BCG BOSTON CONSULTING GROUP

Tech and Innovation Hubs

Program overview and Lansing region data

10 MAY 2023

Contents

Purpose of this session

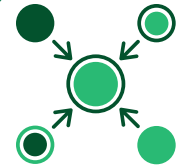Provide details about the Tech Hub Program and a synthesis of the Lansing area's data on tech domains and demographics
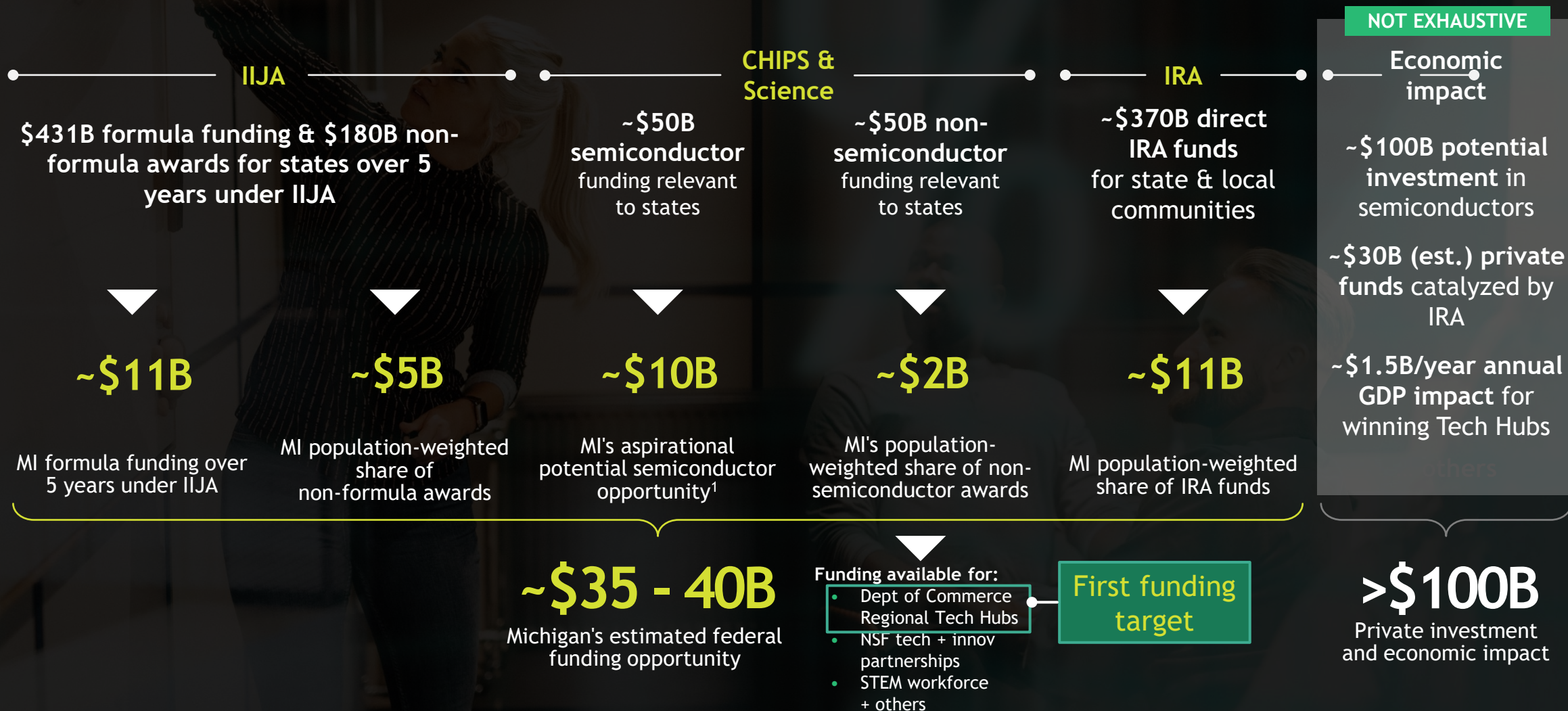
Collaborate on developing the best approach for the Program

Establish next steps for continued engagement

Value at stake is securing Michigan's ~$35-40B federal funding opportunity and >$100B in private investment, targeting first Regional Innovation funding

IIJA		CHIPS & Science		IRA	Economic impact
$431B formula funding & $180B non-formula awards for states over 5 years under IIJA		~$50B semiconductor funding relevant to states	~$50B non-semiconductor funding relevant to states	~$370B direct IRA funds for state & local communities	~$100B potential investment in semiconductors
~$11B	~$5B	~$10B	~$2B	~$11B	~$30B (est.) private funds catalyzed by IRA
MI formula funding over 5 years under IIJA	MI population-weighted share of non-formula awards	MI's aspirational potential semiconductor opportunity[1]	MI's population-weighted share of non-semiconductor awards	MI population-weighted share of IRA funds	~$1.5B/year annual GDP impact for winning Tech Hubs

~$35 - 40B
Michigan's estimated federal funding opportunity

Funding available for:
- Dept of Commerce Regional Tech Hubs
- NSF tech + innov partnerships
- STEM workforce + others

First funding target

>$100B
Private investment and economic impact

1. Based on MI's semiconductor aspirations and identified opportunities in deal pipeline
Sources: EPA; CBO; Credit Suisse 'US Inflation Reduction Act: A Tipping Point in Climate Action', 2022; The White House, BCG analysis

Securing $500M in Tech Hub Program funding could create $1.5B+ annual impact for "up and coming" hubs in Michigan

$500M of direct funding at stake for each potential Tech Hub

Tech Hubs Program Structure

- Over $10B in funds to 20 hubs across the nation
- Targeting 10 key tech areas (automation, biotechnology, AI, nuclear technology etc.)
- Policy specifies that hubs be located in:
  - Regions that have potential to invent new technologies and put them into practice
  - Lagging regions or in areas that are undershooting their economic potential
- At least 3 hubs to be in each EDA[1] region
- Grant allocation distribution—$3B in '23-24 and $7B in '25-'27

Direct fund would also generate significant indirect knock-on impact

$1.5B Estimated annual GDP impact for one hub[2]

1 **Private investment** attracted by innovation	**2** **Synergies** through shared infrastructure
3 **Positive net migration** and retained talent	**4** **Equity** driven through targeted job creation

Healthy, thriving, resilient communities

To secure federal funding, applicants will excel beyond government directives to a differentiated strategy

Table stakes from CHIPs + Science federal directives…

Include and serve underrepresented communities: Engage rural communities, minority owned businesses and HBCUs, tribal colleges & universities

Demonstrate strong & sustainable cross-sector collaboration: Integrate federal research centers and communicate a sustainable business plan for post-grant activities

Display climate impact & economic resilience: Focus on 'dirty fuel' reliant economies and quantify economic impact

… what it will take to win

Clear & specific **focus** on region's strongest advantages: Double down on top economic indicators in region & articulate how federal funding will accelerate innovation activities that are already in motion

Bring deep **contextual awareness to theory of action:** Show deep place-based and organizational history to inform ambition and approach to regional development

Appeal to **diverse geographies:** Develop a partnership that targets Metro & rural areas

Engage industry and **identify community linkages:** Focus on community impact for the hub grounded in employer and workforce perspectives

Innovation Hubs legislative requirements – technology areas

Potential to advance the research, development, deployment, and domestic manufacturing of technologies in a **"key technology focus area"[2]**

1. Artificial intelligence, machine learning, autonomy, and related advances
2. High performance computing, semiconductors, and advanced computer hardware and software
3. Quantum information science and technology
4. Robotics, automation, and advanced manufacturing
5. Natural and anthropogenic disaster prevention or mitigation
6. Advanced communications technology and immersive technology
7. Biotechnology, medical technology, genomics, and synthetic biology
8. Data storage, data management, distributed ledger technologies, and cybersecurity, including biometrics
9. Advanced energy and industrial efficiency technologies, such as batteries and advanced nuclear technologies, including but not limited to for the purposes of electric generation
10. Advanced materials science, including composites 2D materials, other next-generation materials, and related manufacturing technologies

1. 15 USC 3722a: Regional Technology and Innovation Hub Program
2. 42 USC 19107: Challenges and focus areas

We identified six success factors from regular benchmarking on innovation hubs

Ability to attract and grow diverse talent with sustainable workforce pathways to generate economic mobility

Globally differentiated R&D leadership in areas of focus powered by the right infrastructure to spur innovation

Ability to attract relevant investors, from both large F500 and venture capital, across various company lifecycle stages

Adequate incentives and regulations (e.g., low interest loans, non-compete policies)

High quality living environment that is attractive to diverse talent

Ability to convert research/IP into successful business ventures (e.g., manufacturing prototypes, IP/patent agreements)

The State will be a
key partner in winning
Tech Hub funding

1   Provide resources and support to the region

2   Work with regions to align with broader state assets and goals

3   Help steer focus of applications across the state

4   Coordinate stakeholder engagement across the state

5   Coordinate state & local internal communications

Contents

Lansing MSA demographic rankings vary widely by category

Rankings vs. other MSAs in Chicago EDA region (64 total)

Economic Growth rankings (Rank of 1 = faster-growing/more productive)

	GDP per capita	Real 5yr GDP growth	5yr Labor Force Growth	5yr Pop % Change	Econ. complexity / productivity
Lansing	43	15	19	2	18

Equity/Economic Need rankings (Rank of 1 = higher need, (e.g., higher poverty), higher diversity and presence of HBCUs)

	% in poverty	% prime age not working	% with bach / black-white gap	Diversity index	% people of color	# HBCUs
Lansing	30	40	58	25	26	0

Skilled Labor Force rankings (Rank 1 = higher concentration of labor force education/skills)

	% with bachelor degree	# STEM grads age 25+	Comp/sci/eng employment	Adv. industry employment
Lansing	19	14	14	13

Research & Investment rankings (Presence of key R&D assets, close to rank 1 high-ranking patents per 100k pop)

	# MEP Centers	# National Labs	# Manufacturing USA Institutes	# R1 Universities	Patents per 100k population
Lansing	0	0	0	1	40

Quality of Living rankings (Close to rank 1 = "better" quality of living incl. shorter commute, less crime etc.)

	Median home price to household ratio	Cost of living (price parity)	% with less than 30min commute	Violent crime rate per 100k
Lansing	27	50	35	42

Legend: ■ Top 3   ■ Top 25%   ■ Bottom 50%

1. Variety of publicly-available sources-available on request

Key takeaways

- Lansing MSA has strong population growth: 2nd highest % population change last 5 years of all MSAs in Chicago EDA region

- Lansing MSA has a strong, skilled labor force: Top quartile in advanced industry employment, STEM grads 25+, and comp/sci/eng. employment

- Lansing's GDP per capita is in the bottom 50%; additional federal funding could help address existing economic issues

Lansing has consistent NSF awards & pockets of VC activity

vs. other MSAs in Chicago EDA region (64 total)

Rank vs. other MSAs in Chicago EDA Region

	$ NSF awards since 2017	$ NSF Awards / 100k pop	# patent families since 2017	# patent families / 100k pop	VC $ invested '21-'22	VC per $1M GDP	# VC-backed companies
Adv. Materials Sci. & Mfg.	14	9	16	13	14	14	14
Adv. Comms / Immersive Tech	7	6	21	25	64	64	64
AI / ML / Autonomous	9	7	16	15	24	27	19
Biotech / Medtech	5	5	15	17	18	18	16
Computing / Semi cond.	8	6	18	16	10	9	6
Data Mgmt / Cyber / Biometrics	15	13	22	35	64	64	64
Disaster Prev. & Mitigation	7	7	16	24	64	64	64
Energy & Ind. Efficiency Tech	9	7	20	23	64	64	64
Quantum Info Sci. & Tech	8	8	17	14	24	27	19
Robotics / Automation / Adv. Mfg.	9	7	20	26	64	64	64

Legend: ▪ Top 3 ▪ Top 25% ▪ Bottom 50%

Note: VC rankings' positions in the 64th position indicate that these areas received zero VC investments during the '21-'22 period
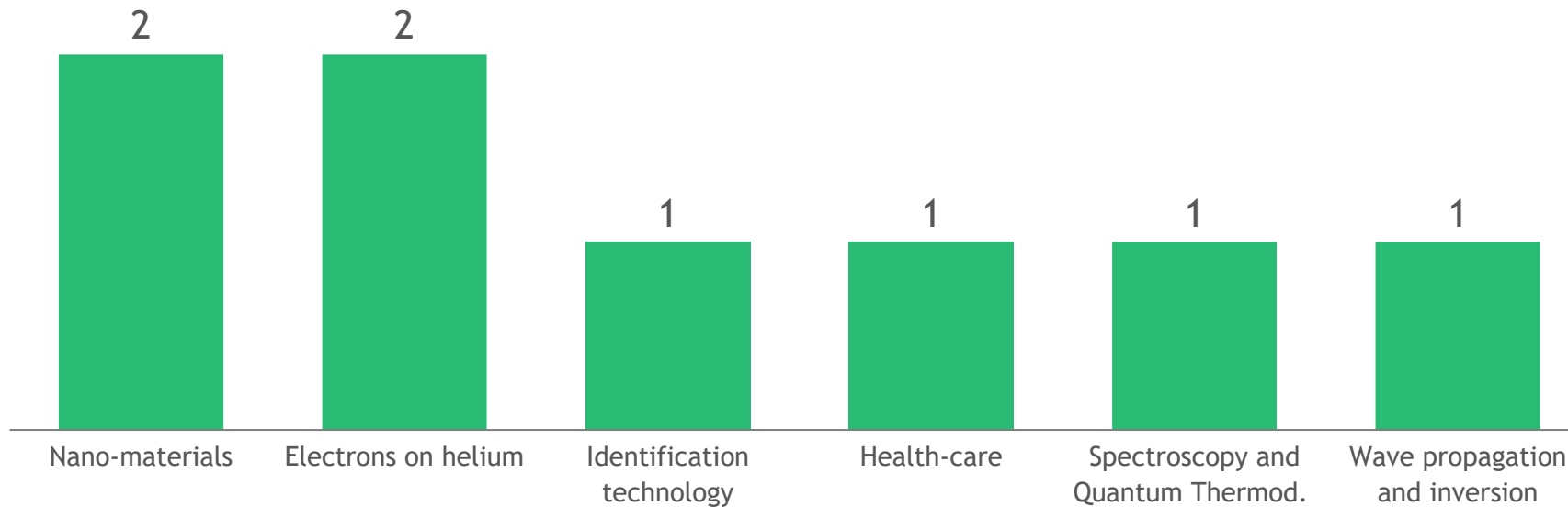1. Methodology/sources for tech trends analysis described in appendix

Key takeaways

Potential tech areas in the Lansing region:
- Adv. Mat. Sci. & Mfg.
- AI / ML / Auton.
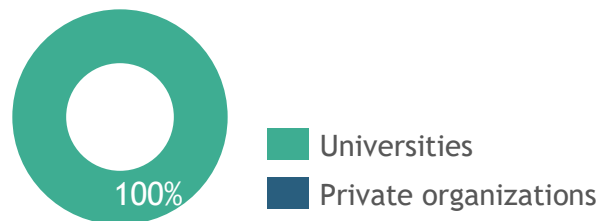- Biotech/Medtech
- Computing / Semi

Low VC funding in most tech areas, except Adv. Materials Sci. & Mfg. and Computing / Semiconductors

Tech area deep-dive | Adv. Materials Science & Mfg.

Key takeaways

 # NSF Awards

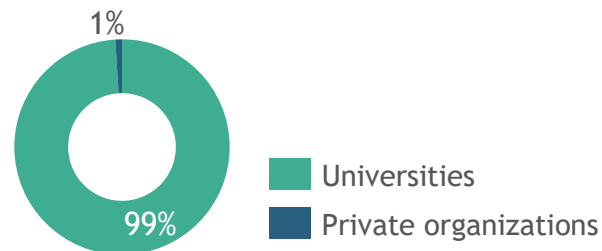| Nano-materials	Electrons on helium	Identification technology	Health-care	Spectroscopy and Quantum Thermod.	Wave propagation and inversion
2	2	1	1	1	1

- The pool of Adv. Materials Science & Mfg. NSF Awards cover 5 subtopics; nano-materials and electrons on helium research are the most awarded areas

- Michigan State University has received 100% of the region's Adv. Materials Science & Mfg. NSF funds

Total Amount Distribution

100%

- Universities
- Private organizations

Top award recipients

- Michigan State University: 8 awards

13

Tech area deep-dive | Artificial Intelligence, Machine Learning, & Autonomous Technologies

NSF Awards

Bar chart values:
- Social causes: 20
- Process Perf. Imp.[1]: 11
- Data Manag.: 10
- Health-care: 8
- Nature Research: 5
- Dynamical Systems: 2
- Id.Tech.: 2
- Mathem. Sciences: 2
- Astronomy: 2
- Adv. Mat. Develop.: 1
- IoT: 1
- Cybersecurity: 1
- Agric.: 1
- Other[1]: 15

Total Amount Distribution

1%
99%
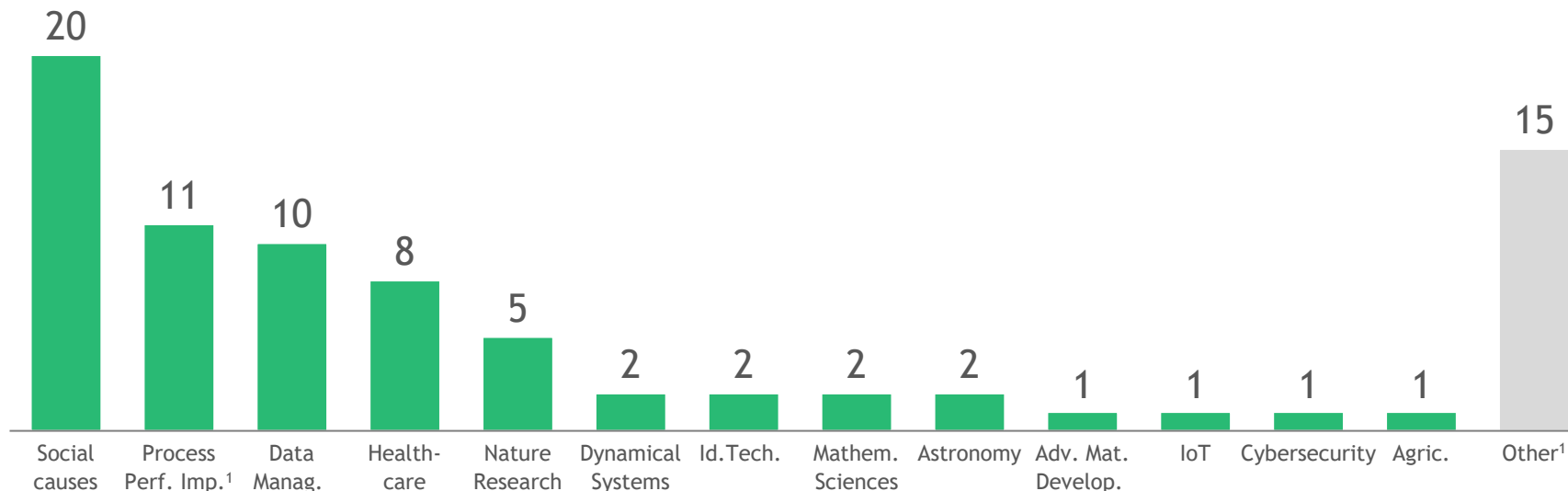
- Universities
- Private organizations

Top award recipients

- Michigan State University: 79 awards
- Ghamut Corporation: 1 award
- Mahmood, Zuhaib Sheikh: 1 award

Key takeaways

- The pool of Artificial Intelligence, Machine Learning & Autonomous Technologies NSF Awards cover a wide range of subtopics; social causes and process' performance improvement are the most awarded areas

- Michigan State University has received the majority of the region's Artificial Intelligence, Machine Learning & Autonomous Technologies

1. Process' performance improvement excludes manufacturing performance improvement and equipment performance improvement.
2. Other includes: Supercomputers, anomalies detection, unstructured environments, climate, natural disasters, nuclear physics, recycling, cloud computing, plasma technology, multiscale systems, non-newtonian fluid Hydrodynamics, multi-scale modeling, molecular dynamics, graph neural networks, efficient inspections

Tech area deep-dive | Biotech & Medtech

NSF Awards

Health-care	Agriculture	Botany	Evolutionary history	Process Perf. Imp.	Social Causes	Agrostology	RNA	Animals Science	Climate	Energy gen. & stor.	Data Manag.	Research equip.	Other[1]
14	6	5	4	4	3	2	2	2	2	1	1	1	10

Total Amount Distribution

3%

97%
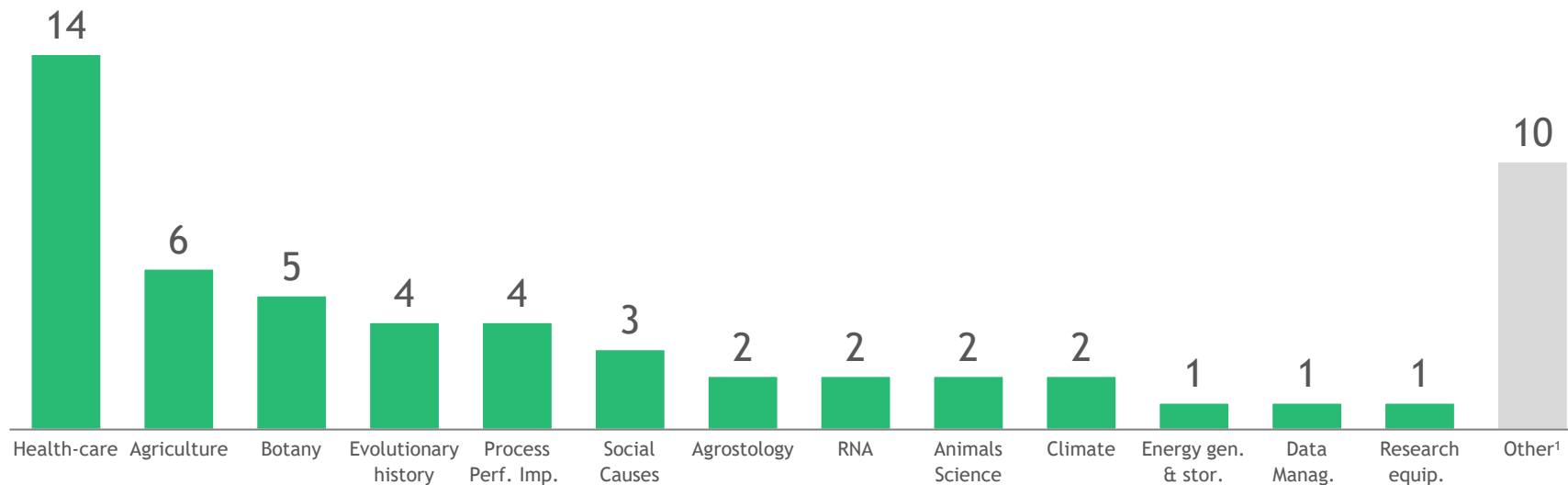
■ Universities
■ Private organizations
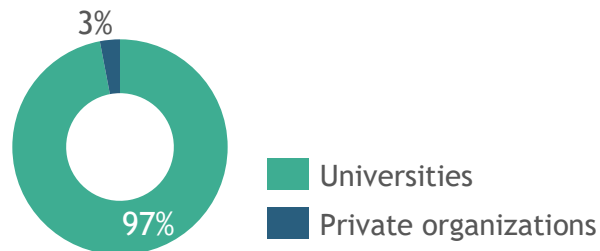
Top award recipients

- Michigan State University: 52 awards
- Iaso Therapeutics Inc.: 2 awards

1. Other includes: Industrial waste, soil microbiome, biological cells, Eukaryotic systems, chemical molecules, fungi research, human genetics, molecular dynamics, biomolecules behavior, photosyntetics organisms

Key takeaways

- The pool of Biotech & Medtech NSF Awards cover a wide range of subtopics; health-care and agriculture are the most awarded areas

- Michigan State University has received the majority of the region's Biotech & Medtech funds

Tech area deep-dive | Computing & Semiconductors

 # NSF Awards

Health-care	Adv. Mat. Develop.	Plasma tech.	Solar Energy	Nano-materials	Research equip.	Process Perf. Imp.	Milim.-wave imag.	HF[1] Magnet Discharge	Quantum particles	Molecules
6	6	3	3	2	2	2	1	1	1	1

Total Amount Distribution

4%
96%
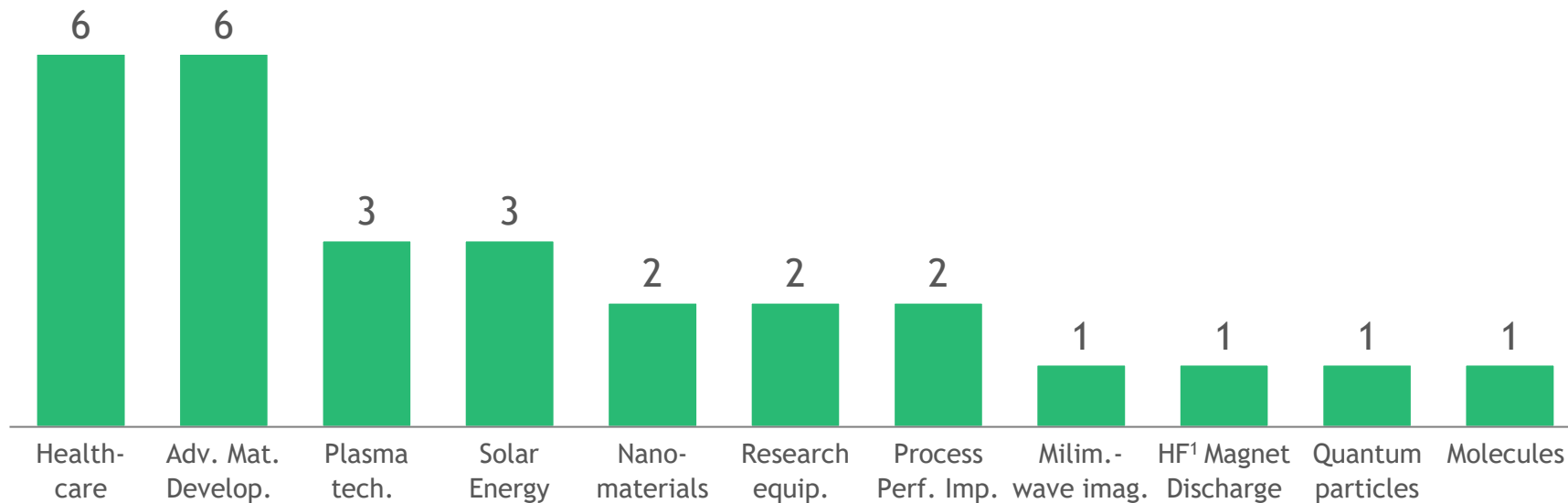
- Universities
- Private organizations
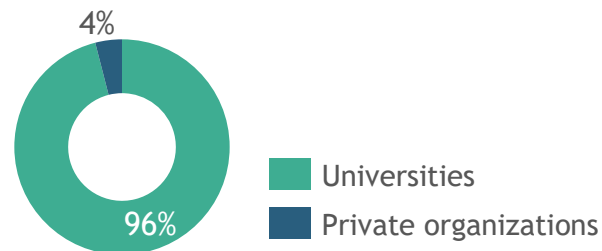
Top award recipients

- Michigan State University: 26 awards
- Scion Plasma LLC[2]: 1 award
- LABSYS LLC: 1 award

Key takeaways

- The pool of Computing & Semiconductors NSF Awards cover a wide range of subtopics; health-care and advanced materials development are the most awarded areas

- Michigan State University has received the majority of the region's Computing & Semiconductors funds

1. HF: High Frequency 2. Start-up company spun out from Michigan State University

Appendix

Lansing – East Lansing MSA encompasses four counties
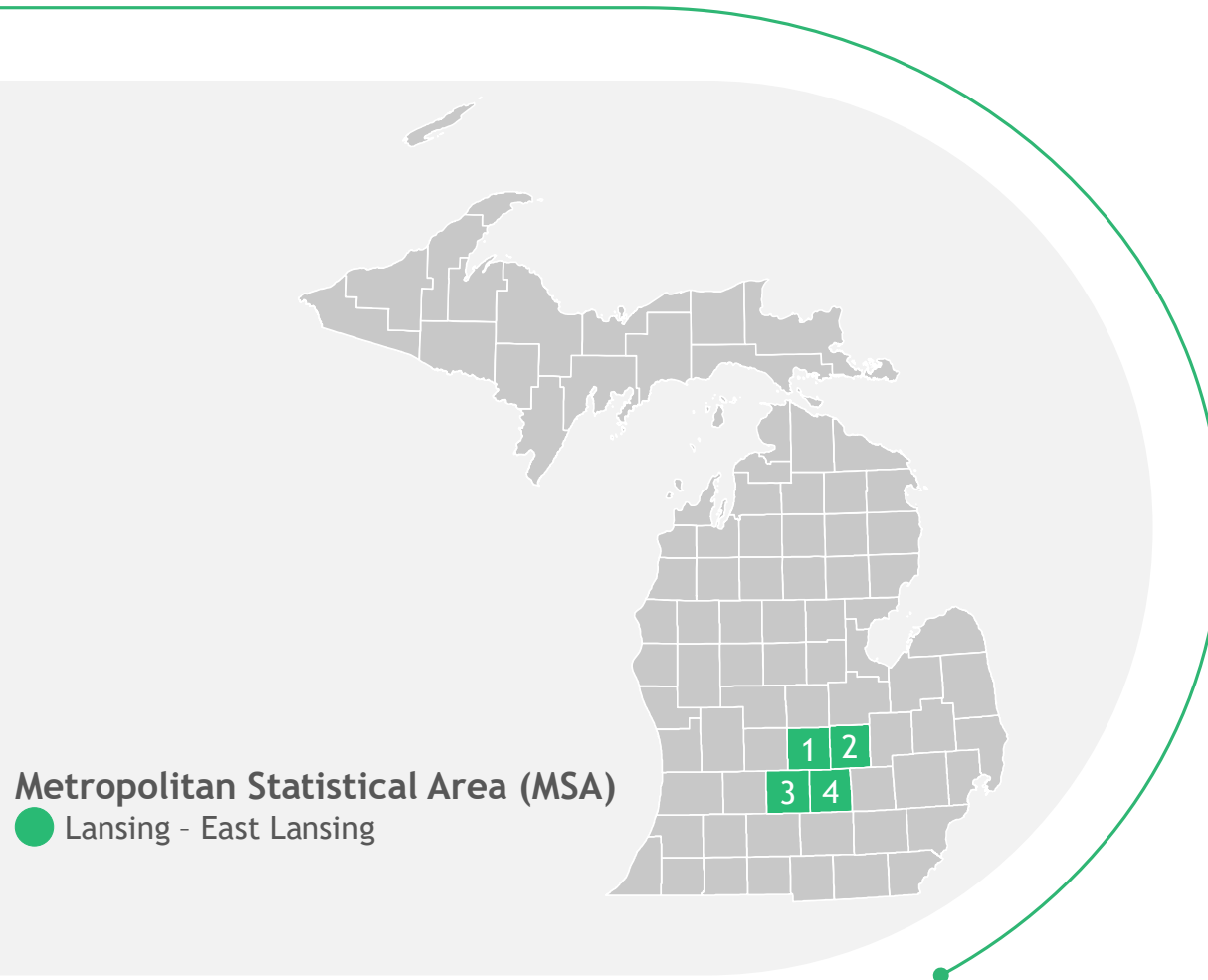
Counties part of the Lansing - East Lansing MSA

1. **Clinton**
2. **Shiawassee**
3. **Eaton**
4. **Ingham**

Metropolitan Statistical Area (MSA)
- Lansing – East Lansing

Demographic data sources

- Bureau of Economic Analysis (BEA) Regional Data and U.S. Census Bureau Population Division;
- Bureau of Labor Statistics (BLS) Local Area Unemployment Statistics (LAUS) accessed via PolicyMap;
- US Census Bureau Metropolitan and Micropolitan Statistical Area Population;
- Data repository for Fritz and Manduca (2021) via Economic Innovation Group (EIG) Innovation Hubs Index (Dec 2022);
- U.S. Census Bureau American Community Survey (ACS) 2017-2021, accessed via PolicyMap;
- U.S. Census Bureau American Community Survey (ACS) 2014-2019, via EIG Innovation Hubs Index (Dec 2022);
- Detailed employment data from 5-yr ACS microdata for 2019 via EIG Innovation Hubs Index (Dec 2022), advanced industries defined in Muro et al. (2015);
- U.S. Patent and Trademark Office (2015) via Center for American Progress CHIPS and Science Act Rankings (Dec 2022);
- Joint Center for Housing Studies' 2022 "The State of the Nation's Housing" report via Center for American Progress CHIPS and Science Act Rankings (Dec 2022);
- Bureau of Economic Analysis Regional Price Parities via EIG Innovation Hubs Index (Dec 2022);
- U.S. Census Bureau American Community Survey (ACS) 2020 via Center for American Progress CHIPS and Science Act Rankings (Dec 2022);
- FBI: Crime in the US by MSA (2019) via Center for American Progress CHIPS and Science Act Rankings (Dec 2022);
- Summarized by EIG Innovation Hubs Index (Dec 2022)

Employment, venture capital, patent, and NSF grant data was mapped to 10 Tech Trends specified in legislation

Mapped by building **data matrix of relevant industries**

Employment by industry (2021)
- Mapped 1,000 4-digit NAICS industry codes (or deeper 6-digit level when necessary)

Venture capital (2021 & 2022, $ and # companies)
- Mapped Pitchbook data in 206 Industry Codes for startups receiving funding

10 Tech Trends in columns

Relevant metric (e.g., employment codes, VC industries) in rows

Classified with **topic categories + text search analytics**

Patents (2017-present)
- Classified all patent family records using topic category, presence of relevant keywords, and inventor addresses

NSF Grants (2017-present)
- Classified awarded NSF grants based on presence of relevant key words in text abstracts

Automated scripts find keywords / classifications and tag relevance for tech trend

Consolidated into total #s / funding by state since 2017

Key Notes:
- **Mapping to tech trends is not MECE-** there is overlap between employment and startup (VC) industries that could apply to multiple Tech Trends
- Employment / VC metrics are **directional estimate of concentration in related/similar areas** (e.g. all software industries were mapped to AI trend)

Industries used in mapping employment and VC funds to relevant tech areas

Short Tech Area name *(in dashboard)*	Tech Area as defined in <u>legislation</u>	Industries used in mapping data *(key industries, not exhaustive list)*
Adv. Materials	Advanced materials science, including composites 2D materials, other next-generation materials, and related manufacturing technologies	*Nanotechnology, carbon fibers, 2D composites, 2D nanomaterials, chemicals, synthetic textiles*
Artificial Intelligence	Artificial intelligence, machine learning, autonomy, and related advances	*Software, computing infrastructure, data processing, computer systems design, automation software, business productivity software, diagnostic equipment*
Biotech / Medtech	Biotechnology, medical technology, genomics, and synthetic biology	*Biotechnology, drug discovery/delivery, diagnostic equipment, Pharma and medicine manufacturing, diagnostic laboratories, life Sciences R&D*
Climate / infrastructure	Natural and anthropogenic disaster prevention or mitigation	*Environmental consulting, Administration of Environmental Quality programs, heavy and civil engineering construction*
Data Mgmt / Cyber	Data storage, data management, distributed ledger technologies, and cybersecurity, including biometrics	*Computer Infrastructure Providers, Data processing, Computer storage device manufacturing, database software, medical records sysems, IT storage, Info mgmt*
Energy Storage	Advanced energy and industrial efficiency technologies, such as batteries and advanced nuclear technologies, including but not limited to for the purposes of electric generation	*Energy infrastructure, energy exploration, alternative energy equipment, electric power generation, transmission, and distribution, battery manufacturing*
Comms/Immersive Tech	Advanced communications technology and immersive technology	*Fiber Optic, communication software/manufacturing, social/platform software, entertainment software, satellite telecommunications*
Quantum Computing	Quantum information science and technology	*Software, computing infrastructure, data processing, computer systems design, automation software, business productivity software, diagnostic equipment*
Robotics / Adv. mfg	Robotics, automation, and advanced manufacturing	*Most advanced computer, chemical, machinery, energy, vehicle, aerospace manufacturing, automation software*
Semiconductors	High performance computing, semiconductors, and advanced computer hardware and software	*All things related to semiconductor devices, computer systems design, computer infrastructure providers, electronic components*

Concepts used in classifying patents / NSF grants under each tech area

Short Tech Area name *(in dashboard)*	Tech Area as defined in <u>legislation</u>	Concepts used in search *(each includes many related keywords in script)*
Adv. Materials	Advanced materials science, including composites 2D materials, other next-generation materials, and related manufacturing technologies	*Nanotechnology, carbon fibers, 2D composites, 2D nanomaterials*
Artificial Intelligence	Artificial intelligence, machine learning, autonomy, and related advances	*Artificial intelligence, machine learning, deep learning, natural language processing, natural language generation, predictive modeling, artificial neural networks, virtual assistants, cognitive computing, recommendation engines, speech recognition, voice computing*
Biotech / Medtech	Biotechnology, medical technology, genomics, and synthetic biology	*Biotechnology, CRISPR, Cas-9, gene therapies, cell therapies, gene editing, next generation sequencing, biomanufacturing, tissue engineering, synthetic biology, biomanufacturing, stem cells, bioreactors, CAR-T cells, DNA therapies, RNA therapies*
Climate / infrastructure	Natural and anthropogenic disaster prevention or mitigation	*Technologies or applications for mitigation or adaptation against climate change, climate change mitigation technologies related to buildings, e.g. housing, house appliances or related end-user applications, capture, storage, sequestration or disposal of greenhouse gases [GHG], climate change mitigation technologies in information and communication technologies [ICT], climate change mitigation technologies in the production or processing of goods, transportation, wastewater treatment or waste management*
Data Mgmt / Cyber	Data storage, data management, distributed ledger technologies, and cybersecurity, including biometrics	*Cyber security, blockchain, distributed ledger, data storage, data management, data security, network security, retina scans, next generation encryption, cryptowallets, cryptocurrencies*
Energy Storage	Advanced energy and industrial efficiency technologies, such as batteries and advanced nuclear technologies, including but not limited to for the purposes of electric generation	*All things related to processes or means, e.g., batteries, for the direct conversion of chemical energy into electrical energy*
Comms/Immersive Tech	Advanced communications technology and immersive technology	*augmented reality, mixed reality, virtual reality, head mounted displays*
Quantum Computing	Quantum information science and technology	*Quantum computing, quantum cryptography, quantum information processing*
Robotics / Adv. mfg	Robotics, automation, and advanced manufacturing	*Robotics, automated guided vehicles (AGVs), machine to machine, surgical robots*
Semiconductors	High performance computing, semiconductors, and advanced computer hardware and software	*All things related to semiconductor devices*

The RECOMPETE program offers another funding opportunity in the CHIPS + Science Act

Recompete Grants – pilot program from focused on "distressed communities" with persistently high prime-age unemployment

- Initial funding for up to 30 "strategy development grants" (likely $1M or less)
- At least 10 "strategy implementation grants" (~$20M for workforce development, business/entrepreneurship, research/tech infrastructure, etc.)
- Initial data suggests that ~13 metro and micro areas in MI would qualify based on sufficient prime-age unemployment gap vs. national avg

Backup | RECOMPETE Analysis Summary - $1B Pilot Program over 5 yrs for 10 communities, $200M in FY23

Context

Overall goal of RECOMPETE grant program **is helping communities build / execute a 10 year strategy** for economic development

CHIPS Act provides for two types of grants:

- **Strategy development grants** ($25M total for up to 30) to help eligible areas develop a RECOMPETE plan/ prepare for development

- **Strategy implementation grants** ($975M) to execute / fund programs – must be at least $20M to each winner

No requirement to win a "development" grant to win an "implementation grant"

Funding will cover programs **for basic infrastructure, job training, land development**

Eligibility

Funding will be **focused on "distressed communities"** that met **either** of two criteria:

- Local labor market (e.g., MSA or similar) **at least 2.5% below** nat'l 5yr avg prime-age (25-64) employment rate

- Local community / gov't with a) **at least 5% below** nat'l 5yr avg prime-age employment rate, b) not in a labor market described above and c) median household income under $75k

Timing

EDA <u>says</u> Notice of Funding Opportunity (NOFO) to be **released in "first half of 2023"**

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