
# America's R&D Retreat: How Policy Reversals Accelerate the Global Innovation Power Shift

A comprehensive analysis of how recent policy decisions are reshaping the global innovation landscape, threatening America's technological leadership, and creating opportunities for competitor nations.

# The Scale of America's R&D Retreat

In absolute terms, the United States remains the world's largest R&D spender with approximately $823 billion in 2023. However, this masks a troubling reality:

**1.7%**

### US R&D Growth

The growth rate of U.S. R&D spending has slowed significantly in 2023

**8.7%**

### China's R&D Growth

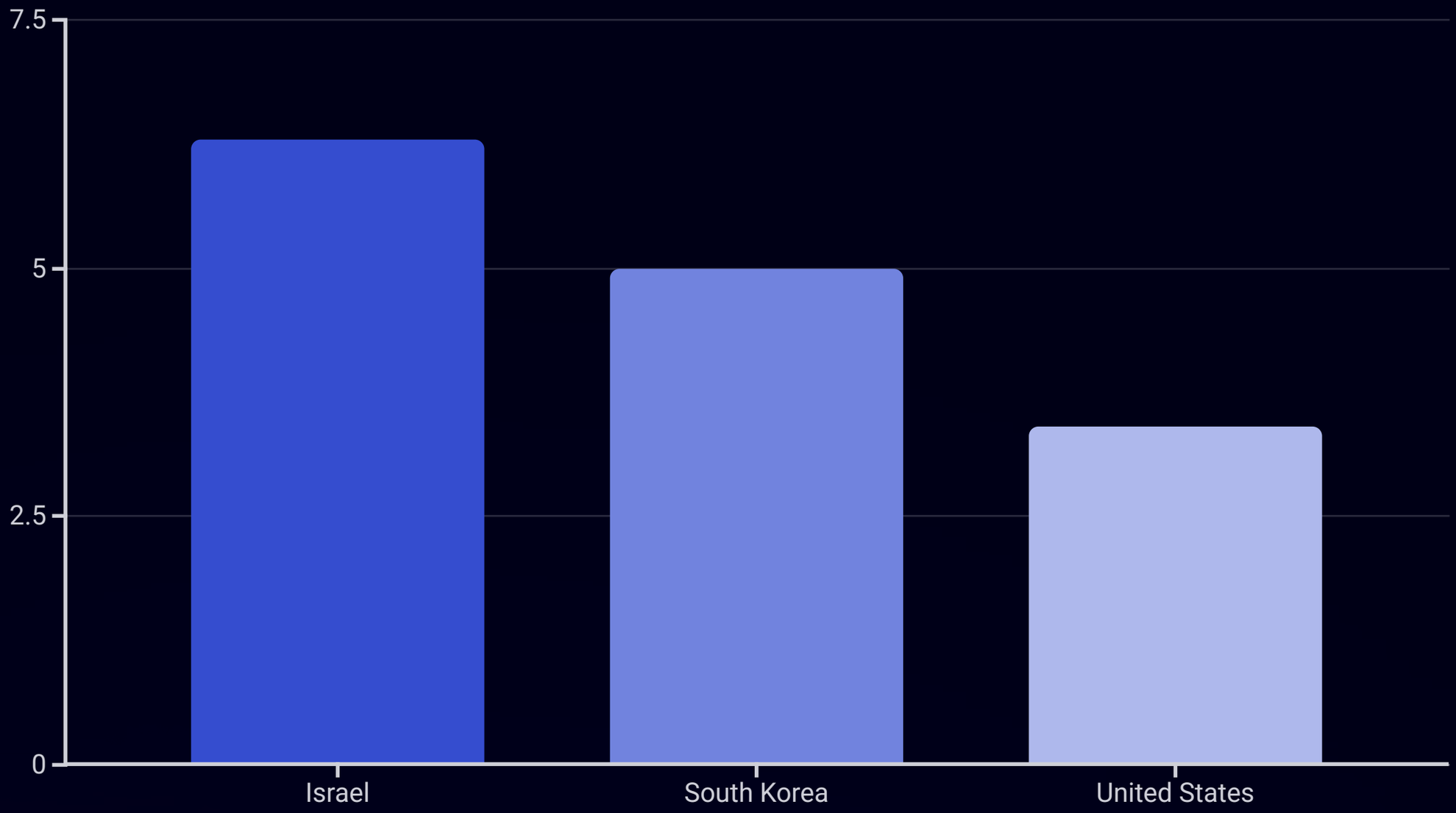
China's R&D expenditure surged in the same period, continuing a multi-decade trend of aggressive investment

**$781B**

### China's Total

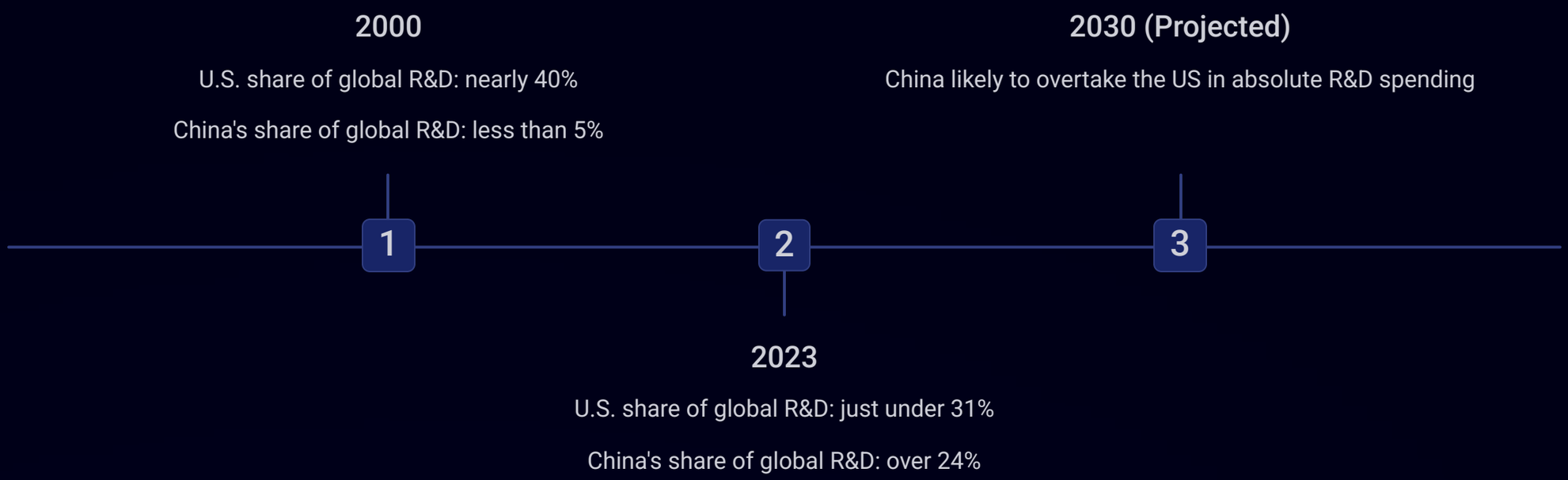
China's total R&D spending is rapidly closing the gap with the United States

# R&D Intensity: A More Telling Metric




R&D intensity—the proportion of a country's GDP dedicated to research—reveals that the U.S. is not leading. With an R&D intensity of 3.4% of GDP, the United States lags behind hyper-innovative economies like Israel (6.3%) and South Korea (5.0%).

# The Shifting Global R&D Landscape




Since 2000, the U.S. share of global R&D has declined significantly, while China's share has exploded, fundamentally altering the innovation landscape.

# The Cost-Efficiency Illusion

Even the U.S. lead in absolute spending is a dangerous illusion. Due to lower labor and operational costs, a Chinese firm can employ 2.3 times the number of research personnel as a U.S. firm for the same investment.

When R&D expenditures are adjusted for this cost-efficiency, China's nominal $781 billion translates to an effective, activity-based investment of approximately $1.8 trillion—more than double the U.S. total.

# The 2025 Policy Avalanche

The decline in U.S. R&D leadership is being actively accelerated by the 2025 policy avalanche, representing the steepest decline in federal science funding since 2013:

### National Science Foundation (NSF)

57% budget reduction from $9 billion to $3.9 billion

Hundreds of employees already laid off

### National Institutes of Health (NIH)

$2.3 billion reduction in new grant awards

Proposed FY 2026 restructuring calling for a 37% budget cut

### Environmental Protection Agency (EPA)

Office of Research and Development facing complete closure

Affecting 1,155 scientists and eliminating federal environmental science capacity

### Department of Energy

24 clean energy projects worth $3.7 billion cancelled

Proposed 74% reduction to the Office of Energy Efficiency and Renewable Energy


# Compounding Factors

## Tax Policy Changes

The Section 174 tax policy change has deferred $59 billion in R&D tax benefits since 2022, further discouraging private sector research investment.

## Immigration Constraints

Limits on the nation's ability to attract global talent, with 442,000 applicants competing for just 85,000 H-1B visa slots, restricting access to international expertise.

# A Tripartite Retreat

The erosion of America's R&D leadership is being actively accelerated by domestic policy reversals in three critical sectors:

### Biomedical Science

Unprecedented cuts to NIH funding and research grants

### Climate Technology

Formal disengagement from international climate science initiatives

### Green Mobility

Systematic dismantling of EV policy framework

# The War on Biomedical Science

The U.S. biomedical research infrastructure is facing an unprecedented assault:

- NIH canceled over $1.9 billion in research grants, affecting more than 1,400 peer-reviewed proposals
- New cap of 15% on indirect cost rates for grants, replacing negotiated rates that typically ranged from 25% to 70%
- Creation of a "lost generation of scientists" and a quantifiable "brain drain"
- European research institutions reporting a 35% increase in applications from U.S.-based scientists

# International Talent Recruitment

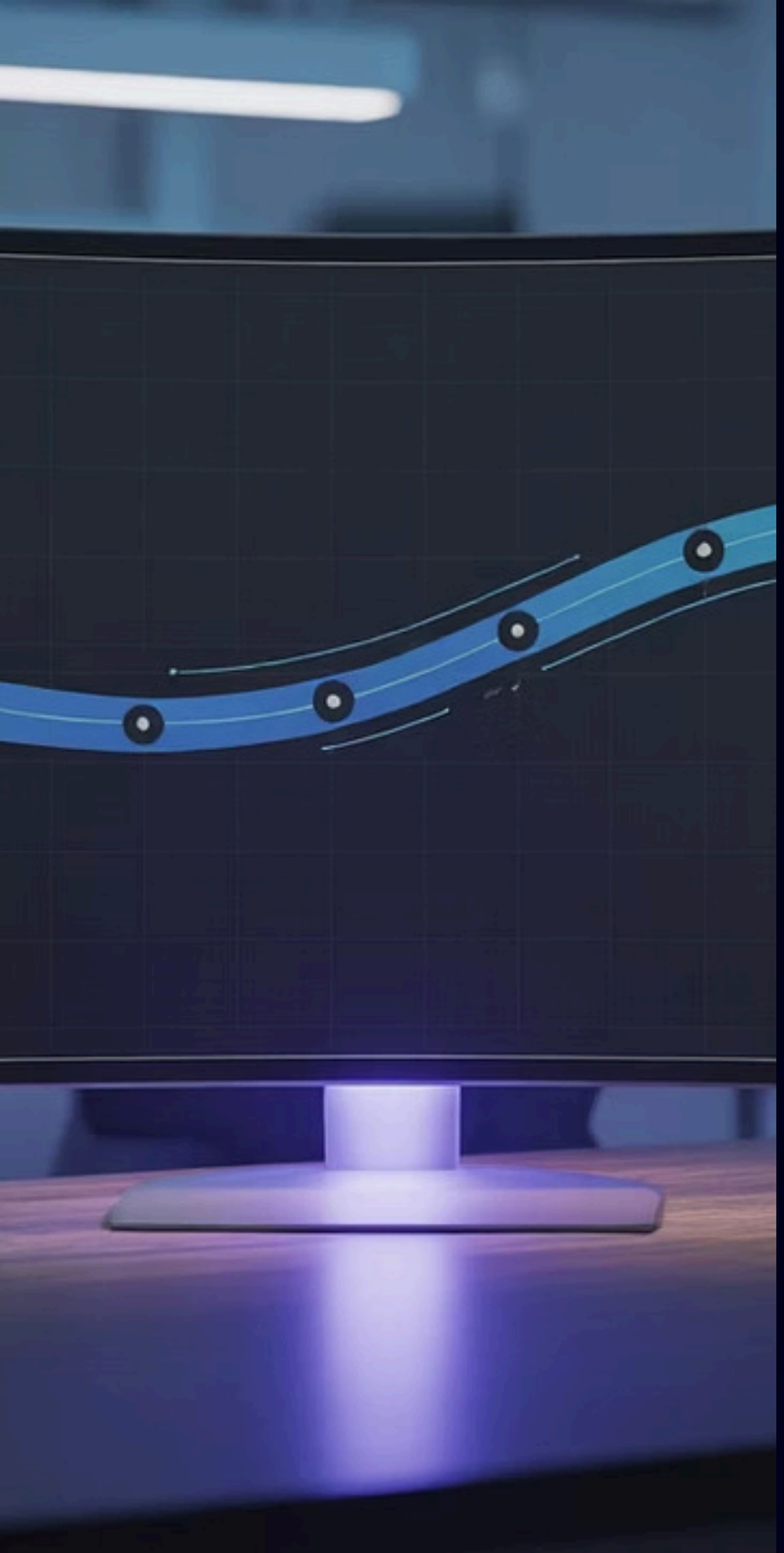
### Canada Leads 100 Challenge

Aggressive recruitment campaign targeting top American scientists with competitive funding packages and streamlined immigration

### Australia's Global Talent Attraction Program

Fast-tracked visas and research grants specifically designed to lure away America's top scientific talent

Competitor nations have launched aggressive recruitment campaigns to capitalize on America's retreat from biomedical research, creating a significant talent drain.



# Impact on Medical Innovation

The disruption to translational science is projected to create a 5 to 10-year delay in the development of new therapeutics and diagnostics.

This delay will have profound consequences for patients awaiting breakthrough treatments and for America's competitive position in the global biomedical industry.

# Abdication from Climate Leadership

### Paris Agreement Withdrawal

Formal disengagement from international climate science, formalized through a January 2025 executive order

### Financial Disengagement

Cessation of all financial contributions, notably to the Green Climate Fund

### Reputational Damage

Significant harm to the nation's scientific credibility and leadership position

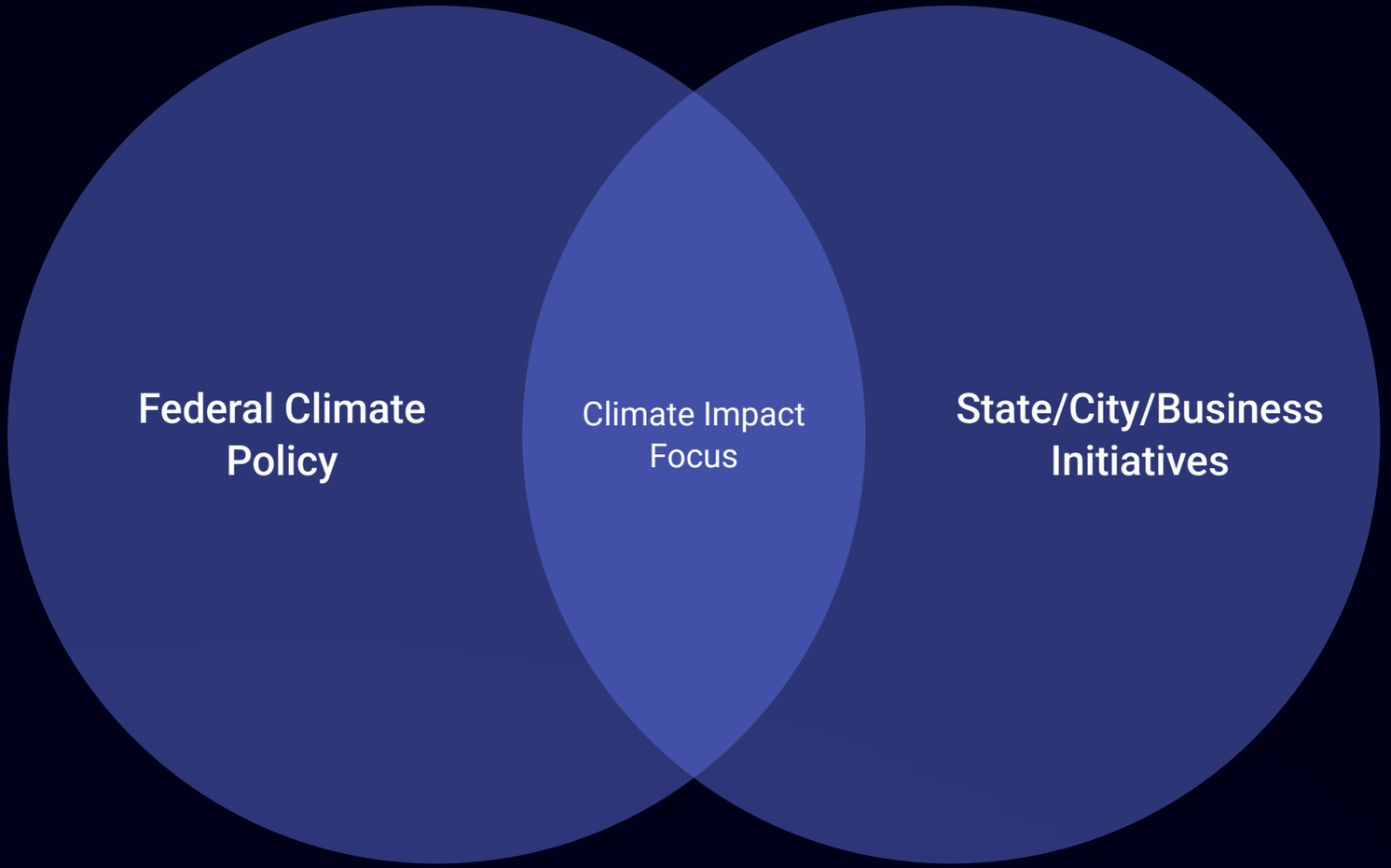
The United States has initiated a formal disengagement from international climate science, creating a leadership vacuum in global climate research and policy.


# Economic Consequences of Climate Disengagement

This federal retreat risks creating a significant "economic and technical lag" as the U.S. loses access to the latest research driving innovation in the clean energy sector, a market projected to reach over $2 trillion by 2035.

China and the European Union have explicitly stepped into the void, issuing a joint statement vowing to lead the global effort in climate science and technology development.

# Internal Climate Policy Schism




While a coalition of U.S. states, cities, and businesses has pledged to continue working toward the Paris goals, this internal schism between federal policy and powerful sub-national actors represents a critical strategic disadvantage in coordinated climate innovation.

# Reversing the Green Transition

The policy framework supporting the transition to electric vehicles (EVs) has been systematically dismantled:

### California Standards Overturned

Congressional Review Act (CRA) used to overturn California's authority to set its own stringent emissions standards

### Fuel Economy Standards Weakened

Federal fuel economy standards neutered, removing key regulatory drivers

1

2

3

### Tax Credits Eliminated

Legislation eliminated federal tax credits for new and used EVs

These changes occurred even as automakers, having already committed massive capital, pleaded for regulatory certainty.


# EV Investment at Risk

U.S. investments in EV and battery manufacturing had reached $199 billion, with $125 billion of that announced in the two years following the passage of the Inflation Reduction Act (IRA)—the very policy framework now being dismantled.

This abrupt reversal has created domestic sovereign risk, sending a chilling signal to global investors that U.S. industrial policy is subject to radical, politically-motivated reversals.

# The Competitive Disadvantage

### United States

- Inconsistent policy support
- Subject to political reversals
- Short-term planning horizons
- Uncertain regulatory environment

### China

- Decades of consistent state support
- Long-term strategic planning
- Massive scale advantages
- Integrated supply chains

American industry is at a severe disadvantage against rivals like China that offer decades of consistent, state-backed support for strategic industries like electric vehicles.


# The Ascendant Powers

While the United States pursues a path of R&D retrenchment, its global competitors are implementing deliberate, state-directed national innovation strategies designed to achieve technological supremacy.

# China: Made in China 2025

### Key Goals

Achieve 70% domestic content in core tech components by 2025; transition from "world's factory" to high-tech powerhouse

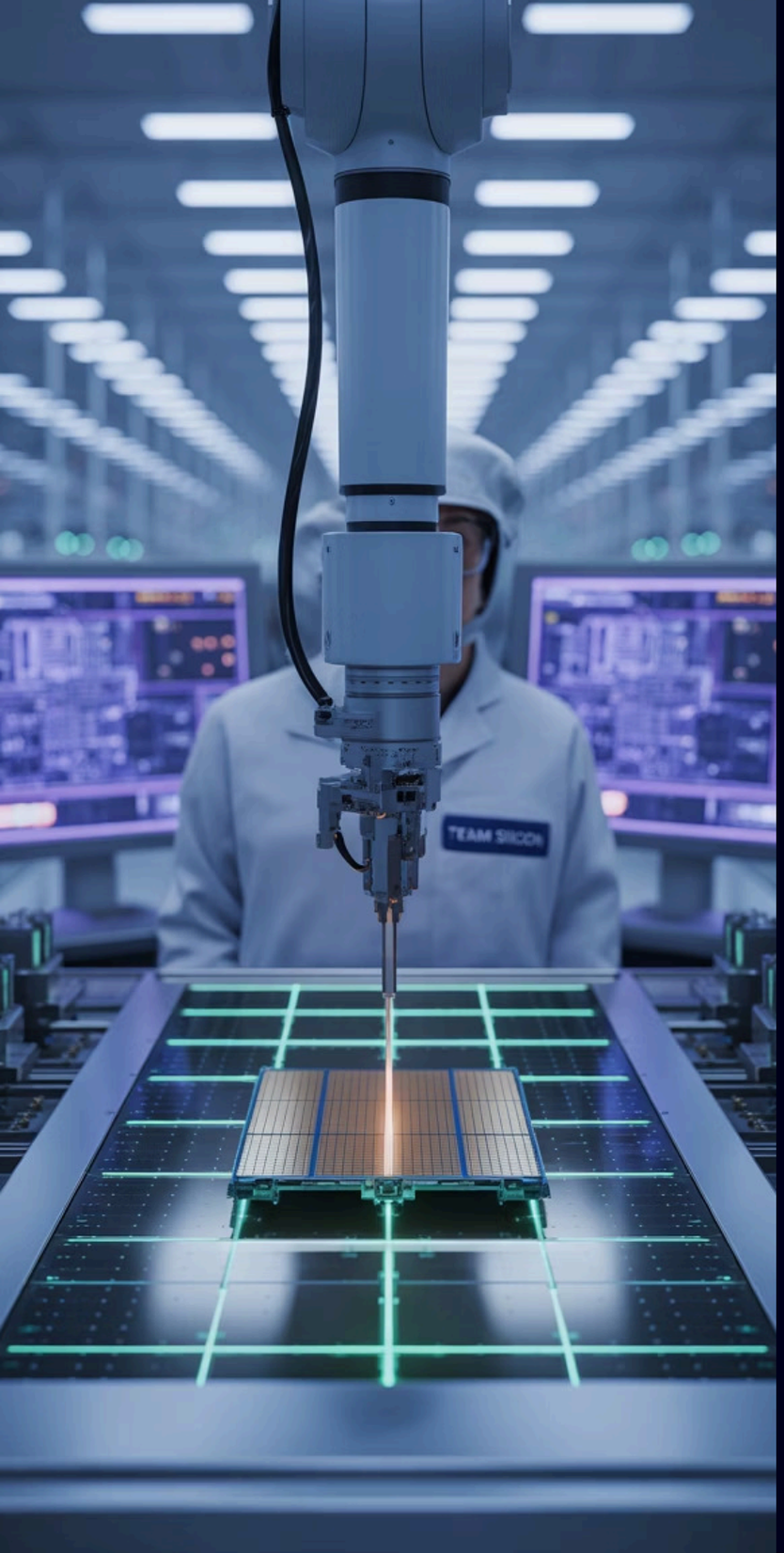
### Target Sectors

New Energy Vehicles, Biopharma, Aerospace, Robotics, Advanced IT, New Materials, AI, 5G, Semiconductors

### Funding

Hundreds of billions in state funding, low-interest loans, tax breaks; National Integrated Circuit Fund ($20.2B); 40 national innovation centers

China's comprehensive blueprint leverages state support to help domestic companies achieve massive scale, driving down costs and allowing them to become formidable global competitors.



# South Korea: MSIT 2025 Work Plan

South Korea is doubling down on its innovation strategy, aiming for "G3 status" in science and technology by 2030 by dominating three "game-changing" technologies:

- AI-semiconductors
- Advanced biotechnology
- Quantum technology

This is supported by its K-Semiconductor Belt Strategy, which commits $450 billion by 2030 to build the world's best semiconductor supply chain.

# Germany: High-Tech Strategy 2025

### Mission-Oriented Framework

Leverage R&D to tackle societal challenges in health, mobility, and sustainability

### Energiewende (Energy Transition)

Become the world's leading market for green technologies

### Circular Economy

Dedicated strategies for green hydrogen and sustainable resource use

Germany's approach reinforces its industrial strength while addressing key societal challenges through coordinated innovation policy.

# Japan: Innovation 25 & New Robot Strategy

## Key Goals

- Raise global innovation rank from 13th to 4th by 2035
- Become a "robotics superpower"
- Become the "most AI-friendly country"

## Major Initiatives

- 10-trillion-yen University Endowment Fund
- Public-private R&D investment expansion
- AI Promotion Act

Japan is pursuing a coordinated national effort to revive its technological prowess, focusing on industrial strengths and setting global standards.


# Israel: Innovation Authority Strategy

Israel aims to transition from "Start-up Nation" to "Scale-up Nation" and ensure sustainable global leadership in high-tech through:

- World-leading R&D intensity (6.3% of GDP)
- Focus on Deep Tech (AI, Quantum), Bio-Convergence, Cybersecurity, Climate Tech, Digital Health
- IIA conditional grants (repaid on success)
- Fast-Track crisis funds

Israel's approach emphasizes an agile, state-enabled ecosystem with proactive investment in future-readiness.

# Comparative Innovation Philosophies

1 **China**

State-led industrial policy; achieve technological self-reliance and global market dominance through scale

2 **South Korea**

Strategic public-private partnership; targeted investment in "game-changing" technologies to leapfrog competitors

3 **Germany**

Mission-oriented social market economy; use R&D to solve societal challenges and build sustainable industrial leadership

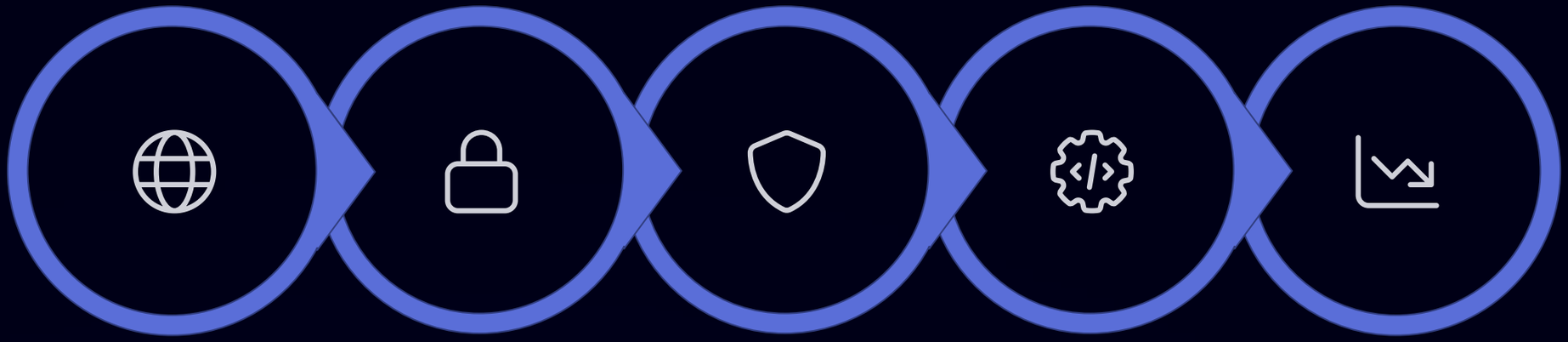
4 **Israel**

Agile, state-enabled ecosystem; proactive investment in future-readiness and risk mitigation to foster resilient innovation

# The New Global Map of Innovation

The divergent paths being taken by the United States and its competitors are redrawing the global map of innovation. The future will be a multipolar innovation world, where leadership is contested across various domains.

# Structural Segmentation




This new reality is shaped by intense geopolitical competition, forcing a "structural segmentation" of the once-integrated global technology ecosystem. Nations and corporations are increasingly compelled to align with emerging and often incompatible tech blocs.

# R&D as National Power

In this fragmented world, R&D capability has become a primary instrument of national power. Technologies like AI and quantum computing are treated as strategic assets, forcing multinational corporations to "ring-fence" their R&D to mitigate exposure to diverging regulations and political risk.


Projections indicate China will likely overtake the US in absolute R&D spending by 2030. Countries leading in AI and advanced technologies could see up to $13 trillion in additional GDP growth by that year.

# The Key Technologies of 2035

### Mature AI

Advanced artificial intelligence systems integrated across industries and society

### Quantum Computing

Practical quantum systems solving previously intractable problems

### Circular Economy

Materials and products designed for complete reuse and recycling

### Autonomous Systems

Self-operating vehicles, factories, and infrastructure

The race is on to dominate these key technologies that will define economic and geopolitical power in the coming decades.

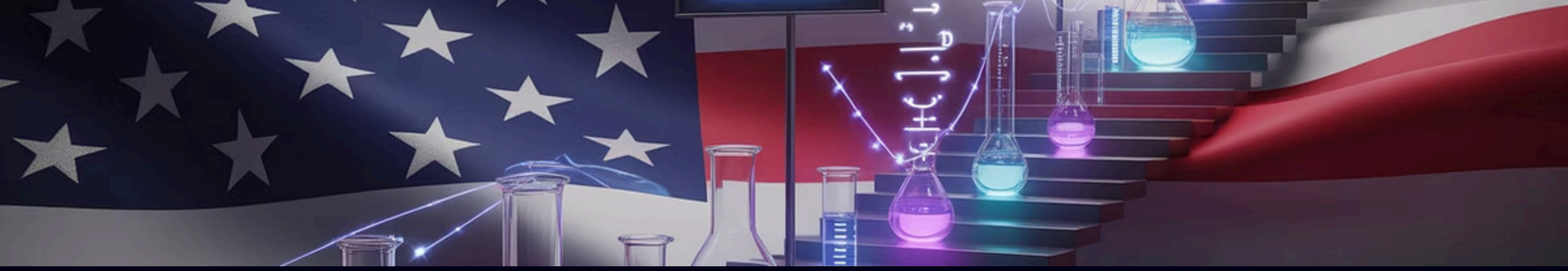
# America's Projected Position

Based on current trajectories, the United States risks finding itself in a diminished position by 2035. While it will likely maintain strength in software and frontier AI models, its policy of retrenchment is paving the way for it to cede leadership in:

- Advanced manufacturing
- Materials science
- Green technology
- Robotics

# The Hollowing Out of U.S. Federal R&D

The "hollowing out" of U.S. federal R&D is not just an economic handicap; it is a profound geopolitical vulnerability that reduces the nation's gravitational pull and accelerates its own relative decline.



# Strategic Imperatives for Reclaiming Leadership

Reversing the decline of U.S. R&D dominance requires a fundamental shift in national policy. The following imperatives provide a roadmap for reclaiming a position of leadership:

# Imperative 1: National Industrial Strategy

1

### Bipartisan Commitment

Establish a consistent, long-term "innovation first" policy that transcends political cycles

2

### Strategic Targeting

Focus on future products and processes where market dominance is not yet established

3

### Leapfrog Opportunities

Identify and invest heavily in technologies where the U.S. can jump ahead of competitors

The U.S. must adopt a coherent, bipartisan national industrial strategy that provides long-term direction and stability for innovation investments.

# Imperative 2: Increase and Stabilize Federal R&D Funding

### Reverse Damaging Cuts

The U.S. must reverse the damaging cuts to agencies like the NIH and NSF to restore research capacity.

### Fully Fund Authorized Programs

Programs like the NSF's Technology, Innovation, and Partnerships (TIP) Directorate—authorized for $20 billion but appropriated only a fraction—must be fully funded.

To provide stability, Congress should shift to five-year grant cycles for universities and government labs, allowing for longer-term research planning.

# NSF Technology, Innovation, and Partnerships (TIP) Directorate

The TIP Directorate represents a critical opportunity to accelerate U.S. innovation in key areas:

- Authorized for $20 billion but currently receiving only a fraction of that funding
- Designed to bridge the gap between fundamental research and commercial application
- Focused on critical technologies including AI, quantum information science, and advanced materials
- Structured to foster partnerships between academia, industry, and government

# Imperative 3: Re-engage in Global Science and Technology Diplomacy

### Rejoin International Agreements

The U.S. must rejoin and actively lead international agreements and standards-setting bodies

### Center of Foreign Policy

Science and technology diplomacy should be a central pillar of U.S. foreign policy

### Build Resilient Supply Chains

Use tools like the Partnership for Global Infrastructure and Investment (PGI) to build "friend-shored" supply chains with trusted allies

Re-engagement in global science and technology diplomacy is essential for maintaining U.S. influence in setting international standards and norms.

# Partnership for Global Infrastructure and Investment (PGI)

The PGI represents a strategic opportunity for the United States to counter China's Belt and Road Initiative while building resilient innovation networks:

- Mobilizes public and private capital for infrastructure development in partner countries
- Creates secure, "friend-shored" supply chains for critical technologies
- Establishes shared standards and norms for emerging technologies
- Strengthens innovation partnerships with like-minded nations

# The Narrowing Window of Opportunity

The window for an effective response is narrowing rapidly. The 2025 policy reversals occur precisely when competitors are deploying sophisticated strategies with massive financial commitments.

Each year of delay compounds the challenge of reclaiming leadership, as competitor nations build momentum and establish dominance in key technology domains.

# America's Stark Choice

| Reverse Course | Accept Decline |
| --- | --- |
| Implement dramatic policy changes and investment to reclaim innovation leadership | Accept that the era of uncontested American technological leadership is ending, replaced by a more competitive, distributed global innovation system |

The choice facing America is stark and the consequences of inaction are profound for the nation's economic prosperity, national security, and global influence.

# The Economic Stakes

**$13T**

### AI-Driven Growth

Potential additional GDP growth by 2030 for countries leading in AI and advanced technologies

**$2T**

### Clean Energy Market

Projected size of the global clean energy market by 2035

**5-10yr**

### Innovation Delay

Projected delay in development of new therapeutics and diagnostics due to biomedical research disruption

The economic consequences of America's R&D retreat extend far beyond budget numbers, affecting future prosperity and competitiveness across multiple sectors.

# The National Security Implications

R&D leadership is increasingly inseparable from national security in an era where technological advantage translates directly to military and intelligence capabilities. America's retreat from R&D leadership creates vulnerabilities in:

- Advanced materials for defense applications
- Quantum computing for cryptography
- AI systems for intelligence analysis
- Secure supply chains for critical components

# The Geopolitical Consequences


Beyond economic and security impacts, America's R&D retreat has profound geopolitical consequences, reducing the nation's ability to shape global norms and standards in emerging technology domains.

# Case Study: Semiconductor Leadership

The semiconductor industry illustrates both the challenges and opportunities in maintaining U.S. technological leadership:

- U.S. companies still lead in chip design, but manufacturing has largely moved offshore
- The CHIPS Act authorized $52 billion to rebuild domestic manufacturing capacity
- Taiwan and South Korea have established dominant positions in advanced manufacturing
- China is investing heavily to achieve self-sufficiency in semiconductor production

This critical industry requires sustained, strategic investment to maintain U.S. competitiveness.

# Case Study: Artificial Intelligence

### U.S. Strengths

- Leading companies in frontier AI models
- Strong university research ecosystem
- Venture capital funding advantage

### U.S. Vulnerabilities

- Declining federal research funding
- Talent constraints due to immigration policies
- Fragmented regulatory approach

AI represents both America's strongest current position and an area of significant vulnerability if current trends continue. Maintaining leadership requires addressing both immediate policy barriers and long-term strategic investment.

# Case Study: Biomedical Research

The U.S. has historically dominated biomedical research through institutions like the NIH, but this leadership is now threatened:

- NIH budget cuts affecting thousands of research projects
- Indirect cost rate caps undermining university research infrastructure
- Increasing competition from China, which has doubled biomedical research funding in the past decade
- European initiatives to capitalize on U.S. retreat by recruiting top talent

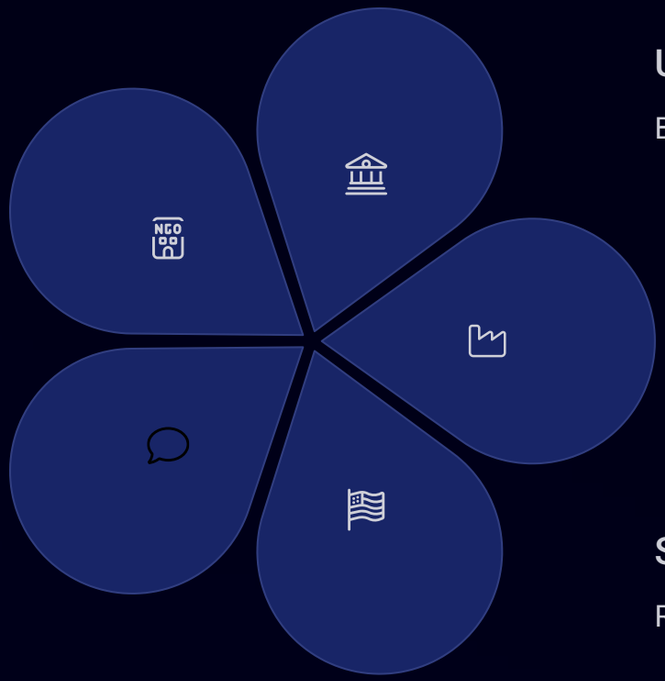
# The Path Forward: A Whole-of-Nation Approach

### Federal Government

Stable, strategic R&D funding and policy framework

### Universities

Basic research and talent development




### Industry

Applied research and commercialization

### Nonprofits

Targeted funding for strategic priorities

### State & Local

Regional innovation ecosystems

Reclaiming U.S. innovation leadership requires coordination across all sectors of society, with each playing a distinct but complementary role.

# Lessons from History: Sputnik Moment

The 1957 launch of Sputnik by the Soviet Union created a national crisis that galvanized American science and technology policy:

- Led to the creation of NASA and DARPA
- Sparked massive increases in federal R&D funding
- Transformed science education nationwide
- Resulted in the moon landing and countless technological breakthroughs

America's current R&D retreat requires a similar whole-of-nation response to a competitive challenge.

# Building a Sustainable Innovation Ecosystem

A sustainable innovation ecosystem requires long-term thinking and coordination across sectors, creating a virtuous cycle of research, development, commercialization, and reinvestment.

# The Cost of Inaction vs. Investment

### Cost of Inaction

- Diminished economic competitiveness
- Reduced national security capabilities
- Decreased global influence
- Lost generation of scientific talent
- Dependence on foreign technology

### Return on Investment

- Economic growth and job creation
- Technological advantage in critical sectors
- Enhanced national security
- Global leadership in setting standards
- Attraction and retention of top talent

The economic and strategic returns on R&D investment far outweigh the costs, while the price of inaction compounds over time.

# America's Innovation Crossroads

America stands at a critical crossroads in its innovation journey. The 2025 policy reversals have accelerated a concerning trend of R&D retreat, while global competitors implement ambitious strategies to achieve technological supremacy.

The window for an effective response is narrowing. The choice is clear: reverse course through dramatic policy changes and strategic investment, or accept a diminished position in the global innovation landscape of the future.

The stakes extend far beyond economic metrics to the core of America's prosperity, security, and global influence in the decades ahead.