THE COUNCIL FOR CHEMICAL RESEARCH

A Workshop on

Assessing and Enhancing the Impact of Science R&D in the US: Chemical Sciences

held at the

National Science Foundation

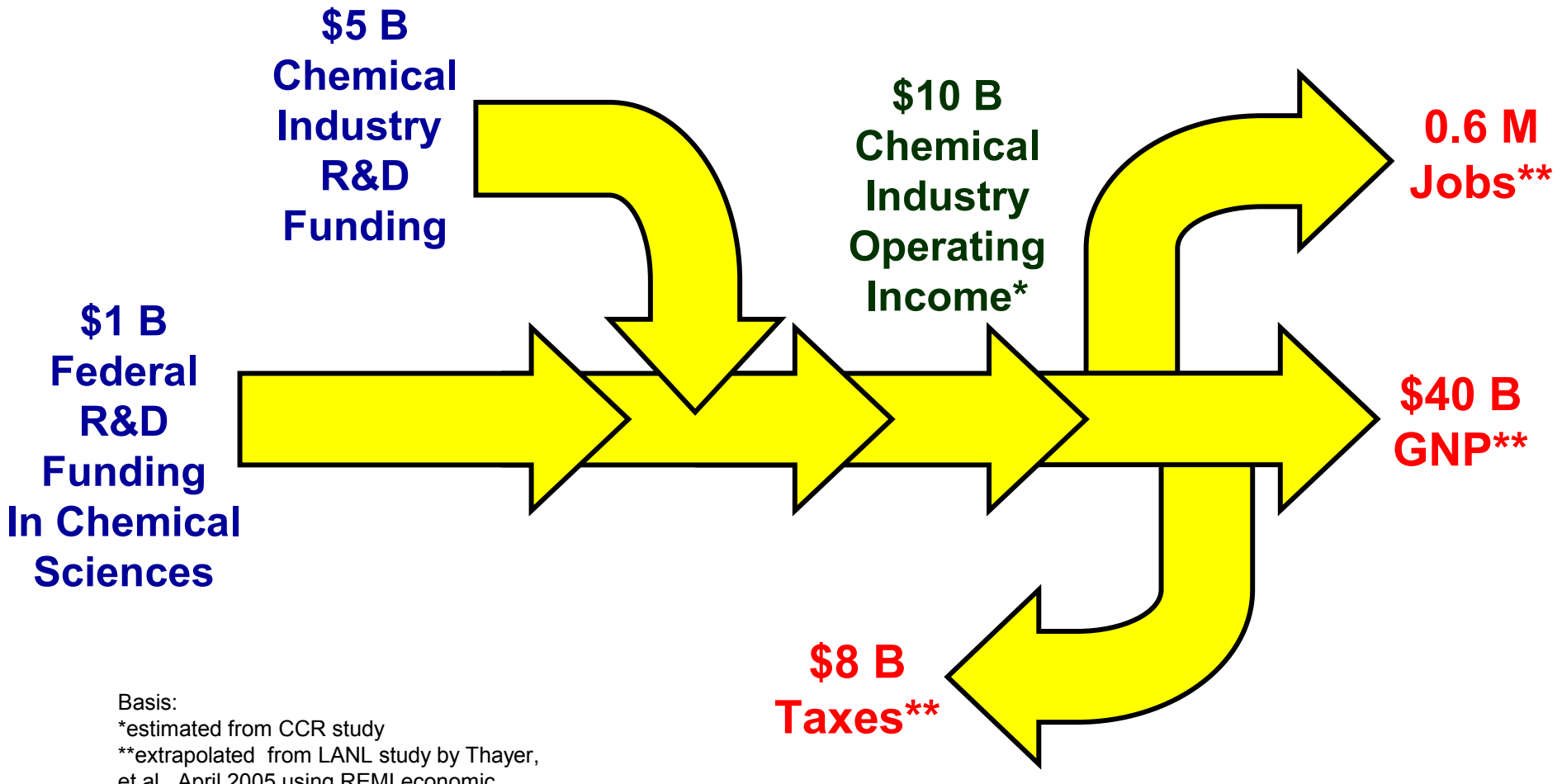
Arlington, VA

November 17, 2009

CCR Studies on Impact of R&D

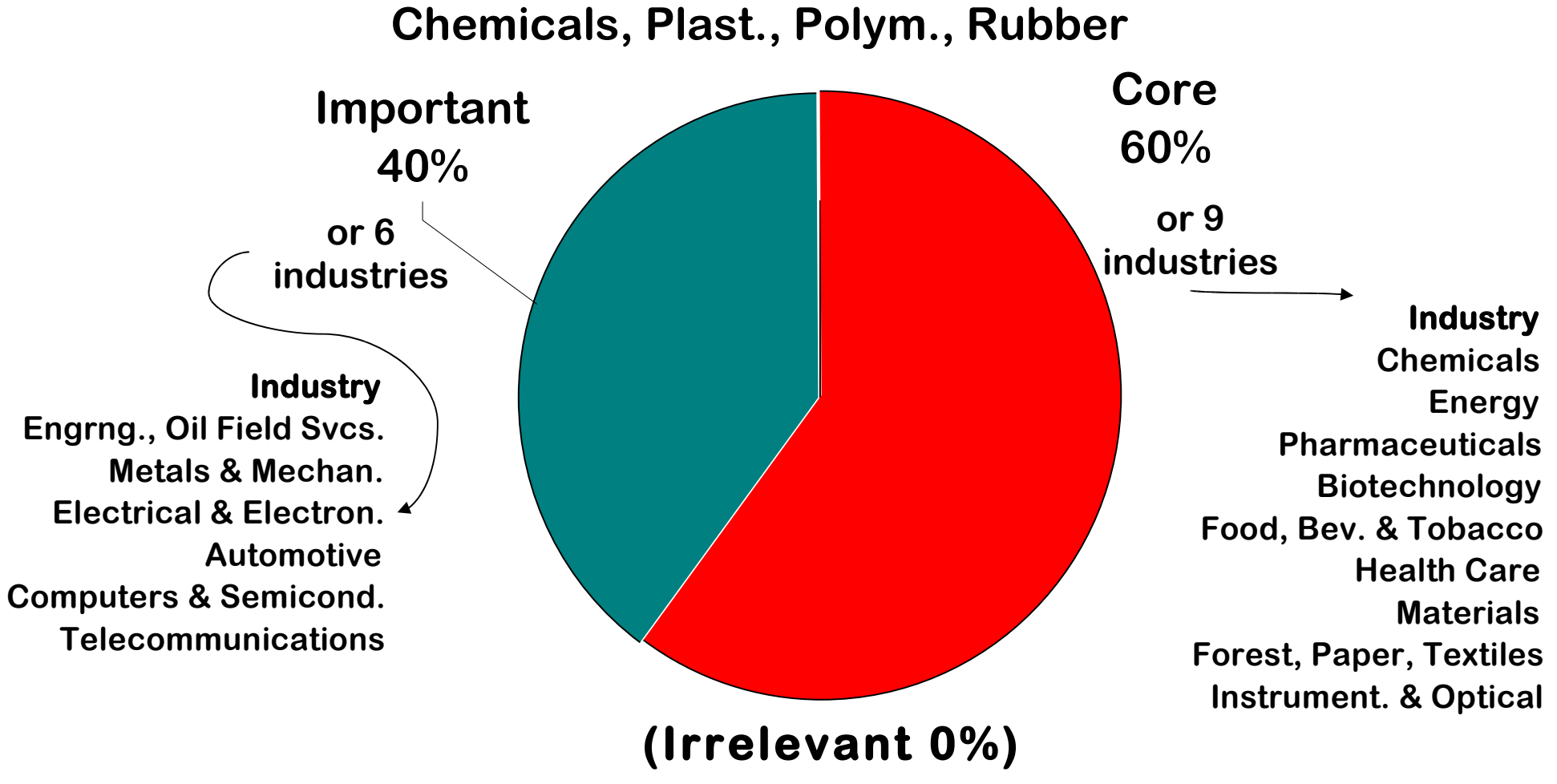
- **Results of the 5 year (2 phase) study were published in two reports:**
  - ***"Measuring Up: R&D Counts for the Chemical Industry"*** *– 2001*
  - ***"Measure for Measure: Chemical R&D Powers the U.S. Innovation Engine"*** *- 2005*

Macroeconomic Implications



Basis:
*estimated from CCR study
**extrapolated from LANL study by Thayer, et al., April 2005 using REMI economic model

Chemical technology creation is core or important in all 15 of the industries



CCR Studies - Overall Conclusions

- Chemical companies get $2 of operating income for every $1 of R&D invested; that's a 17% after tax return
- Chemical technology is highly dependent on publicly funded chemical science research
- U.S. economy gains roughly $40 dollars in GDP growth and $8 in increased tax revenues for every dollar of federal investment in chemical sciences research
- Technology quality, innovation speed and strong scientific links deliver greater shareholder value
- All industries are significantly impacted by the chemical sciences. It is the most enabling science and technology
- The big opportunity is to reduce the 20-year innovation time lag from initial public research funding to commercialization

to continue the discussion…

A Follow-on Study

Questions of Interest:

- How can we measure the broad (economic, social and scientific) impact of scientific research?
- What is the nexus between industrial and federal investments in science R&D?
- How can an optimal portfolio of (public and private) science R&D investments be characterized?
- How can economics inform the accountability process related to federal R&D investments?

Workshop Objective

- To bring together academic scholars and industry experts to discuss the state of knowledge about the impact of science R&D in the United States, focusing on chemical sciences and related industries.
- The workshop was intended to advance our understanding of how to characterize an optimal portfolio of R&D investment in the chemical sciences, and what economic analyses could be used to guide a public-sector support strategy.
- The timing of the workshop was particularly important, given the importance of science R&D in the centerpiece of the American Recovery and Reinvestment Act of 2009.
- An intended output of this workshop was the identification of useful and important directions for relevant future scholarship.

Workshop Agenda

8:30 – 8:45 Opening Remarks
Arden L. Bement, Jr., Director of the NSF

8:45 – 9:00 Welcome, Purpose of the Workshop, and Overview of the Day
Kelsey D. Cook, NSF and **Hratch G. Semerjian**, CCR

9:00 – 10:00 ***Understanding the Impact of R&D in the Context of the Chemical Sciences***
Baruch Lev, NYU
Discussant, **Adam Jaffe,** Brandeis

10:15 – 11:15 ***Indicators of R&D Performance in the Chemical Sciences Industry***
Fiona Murray, MIT
Discussant, **Bob Cava**, Princeton

11:15 – 12:15 ***The Role of Public Infrastructure in the Context of the Chemical Sciences***
John Scott, Dartmouth College
Discussant, **Greg Tassey**, NIST

Workshop Agenda (Cont'd)

Lunch speaker, **Katie Hunt**, Dow Chemical,
Leadership at the Intersection of Innovation and Globalization

1:15 – 2:15 ***Returns to Public R&D Investments in Chemical Science: Empirical Evidence***
Bronwyn Hall, UC Berkeley
Discussant, **Albert Link**, University of North Carolina at Greensboro

2:30 – 3:45 ***Lessons Learned from the Day: Academic and Industry Perspectives***
Wes Cohen, Duke

Panel Discussion, Moderator, **Wes Cohen**
Robert Boege, ASTRA
Robert Fry, DuPont
Katie Hunt, Dow Chemical
Matt Yates, Eli Lilly
Robert Wikman. BASF

3:45 – 4:00 Closing Remarks and Next Steps
Kelsey Cook and **Julia Lane**, NSF

Summary of Findings

- Investors systematically undervalue publicly-traded R&D companies because of deficient financial disclosure standards
- Underinvestment in R&D falls under the rubric of market failure
- Companies cannot fully appropriate the returns to their investments in R&D
- Shares of R&D-intensive companies are systematically undervalued due to asymmetry of information between company stakeholders and potential investors
- This leads to excessive cost of capital, which in turn leads to underinvestment in R&D

Summary of Findings (Cont'd)

- Undervaluation of stocks result in "*abnormal returns*" in future years
- Better accounting standards and disclosure of information about innovative activities could lower the private hurdle rate for investments
- Both *Ex post* and *Ex ante* cross-sectional studies could be significantly improved
- Evaluation of social and scientific impact need to be enhanced
- Scientific trends re. pubs and patents (compared to other developing countries), and paucity of collaborations between industry and academic scientists are disturbing

Recent IP Workshop

Intellectual Property Issues Affecting
Industry – University Partnerships

Arlington, VA, April 3-4, 2008

This workshop was focused on IP issues related to:

- **The Chemical Research Enterprise**
- **Industry-sponsored university research, collaboration, and forward licensing**

Workshop objectives were to:

- **Identify challenges to developing effective agreements**
- **Discuss implications of US tax laws on partnerships**
- **Identify best practices for risk sharing**
- **Examine partnership models in other countries**
- **Identify strategies for developing model agreements**

CTO Roundtable

January 28. 2010

Questions of Interest

- Does an increase in US based R&D translate into an increase in manufacturing activity in the US?
- What type of tax and other incentives can the Federal government provide to encourage global companies to locate their R&D facilities in the US?
- What type of tax and other incentives can the Federal government provide to encourage global companies to locate their manufacturing facilities in the US?
- How can the Federal government encourage industry to increase its R&D investments in the US and contribute to the goal of the current Administration to increase total US R&D investments (public and private) up to 3% of GDP?
- How can the Federal government accelerate US innovation?
-