

Relationships Between Market Structure and Innovation

By

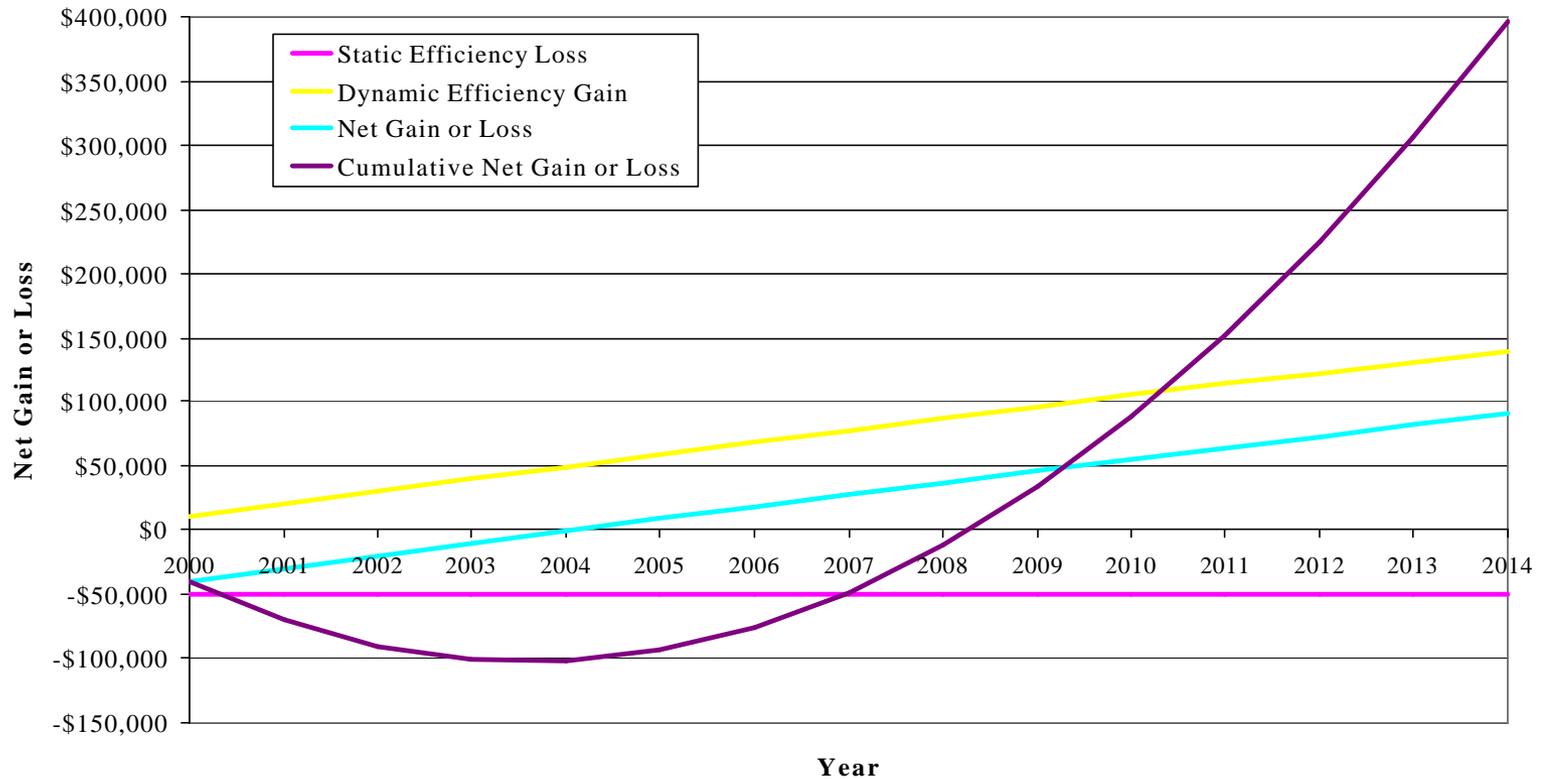
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February 20, 2002

Innovation Is Critical Element of Market Performance: Dynamic Efficiencies Can Swamp Static Inefficiencies



Potential Relationships Between Market Structure and Innovation

- “Schumpeterian Hypothesis”: Large firms in concentrated markets are more likely to support innovation.
- Innovation shapes market structure.
- Market Structure and innovation are simultaneously shaped by underlying market characteristics, such as innovative opportunities and appropriability.

There is some support for the
“Schumpeterian Hypothesis”

Theoretical Support For “Schumpeterian Hypothesis”

- A larger scale firm may benefit more from an innovation (e.g., percentage cost reduction applied to larger volume)
- A large diversified business may allow a firm to capture more benefits from an innovation
- Large firms may be able to support a larger portfolio of R&D efforts, increasing the likelihood that it will develop an improved product or process

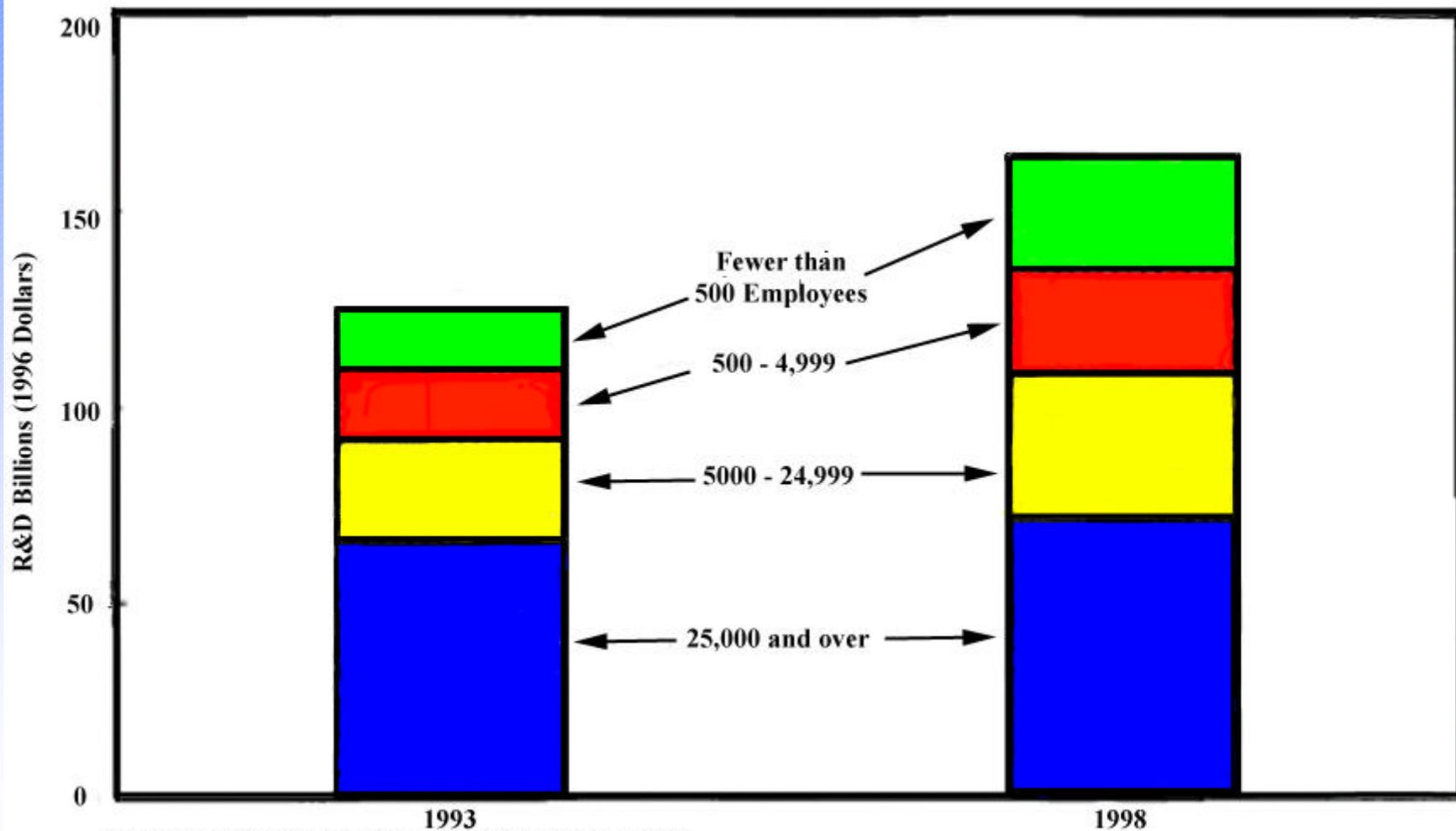
Theoretical Support For “Schumpeterian Hypothesis”

- Large firms may have scale advantages in the R&D process
- Larger firms may be better-positioned to finance large-scale R&D efforts
- Large firms may market innovations more effectively
- However, theoretical research also indicates that a monopolist can have less incentive to innovate
 - Arrow (1962) shows that a competitor can profit more than a monopolist from innovation
 - Others have argued that large firms’ organizational structures may deter innovative activity

Empirical Evidence Related to the “Schumpeterian Hypothesis”

- Some early studies for the United States and other leading nations found a positive correlation between concentration/firm size and a measure of innovation.
- Some studies found non-linear relationships that suggest that innovative activity increases with firm size/concentration to some point, then levels off or declines.
- However, these early studies employed simple models, used aggregated data, and did not always control for industry effects.
- Case studies show that a significant number of major inventions came from smaller firms (firms without major labs).

Large Firms Fund Most R&D, But Small Firm R&D Has Been Increasing Faster



Source: Chart 3-9 Economic Report of the President, 2000

Empirical Evidence Related to the “Schumpeterian Hypothesis”

- More recent empirical work considers the possibility that R&D intensity and market structure are both determined by other market characteristics
 - Levin & Reiss (1984, 1988): Study R&D and Concentration in simultaneous equations models controlling for technical opportunity and appropriability conditions using LOB and survey data
 - Symeonidis (1996): “Recent empirical work suggests that R&D intensity and market structure are jointly determined by technology, the characteristics of demand, the institutional framework, strategic interaction and chance.”

Innovation Can Affect Market Structure

Innovation May Lead To Increased Concentration

- Patent protection and trade secrets can insulate innovators, increasing concentration
- Even without IP protection, innovators may be insulated from competition
 - Costs of duplicating unpatented new products can be large (may exceed 50% of original innovation costs)
 - Network effects, learning, and other structural characteristics of the market may insulate first movers

Innovation May Also Reduce Market Concentration

- Some studies have found that innovation can lead to growth of smaller firms or entry
- Other studies have found that innovative activity is associated with both higher and lower levels of concentration, depending on the nature of the R&D effort.
 - When R&D is focused on the development of new products, it tends to be associated with lower concentration
 - When R&D is focused on the development of new production processes, it tends to be associated with higher levels of concentration

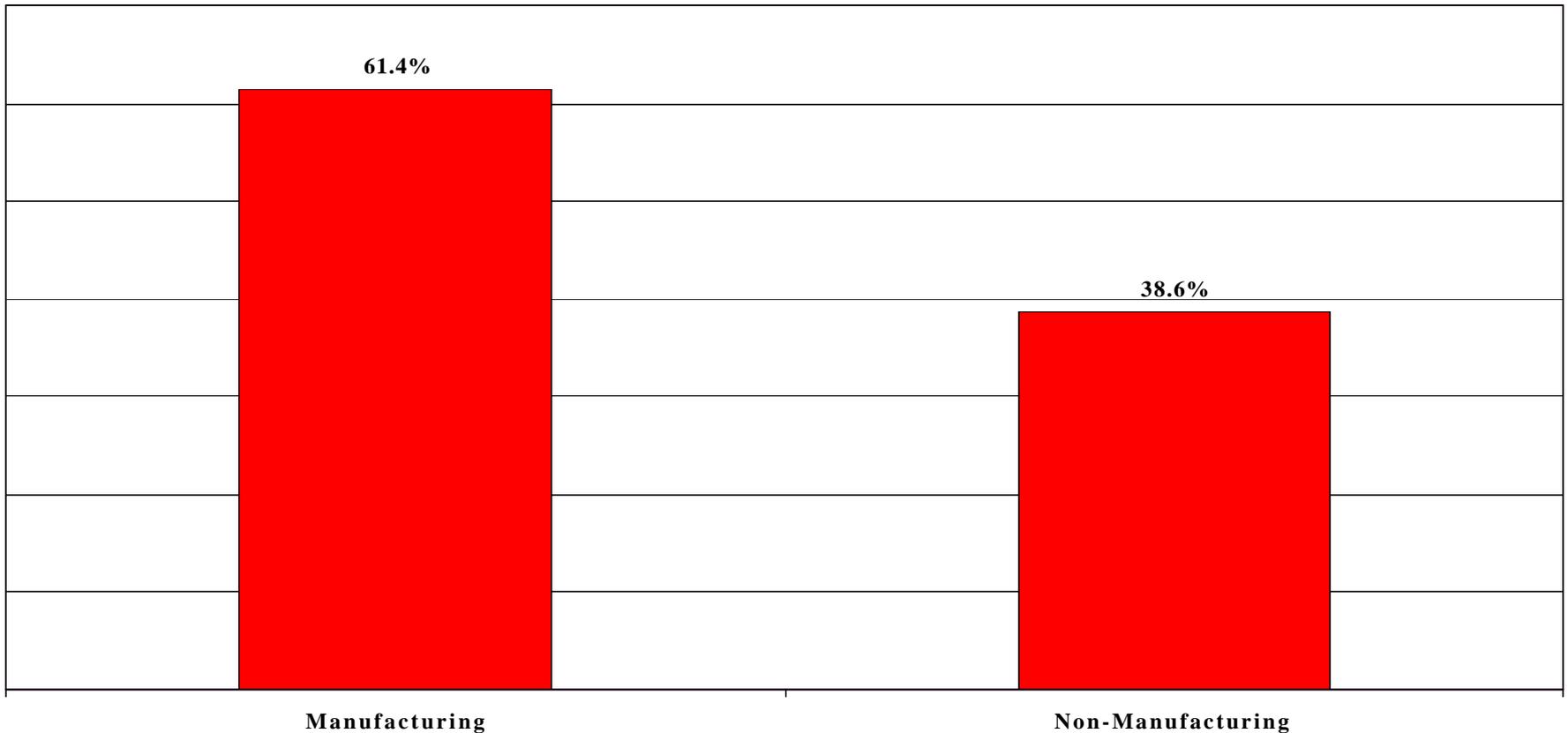
Market Concentration and
Innovation May Be
Simultaneously Shaped By
Fundamental Market
Characteristics

Innovation and Concentration May Be Endogenous

- FM Scherer: “[T]he market structure affecting R&D decisions is not given, but endogenously determined by technology and competition.”
- Inter-industry differences in technological opportunity appear to have much greater power in explaining varying innovation intensities than differences in concentration.
- As indicated above, richer data sets and more recent theoretical work suggest the existence of complicated simultaneous relationships

R&D Varies Across Industries: Sector R&D/ Total R&D

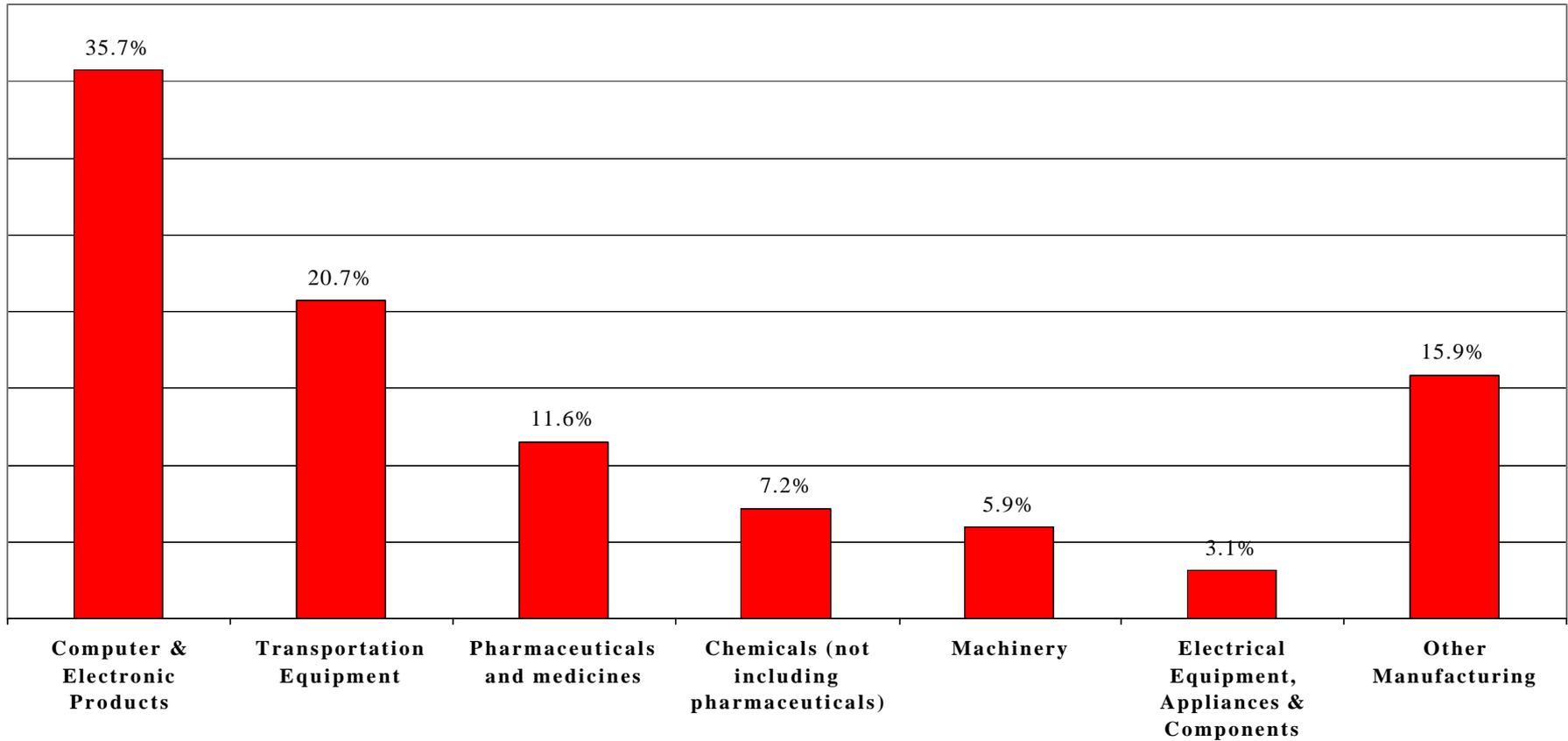
Sector R&D Funds as a Percentage of Total Industrial R&D Funds, 2000



Source: National Science Foundation/Division of Science Resources Statistics, Survey of Industrial Research and Development: 2000

R&D Varies Across Industries: Industry R&D/Manufacturing R&D

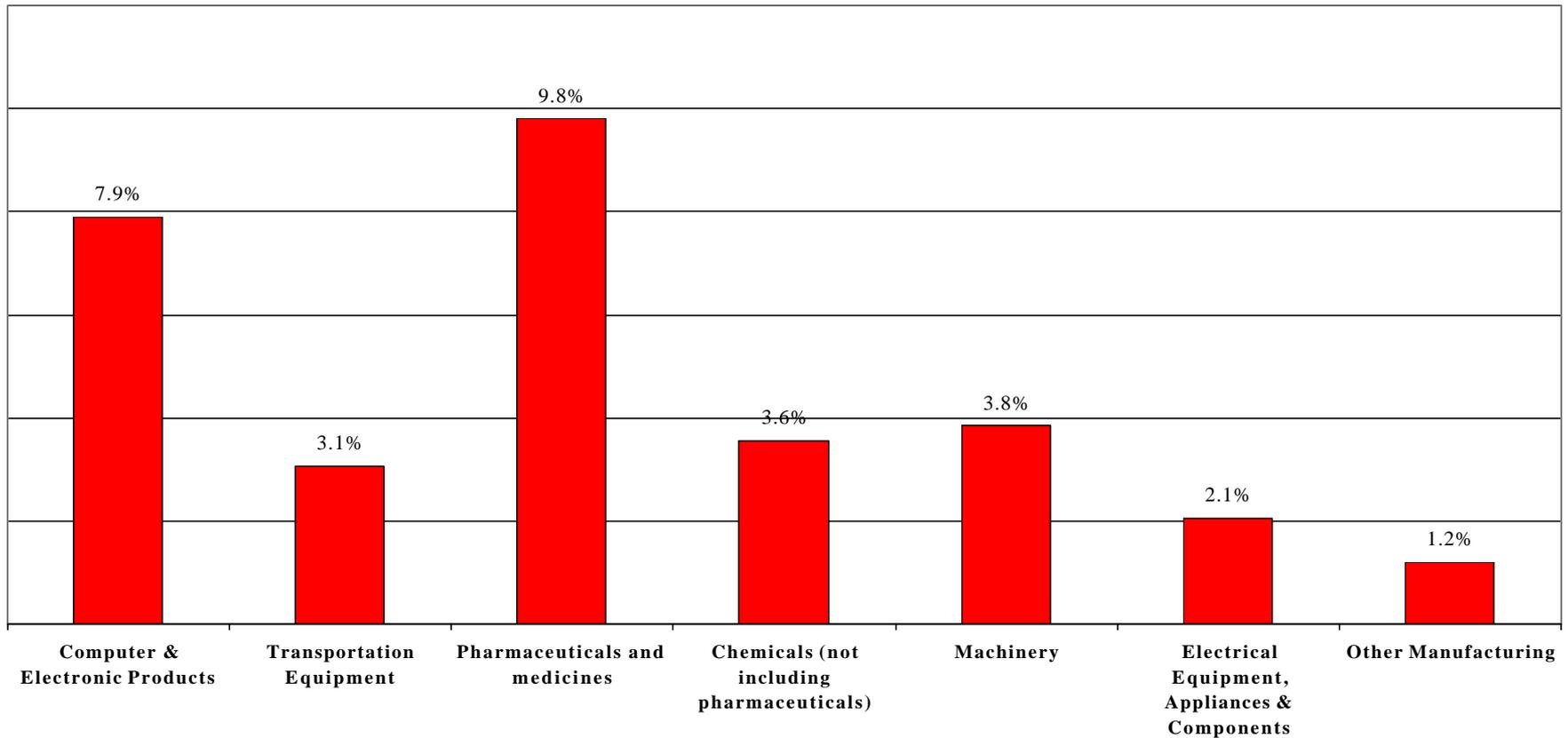
Industry R&D Funds as a Percentage of Manufacturing R&D Funds, 2000



Source: National Science Foundation/Division of Science Resources Statistics, Survey of Industrial Research and Development: 2000

R&D Varies Across Industries: R&D/Sales

Research & Development Funds as a Percentage of Sales of Manufacturing Industries, 2000



Source: National Science Foundation/Division of Science Resources Statistics, Survey of Industrial Research and Development: 2000
Table E-4 Domestic net sales of companies that performed industrial R&D in the U.S., by industry, by size of company: 2000

Characteristics of Innovative Activity

- **Types of R&D Vary:** “Product” vs. “Process” & “Basic” vs. “Applied” R&D
 - Most R&D is “Product R&D” (Roughly 75% according to some estimates)
 - “Basic R&D” is a small percentage of R&D (Less than 5% according to some estimates)
 - Universities, non-profits, and government labs play a more significant role in basic R&D than in other R&D.
- **Cost of R&D Varies:** Innovation can be expensive, especially during later stages. But, this varies across projects and industries.

Characteristics of Innovative Activity

- **Funding Source Varies:** Much innovative activity is privately funded, although public funding plays an important role in some R&D efforts.
- **Risk Varies:** Successful innovation is not certain—there is often a random component. Risk varies across projects and over the lifecycle of an innovation.
- **Technical Opportunity Varies:** Innovative opportunities vary across industries and over time. What has gone before contributes to what is possible today.

Characteristics of Innovative Activity

- **Complementary Technology Varies:** Introduction of a successful innovation may require access to complementary capabilities or intellectual property. Supporting inventions may be required before the original innovation is technically or economically viable.
- **Industry Interfaces Vary:** Inventions by one industry often must be accepted by another industry before consumers benefit. Indeed, studies have shown that innovative ideas often come from outside of the firm that implemented them.

Characteristics of Innovative Activity

- **Technical Challenges Vary:** The challenges posed by the innovative process vary over the life cycle of an innovation, which implies that the capabilities needed to clear the hurdles at different stages of the process differ.
- **Appropriability Varies:** Innovations vary with respect to the costs others would incur to replicate the invention and/or take advantage of it.

Conclusions

- Empirical work is complicated
 - There are several related endogenous variables
 - Need to control for changes in demand
 - Need correct lags (innovation may be pulled by lagged demand and theory implies that historical profits support increased innovation)
- Nonetheless, economists have learned much.
- There does not appear to be a simple relationship between innovation and market concentration: Market concentration and innovative activity are both the product of a number of economic relationships that vary across market environments.