

Major Issues in Science and Technology Policy

**How Sustainable is the Modern
Research University?**

AAAS Science and Technology Policy Forum

AAAS Committee on Science, Engineering and Public Policy

- “Foresight” exercise 7/02
 - Ten years in the future
- The Future of Particular Sectors
 - Federal R&D Agencies and Decision-Making
 - Academic Research
 - Industrial R&D
 - State-Level Science and Technology

“Big Picture” Changes in Science Generally (per COSEPP)

- Privatization of research and obsession with intellectual property issues
- Integrity in science
- Radical transformation of the means for scientific communication

Academic Research Sector: Over-arching Principles

- Team-oriented research will become the norm as university research is more directed towards solving societal problems.
- The current system of university research is not sustainable over the long-term.
- The current system of financial support for university research is probably not sustainable.
- University researchers should not over-promise.

Today's Session

How Sustainable is the Modern Research University?

How Sustainable is the Modern Research University?

- Changes in mission, funding, and management structures
- Public expectations
- Structural strains
 - Research and teaching
 - Graduate and undergraduate education
 - Academic departments and research centers
- Public universities and autonomy

Speakers for this Session

- John Engler, Michigan
- C. Peter Magrath, NASULGC
- Irwin Feller, Pennsylvania State University
- Robert Barnhill, University of Kansas/NSF

Discussant

- Lynn Jelinski, Sunshine Consultants

University Research: Leadership, Sustainability and Competitiveness

Robert E. Barnhill

NSF/CGS Dean in Residence

Past President, KU Center for Research

Institutional Leadership

"Institutional research competitiveness requires leadership at every level of the university."

~1995 AAAS Research
Competitiveness Meeting

Orchestrating Leadership

“When you go before an orchestra, you need to have a clear idea in your mind - a sound image - of what you are trying to achieve...If your imagination is clear, then you will communicate with the orchestra even if your beat and technique are not first-rate...I learned that they generally played below the level they were capable of achieving, and that they were happier when I made them play at their highest level. A sense of accomplishment is the best gift that any conductor can bestow on an orchestra.”

~ Sir George Solti

Transparency of Leadership

*"Modesty and unselfishness –
these are virtues which men praise –
and pass by."*

~ Andre Maurois

American Academic Research: History and Background

American Academic Research Enterprise

- “Sustaining technology” mode (Innovator’s Dilemma) until major external event such as WW II or Sputnik
- Then: “Disruptive technology” mode
 - WW II itself: radar, bombs
 - Post WWII: Vannevar Bush’s Science: The Endless Frontier
 - Post Sputnik: NDEA fellowships, federal research support
 - Vannevar Bush: health, wealth and defense
 - Other Vannevar Bush priorities
 - Trained professionals
 - Commercialization

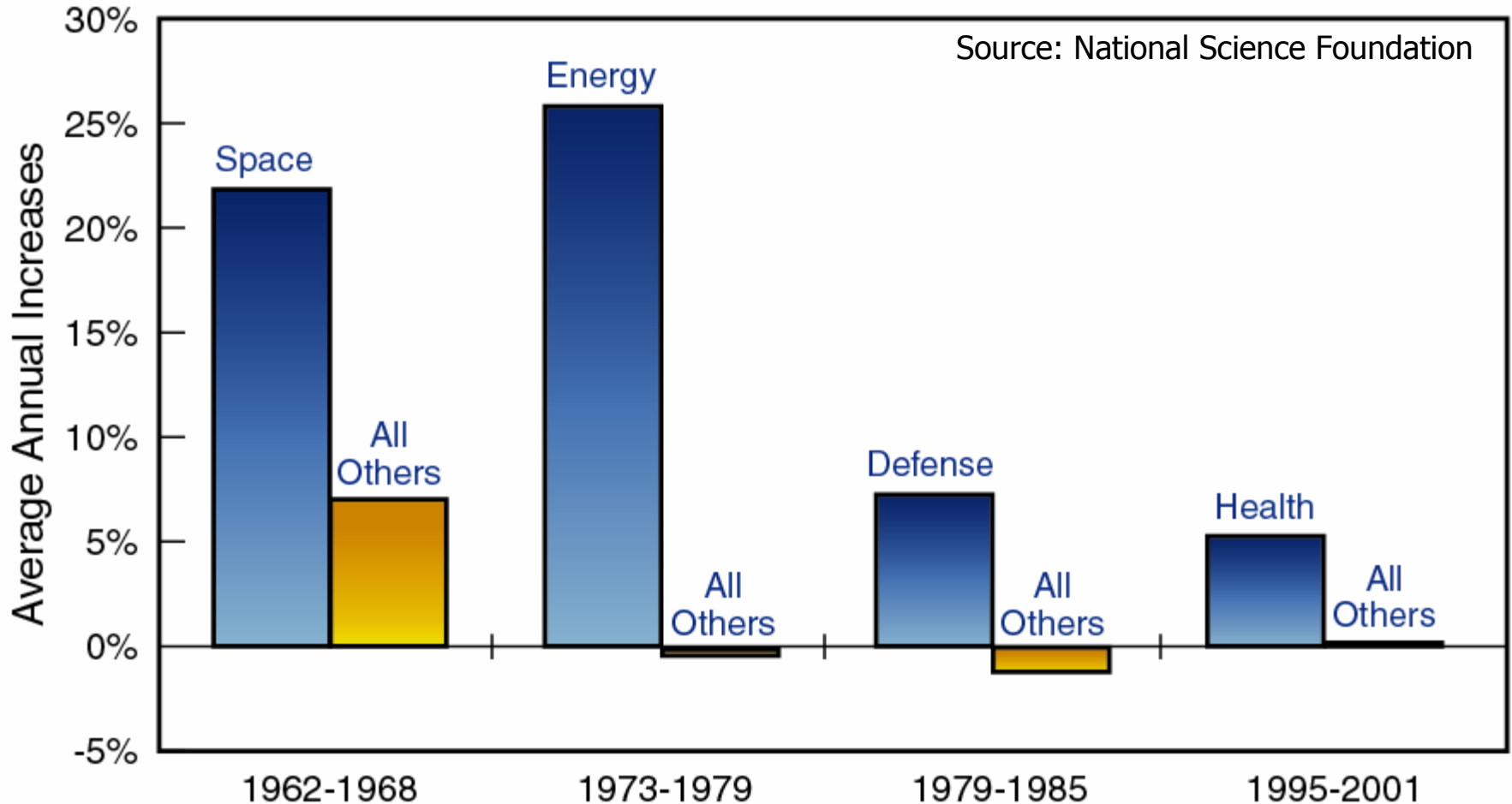
Sustainability of Research Support

- The current situation
 - Federal government
 - Focused on terrorism now (see historical slide)
 - Industry
 - Variable
 - States
 - Support for higher education is down in general
 - Endowments and foundations
 - Down somewhat

Historical Perspective

R&D Balance Includes Setting Priorities

(Obligations, in 1996 constant dollars)



Federal Support of Research

- Tax cuts and poor economy → less money for all discretionary spending, including research
- More focus on applied research
 - Post 9/11 research
- Unfunded mandates
- Post 9/11 restrictions

State Support of Research

- State support of public universities is decreasing and will not proportionally increase after and if the economy improves.
- Universities should properly portray their contributions to state economic development.
 - Graduates are the best form of “tech transfer”

State Support: Steps to Take

- Targeted requests for major research facilities and personnel
 - Example: Kansas bond issue
- Economic development for
 - The state
 - The university community

University Support: Steps to Take

- Team-oriented, interdisciplinary research as the norm.
- How to organize?
 - Research centers, not departments
 - Research/education: a false dichotomy?
 - Implications for Academic Affairs/Research
 - The current tenure system
 - Example: KU Centers (next slides)

Scholarship Reconsidered

Ernest L. Boyer

“Now is the time, we conclude, to build bridges across the disciplines, and connect the campus to the larger world.”

“The conclusion is clear. We need scholars who not only skillfully explore the frontiers of knowledge, but also integrate ideas, connect thought to action, and inspire students.”

KU Designated Center Criteria

- Interdisciplinary research focus
- World class
 - Invited to all the right meetings
 - \$5 million funding/year (\$10 million as a near term target) or equivalent stature in field
 - Prestige (publications, presentations, etc.)
 - “You know you are in a center”
- Ties to academic units
- Education, especially graduate education
- Significant return on investment

Organizing the University for Research Success

- Research centers should report centrally and not to academic units
 - Promotes interdisciplinarity
 - Allows them to focus on research
- Must address credit and internal funding to avoid bureaucratic competition between centers and academic units
- If properly organized, the good deans and department chairs will want their faculty members to work in research centers

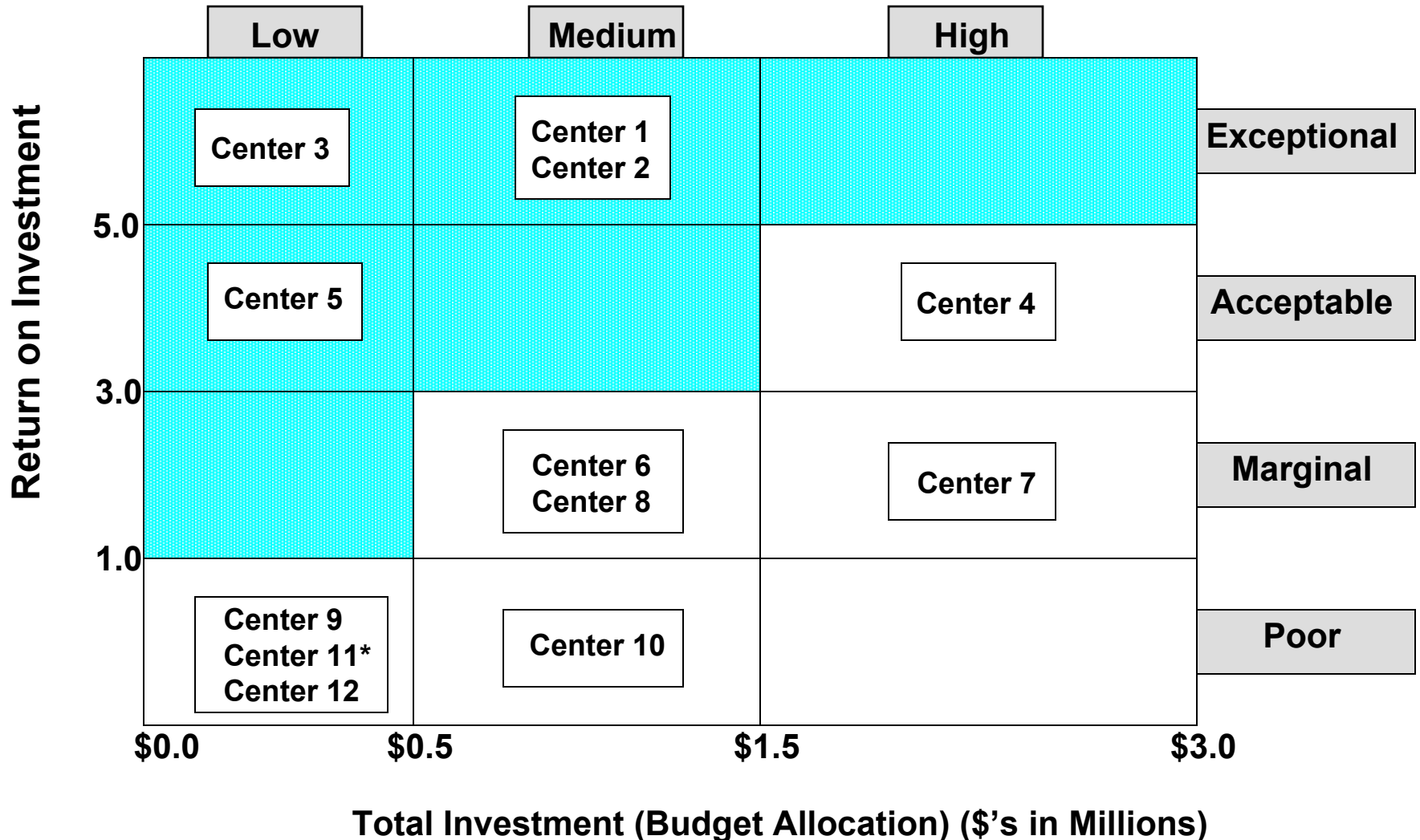
Avoiding Competition Between Research Centers and Academic Units

- Matrix model of research centers and academic units
- Algorithmically return research overhead funds to **BOTH** deans and center directors
- Assign research credit in multiple ways
 - Individual researcher => dean and chair
 - Grant or contract => center director

Measuring Research Center Performance

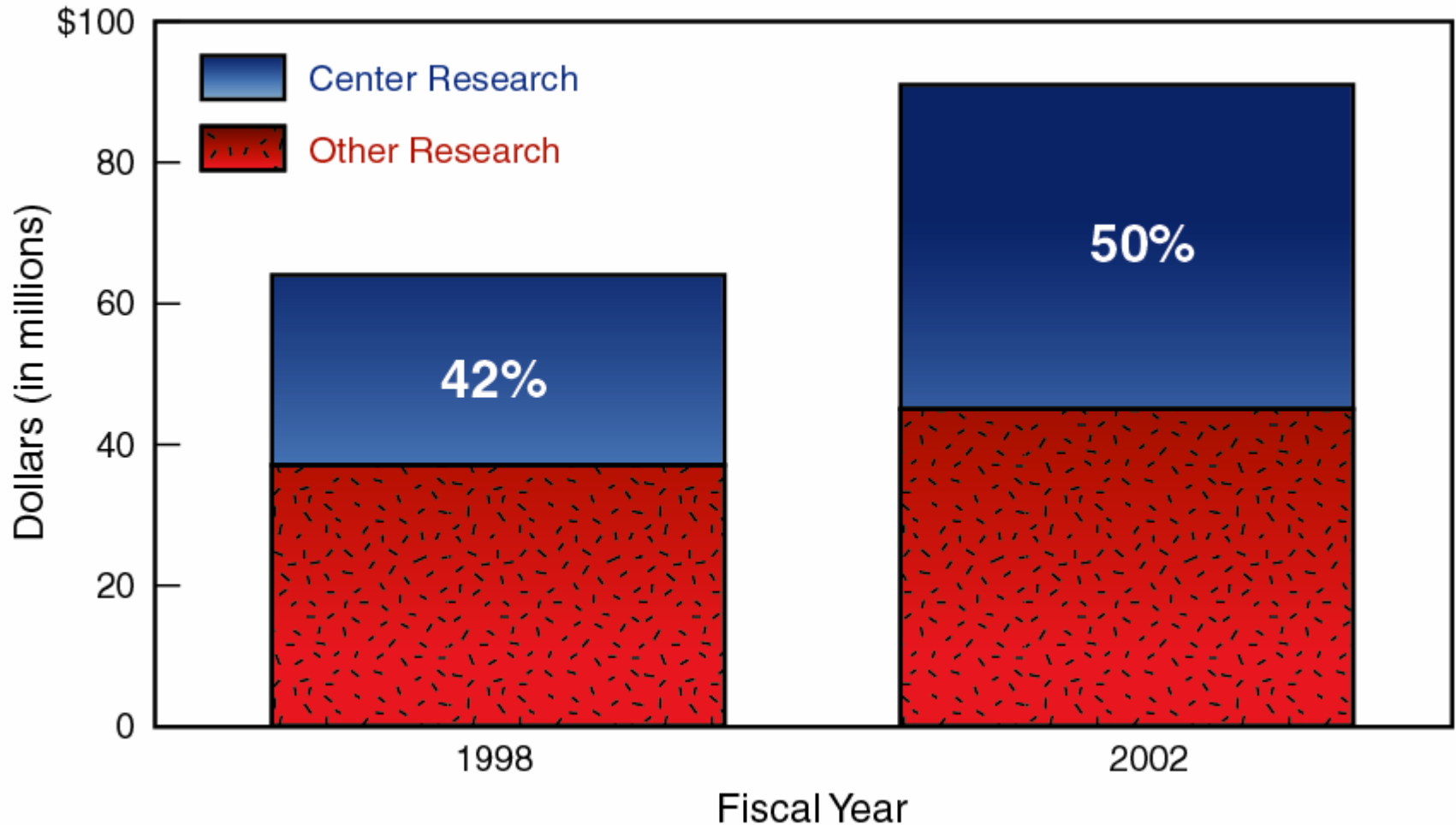
- Publications
- Volume of grants and contracts
- Prestigious awards
- National leadership
- The nitty-gritty: Return-on-investment

Federal Science and Engineering Expenditures Return on Investment (FY01)

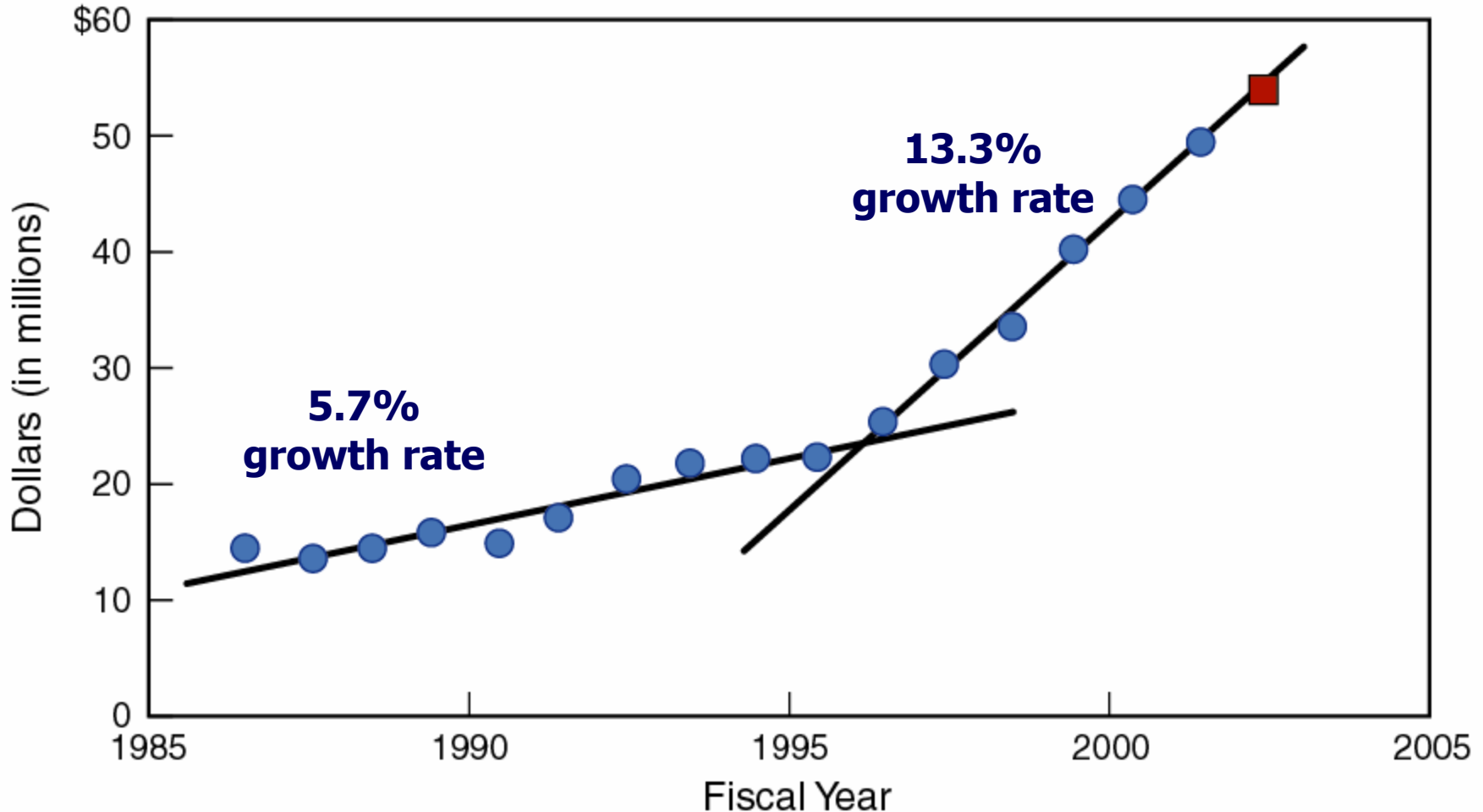


* - Exempted from reductions because of excellent qualitative results.

Growth of Sponsored Project Research Expenditures in Centers at KU Lawrence Campus

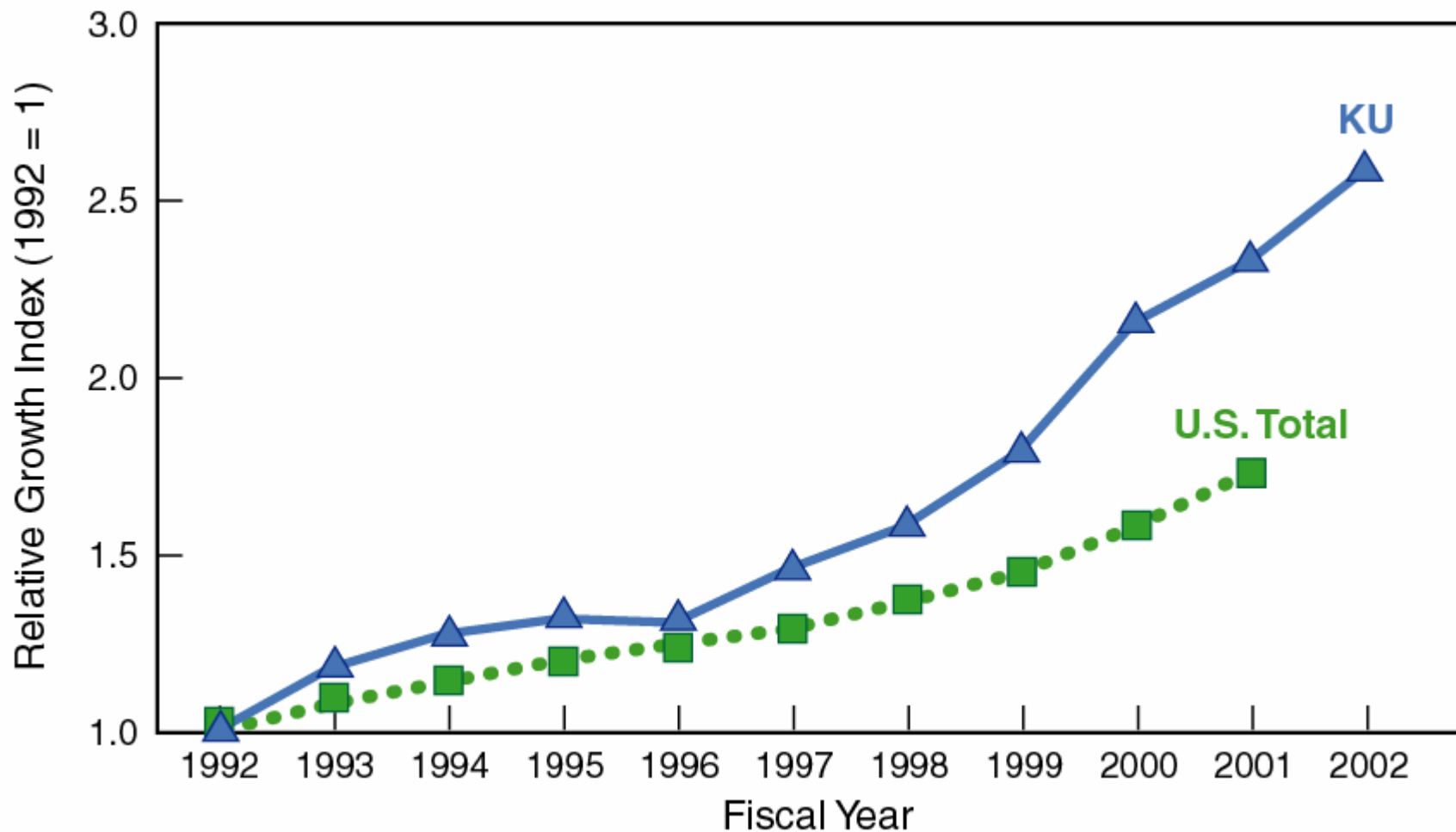


Lawrence Campus Federal Science and Engineering Research Expenditures



Relative Growth in Federal Science and Engineering Research Expenditures

University of Kansas Compared to All U.S. Universities



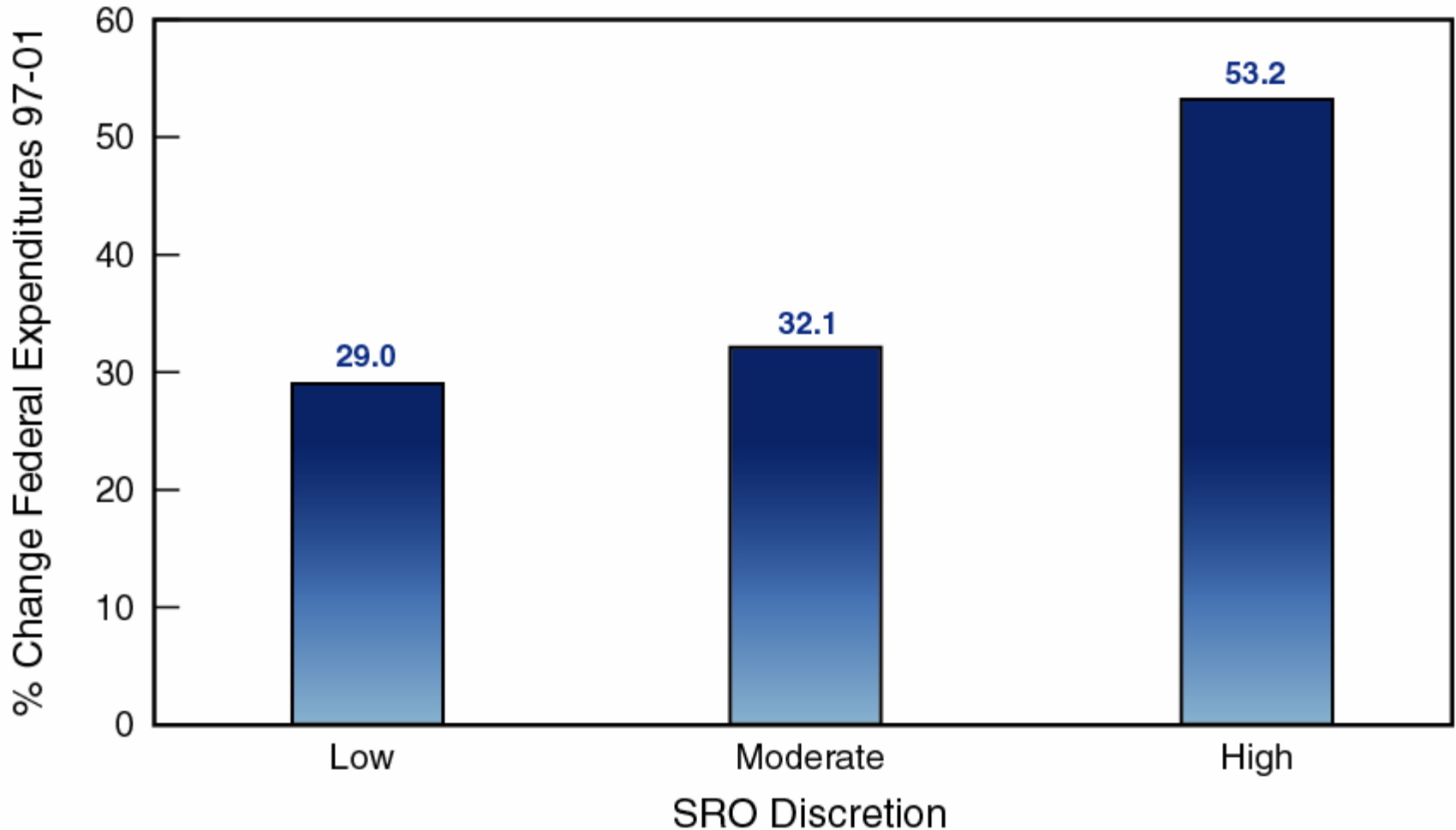
What Else Does It Take?

- Leadership at all levels
- Campus buy-in and pervasive conversation about research
- Promotion of large interdisciplinary projects
- Central consolidation of research funds
- Measurement of results
- An avenue for financial flexibility in acquiring research space and equipment

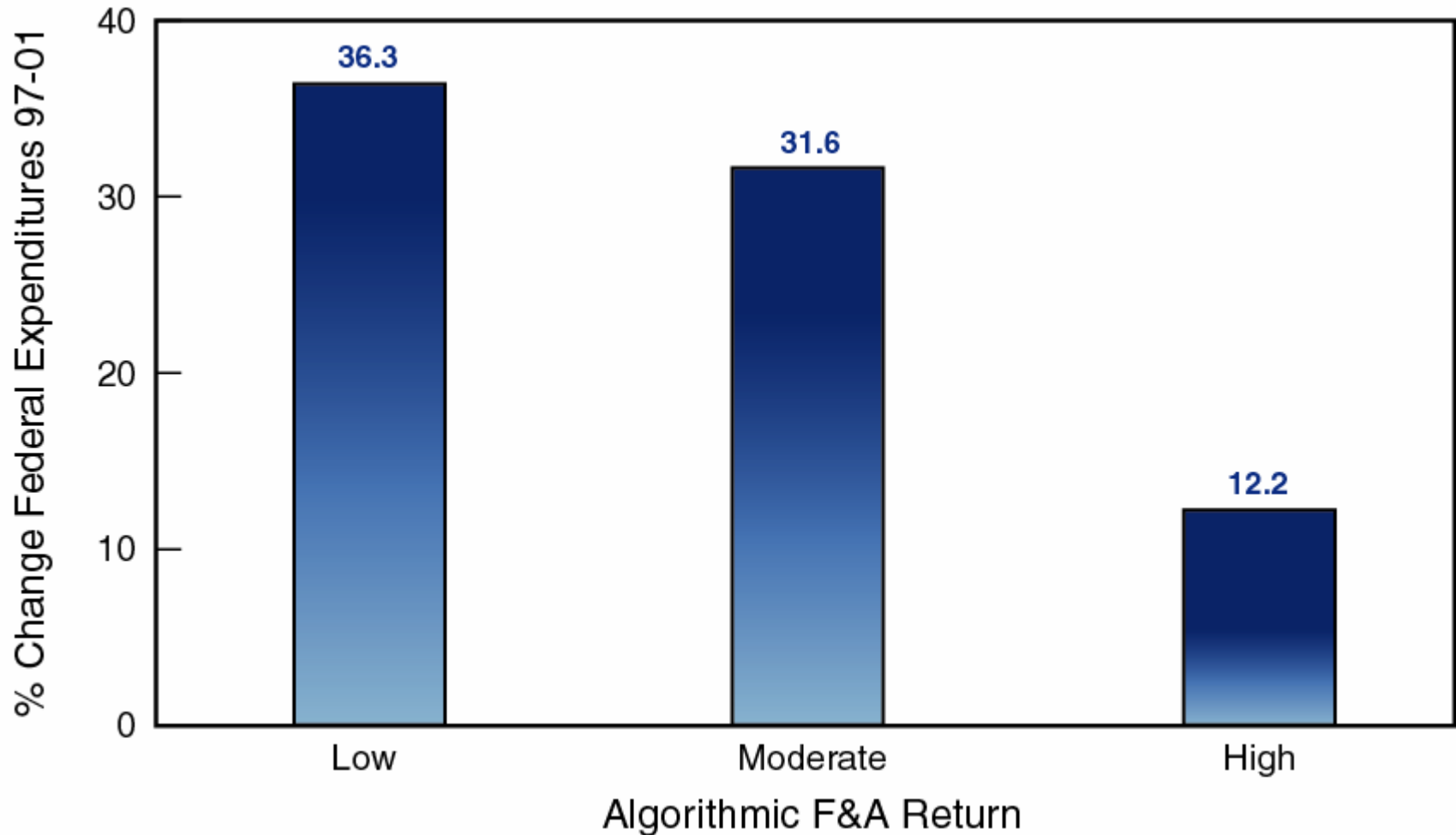
Central Control of Research Funds

- University budgeted funds for research
 - Research centers
 - Internal research grants
 - Core support laboratories
- Research overhead funds
 - Allows for big investments
 - Allows for strategic actions
 - Avoids dispersal of little ineffective sums
 - Can still have some algorithmic return to deans, chairs, directors, and PIs

Relationship Between Senior Research Officer Discretion over F&A Funds and Growth in Federally Financed Research Expenditures



Relationship between Algorithmic F&A Return and Growth in Federally Financed Research Expenditures



The Future

- Perhaps universities should organize themselves around centers instead of academic departments
- What would a centers-based university look like? Would centers:
 - **Award degrees?**
 - **Researchers receive tenure?**

The Future (continued)

- Caveat: Centers must be careful and retain their flexible/meritocracy nature so they don't turn into new versions of departments
- The university must still be able to turn out professionals and focus on disciplines
- Can we have it both ways?

Innovative Thinking

- *"Hell, there are no rules here, we're trying to accomplish something."*
~ Thomas Edison
- *"The human mind treats a new idea the same way the body treats a strange protein: it rejects it."*
~ P.B. Medwar
- *The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift.*
~ Albert Einstein

Innovative Research Leadership

- Leadership at every level needed
- Trust
 - Ethics essential
- Collaboration
 - Make it easy
- Flexibility
 - Remove barriers to big projects.

Closing Statement

"Without vision, the people perish."

~ Proverbs

(Inscribed on the wall of the House Science Committee)

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