How Valuable are Patents as a Proxy for Innovation?
Science and Engineering Indicators Perspective

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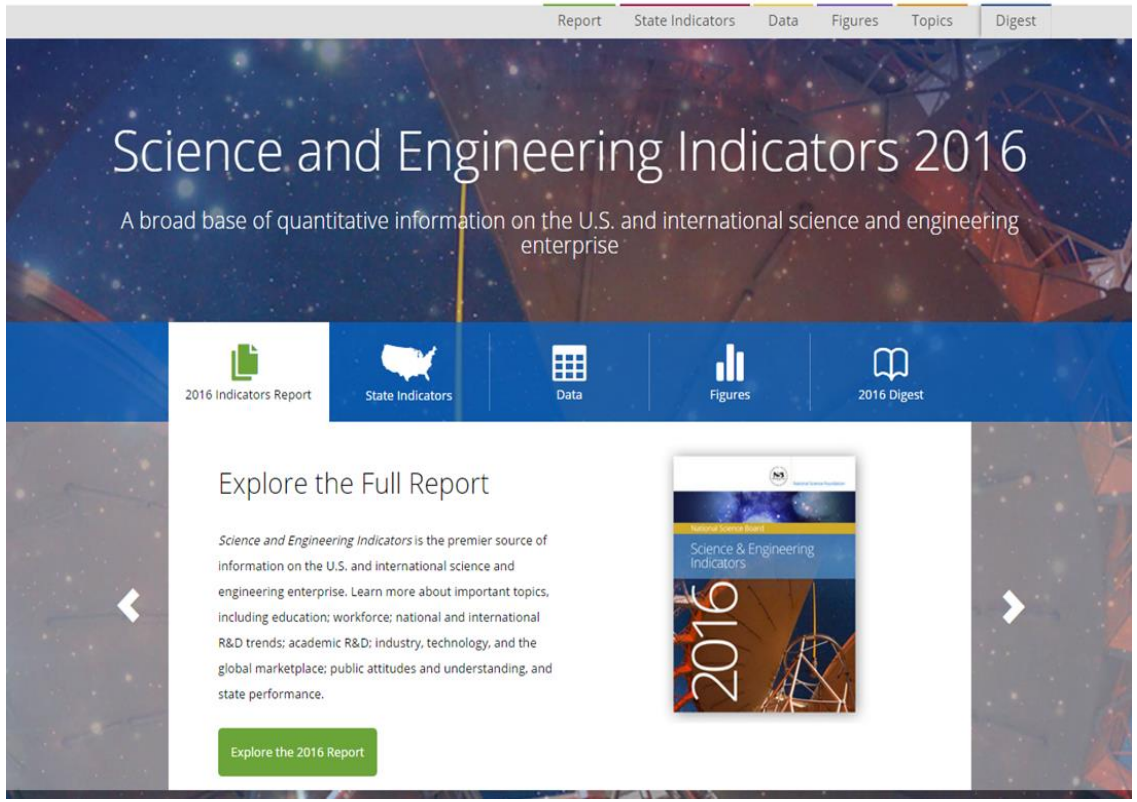
Science and Engineering Indicators Program

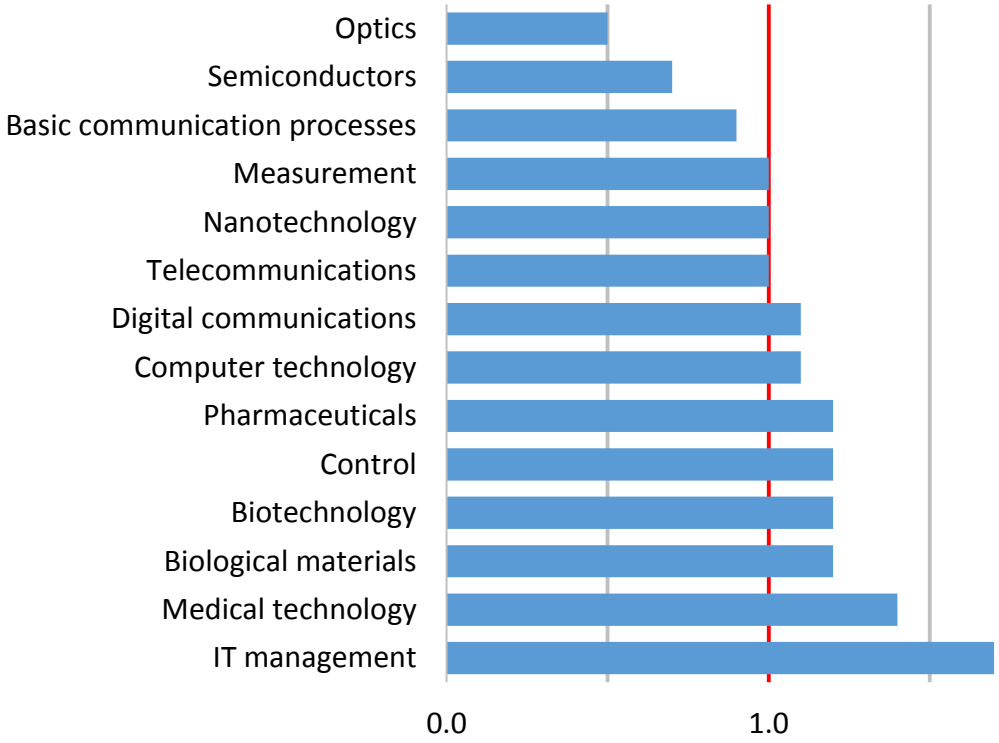
National Center for Science and Engineering Statistics, NSF

Science and Engineering Indicators: Background

- A National Science Board Report produced and published by NCSES under the guidance of the NSB
- High quality, quantitative, policy neutral data on the U.S. and international S&E enterprise
- Congressionally mandated release on/before Jan. 15 of even numbered years
- Extensive review: outside experts, federal agencies including NSF, NSB



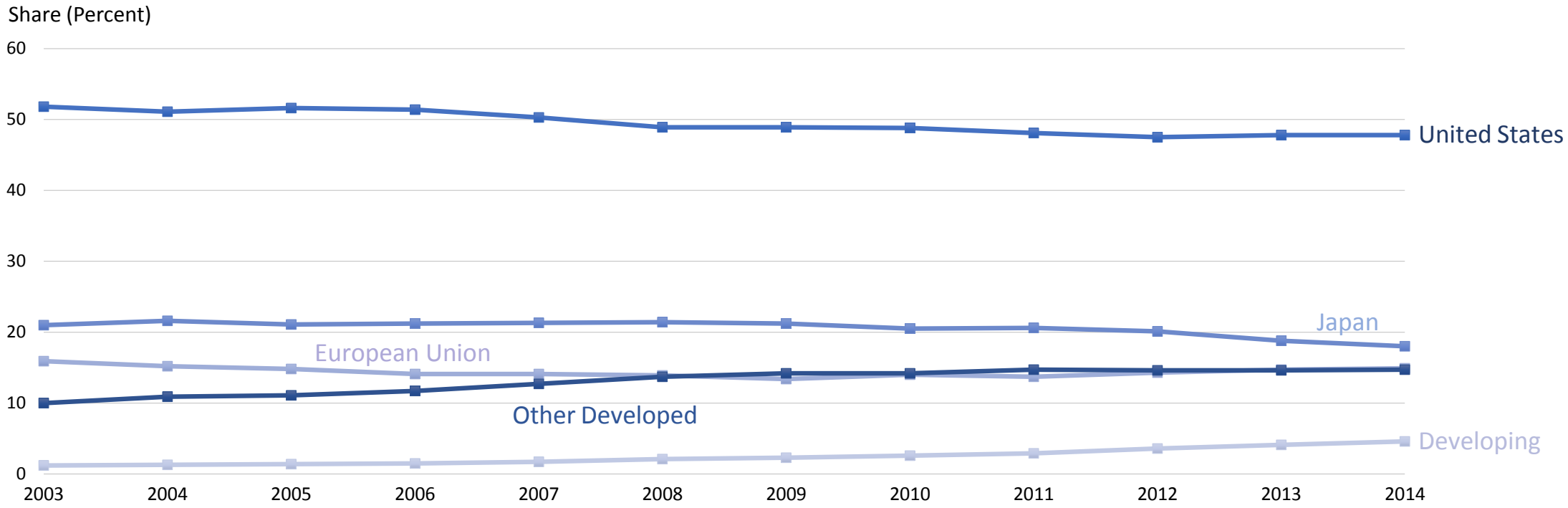
Patent activity index of selected technologies for the United States: 2012–14



- Ratio of the share of a technology area to its share of all patents.
- Greater than 1.0 indicates that the country is relatively more active in that technology area.

SOURCES: Science-Metrix, LexisNexis, and SRI International. *Science and Engineering Indicators* 2016.

USPTO Patents granted by location of inventor: 2003-2014

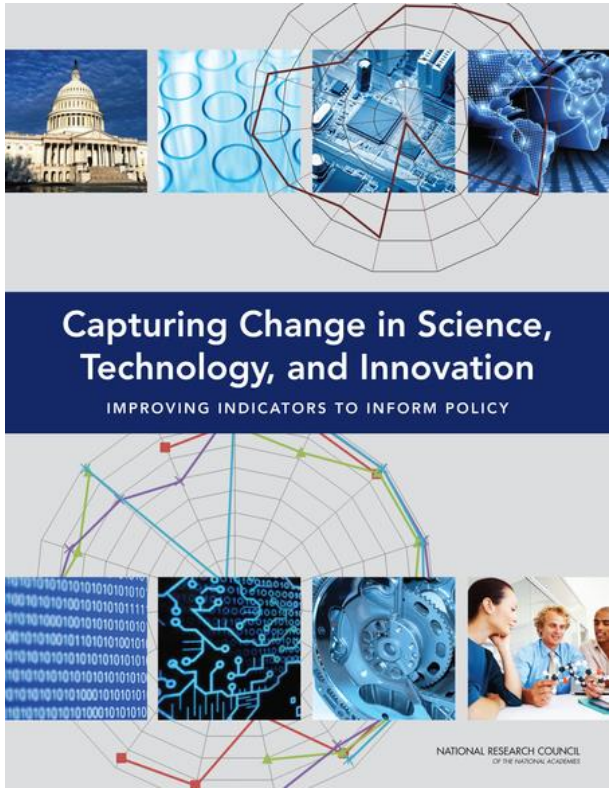


USPTO = U.S. Patent and Trademark Office
SOURCES: Science-Metrix, LexisNexis, and SRI International. See appendix table 6-37

What makes a good STI indicator?

- Uses
  - Benchmarking for performance assessment
  - Informing public policy decisions
  - Informing private sector decision making
  - Facilitating social science research
- Data Issues
  - Data Dimensions
  - Data Generation and Collection
  - Data Quality
- For understanding a complex set of processes SEI uses a broad scope of individual indicators

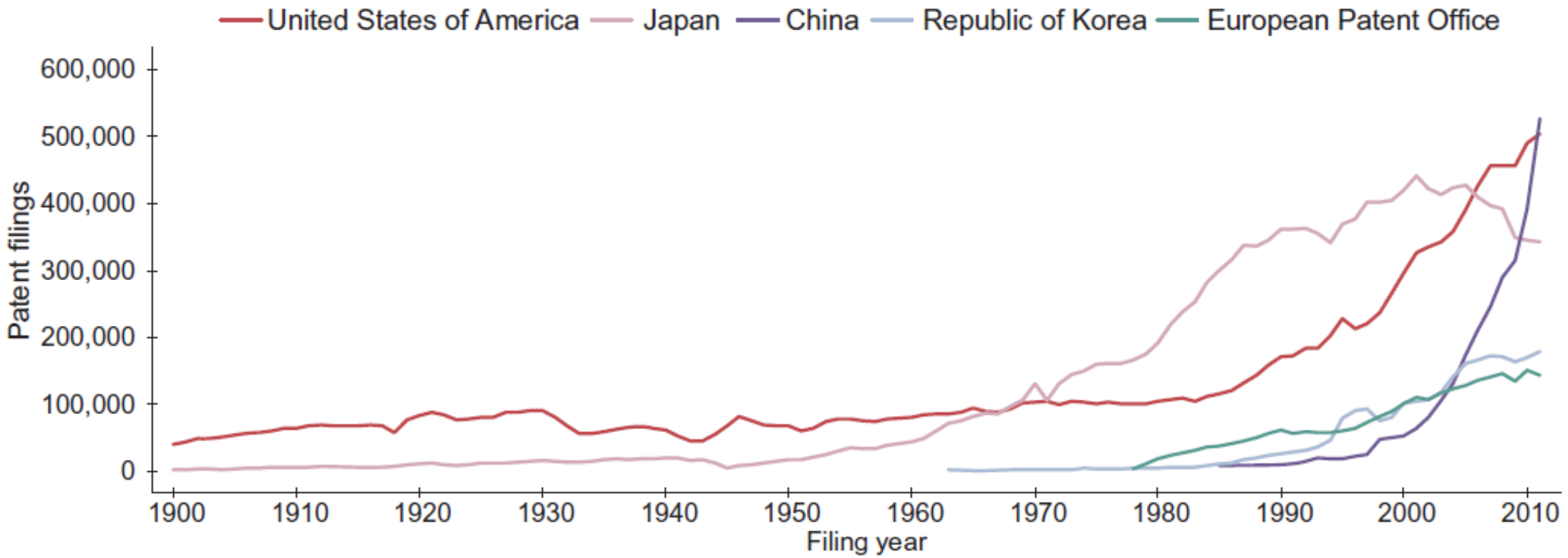
Hall and Jaffe, 2012. Measuring Science, Technology, and Innovation: A Review



What is an innovation in *Science and Engineering Indicators*?

- "Technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in products and processes." OECD Eurostat, Oslo Manual Second Edition, 1997
- "An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organization method in business practices, workplace organisation, or external relations." OECD Eurostat, Oslo Manual Third Edition, 2005
- Fourth edition: forthcoming

Patenting is rising globally

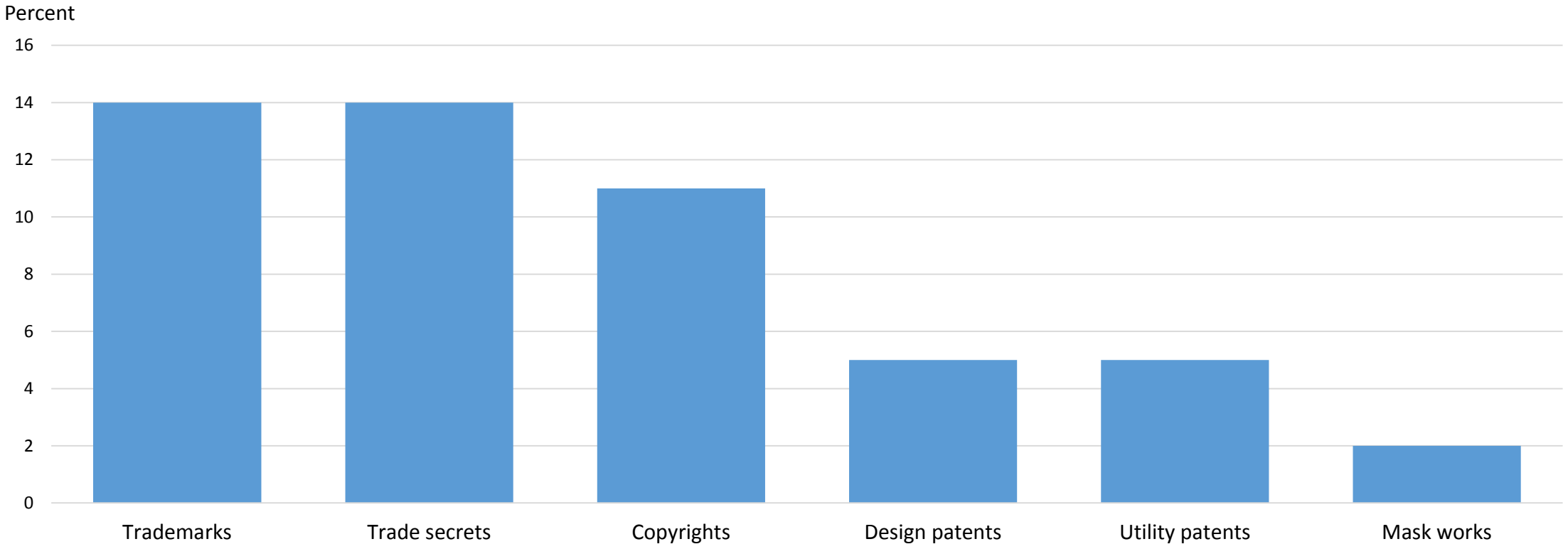


Source: Fink, Khan, and Zhou, 2015. "Exploring the Worldwide Patent Surge, Economics of Innovation and New Technology.

Patents: Invention, innovation, or Intellectual Property?

- Many inventions are not patented
- Many patents have no commercial value
- Patents may signal duplicate protection in multiple locations
- Not all innovation requires intellectual property protection
- Strategies other than patents protect intellectual property

Percent of companies that rate intellectual property as being very or somewhat important: 2011



SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, Business R&D and Innovation Survey (2011).

SEI 2018: Invention, knowledge transfer, and Innovation

Innovation:

- Inputs
  - Intangible Capital
  - Human Capital
  - Freely-revealed knowledge
- Incidence
  - Innovation Survey data
- Impacts
  - Employment growth, creation of new firms, destruction of existing firms
  - Multifactor productivity

Contact

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NCSES National Center for Science and Engineering Statistics