

Chapter 9 Research & Technology Transfer

Goals

Excellence in research and scholarly activity is a central tenet of the University of Michigan's mission. The broad scope, overall size, and emphasis on interdisciplinary approaches of the U-M's research program contributes to university's standing as one of the world's leading research institutions. As such, the faculty attracts generous financial support from the public and private sectors.

The University expects that research by many of faculty discoveries will contribute to the development of innovative products and processes. The U-M places a high priority on supporting this kind of activity through the Office of Technology Transfer and the Business Engagement Center.

Overview

This chapter largely examines data about externally funded projects. Total research expenditures by the University from all sources (external and University funds) exceed \$1.4 billion per year, which ranks U-M No. 2 in the nation among all universities and No. 1 among public universities. Seventy percent of U-M's research spending is provided by outside sources, while the largest share of research funding comes from the federal government.

The University's largest fraction of grant-supported work occurs in the biomedical and clinical sciences. The U-M Medical School alone regularly attracts close to \$300 million each year in research funding.

Some research is of special interest to the private sector. The Office of Technology Transfer works with faculty inventors to file patents and negotiate licensing agreements that benefit the University's industry partners and fund additional

research and development work on campus. In certain instances, U-M faculty members establish companies to develop their inventions, thanks in part to an emerging campus culture of innovation and entrepreneurship.

U-M wishes to promote partnerships that involve academia, government and industry. Toward this goal, the University designates funds to interdisciplinary teams whose work has potential for broad societal impact.

For More Information









U-M Office of Research (research.umich.edu/)

Office of Technology Transfer (techtransfer.umich.edu/)

Business Engagement Center (bec.umich.edu/)

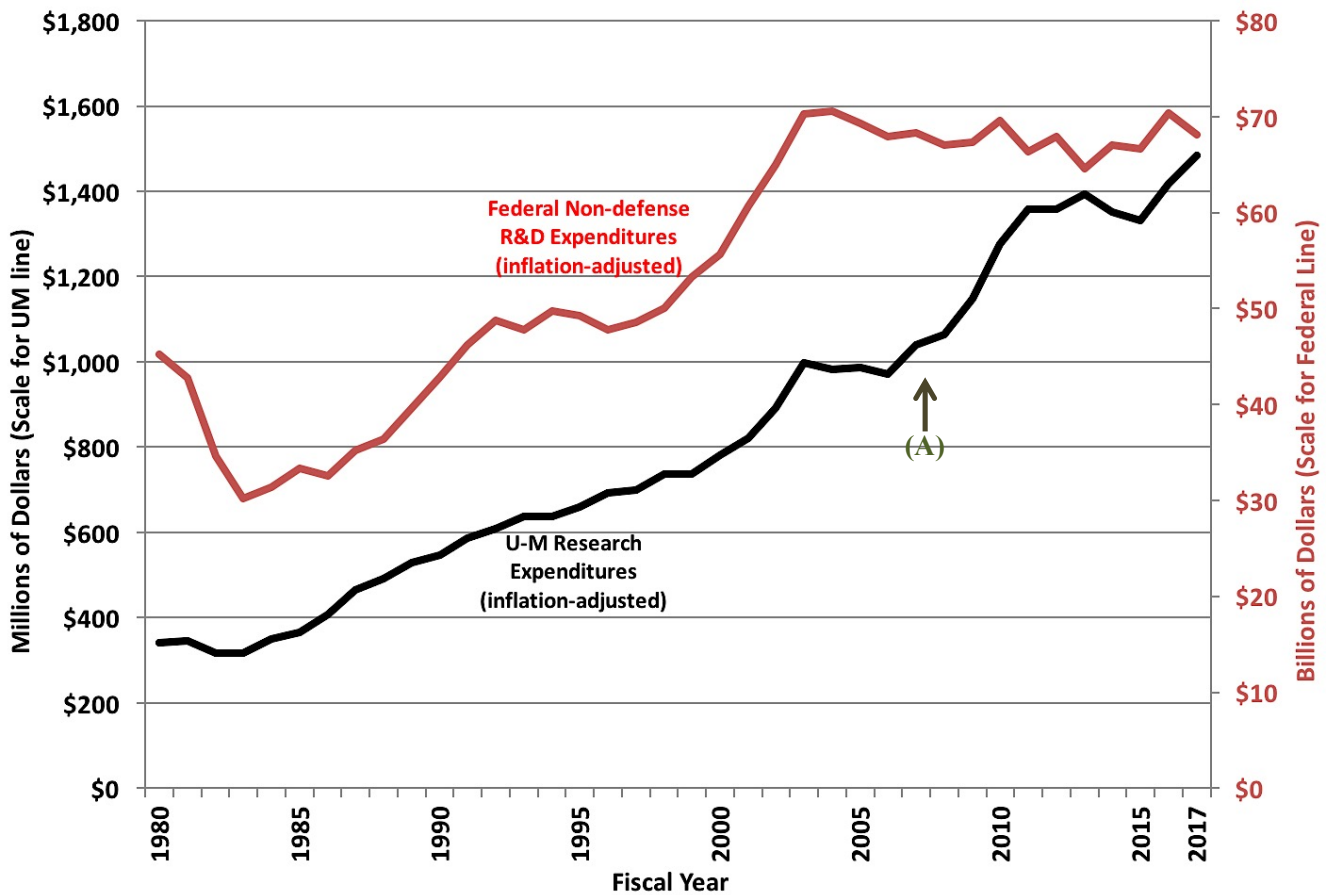
 *Chart updated since the September 2017 edition.*

Charts in Chapter 9

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During the last three decades, total research expenditures (adjusted for inflation) for all three U-M campuses from all sources (including U-M funds) have more than quadrupled.

9.1.1 Total Research Expenditures, Adjusted for Inflation¹, 1980-2017.



SOURCE: U-M Financial Operations.

The trend in University of Michigan research expenditures (adjusted for inflation, black line) largely mirrors the total federal non-defense R&D spending (red line) through FY2006. The increase in FY2007 – indicated as (A) – is an artifact of a change how U-M calculates research spending².

Likewise, the lack of growth from FY2011 in both total federal non-defense R&D and U-M research expenditures largely reflects the depletion of ARRA funds combined with overall decline in growth of federal funding of research.

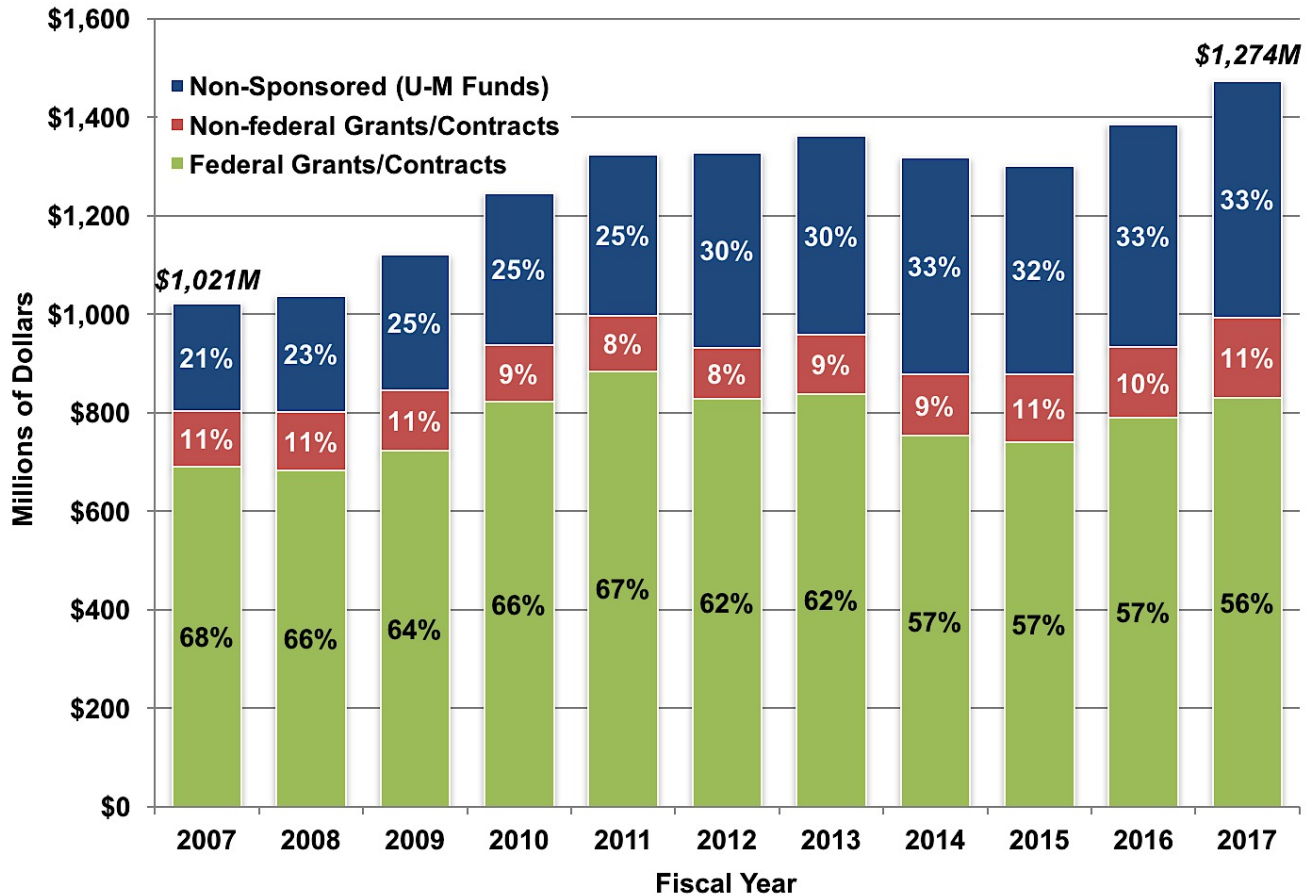
The total Federal Non-defense R&D Expenditures is estimated for 2017; a final figure is not available yet.

¹ Based on 2017 U.S. Consumer Price Index.

² Starting in FY2007, research support originating from the U-M faculty medical group practice was included as research expenditures. Previously this was reported with clinical activity.

Federal grants and contracts now cover less than 60% of U-M research expenditures.

9.1.2 Research Expenditures by Major Funding Source, Adjusted for Inflation³, FY2007-17.



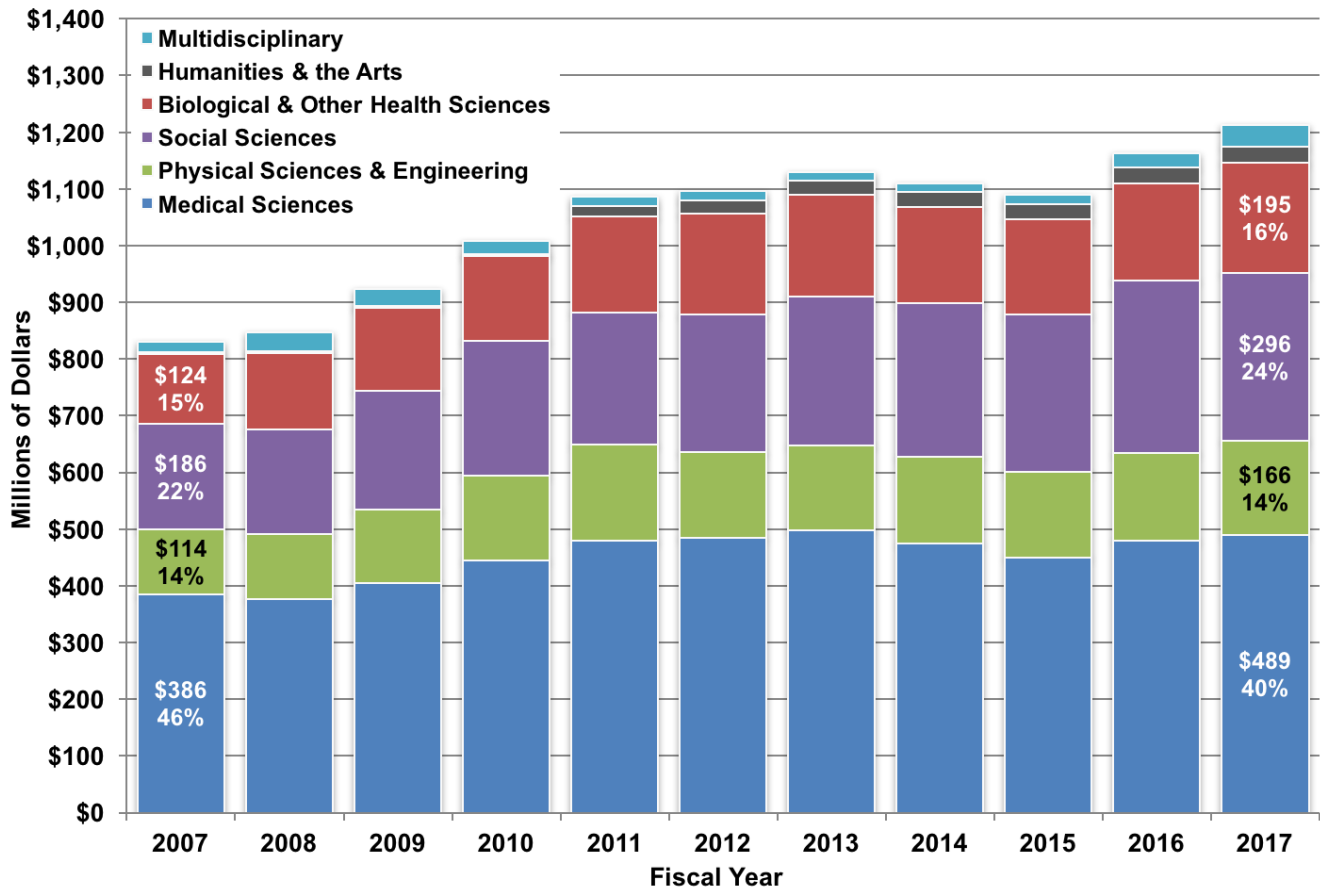
Source: U-M Financial Operations.

In FY2007 the U-M began to include research support from the medical group practice revenues as part of Non-sponsored research expenditures (see “A” in chart 9.1.1).

³ Based on 2017 U.S. Consumer Price Index.

Direct research expenditures increased in FY2017 for the third year in row.

9.1.3 Direct Research Expenditures by Discipline, Adjusted for Inflation⁴, FY2007-17.



SOURCE: U-M Financial Data.

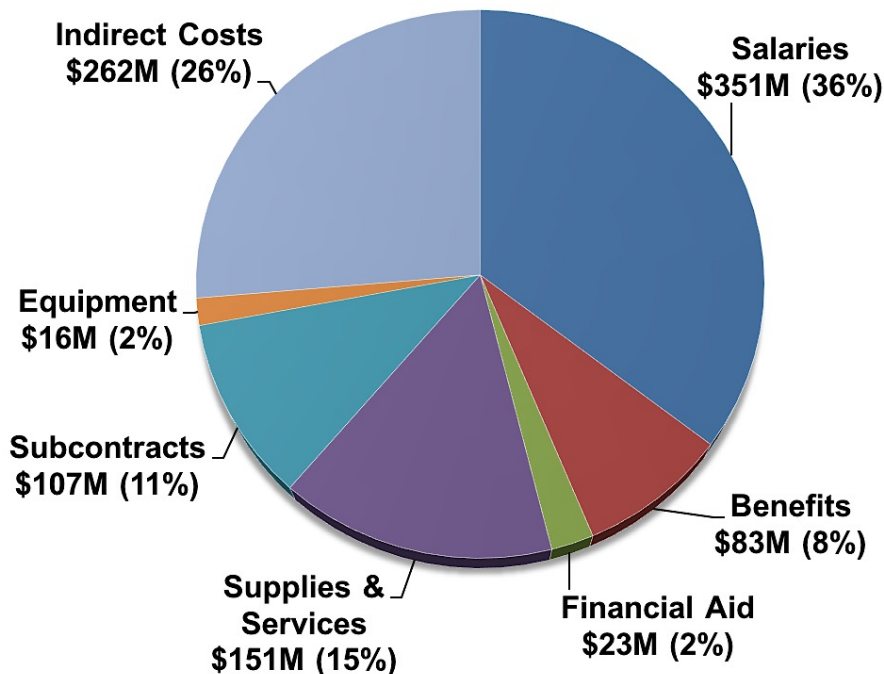
Direct expenditures cover salaries and benefits of researchers, whether faculty, staff or students, as well as equipment and supplies, research-related travel and other expenses tied to specific projects. Chart 9.1.5 displays overhead spending for items such as utilities, administration, and general maintenance of research facilities – known as “indirect” costs – that supports the entire research enterprise.

⁴ Based on 2017 U.S. Consumer Price Index.

About 45 percent of the total annual sponsored research expenditures on the Ann Arbor campus goes to salaries and benefits for faculty, staff and graduate students.

9.1.4 Sponsored Research Expenditures by Type, FY2017.

FY2017 Total: \$992,877,917



SOURCE: U-M Financial Operations.

The FY2017 total externally funded research expenditures for the Ann Arbor campus was \$992.9 million, which is an increase of \$60.4 million from the previous year. Salaries and benefits is largest cost component.

Indirect costs (IDC) are the costs of University operations that are not assigned to a particular project, such as the costs for general research administration, utilities use in research space, and other services that contribute broadly to the operation of the University’s research enterprise.

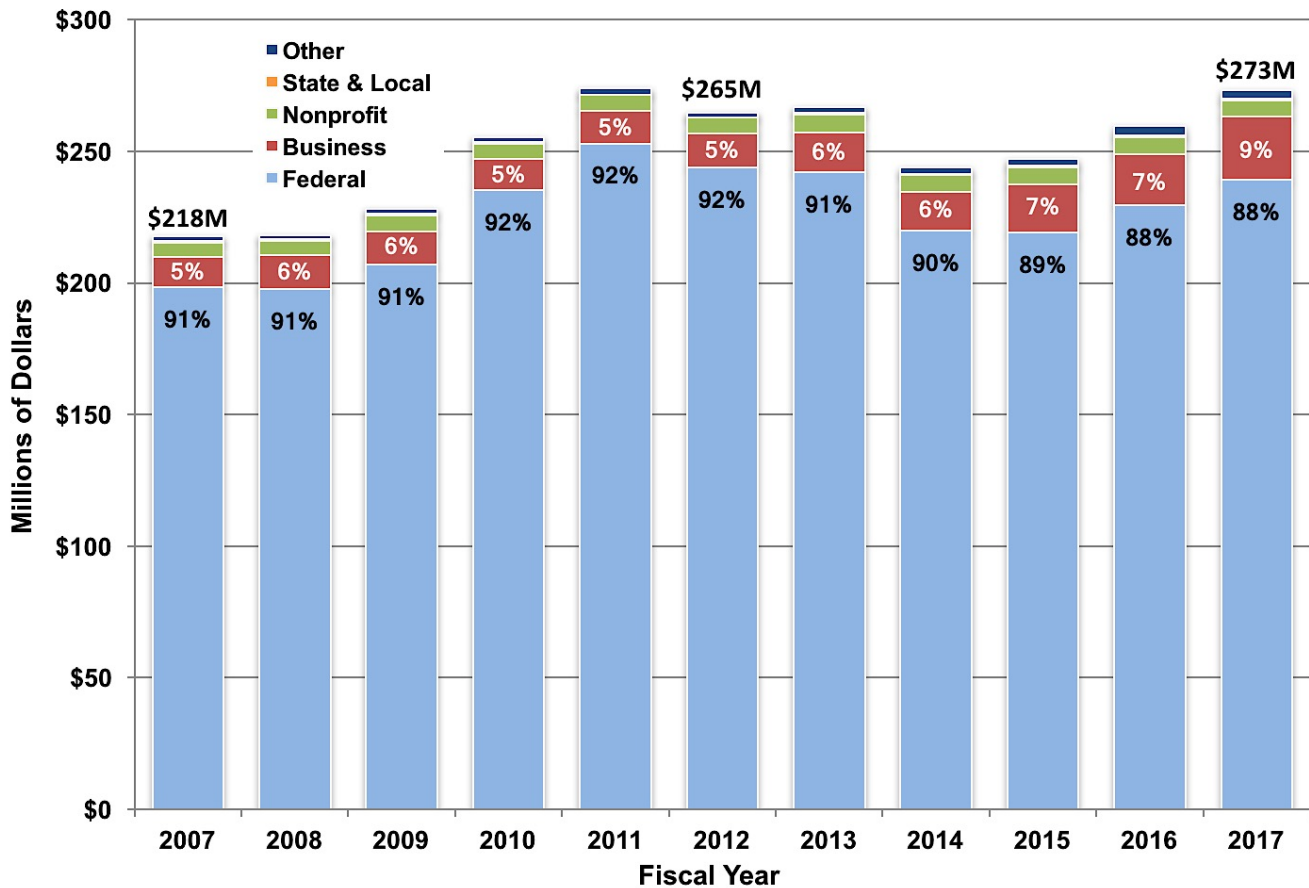
For FY2017, 26 percent of the total research expenditures went to pay for indirect costs; however, the actual indirect cost recovery rate varies for each project based on the type of research activity and the sponsor. The indirect cost recovery rate for research funded by the Federal government or

industry is 55 percent for on-campus research and 26 percent for off-campus research.

The indirect cost recovery rates charged to non-federal sponsors, such as foundations, State of Michigan agencies, and private companies, vary according to the sponsor's policies or through negotiations with the sponsor. In such situations, the recovery rate may not cover the actual expenses incurred by the U-M to support some of these projects.

Federal sponsored projects provide nearly 90 percent of indirect cost recovery funds.

9.1.5 Sponsored Research Indirect Cost Recovery by Source, Adjusted for Inflation⁵, FY2007-17.



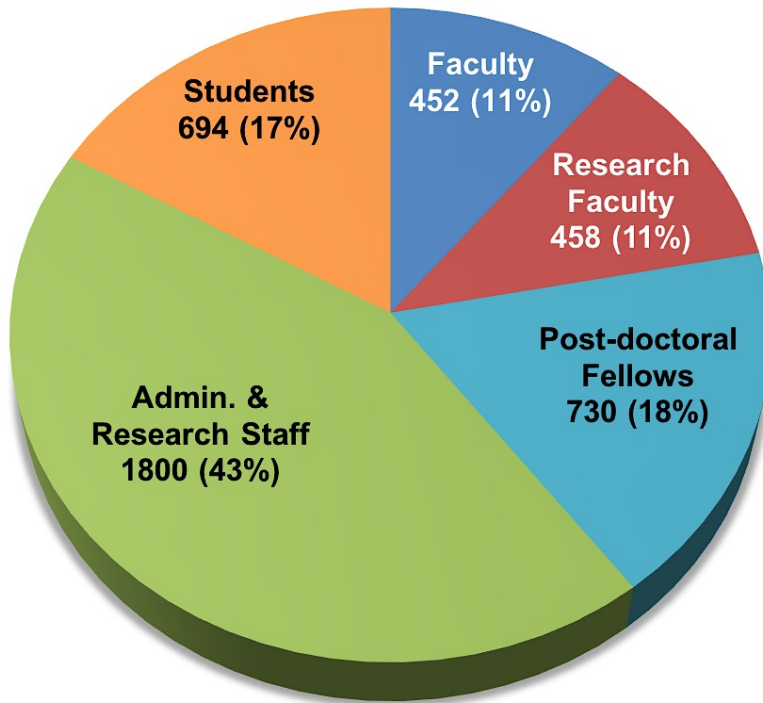
SOURCE: U-M Financial Data.

The peak in indirect cost recovery for FY2011 is largely due to the bump provided by federal “stimulus” funds that had supported research. The inflation-adjusted total indirect cost recovery is still down by 5 percent since the 2011 peak year.

⁵ Based on 2017 U.S. Consumer Price Index.

A fall 2016 snapshot of personnel paid under sponsored projects shows that grants and contracts fund the full-time equivalent of 4,134 faculty members, post-docs, staff and students.

✦ 9.2 Research Workforce by Full-Time Equivalents (FTEs), Fall 2016.



SOURCE: U-M Human Resources Data.

Many tenured and tenure-track faculty members play key roles in sponsored research activity. Research faculty members, post-doctoral fellows, graduate (and some undergraduate) students and a subset of the staff also contribute in major ways to the research enterprise.

The Fall 2016 total represents an decrease of 24 FTEs (0.6 percent) supported on sponsored projects compared to Fall 2015.

U-M spends more on research than any other U.S. public university.

9.3 University R&D Expenditures, U-M and Other Leading Institutions, FY2012-16.

Institution ⁶	FY2012	FY2013	FY2014	FY2015	FY2016
Johns Hopkins ⁷	\$2,106M	\$2,169M	\$2,242M	\$2,306M	\$2,145M
MICHIGAN	\$1,323M	\$1,375M	\$1,349M	\$1,369M	\$1,436M
Pennsylvania	\$847M	\$828M	\$828M	\$864M	\$1,296M
UC San Francisco	\$1,033M	\$1,043M	\$1,084M	\$1,127M	\$1,294M
Washington	\$1,109M	\$1,193M	\$1,176M	\$1,181M	\$1,278M
Wisconsin	\$1,170M	\$1,124M	\$1,109M	\$1,069M	\$1,158M
UC San Diego	\$1,074	\$1,076M	\$1,067M	\$1,101M	\$1,087M
Harvard	\$799M	\$1,013M	\$934M	\$1,014M	\$1,077M
Stanford	\$903M	\$945M	\$959M	\$1,023M	\$1,066M
Duke	\$1,010M	\$993M	\$1,037M	\$1,037M	\$1,056M

SOURCE: National Science Foundation, Higher Education Research and Development Survey.

The U-M has been the nation's leading public university in total research spending for the past five years. Total expenditures include research spending from government sources, non-government sources, and the institution's own budget.

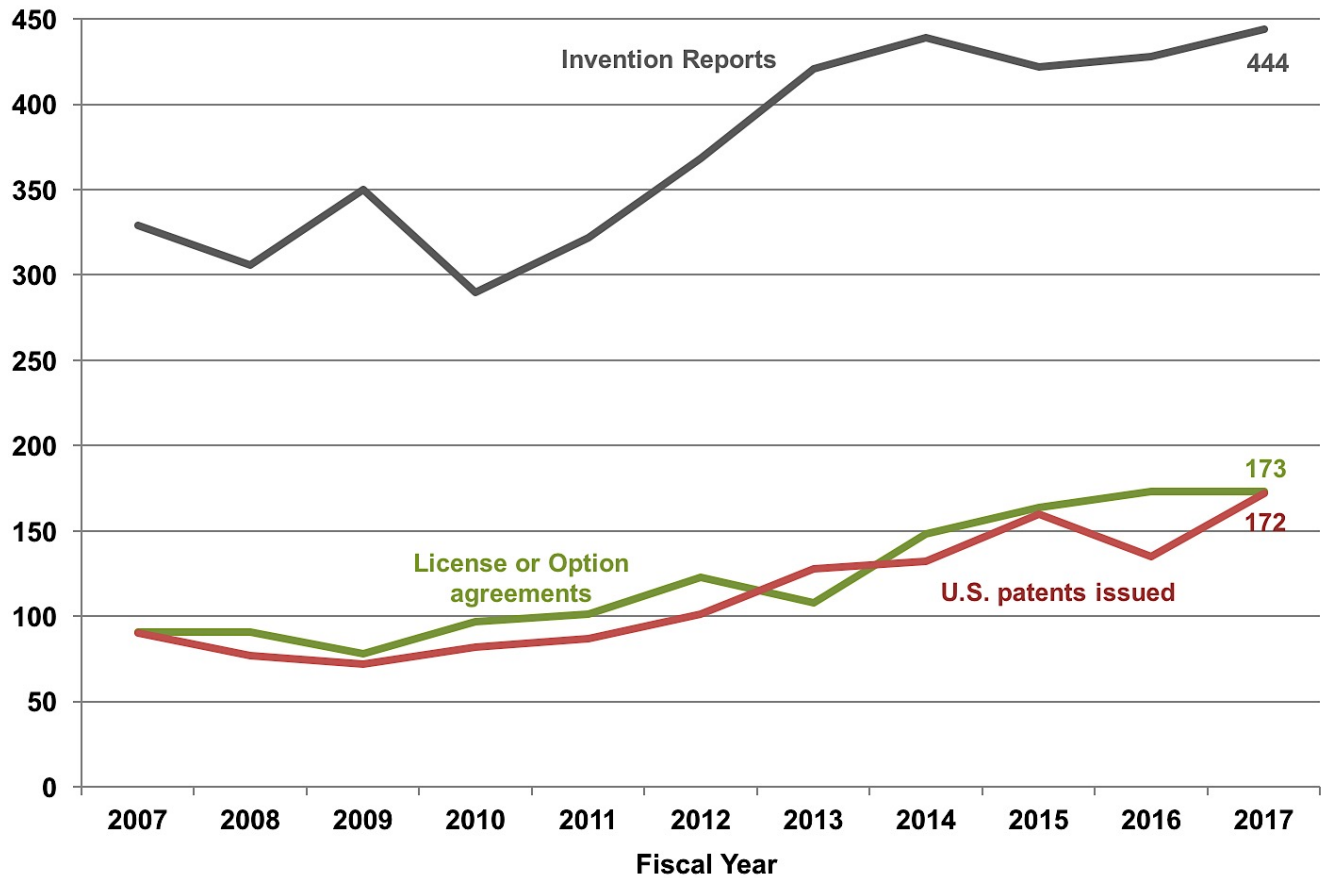
The list above is ordered by total research expenditures for FY2016. Data for public universities are shaded in yellow; private university data are shaded in blue.

⁶ Starting in FY2010, the NSF ranked institutions by geographically separate campuses, each headed by a campus-level president or chancellor. Prior to that, some institutions were ranked by the aggregate R&D expenditures for all campuses in a multi-campus university or state system.

⁷ Johns Hopkins University expenditures include those by the Applied Physics Laboratory. In FY2016, APL R&D expenditures totaled \$1.403M, 58% of JHU's total for the year.

Since 2007, U-M faculty, staff and students have reported 4,119 inventions, 1,347 licensing agreements, and 1,236 U.S. patents.

9.4.1 Invention Reporting, Licensing and U.S. Patent Activity at the U-M, FY2007-17.

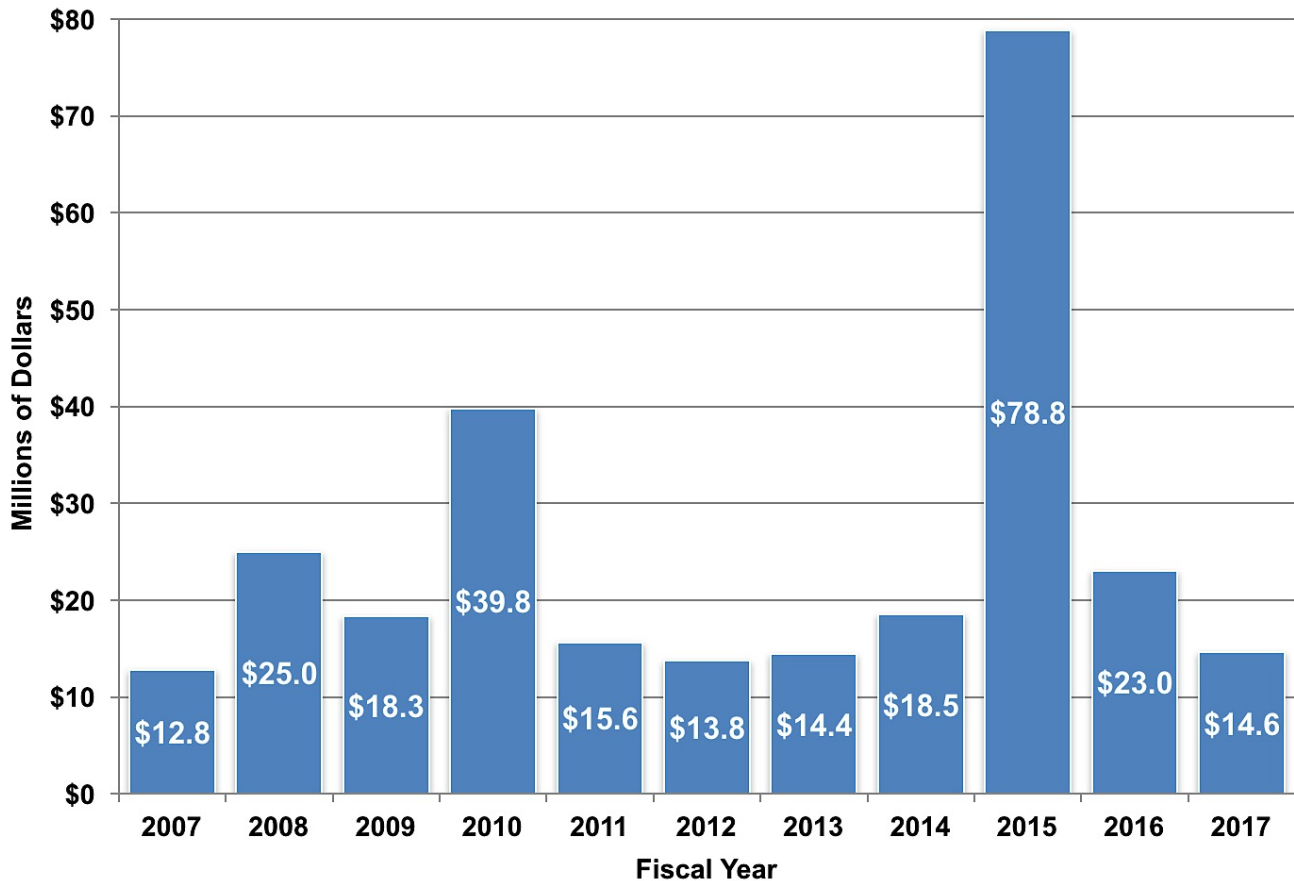


SOURCE: U-M Office of Technology Transfer.

Invention reports are descriptions of discoveries made by U-M faculty, staff and students with the potential to be further developed into new products or processes. Patents protect intellectual property that shows some promise for future development and application. License and option agreements are legal arrangements with companies (some of which have U-M faculty involvement) that allow the firms to use University-owned technology in products or processes being developed for the market.

Over the last decade, U-M discoveries have generated \$275 million in revenues. The inventors and University share these revenues, with the U-M's portion devoted to ongoing research and development.

9.4.2 Revenues from Royalties and Equity Sales, FY2007-17.



SOURCE: U-M Office of Technology Transfer.

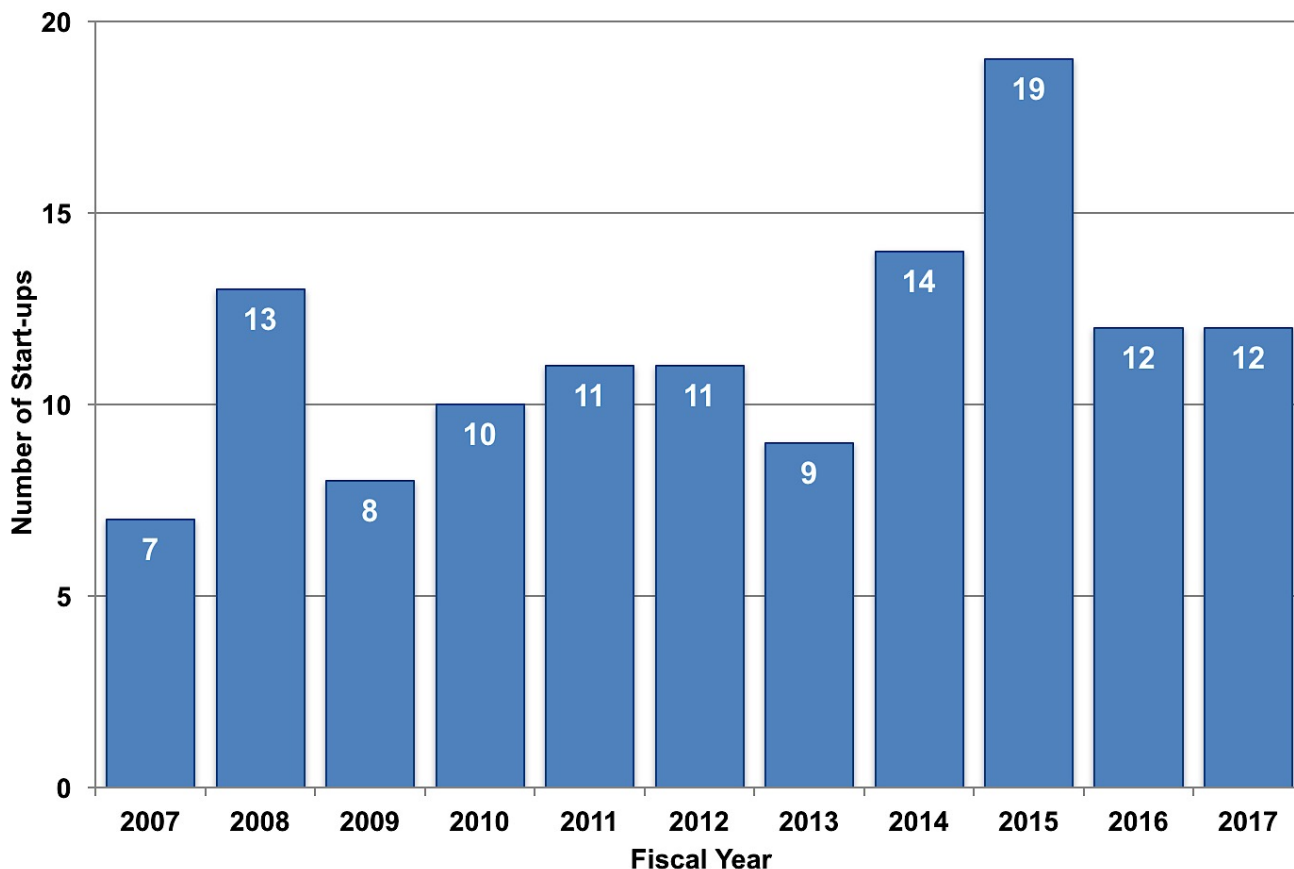
Revenues from licensing agreements support technology transfer operations as well as provide valuable resources for investment in research, education, and innovation.

Royalties are periodic payments by a licensee to the University of Michigan in order to have continued access to U-M-owned intellectual property. Equity sales include transfers of stock or cash payments by a licensee to the U-M.

Royalty revenues reached an all-time high in FY2015. Nearly \$75 million of that total comes from a new royalty agreement connected to a drug to help patients with Gaucher disease that was developed at U-M, according to the Medical School.

Since 2007, 126 new companies employing U-M discoveries have been launched.

9.4.3 Formation of Start-up Companies that Utilize U-M Technology, FY2007-17.



SOURCE: U-M Office of Technology Transfer.

While much of the new technology developed at the U-M is licensed to existing companies for use in new products and processes, some inventions become the basis of new enterprises. Often this occurs when the U-M inventors wish to have hands-on involvement in the further development of the technology.

Several U-M start-ups have reached a level of success such that larger firms have acquired them. For example, two medical device start-ups – HandyLab and Accuri Cytometers – were acquired by Becton Dickinson in 2009 and 2011, respectively. Arbor Networks, which provides internet protection tools, was purchased in 2010 by Tektronix Communications, and Health Media, developer of health support programs, was acquired in 2008 by Johnson & Johnson. And in October 2012, Compendia Bioscience, which has developed an oncology database that drug companies utilize in drug discovery work, was acquired by Life Technologies Corp.

In 2011, the U-M opened the Venture Accelerator at the North Campus Research Complex. The Venture Accelerator provides laboratory and office space, as well as business services, to startup companies emerging from the pipeline of new ventures at U-M Tech Transfer.

Portfolio of U-M start-ups:
techtransfer.umich.edu/about/startups.php

By several indicators of technology transfer activity, the U-M ranks highly compared to leading U.S. universities according to research expenditures⁷.

9.5 Technology Transfer Indicators for the U-M and Research-Intensive Universities, FY2015.

Institution (FY2015 R&D Expenditures)	Invention Reports	Issued Patents	New Agreements	Startups	License Revenue
Johns Hopkins (\$2,306M)	517	122	149	16	\$17.9M
MICHIGAN (\$1,369M) 2nd	422 (5 th)	159 (4 th)	164 (3 rd)	12 (6 th)	\$78.8M (2 nd)
Washington (\$1,181M)	373	81	337	15	\$42.8M
Wisconsin (\$1,069M)	387	161	70	6	\$40.0M
Duke (\$1,037M)	229	79	162	7	\$36.8M
Stanford (\$1,023M)	483	232	112	28	\$95.1M
Harvard (\$1,014M)	354	50	268	16	\$18.5M
North Carolina (\$967M)	399	103	157	16	\$42.0M
Cornell (\$954M)	318	40	99	11	\$2.5M
MIT (\$931M)	795	314	124	28	\$34.8

SOURCE: Association of University Technology Managers.

The University of Michigan rank for every indicator is listed next to each indicator's number value. These universities are ordered according to the size of their research expenditures, as reported to the National Science Foundation Higher Education Research & Development Survey for FY2015.

The indicator value in each category is highlighted in green. Data for public universities are shaded in yellow; private university data are shaded in blue.

⁷ The University of California System and University of Texas System report their indicators in the aggregate, not by individual university, so comparisons to schools such as UC-San Diego, UCLA or UT-Austin are not possible.

