



# The Perils of Complacency: America at a Tipping Point in Science and Engineering

April 12, 2021 | 12:45 - 1:45 PM ET



**Moderator:**  
**France Cordova**  
**NSF (Retired)**



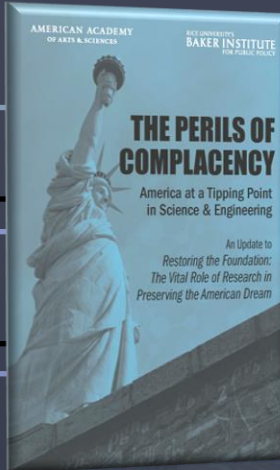
**Neal Lane**  
**Rice University's Baker**  
**Institute for Public Policy**



**Norman Augustine**  
**Lockheed Martin Corporation**  
**(Retired)**



Strengthening  
University-Industry  
Partnerships

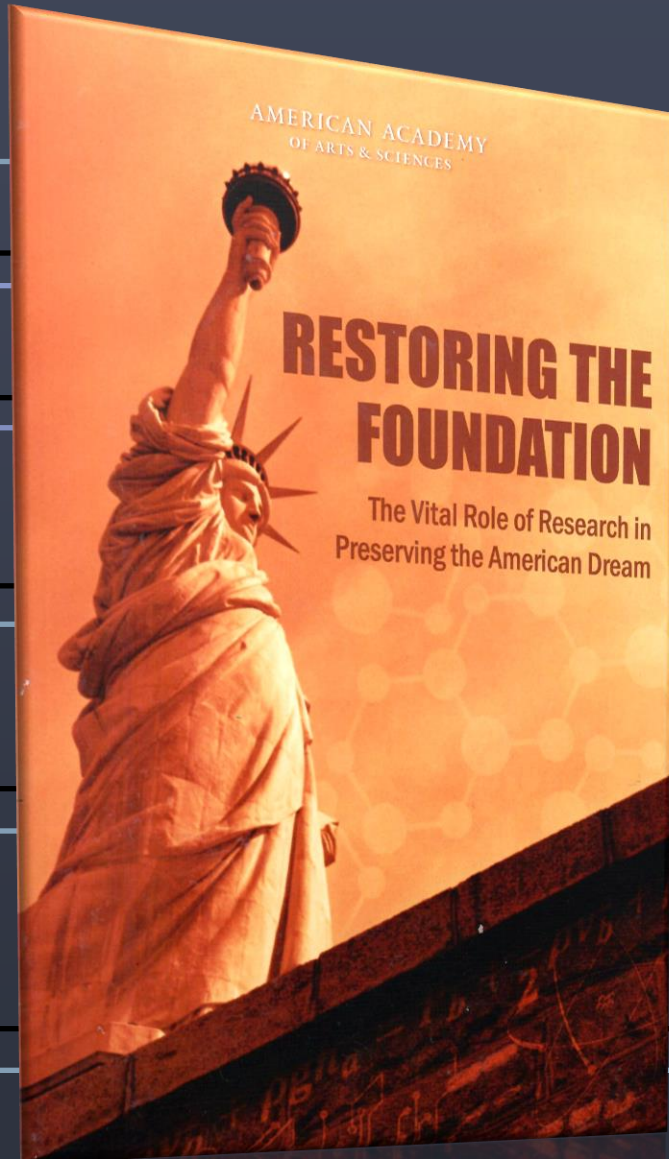


# THE PERILS OF COMPLACENCY

## *America at a Tipping Point In Science & Engineering*

*A report of the American Academy of Arts and Sciences  
and Rice University's Baker Institute for Public Policy*

*Committee Co-Chairs - Norman Augustine & Neal Lane*

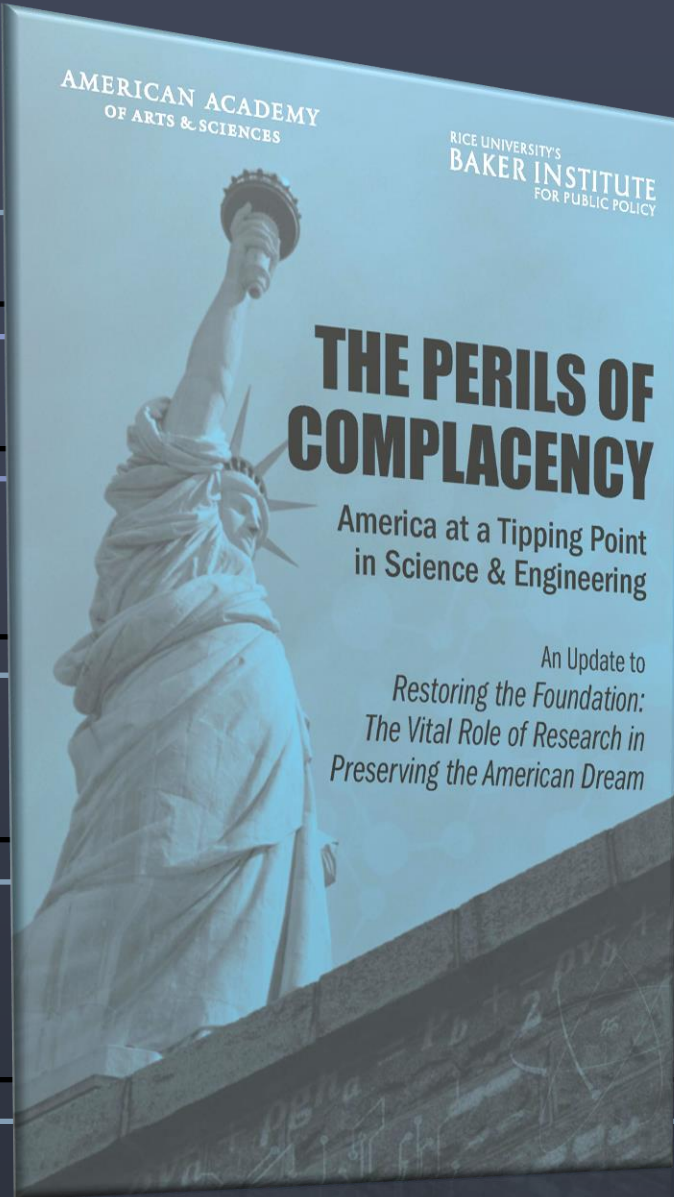


# RESTORING THE FOUNDATION

*The Vital Role of Research in  
Preserving the American  
Dream*

## Committee Members

- **Neal Lane (Cochair)** – Rice University
- **Norm Augustine (Cochair)** – Lockheed Martin Corp.
- **Nancy C. Andrews** – Duke University
- **Thomas R. Cech** – University of Colorado Boulder
- **Steven Chu** – Stanford University
- **Jared Cohon** – Carnegie Mellon University
- **James J. Duderstadt** – University of Michigan
- **Mark C. Fishman** – Harvard University
- **Sylvester James Gates, Jr.** – American Physical Society
- **Bart Gordon** – United States House of Representatives/  
K&I Gates
- **M.R.C. Greenwood** – University of Hawaii/ University of  
California, Santa Cruz
- **John L. Hennessy** – Stanford University
- **Charles O. (Chad) Holliday Jr.** – Royal Dutch Shell/  
Bank of America/DuPont
- **Peter S. Kim** – Stanford University School of Medicine/  
Chan Zuckerberg Biohub
- **Richard A. Meserve** – Carnegie Institution for Science/  
U.S. Nuclear Regulatory Commission
- **C.D. Mote, Jr.** – University of Maryland/ National Academy of  
Engineering
- **Venkatesh “Venky” Narayanamurti** – Harvard University
- **Maxine L. Savitz** – Honeywell, Inc.
- **Robert F. Sproull** – University of Massachusetts Amherst
- **Subra Suresh** – Nanyang Technological University, Singapore
- **Shirley M. Tilghman** – Princeton University
- **Jeannette M. Wing** – Columbia University
- **Elias Zerhouni** – Johns Hopkins Medicine



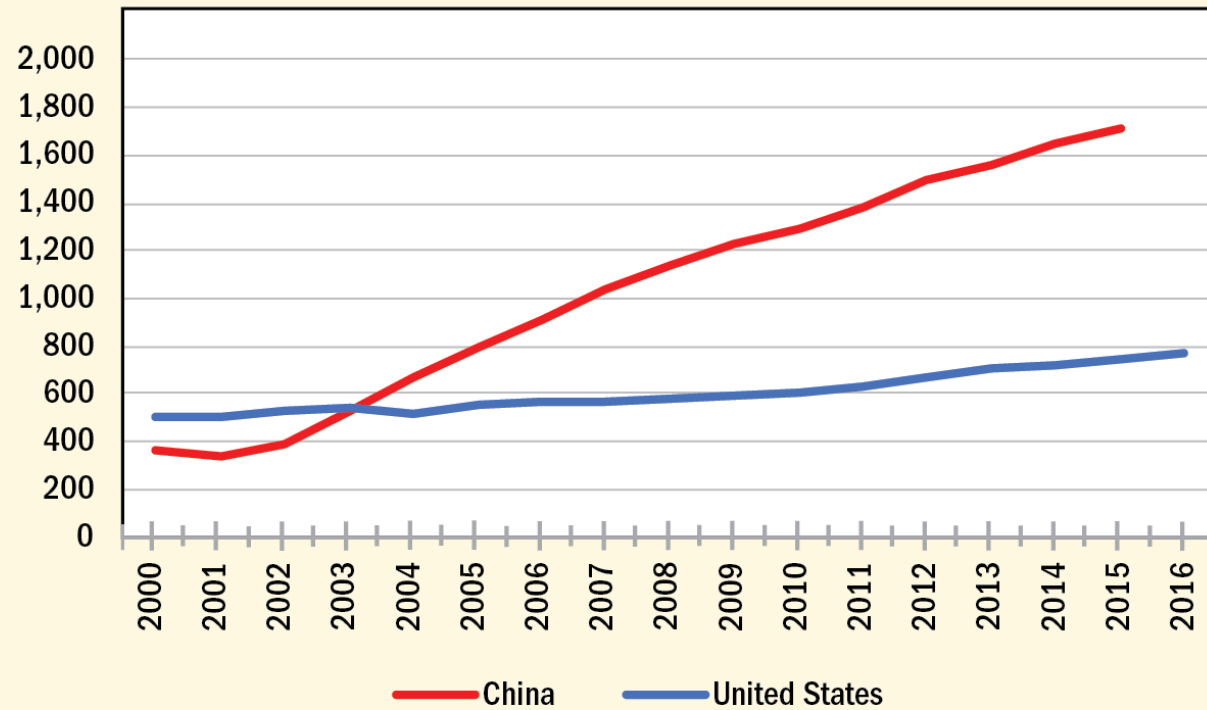
**THE PERILS OF  
COMPLACENCY**  
*America at a Tipping  
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Engineering*

*“The history of modernization is, in essence, a history of scientific and technological progress. Inventions have brought about new civilizations, modern industries, and the rise and fall of nations....I firmly believe that science is the ultimate revolution.”*

- Wen Jiabao, former Premier of the State Council of the People's Republic of China

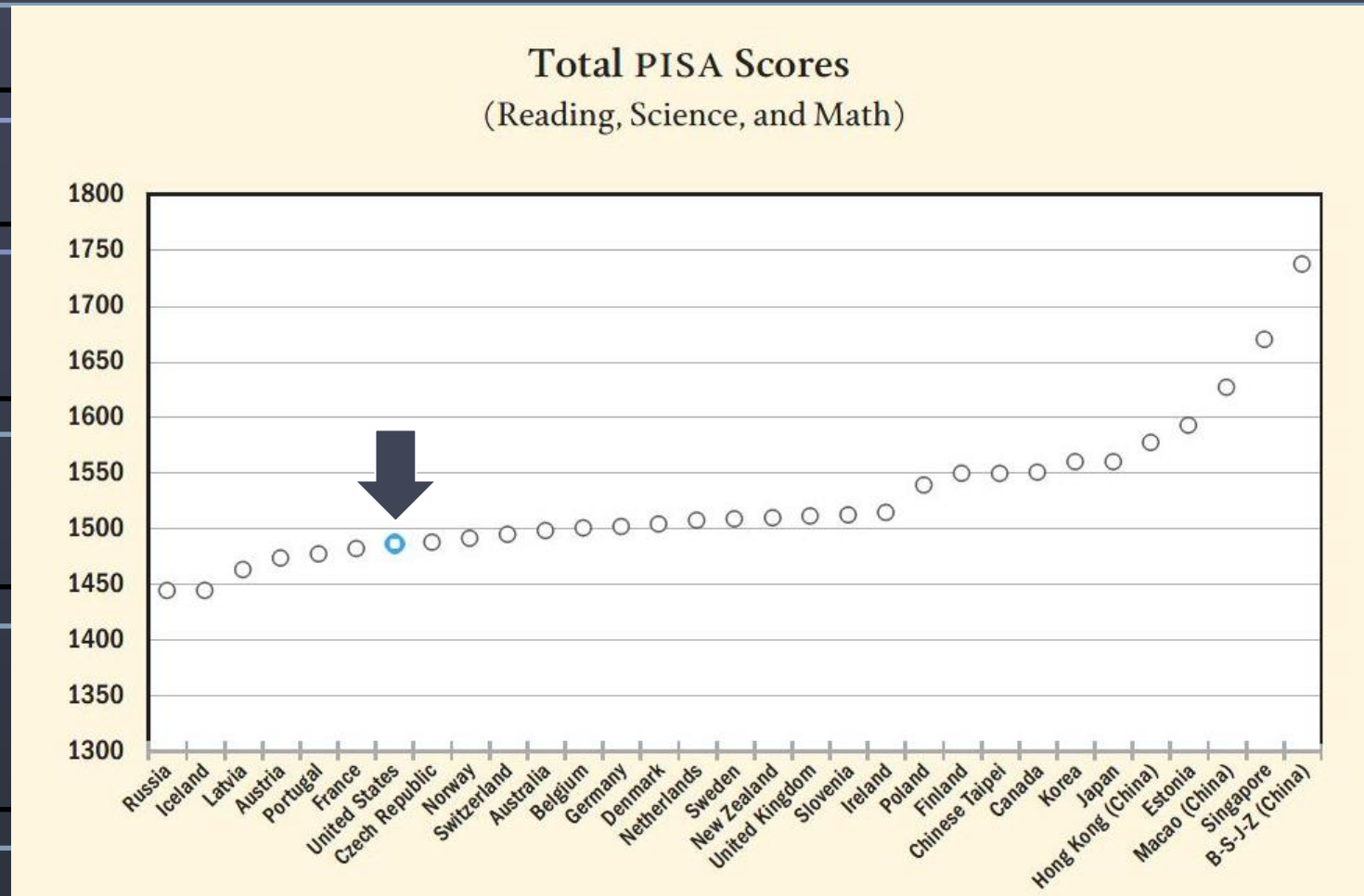
# S&E First Degrees Granted

S&E First University Degrees Granted by Institutions in Selected Country in thousands



Reproduced from Figure 2-19 in National Science Board, Science & Engineering Indicators 2020 (Alexandria, VA: National Science Foundation, 2020).

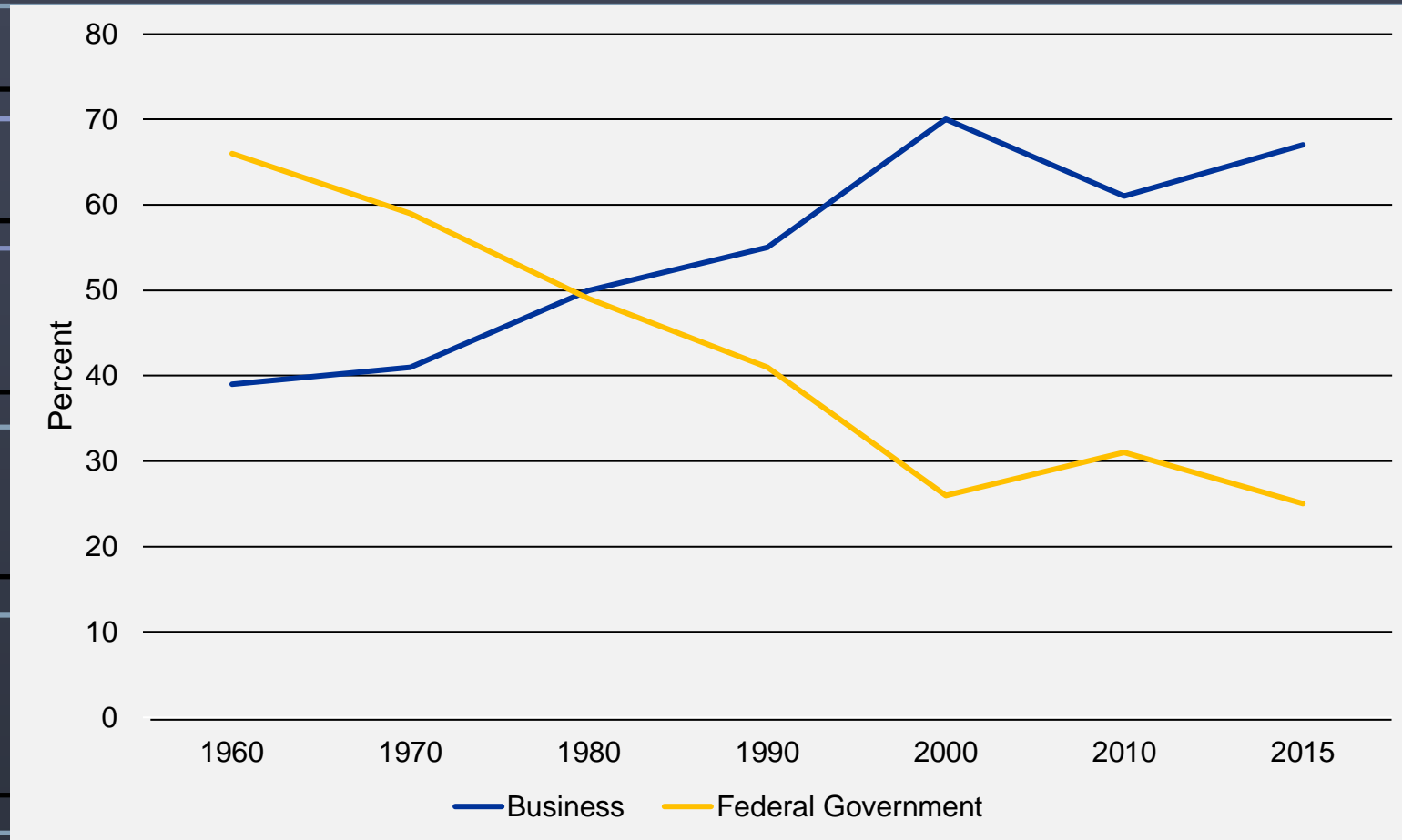
# Total PISA Scores



Source: OECD



# U.S. R&D Funding (Percent)

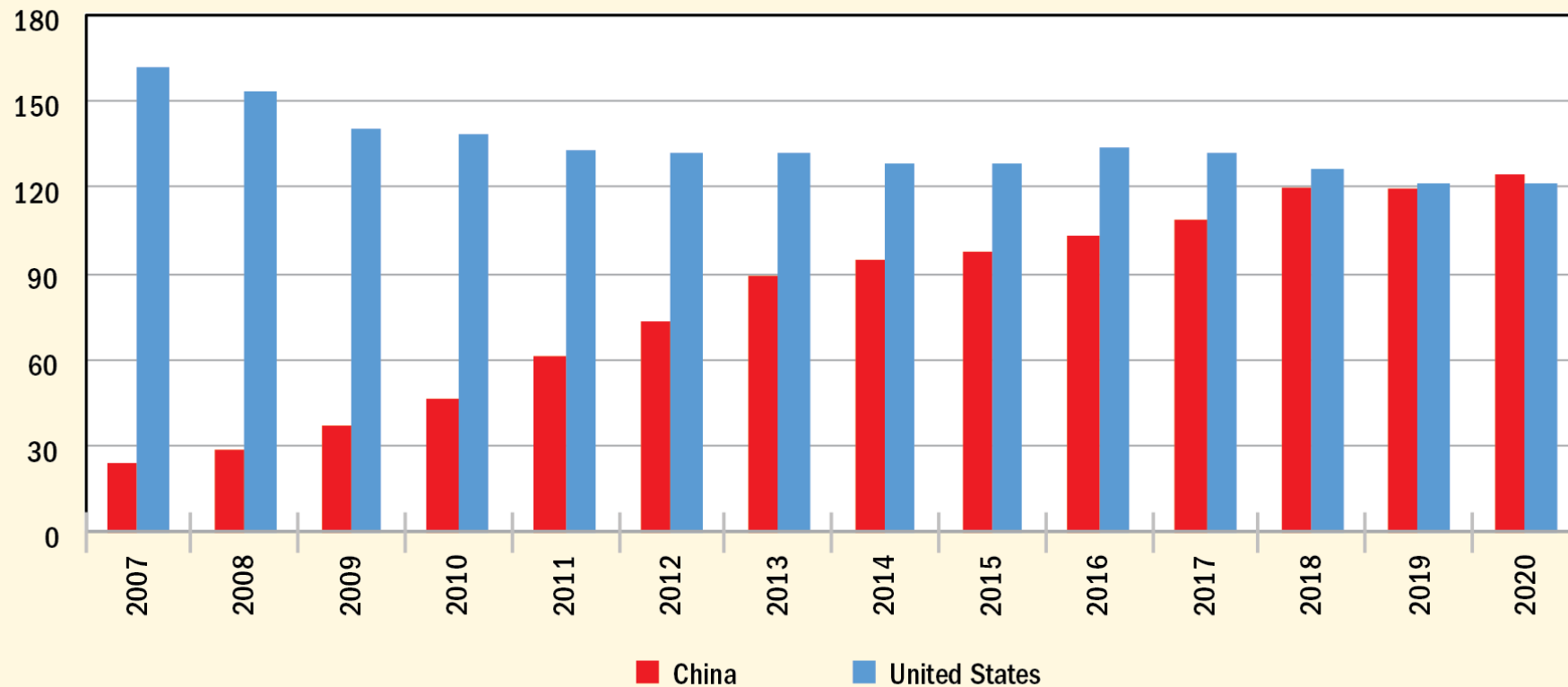


Source: National Science Foundation

BC-281

# Number of Companies in Global Fortune 500

Number of Companies  
in Global Fortune 500



# Top Merchandise Trading Partner



# State of the Union in R&D Competitiveness (U.S. Rank)

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<b>Investment in R&amp;D (PPP)</b>	<b>1<sup>st</sup></b>
<b>Innovation<sup>1</sup></b>	<b>8<sup>th</sup></b>
<b>R&amp;D as Percent of GDP<sup>2</sup></b>	<b>9<sup>th</sup></b>
<b>Education<sup>3</sup> (primary and secondary)</b>	<b>25<sup>th</sup></b>
<b>Professionals Engaged in R&amp;D Per Capita</b>	<b>28<sup>th</sup></b>
<b>Fraction of Research Funded by Government</b>	<b>29<sup>th</sup></b>
<b>Fraction of Initial Degrees Awarded in Engineering<sup>4</sup></b>	<b>76<sup>th</sup></b>

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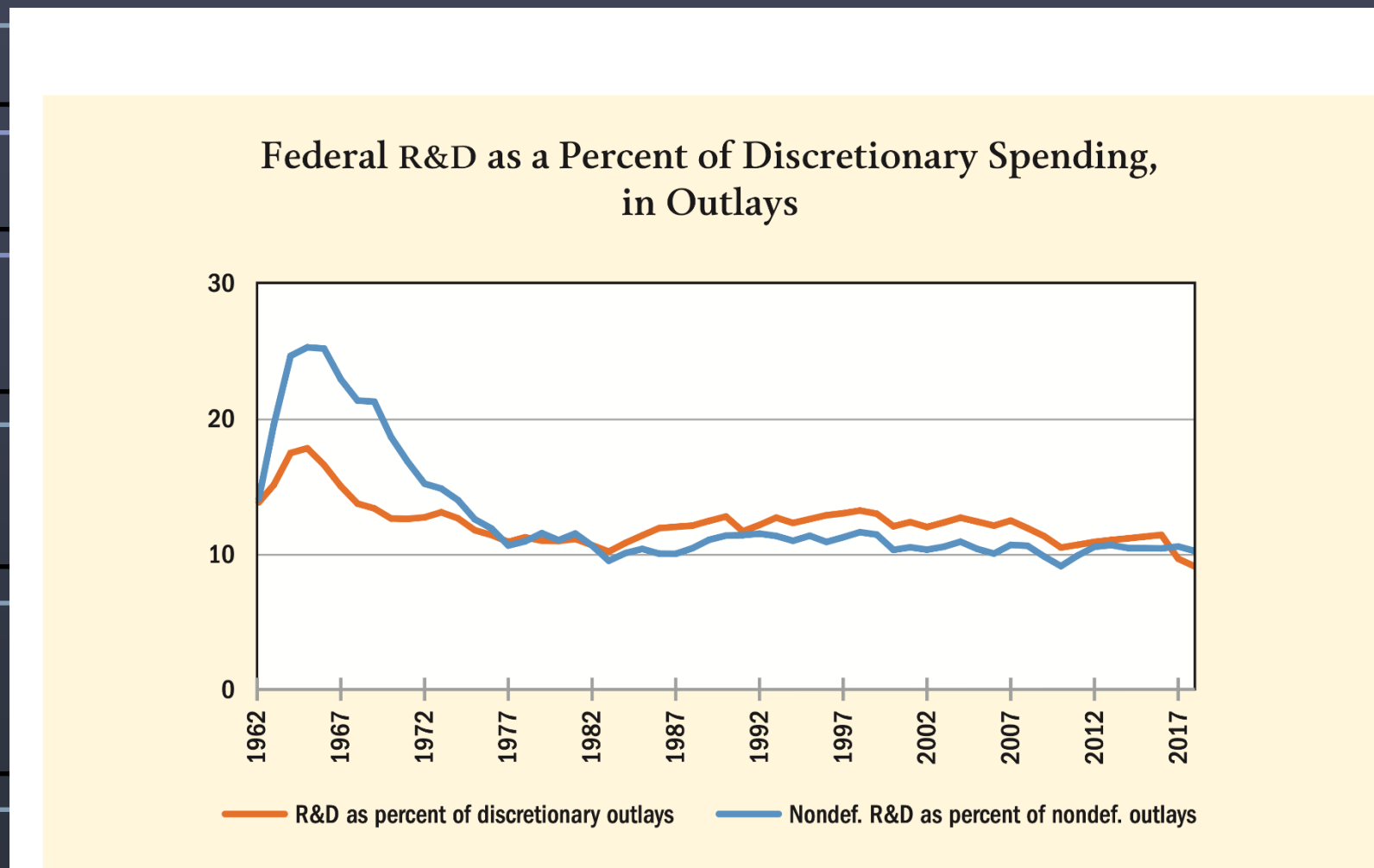
<sup>1</sup> Bloomberg Index

<sup>2</sup> OECD Nations

<sup>3</sup> PISA Test – Composite reading, math, science score

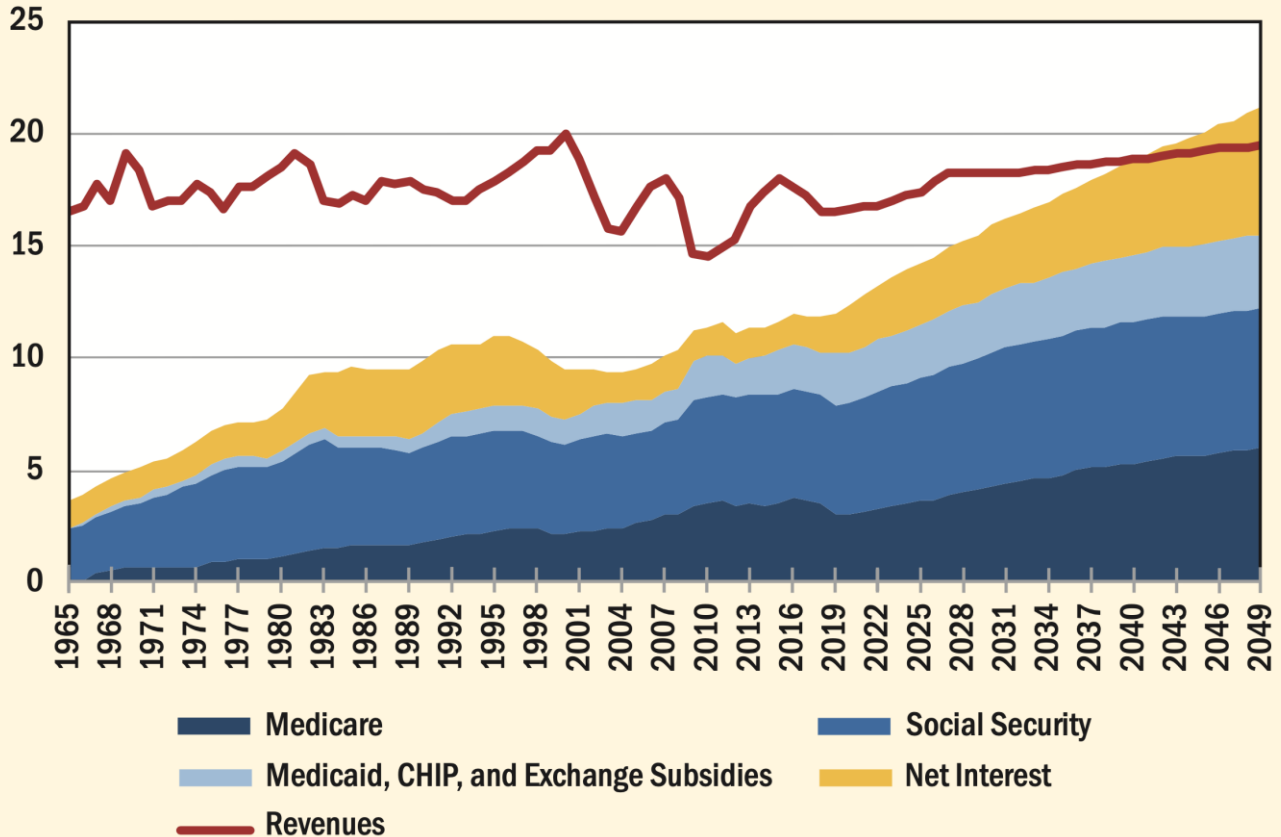
<sup>4</sup> Fraction of individuals receiving tertiary education

# Federal R&D as a Percent of Federal Discretionary Spending



# Federal Revenue and Nondiscretionary Spending

Federal Revenue and Nondiscretionary Spending  
as a Percentage of GDP



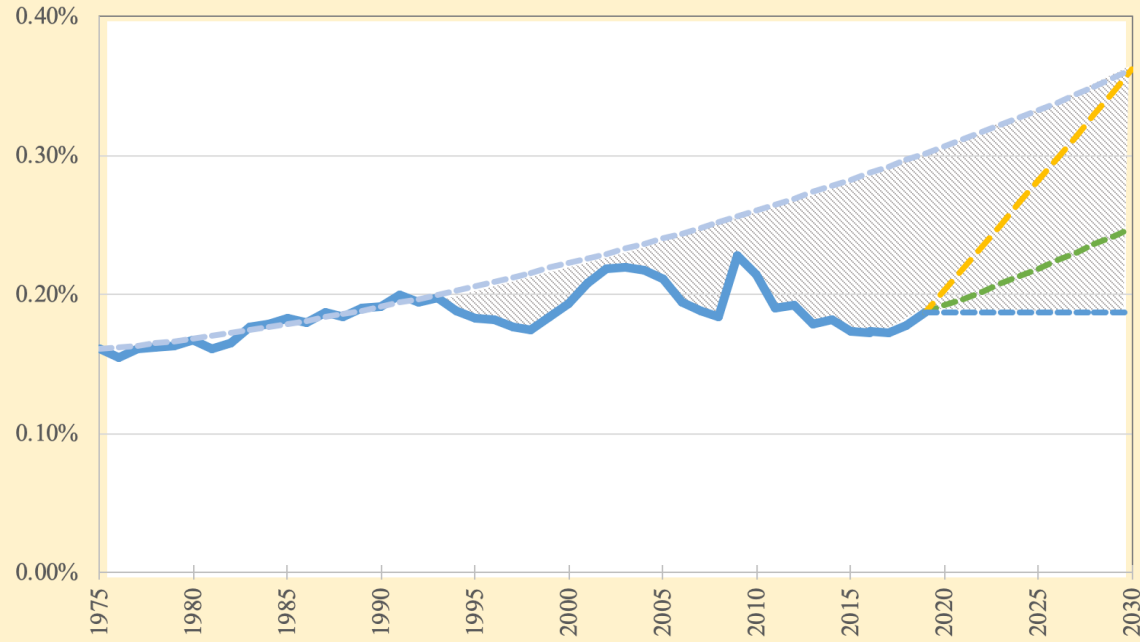
# Recommendations

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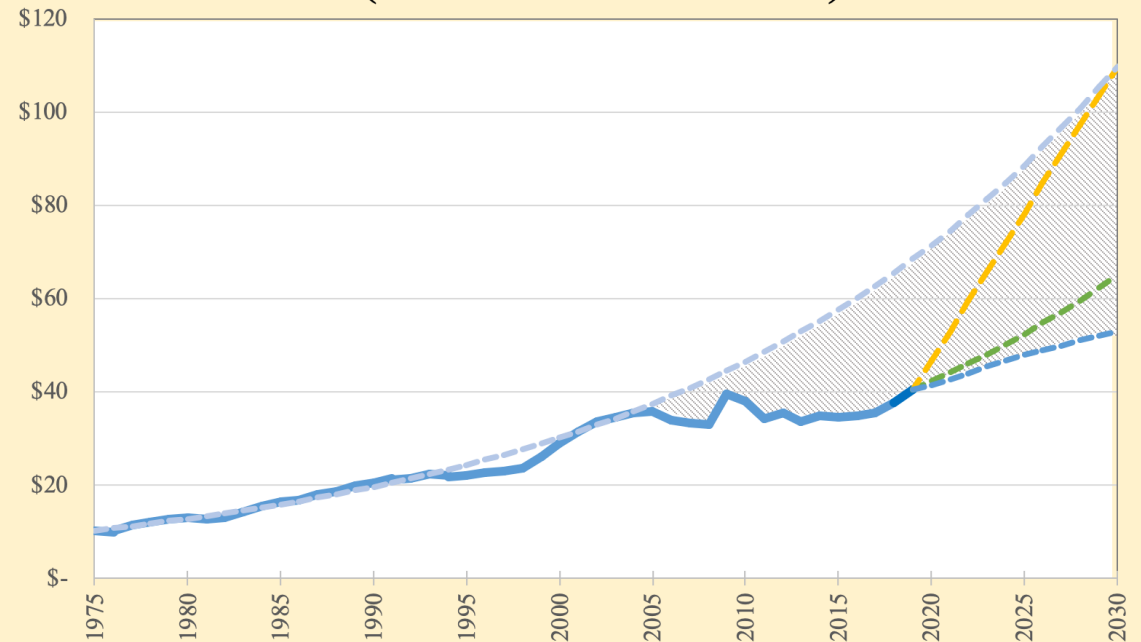
- **R&D – boost federal research funding by at least 50%**
- **Budget process – rolling 5-year plan, 2-yr funding cycle and capital budget**
- **Rules & regulations – review, replace or remove**
- **Workforce – grow STEM numbers and skills – US & foreign born**
- **Education – transform quality of pre-K12 education & access for all Americans**
- **GUI partnership – change laws & regulations and offer incentives**
- **Universities – restore State funding – Congress repeal tax on endowments**

# US Federal Basic Research Investment

## Share of GDP



## Obligation (in billions US 2020\$)



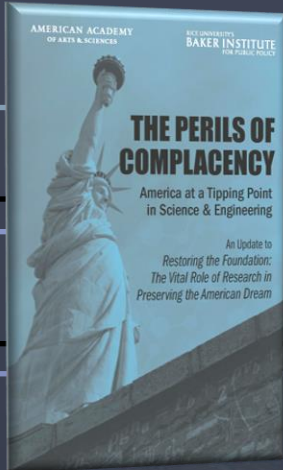
- Federal Basic Research Obligations
- - - Return to Competitive Growth Rate (1975–1992)
- - - Accelerated Growth
- - - Flat Relative to Economic Growth
- - - Historic Competitive Track (1975–1992)

Source: National Center for Science and Engineering Statistics “Survey of Federal Funds for Research and Development”

Notes: Baseline calculated assuming R&D budgets continue to be directly proportional to total discretionary outlays, as they have for decades. Constant dollars are calculated using total nondefense composite outlay deflators from Office of Management and Budget. 2020. “Fiscal Year 2021 GDP and Deflators.”

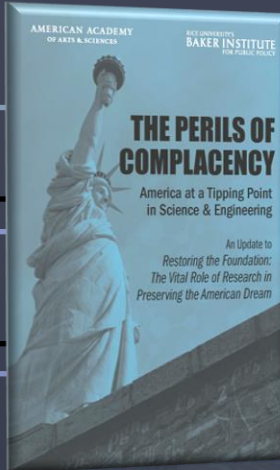


# Our Message to Policymakers



## How to Lose Global Competitiveness in 10 Easy Steps

- ☑ 1. Underfund R&D: fail to increase basic research funding to 0.3 percent of GDP and fail to grow the national R&D investment to 3.3 percent of GDP
- ☑ 2. Deter immigration of talented STEM students and workers
- ☑ 3. Have no integrated, coherent federal funding strategy
- ☑ 4. Provide minimal capital resources to federally funded R&D facilities
- ☑ 5. Fund long-term scientific projects through single-year, volatile funding cycles
- ☑ 6. Saddle researchers with onerous regulations that offer no clear benefit
- ☑ 7. Maintain a second-rate primary and secondary education system in STEM
- ☑ 8. Continue to cut state investments in higher education
- ☑ 9. Avoid high-risk/high-potential research and federal support of innovation
- ☑ 10. Maintain a federal budget that produces vanishing discretionary funds in the future



# THE PERILS OF COMPLACENCY

## *America at a Tipping Point In Science & Engineering*

*Thank you !*