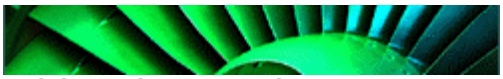
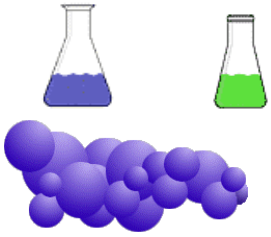


Ohio's innovation economy



Industry R&D

- Ohio businesses spent $5.6 billion on R&D in 1997. This figure represents 1.7 percent of Ohio's gross state product.
- Four sectors accounted for just over half of this total—chemicals, electrical equipment, transportation equipment, and rubber and plastics.
- Ohio leads the nation in private-sector rubber and plastics R&D and ranks third in commercial research, development, and testing behind California and Massachusetts.
- According to National Science Foundation estimates, Ohio's share of U.S. industry-wide R&D expenditures was 4.4% in 1977. This percentage dropped to 3.4% in 1981; rose steadily to 4.6% in 1991; fell sharply to 3.0% in 1995; then rebounded to 3.6 in 1997—the latest year for which estimates are available.

Federally-funded R&D

- Federal government obligations for R&D in Ohio totaled $1.8 billion in 1997. The preponderance of these monies funded space and defense-related research.

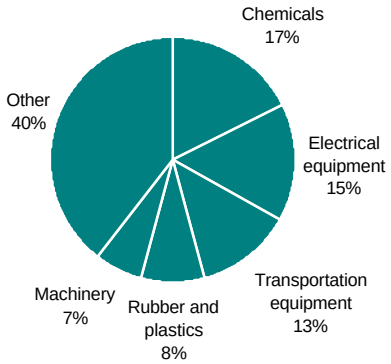
Patents

- In 1998, the U.S. Patent and Trademark Office granted 4,420 patents that credited an Ohio resident. Out of this total there were 3,891 patents where the Ohio resident was listed first, and out of this second category, 3,273 patents were classified as utility or inventor patents.
- Ohio ranked 9th among the 50 states based on these 3,273 inventor patents.
- Ohio's share of the U.S. inventor patent total was 4.1 percent in 1998—compared to 6.2 percent in 1978. For every million residents, there were 291 Ohio patents in 1998 compared to 239 patents in 1978. The U.S. ratio was 185 in 1978 and grew to 297 in 1998.

Patent technologies

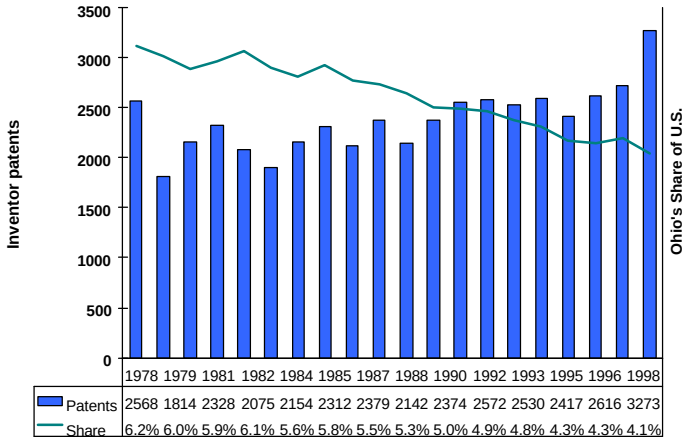
- The federal government classifies inventor patents into three main groups: chemical, electrical and mechanical. Mechanical patents comprise 46 percent of the Ohio inventor patent total.
- The list of organizations owning technologies developed by Ohio inventors is dominated by Fortune 500 companies, and the leaders are among the top employers in the state.

R&D Expenditures by Sector, 1997



Source: National Science Foundation

Ohio Inventor Patents



Source: U.S. Patent and Trademark Office

Ohio Patent Leaders, 1994 - 1998

Company	Patents	Key Categories
Procter & Gamble	1,305	personal care, food, cleaners, and medical
General Electric	664	jet engine parts; lighting systems
Goodyear	317	tires, PVC foam, and composites
General Motors	294	ignition, brake, and air bag systems

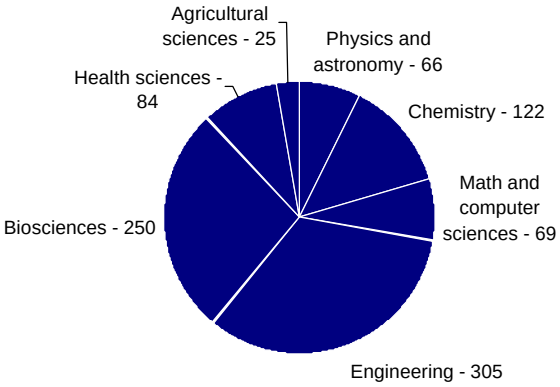
Source: U.S. Patent and Trademark Office

Technology-Intensive Industries, 1997

	Value Added (millions)	Employment	Location Index
Total:	$12,042	176,554	0.7
Computer and data processing	$3,966	63,370	0.8
Industrial chemicals	$1,939	16,251	1.5
Aerospace	$1,473	20,733	0.8
Communications eqpt	$1,014	8,608	0.7
Research and testing	$908	27,660	0.7
Computer and office eqpt	$836	8,795	0.6
Measuring and controlling	$726	14,333	1.1
Electronic parts	$639	12,017	0.4
Drugs	$507	4,100	0.4
Search and navigation eqpt	$34	686	0.1

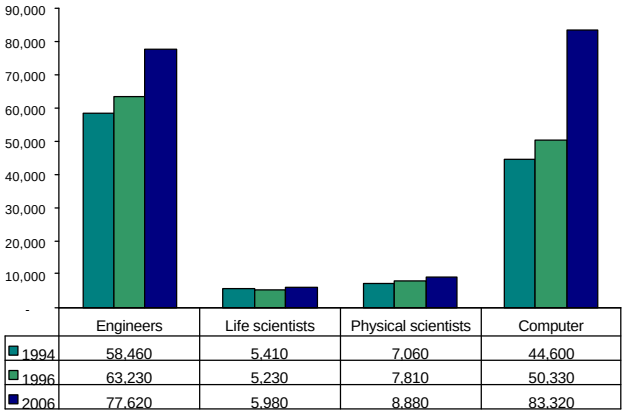
Source: IMPLAN, MIG, Inc.

Science and Engineering Doctorates, 1998



Source: National Science Foundation

Science and Engineering Workers



Source: Ohio Bureau of Employment Services

High-Tech Workers

Ohio Technology-Intensive Industries

- The U.S. Bureau of Labor Statistics recently identified ten "high-technology **intensive**" industries. To make this list an industry must have a concentration of scientific, technical, and engineering workers that is at least five times the national average.
- In Ohio, these ten industries employ 177 thousand workers, according to the latest federal government estimates. This estimate represents 2.7 percent of the total number of workers in the state.
- The two non-manufacturing sectors—computer and data services and research and testing—employ the largest number of workers and have the fastest growth rates. These two sectors added 35 thousand jobs from 1988 to 1997 and are expected to add 42 thousand jobs by 2006.
- Two of the three largest manufacturing industries—measuring and controlling equipment and industrial chemicals— have location index numbers greater than one indicating that their share of total employment is greater in Ohio than the nation.
- A broader view of employment takes into account workers in sectors that provide services or make parts for these 10 industries. Using the IMPLAN input-output model, OSR estimates that this expanded definition adds 66 thousand workers from industries such as trade accounting, engineering, and transportation.
- These 10 sectors are comprised of 53 four-digit industries. At this finer level of industry detail, Ohio ranks first in calculating and accounting equipment and industrial inorganic chemicals. And Ohio is second in aircraft engines, environmental controls, electron tubes, and information retrieval services.

Doctorate Recipients

- Each year the National Science Foundation publishes the number of research doctorates by major field. In 1998, Ohio's academic institutions awarded 1,863 research doctorates—4.4 percent of the national total.
- Ohio ranked second (tied with Texas) in the number of chemistry doctorates and ranked sixth in engineering and biosciences.

Scientists and Engineers

- There were 63.2 thousand engineers working for Ohio employers in 1996. Employment projections indicate this figure will grow to 77.6 thousand engineers by 2006. Eight percent of the nation's material engineers; seven percent of the industrial engineers; and 6 percent of aeronautical engineers are employed in Ohio.
- The number of people working in computer and related occupations is expected grow 66 percent from 1996 to 2006.