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Regional Strategies in the U.S. to Promote Entrepreneurship and Innovation

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Outline of Presentation

- Federal, state, and local roles in U.S. economic development
- Typical “challenges” or tasks that the leaders of U.S. regions face as they try to encourage local high-tech entrepreneurs and build successful regional innovation ecosystems
- The case studies:
  - Austin, Texas
  - Columbus and Cleveland, Ohio
  - Knoxville, Tennessee
  - Pittsburgh, Pennsylvania
  - Two less successful regions: Baltimore and New Haven
- Conclusions and implications for other regions

This Study's Questions

- What features of a region's "innovation ecosystem" help local entrepreneurs to build successful high-tech companies and industries?
- How have government programs and private initiatives in the U.S. helped entrepreneurs and contributed to the creation of regional innovation ecosystems?
- How do large companies in a region directly or indirectly help entrepreneurial high-tech firms?
- What are the implications for building successful regional entrepreneurial support systems?

Government Programs and Private Initiatives in the U.S.

- U.S. federal policies and programs are important but limited.
  - The federal government sets general rules (tax policy, patent policy, etc.) and provides important funding for research and development.
  - Some programs directly help regions or entrepreneurs, such Small Business Administration (SBA) support for local Small Business Development Centers or the National Science Foundation's "Innovation Corps" program. But these programs are small.
- State governments have high degree of independent authority and actively promote economic development.
  - Many states have programs to help high-tech entrepreneurs.
  - But these programs often change, because new governors want their own programs or because of state economic problems lead to budget cuts.
- Local/Regional initiatives – often involving government and non-governmental organizations – are key elements of the U.S. system to support entrepreneurs.

Typical Challenges That Regions Face When Promoting Entrepreneurship

Challenge	Roles of state and local initiatives
Leadership and strategy	Create a strategy for how the region can grow and build political support for that strategy.
Research institutions	Strengthen local universities and other research organizations and their links to the local economy.
Encourage entrepreneurs	Encourage potential entrepreneurs. Welcome immigrants.
Mentorship	Provide new entrepreneurs with advice about business plans, markets, and creating start-ups.
Funding	Enable and facilitate risk capital, and connect entrepreneurs.
Support services	Connect entrepreneurs to specialized professional services and facilities.
Workforce	Help recruit or train executives, engineers, and others.
Program evaluation	Regularly evaluate local organizations and programs that help new entrepreneurs.

How Large Companies Help Local High-Tech Entrepreneurship

- Large companies in a city or region help entrepreneurs in both direct and indirect ways.
  - Direct help from large firms includes investing in or becoming customers of entrepreneurial firms.
  - Indirect help includes contributions to local university research programs, contributions to mentoring organizations, participation in local civic groups, and expanding the talent pool.
  - Also, executives and engineers from large firms sometimes become entrepreneurs themselves.
- In general, “home-grown” large firms contribute more to the local innovation ecosystems than do local offices of large firms with headquarters in other cities.
  - For example, the executives from local large firms often will mentor new local entrepreneurs or will help start local venture capital firms.

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Austin, Texas

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- Successful case of planned and organized technology-based economic development.
- 1970: state capital and university city with metro population of 400,000.
- Today: metro area of over 2,000,000; diverse and growing tech companies.
- Tech industry began with a small defense electronics firm (Tracor) and an IBM typewriter factory. It has grown to include many diverse IT companies (semiconductors, computers, software, gaming) and increasingly other technologies (biomedical, cleantech, space, etc.)
- Growth has been from a mix of **home-grown** companies (Dell, Tracor, National Instruments) and the **attraction of branches of companies created elsewhere** (IBM, Motorola, AMD, Apple, Samsung, Google, Facebook). Company attraction and entrepreneurship work together – companies spinoff entrepreneurs; startup diversity helps attract talent.
- Austin development path was based on strong local leadership, a strong university, low costs, and an attractive culture and environment.

Austin 50-Year Development Timeline

Pre-1970 -- University and Government Economy

- University of Texas invests to upgrade research.
- Economic strategy to attract light electronics manufacturing.
- Tracor founded in 1954. UT defense lab spinoff.
- IBM establishes typewriter factory in 1967.
- Texas Instrument establishes plant in 1969.

1970s – Beginnings of Tech Industry

- Motorola plant in 1974; AMD plant in 1979.
- Austin City Limits, PBS music show starts in 1974.
- National Instruments founded in 1976.
- IC^2 Institute established at UT in 1977.

1980s – Take-Off

- Austin wins MCC competition in 1983.
- Knowledge economy strategy adopted in 1985.
- Dell computers founded in 1984 (IPO in 1988.)
- Austin wins competition for Sematech in 1988.
- Austin Technology Incubator founded in 1989.
- By 1990, 3M, Applied Materials, Intel had established manufacturing; and IBM grew to 8000 employees.

1990s – Sustained Growth

- Innovation ecosystem continues to strengthen.
- By 1998, 650 software companies employed more than 24,500 people in the Austin area.
- Dell grows to 17,500 employees.
- SXSW music festival expands; becomes tech/media event.

2000s to Present – Expansion and Diversification

- In 2001 to 2003 the dot.com bust leads to jobs cut but by 2005 Austin is again growing rapidly.
- Facebook & Google & Apple all expand Austin offices.
- Growth expands to 5-county region, from San Marcos to Georgetown.
- Austin Community College and Texas State University are key parts of tech workforce development system.
- Dell Medical School created at UT in 2016;
- Innovation system expands to biotech, energy, other.

Austin's Innovation Ecosystem

- Key Institutions at Development Stage
  - Anchor institutions: UT; MCC & Sematech; Dell; IBM, Tracor, National Instruments
  - Bridging/connecting/leadership individual or organization: IC^2 Institute, Austin Chamber of Commerce, Austin Economic Development Department, Austin Technology Council
  - Austin Technology Incubator
- Supporting State Programs
  - University of Texas institutional funding
  - Texas state research programs provide additional funds at key times (e.g. winning competitions for consortia and centers)
  - Low tax state – no state personal income tax
- Supporting Federal Programs
  - Federal research grants to UT
  - Sematech in past
  - NSF I-Corps at UT managed by IC^2
  - Small Business Development Center assists small business, including help with SBIR/STTR
- Austin has evolved an extensive ecosystem of venture funding, accelerators, incubators, networks and support groups, training courses, and other resources

Ohio – Columbus & Cleveland

- Ohio was strong in manufacturing (steel, glass, rubber, auto parts, tires) but manufacturing has declined since 1980s. Northern Ohio especially hard hit.
- State population has been nearly stagnant since 1970s (10.6 million in 1970 v. 11.6 million in 2016).
- Ohio established state technology programs in 1980s to help retain manufacturing and develop new industries to replace those that were lost.
- State tech programs expanded greatly in 2000s with launch of "Ohio Third Frontier" program, which supported university research, university-industry collaboration, new industry clusters, entrepreneurship, venture capital,
- Third Frontier program is now focused more narrowly on entrepreneurship support, implemented primarily through 6 regional organizations.

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Ohio's angel and venture capital investments were $470 million in in 2016, up 46% from 2014.

- $244 Million in IT (health care IT, e-commerce, business products & services, etc.)
- $144 Million in Life Science
- $57 Million in Manufacturing, Robotics, & Automation
- $25 Million in others.

Columbus, Ohio

- **State Capital** and has major university (**Ohio State**); major non-profit research institute (**Battelle**).
- **Population of 860,000, up from 539,000 in 1970**. Metro area population is 2 million.
- **Healthy and diverse economy** based on education, government, insurance, banking, defense, aviation, food, clothes, logistics, steel, energy, medical research, health care, hospitality, retail, and technology.
- Headquarters of **five Fortune 500 corporations**: Nationwide Mutual Insurance Company, American Electric Power, L Brands, Big Lots, and Cardinal Health.
- **Well-organized regional economic strategy** (Columbus 2020) both in city, and throughout mid-Ohio region with **attention to innovation and entrepreneurship** (strategy development supported by U.S. Economic Development Agency).
- **One of most successful cities in Midwest U.S.** Recently beat 78 other cities to win major U.S. Department of Transportation $40 million “Smart City Challenge” award.

Columbus Technology Entrepreneurship Support

- Rev1Ventures is state-supported entrepreneurial services provider. Provides incubator, seed funding, and mentoring; meeting place for tech community. Links start-ups with large companies.
- Other regional incubators/co-working spaces in region
  - Innovate New Albany
  - Cultivate Business Incubator
  - Dublin Entrepreneurial Center
  - Women's Small Business Accelerator
- Ohio State University historically strong in industrial research but not a leader in start-ups. Gradually improving.
- **Columbus venture creation is healthy and improving**. Some major successful "exits". Ranks 4th in Kauffman Foundation's Index of Growth Entrepreneurship.

Columbus Startups

- CoverMyMeds -- software to automate health care insurance authorization. Founded in 2008; acquired by drug distributor McKesson for **$1.1 Billion** in 2017.
- Uptivity -- call-center software (acquired by inContact for $46 million).
- Updox – Physician, pharmacy and patient customer relationship management software; 300,000 users and 72 million patients
- Mentorcliq – software to help companies with mentoring programs
- Nchannel -- provides cloud-based product information management, order & inventory sync, and multichannel listing capabilities to retailers
- CrossChx – AI for healthcare data management (funded at $35,000,000)

Cleveland, Ohio

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- Historical Context:
  - Greater Cleveland industrial region (includes Akron, Canton, Youngstown, etc.) was major center of U.S. manufacturing (steel, auto parts, polymers, tires) but has declined.
  - **Cleveland city population peaked at 915,000 in 1950; 385,000 today**. Metro area population 2 million; larger Cleveland-Akron-Canton area is 3.5 million.
  - Decline of manufacturing and city has **legacy of depressed neighborhoods, crime, and racial inequalities**, which hurt economic growth.
  - Region still has substantial industry: manufacturing, finance, materials , instruments, controls and electronics. But growth has been in health care.
  - Notable cultural resources: Cleveland Orchestra, Rock & Roll Hall of Fame, Cleveland Institute of Art, Institute of Music
- Key Innovation Institutions Today
  - Cleveland Clinic and other hospitals
  - Case Western Reserve University
  - Cleveland State, Kent State, University of Akron, etc.
  - NASA Glenn
- Has strong entrepreneurial support programs, but working against legacy of decline. Cleveland ranks 19th on Kauffman Growth Entrepreneurship index.

Cleveland Entrepreneurship Ecosystem

- Jumpstart – Manages state-funded Northeast Ohio Entrepreneurial Services Provider network; says it has helped more than 1,000 companies, that have raised over $2 billion in capital, generated $2 billion in revenue and helped to create more than 10,000 total jobs.
- Cleveland Clinic Innovations -- Innovation arm of Cleveland Clinic, started in 2000. 800+ patents; 450+ licenses, 40+ active spinoffs.
- Bioenterprise -- Nonprofit health care and bioscience business accelerator, supports growth of bioscience startups in region.
- Incubators/accelerators include:
  - Global Cardiovascular Innovation Center has incubator offers 50,000 sq.ft. of customizable laboratory facilities & office space.
  - Incubator at MAGNET (Manufacturing Advocacy and Growth Network, an MEP center) focuses on manufactured product businesses.
  - Flashstart, LaunchHouse, and Bizdom Accelerators.
- Federally funded Small Business Development Centers at Cleveland State University, at the Hispanic Business Center, and at Urban League of Greater Cleveland.
- Lab and Maker Spaces – at Cleveland Clinic, Case Western Reserve University, Community Colleges.

Notable Cleveland Startups

Cardio insight, maps electrical disorders of heart, acquired by Medtronics for $93 million. Technology licensed from Case Western

Onshift – workforce management software for senior care

Cleveland HeartLabs , a cardiovascular diagnostic testing company spun off from Cleveland Clinic; acquired by Quest Diagnostics

Cardinal Commerce – Founded in 1999, provides secure transactions, acquired by Visa in 2017.

Knoxville, Tennessee

- An old industrial city formerly based on declining or stagnant sectors (resource extraction, textile manufacturing, water and rail transportation)
- Population of 185,000 (~one million in the region)
- Hosts major federal S&T-based activities that only became accessible to regional entrepreneurs within the past two decades
  - Oak Ridge National Laboratory
  - Y-12 Nuclear Security Complex
  - Tennessee Valley Authority
- University of Tennessee and Pellissippi State University are strong (advanced materials, supercomputing, nanotech, agriculture, manufacturing education)
- Recent growth in auto parts manufacturing firms, several from Japan
- Several non-tech/mid-tech start-ups grew quite large in earlier decades
- Six major medical centers are growing rapidly
- Outstanding outdoor recreation and cultural amenities help attract key people

Knoxville's Entrepreneurial Culture

- Support institutions fill all the niches in the entrepreneurial ecosystem, but most are new and their success is not assured
  - Knoxville-Oak Ridge Innovation Valley (strategy development, marketing)
  - Knoxville Entrepreneur Center (networking, training)
  - Launch Tennessee (state-wide program including financing)
  - UTK Anderson Center for Entrepreneurship and Innovation (education)
  - Innov865 Alliance (networking)
  - Three Roots Capital (venture investing)
  - Pershing Yoakley & Associates (consulting on new venture management)
  - teknovation.biz (on-line news for local entrepreneurs)
  - The Maker City (links "makers" and artists to entrepreneurs)
- Recent explosion of interest and activity in new business formation, from retail sales to advanced technology companies

How is Knoxville Doing?

- Knoxville came late to strategic development of an entrepreneurial culture, but business and political leaders now understand its importance to future economic success.
- Knoxville has established numerous entrepreneurial support activities and has several examples of successful entrepreneurial companies.
- Start-ups are gaining traction in areas such as composites manufacturing, 3-D printing, video production, and medical device manufacturing.
- A few large, established institutions still play dominant roles in the local "entrepreneurial ecology"—ORNL, UTK, Y-12, TVA.
- Work is just beginning to link successful entrepreneurs from the 1960s, 70s and 80s to the new generation of entrepreneurs and start-ups.
- It is too soon to know whether the entrepreneurial support activities will significantly affect Knoxville's long-term economic and social development.

Pittsburgh, Pennsylvania

- City population is 300,000 with 2.5 million in the region
- An early and important U.S. manufacturing city, based on steel, aluminum, electrical equipment and energy (coal, oil, gas)
- Also had supporting industries including finance
- Fell into deep economic and social decline in the 1970s and 1980 as key industries failed to modernize and faced vigorous competition from abroad
- Has three major and many smaller universities
  - Carnegie Mellon Univ. (materials, software, robotics, AI, cybersecurity)
  - The Univ. of Pittsburgh (medicine, biosecurity)
  - Duquesne Univ. (business and engineering)
- Home of the huge University of Pittsburgh Medical Center

Pittsburgh's Recent Economic Revival

- Civic and business leaders recognized 50 years ago that Pittsburgh needed to diversify and revitalize its economy.
- Disappearing industrial firms left a legacy of large, flexible spaces being repurposed to house entrepreneurial companies.
- Leaders focused on supporting and expanding the universities and the medical services industry.
- Carnegie Mellon shifted its focus from supporting legacy industries with low entrepreneurial opportunities to 21st century fields with high growth potential.
- U. of Pittsburgh Medical School and allied U. of P. Medical Center are leading teaching, research and service institutions that now emphasize spin-offs to create new firms around their inventions.

Pittsburgh's Entrepreneurial Ecosystem

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- Pittsburgh has developed a full array of organizations and institutions to support technology-based entrepreneurship.
- The universities, medical institutions, private philanthropies and the non-profit sector are supporting these efforts.
- Pittsburgh is seen as successful in nurturing formation of entrepreneurial firms, but as less successful in growing them large enough to have major impacts on regional employment.
- Perhaps more than most regions, Pittsburgh has worked to include female and minority-based businesses in its entrepreneurial support portfolio, driven by the evident economic distress that persists in many parts of the city.

Less Successful Case: Baltimore

- Home of Johns Hopkins University, which receives more Federal R&D funding than any other U.S. university
  - Top rated medical school and hospital
  - Applied Physics Laboratory – leading DOD-funded university applied research center (near Baltimore in Columbia, MD).
- Baltimore has had generally poor economic performance. Key issues:
  - Economic development focused on sports, inner harbor, and tourism, not so much on entrepreneurship
  - Many social issues – poverty, race relations, crime
  - Johns Hopkins not an early leader in technology transfer/entrepreneurship.
- But entrepreneurship beginning to pick up
  - Under Armor is local success and is reinvesting in community
  - City has neighborhoods that are attracting educated youth
  - Johns Hopkins Technology Ventures is now highly active -- created 18 startup companies in FY 2017
  - University of Maryland Baltimore County active in STEM education
  - State tech programs are supporting entrepreneurship

Less Successful Case: New Haven

- Home of Yale University, one of most prestigious U.S. universities.
- Generally poor economic performance; city population declined from 160,000 in 1950 to 130,000 today.
- Formerly manufacturing city, but now dominated by Yale University and health care.
- Yale is more known for law, economics and government than technology (but does have strong biology/medicine). Has national, not local, focus.
- Yale was slow to develop technology transfer and entrepreneurship programs
  - Launched entrepreneurship program in School of Management in 2014.
  - Blavatnik Fund for proof of concept work started in 2016.
- New Haven Economic Development Corporation focused on company attraction and retention, not entrepreneurship.
- State of Connecticut does not have strong technology programs.

Findings from the Case Studies

- The creation of regional innovation ecosystems can take decades.
- While every region is different, several steps help entrepreneurs:
  - Regions with programs that meet the typical challenges identified earlier are more likely than other regions to succeed in helping high-tech entrepreneurs.
  - Building networks among key people in local government, business, and universities is important in creating and operating successful regional programs.
- State governments help regions through support for mentoring programs, seed funds, and research institutions, and by attracting federal money.
- The priorities and strengths of each region are important.
  - While some regions focus on sustaining existing large companies, others change their mindsets and focus on building new companies and industries.
  - Regions with strong universities have an advantage.

Implications for Other Regions

- Regional leadership and regional initiatives are critical.
  - Regional leadership is vital to helping entrepreneurs.
  - Focus on directly helping entrepreneurs and not on spending large amounts of money on new buildings or big technology transfer offices.
  - Build on regional strengths but create innovation systems that help entrepreneurs build new industries as new opportunities arise.
- Central governments help entrepreneurship through pro-business national policies and support for regional initiatives.
  - Pro-entrepreneurship tax policies, R&D investments, and infrastructure.
  - Help regions that want entrepreneurship by providing money for planning, mentoring, and seed capital.

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U.S. S&T and R&D Policy in 2018 and Comments on NSF SciSIP Program

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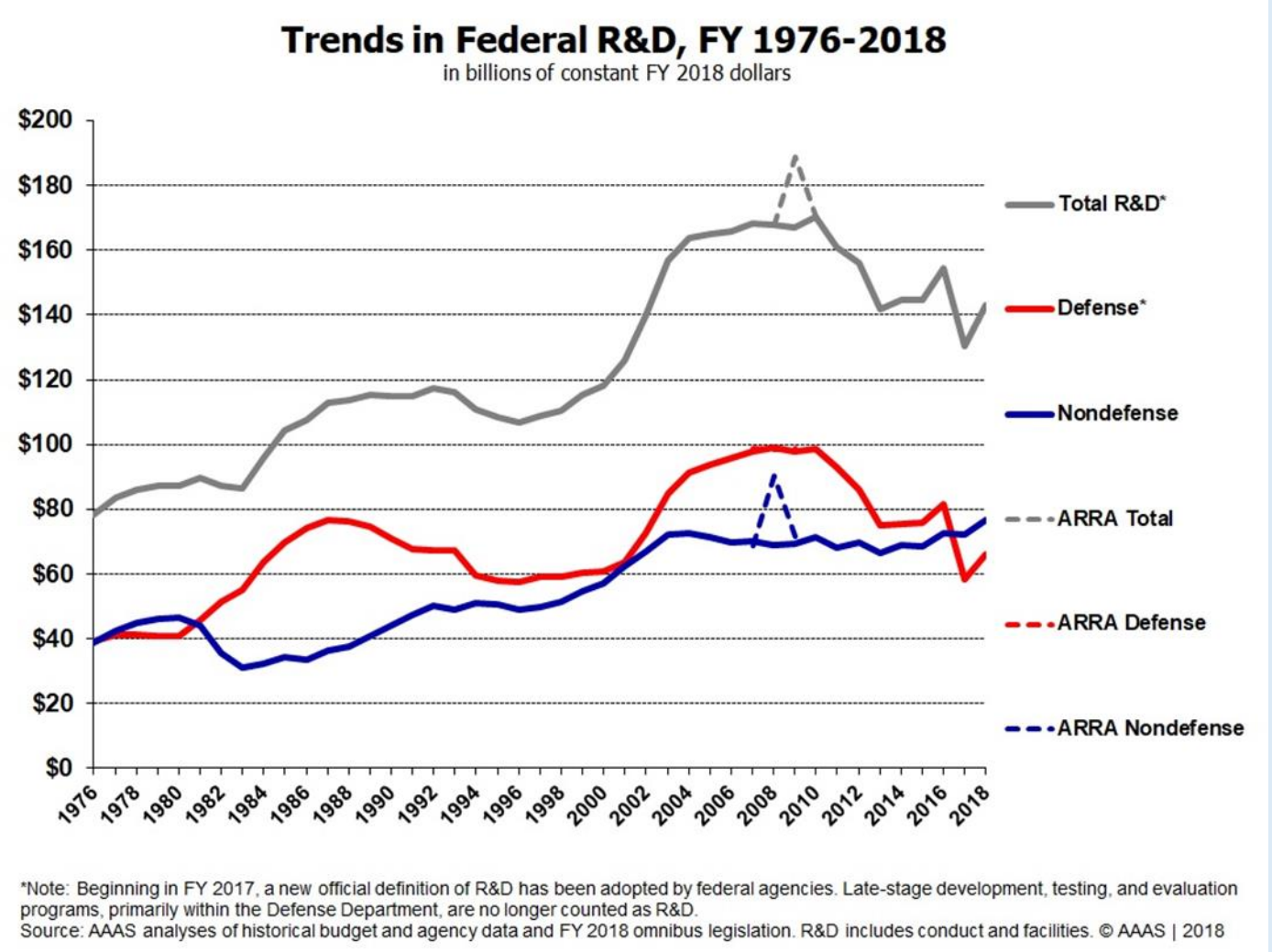
S&T in the Trump Administration

- Trump and his senior appointees seem generally to be somewhere between indifferent and hostile to S&T
  - President's FY2018 budget proposed massive cuts in the R&D budgets of most agencies
  - The position of Director of OSTP and Science and Technology Advisor to the President has not been filled.
  - Key cabinet officials have taken actions that reduce the roles of both staff scientists and science advisors in agency operations
    - EPA
    - Department of the Interior
  - Agencies are rolling back prior actions based on scientific evidence and/or failing to act in ways that the evidence suggests are prudent
    - Especially on climate change but also on public health challenges

Countervailing Actions

- Budget and Funding Actions
  - Congress did not agree to the proposed FY2018 R&D budget cuts.
  - Instead, most R&D agencies and programs received significant budget increases
  - This unexpected turn of events was the result of political “brinkmanship” regarding the final omnibus appropriations act for FY2018
  - It was not the result of a change of heart by the Trump administration
- S&T Policy Making
  - A number of the Administration’s attempts to roll back science-based regulations and executive orders have been challenged in court by various groups, including quite a few U.S. state Attorneys General
  - Most of these suits are not yet resolved, but preliminary rulings have halted implementation of key Trump decisions

Ups and Downs of Federal R&D



Notes: Data from AAAS, available at https://www.aaas.org/page/historical-rd-data

ARRA is the American Recovery and Reinvestment Act of 2009, law that provided a short-term economic stimulus

Overall Situation for S&T/R&D

- We expect the current feeling of stagnation and opposition to prevail so long as the Trump administration is in power
- Many senior S&T positions remain unfilled, many without even a nominee https://www.washingtonpost.com/graphics/politics/trump-administration-appointee-tracker/database/?utm_term=.6e7aafd78e45
- There is no evidence for any softening of their stance
  - FY2019 budget proposal recommended many agency cuts and quite a few program eliminations
  - Disregard for S&T in policymaking continues
  - President refuses briefings on the S&T aspects of NK nukes
- DoD seems somewhat immune to the current malaise
- NASA presents a mixed picture-new starts, not enough money
- International S&T cooperation is not favored under “America First” attitude
- Congress may re-establish OTA this year!

NSF SciSIP Program ("Science of Science and Innovation Policy")

- The program continues, quietly
  - Heavy emphasis on "big data" analytics in S&T policy
  - Still not well-connected with actual S&T policy issues
  - NSF senior management not sure what to do with SciSIP program
- Several leadership changes
  - Former program head, Maryann Feldman, departed after remaining longer than originally planned to help sustain the program
  - Interim head, Mark Fiegener, was appointed from inside NSF
  - A new head, Cassidy Sugimoto, is expected to arrive shortly for a one-year rotation
  - The NSF Assistant Director who oversees the SciSIP program is vacant
- Program strategic direction is unclear owing to absence of key officials in the White House and other "consumers" of SciSIP research

Thank You

We look forward to your questions and comments