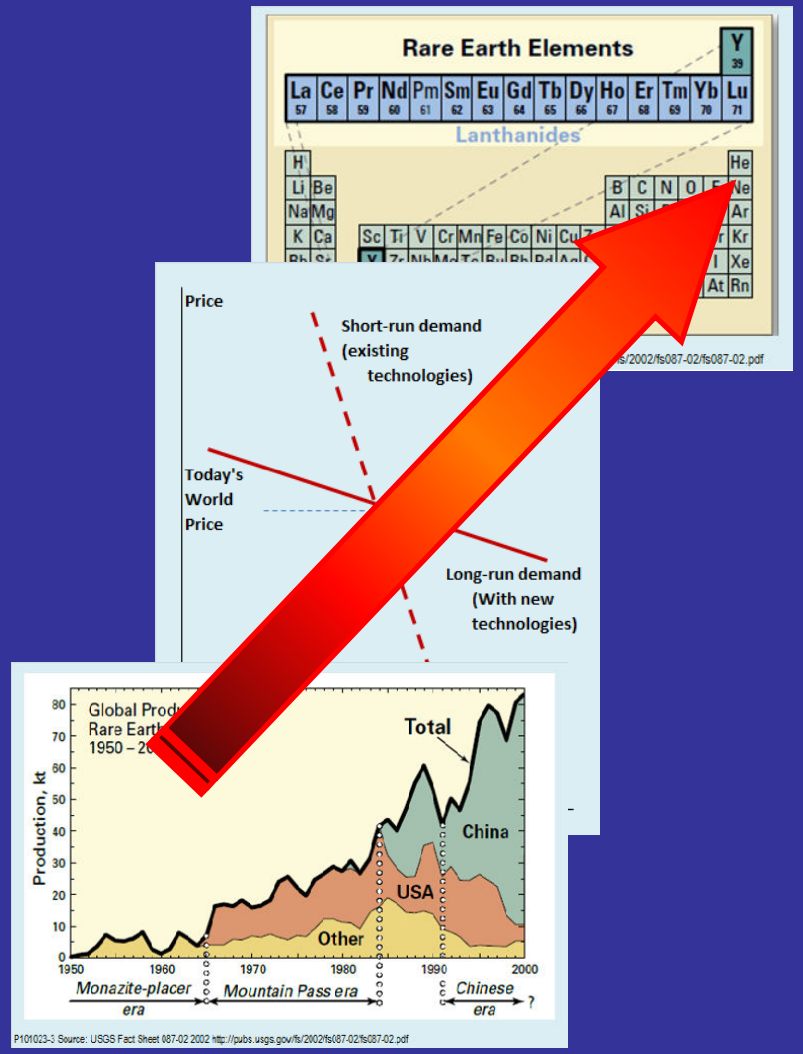
- In the short-run, China can send prices soaring by restricting exports, as it has done in 2010
- In the long-run, high prices are self-defeating, since they only encourage opening of new mines and research on substitutes

Source: Bloomberg, http://www.bloomberg.com/news/2010-10-20/china-pledges-to-maintain-rare-earth-sales-official-says-exports-may-rise.html

The Bottom Line: Big Market Share but Fragile Monopoly

The bottom line:

- A 95% market share does not mean China has a secure natural monopoly
- China will soon begin to lose market share if it pushes its short-run advantage too hard
- *China's best strategy:* Be content with moderate profits and use "limit pricing" to slow growth of competition
- *Competitors' best strategy:* Use all available market and regulatory incentives to encourage development of new sources and new technologies



Post P101023 from Ed Dolan's Econ Blog *http://dolanecon.blogspot.com/*