

Illinois Innovation Index

Innovation news and metrics for metropolitan Chicago and the state of Illinois



2014 Quarter 1

R&D expenditures by Illinois universities hold steady

OVERVIEW

A state's academic institutions play a critical role in attracting the funds and talent to support research and innovation. This quarterly report examines recent trends in a key indicator—academic R&D expenditures—with a focus on leading Illinois metropolitan statistical areas (MSAs). Recent data from the National Science Foundation indicate that R&D spending at academic institutions in Illinois rose slightly in 2012 (the latest year for which data are available).

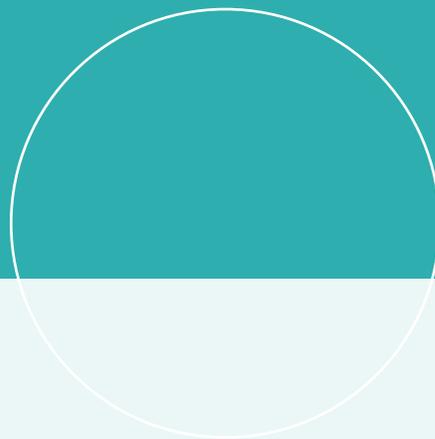
Key findings

- Illinois continued to be most specialized in math and computer science R&D among all states nationwide.¹
- Illinois academic institutions increased their total R&D expenditures to \$2.36 billion in 2012—a small year-on-year increase, but slow compared to previous years the Index has studied.
- In 2012, Chicago maintained its position as one of the top MSAs in the country for academic R&D expenditures, ranking eighth with a total of \$1.67 billion. Other Illinois MSAs exhibited a strong concentration in various R&D areas; Champaign, for instance, boasts the highest specialization in math and computer science expenditures among the top 100 MSAs by academic R&D spending.
- At the institution level, the University of Illinois at Springfield had the highest specialization in social sciences R&D among all schools nationwide; Columbia College Chicago was second-most specialized nationally in math and computer science R&D; and DePaul University was third-most specialized nationally in psychological sciences R&D.

¹ Location quotients (LQs) can identify local specialization across fields or industries. Here, LQs were calculated by comparing each metro's expenditures by research fields to the corresponding national distribution.

About the data

Each year, the National Science Foundation (NSF) sends out its Higher Education Research and Development Survey (HERD) to academic institutions, which report on their R&D expenditures. Beginning with the most recent HERD survey, the NSF provided a short-form questionnaire to institutions with less than \$1 million in total R&D spending in 2011. By moving these schools to the short-form survey, the full survey's sample size was reduced from 912 institutions in 2011 to 655 in 2012. Although many in number, the short-form schools collectively spent \$145 million—just 0.2 percent—of the nearly \$66 billion in total expenditures. As a result, their effect on the full-survey totals is negligible. However, the full-survey respondents for certain MSAs did drop as a result. Chicago, for instance, saw its number of institutions drop from 28 in 2011 to 18 in 2012. All numbers in this report reflect only the full-survey data.

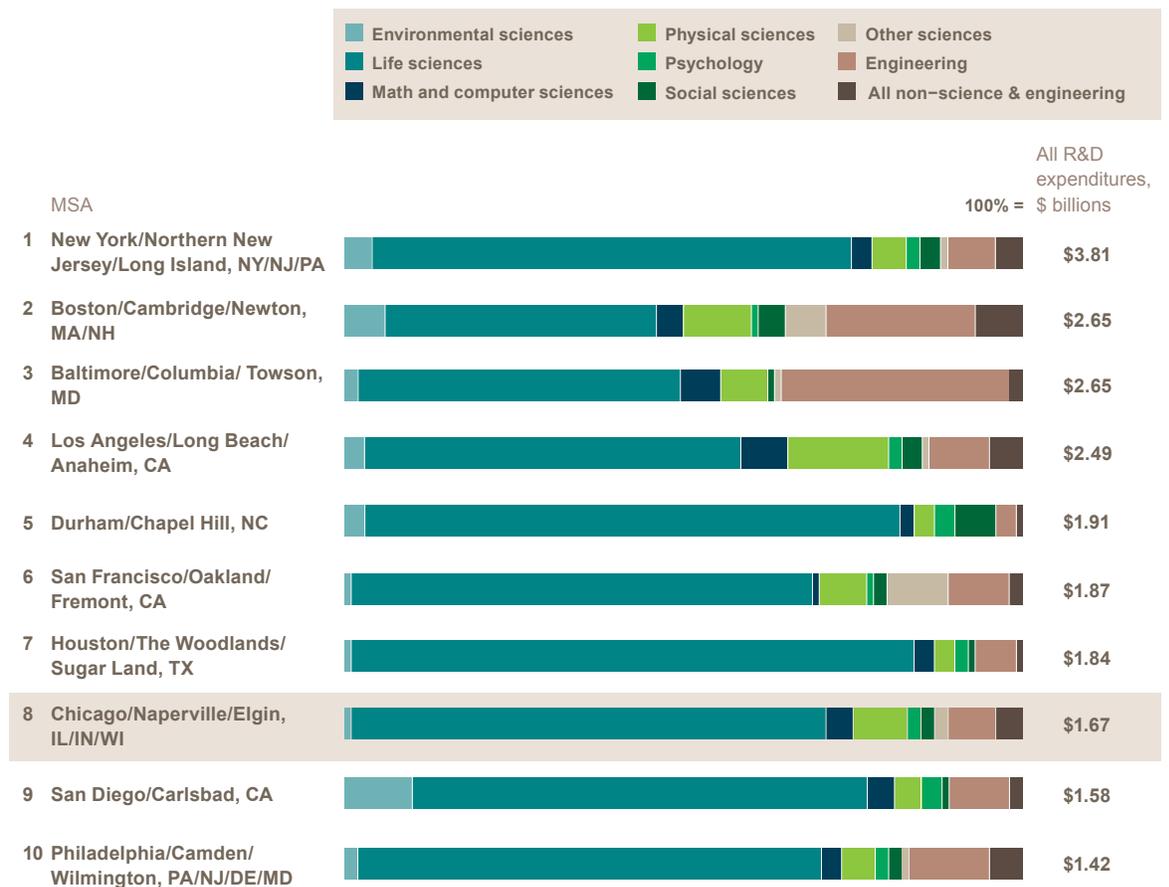


The Chicago MSA's performance

In 2012, the academic institutions in the Chicago MSA invested \$1.67 billion in R&D, just below the \$1.69 billion from the previous year (see the [Q1 2013 report](#) for more detail). This level of spending placed Chicago universities eighth among the nation's MSAs—unchanged from 2011 rankings. Nearly two-thirds of Chicago's spending was concentrated in life sciences, though several areas—physical sciences, psychology, and other sciences—also reflected significant emphasis. (For more information on expenditure categories, see sidebar “[Know your sciences.](#)”) This spending helps Chicago academic institutions conduct cutting-edge research as well as attract top talent in science fields. For instance, according to a World Business Chicago (WBC) analysis, the Chicago MSA has the second-highest number of graduates with master's and doctorate degrees in math and computer science (1,785) among the top 100 MSAs on an annual basis.² Chicago-area institutions' R&D spending in non-science and engineering fields, which includes business management and communications, was fifth among the top MSAs.

² WBC analysis, National Center for Education Statistics, Integrated Postsecondary Education Data System, 2012 Degrees Survey, CIP 11 & 27.

Top 10 US metros by total R&D investment of educational institutions, 2012, by percent



Source: National Science Foundation

Know your sciences

The categories of academic R&D expenditures consist of a number of distinct sciences. The composition of each category informs the concentration of R&D expenditures by certain institutions and suggests opportunities for greater collaboration with industry. For example, universities with significant investments in life sciences could be well placed to team with agribusiness or biopharma companies.

Computer and math sciences

Data processing; information sciences; applied mathematics; geometry

Engineering

Aeronautical/astronautical, bio/biomedical, chemical, civil, electrical, mechanical, and metallurgical/materials engineering

Environmental sciences

Atmospheric and earth sciences; oceanography

Life sciences

Agricultural, biological, and medical sciences

Other sciences

Expenditures not elsewhere classified

Physical sciences

Astronomy; chemistry; physics

Psychology

Educational psychology; human development and personality

Social sciences

Economics; political science; sociology

Non-science and engineering

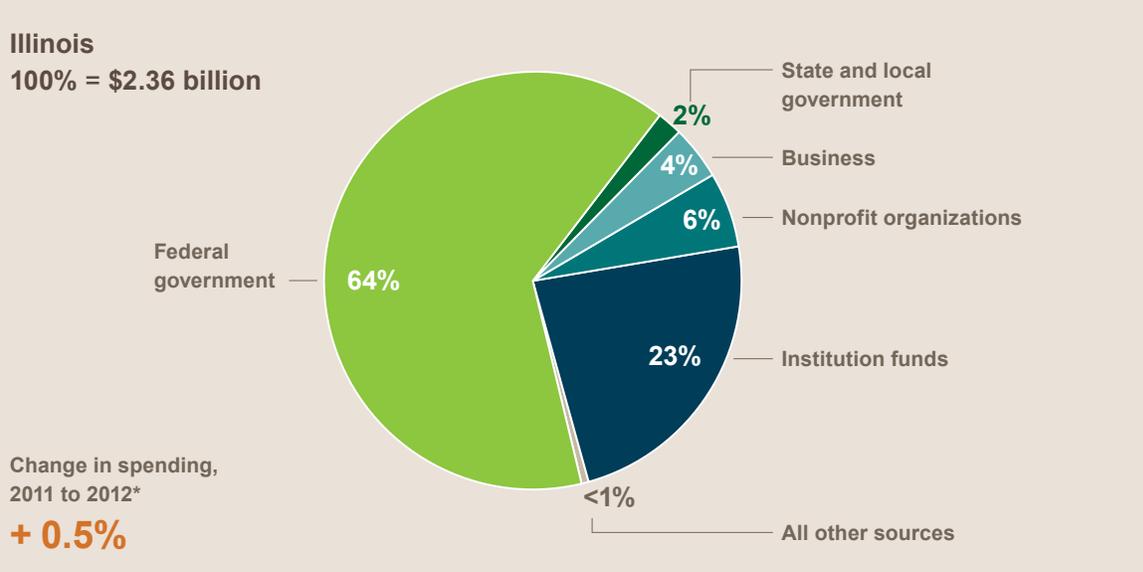
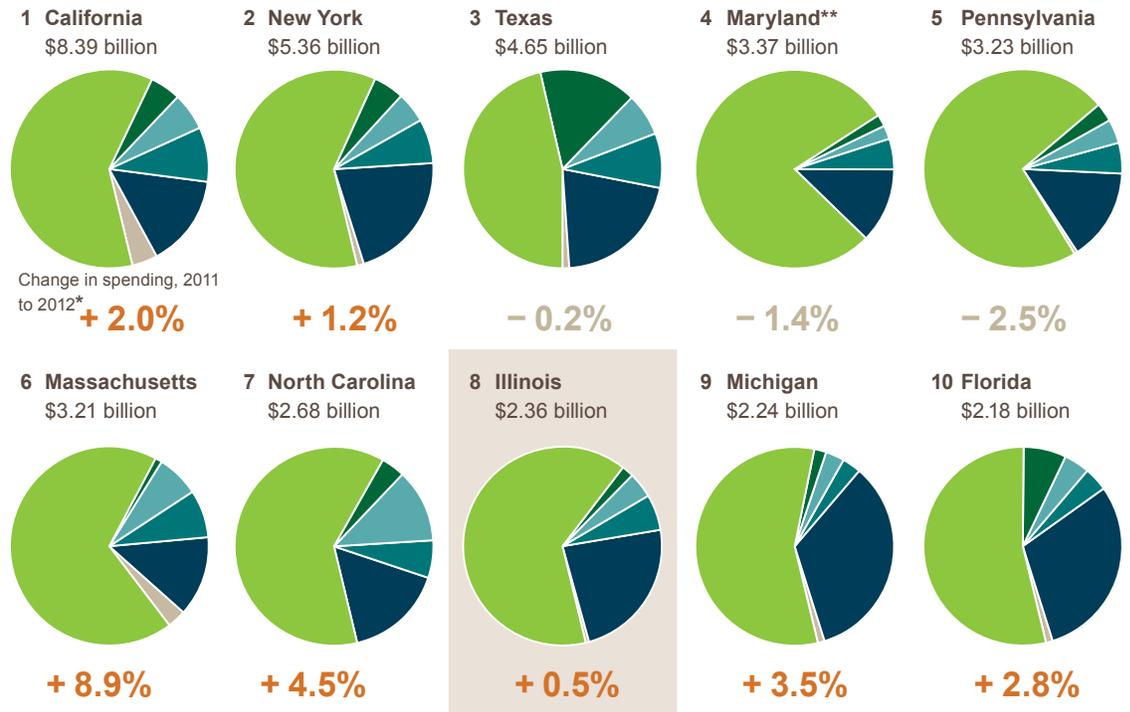
Business and management; communications, journalism, and library science; education; humanities; law; social work; visual and performing arts

Illinois' performance compared with top states

In 2012, academic institutions throughout the state of Illinois invested a total of \$2.36 billion in R&D, an increase of \$11.2 million or 0.5 percent over 2011. Massachusetts had the largest one-year increase in total R&D investment, while several states saw their totals drop from the previous year. The only change to the top-ten rankings by total spending in 2012 occurred in the last two slots, as Michigan took 9th place (from 10th in 2011), Florida took 10th place (from 11th), and Ohio fell to 11th (from 9th).

For the top states, federal funding accounted for anywhere from one-half to two-thirds of total expenditures. Academic institutions' dependence on this funding warrants a discussion of the impact of the federal budget on universities and research, especially in light of the [Budget Control Act of 2011](#). The impending risk of an innovation gap is discussed further in the *ISTC Catalyst* article "[Federal Support for Basic Science & Technology Commercialization: Sparking Economic Growth for Illinois.](#)"

Top 10 states for total academic R&D investment by source, 2012, by percent



* Some of the 2011-to-2012 changes may be partly due to inconsistencies in the survey sample and methodology between those two years (see sidebar "About the data").

** Johns Hopkins University includes expenditures for the university-affiliated Applied Physics Laboratory (APL), which accounted for \$1.12 billion of Maryland's 2012 total. The APL is a division of the university but is located off-campus and functions as a separate nonprofit research center.

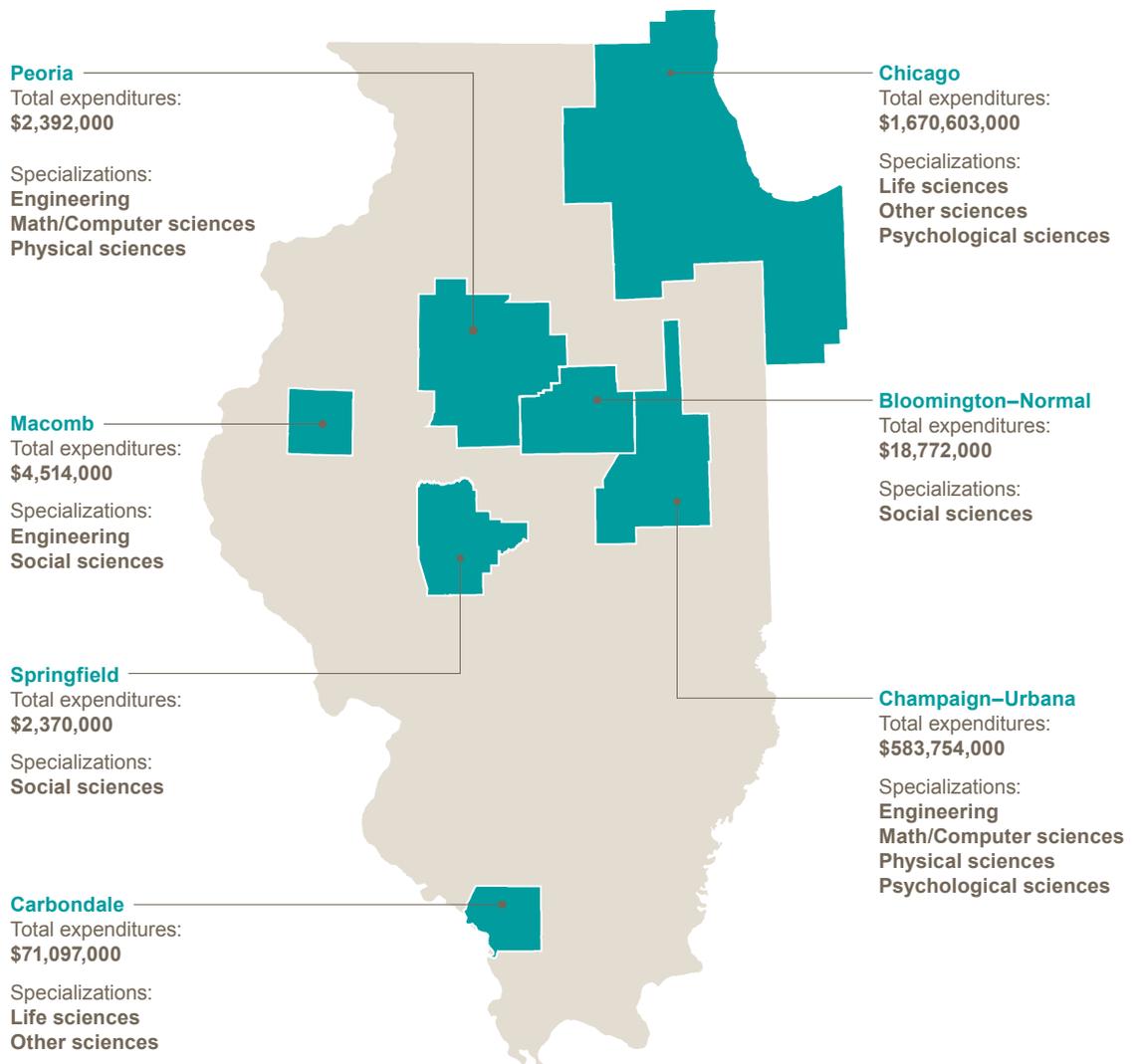
Source: National Science Foundation

Illinois' performance in math and computer science

Illinois academic institutions excelled in a number of categories in 2012. That year, the state ranked sixth in the nation by total investment in math and computer science R&D and graduated the third-highest number of students with master's and doctorate degrees in this field.³ According to the National Center for Education Statistics, in 2012 more than 8,000 undergraduate students were enrolled in engineering fields across University of Illinois campuses (Urbana–Champaign and Chicago)—a number that exceeds the combined total of Berkeley, Caltech, MIT, and Stanford. MSAs across the state have developed

³ WBC analysis, National Center for Education Statistics, *ibid.*

Illinois MSAs by academic R&D specialization,* 2012



Note: Location quotients (LQs) can identify local specialization across fields or industries. Here, LQs were calculated by comparing each metro's expenditures by research fields to the corresponding national distribution.

*Specializations on this map reflect LQs of 1.2 or higher.

Source: National Science Foundation

concentrations in specific science categories, as defined by the location quotient (LQ) of academic expenditures; this specialization helps define the priorities and strengths of specific institutions and geographic areas by identifying outsized focus even when total expenditures are relatively small.

The strength of the state's academic network is reinforced by the emergence of several MSAs in selected categories. The Champaign–Urbana MSA's R&D expenditures, for example, increased by \$38 million from 2011 to 2012. Its \$97.6 million investment in math and computer science R&D ranked seventh in the nation among MSAs, behind only vastly larger metros (such as Los Angeles, New York, and Boston). This emphasis on math and computer science enabled Champaign–Urbana to record the highest LQ in this category among the top 100 metros.⁴ Also in 2012, Peoria ranked third out of 235 metros with a surveyed institution⁵ by percentage of R&D funding from the private sector: 38.5 percent of its expenditures came from business compared with the national average of 6 percent. And Springfield was the most specialized in social science R&D investment out of all 235 MSAs across the nation with an LQ of 27.2. All of these findings suggest that central Illinois is becoming a powerhouse for both research and partnerships with private companies.

⁴ MSAs that invested in excess of approximately \$150 million in academic R&D.

⁵ Of the 388 total MSAs in the nation, 235 are home to an institution that participated in the survey.

Illinois on the forefront of advanced manufacturing

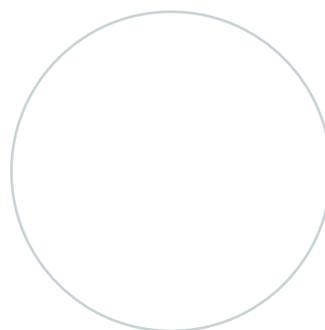
When President Obama announced that Illinois would be home to the new Digital Manufacturing and Design Innovation (DMDI) Institute, it was a recognition of state's vision to establish an advanced manufacturing hub—an achievement that will be aided by harnessing academic R&D. UI Labs will host the institute, which received \$70 million in federal funding and an additional \$250 million in industry commitments. The project represents an important collaboration

between 23 academic institutions, 41 corporations, and 9 nonprofit organizations. The DMDI Institute will focus on the flow of digital data across design, engineering, manufacturing, and maintenance systems and the networked supply chain as a whole.

Note: *Since the DMDI Institute is a public-private partnership, its funds will not appear in figures for academic or industry R&D.*

Looking ahead

Over the past several months, the Index has explored the impact of academic R&D on the innovation ecosystem through indicators such as [technology transfer and patent output](#). The recent announcement of the DMDI Institute demonstrates how collaboration among academia and business has the potential to accelerate innovation and further the state's goals. As the [October 2013 Index noted](#), industry R&D in Illinois was more than \$12 billion in 2011 but accounted for just \$100 million in academic R&D expenditures, suggesting an opportunity to boost industry funding for academic R&D through closer collaboration. And in support of federal investment in academic R&D, earlier this month US Senator Dick Durbin (D-IL) introduced [legislation that would provide \\$150 billion over the next decade to fund biomedical research through four federal agencies](#). ■



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