



Innovation & the Role of Public-private Partnerships in the Knowledge-based Economy

OECD Global Forum on the Knowledge Economy
Brasilia, 2002

Dr. Sujai Shivakumar

Board on Science, Technology & Economic Policy

U.S. National Academies



Science Based Growth

- The New Economy
 - Not a conceptual fad, but a long-term productivity shift of major significance
 - Key feature: integration of advanced productivity enhancing technologies into processes of production and value creation
 - U.S. productivity growth reflects this:
 - +5%, average growth Q1 Q2 2002
 - +2.2% average annual growth since 1995
 - 2001 Report of Council of Economic Advisors



Fostering Science Based Growth

- Basic Research Underpins Science Based Growth
 - Basic research is key in supplying new ideas
 - Innovations can become products driving growth
- In the U.S., increased attention to partnerships & role of universities
- Elsewhere, (e.g. E.U.) reflected in increased commitments to R&D funding
- Genuine ambivalence in U.S. about the partnership organizations despite current practice & past success.
- Academy Study to Ease Ambivalence.



Academies' Study of Public-private Partnerships

- **Program-based analysis of U.S. partnerships**
 - Committee led by Gordon Moore includes nationally recognized members from Academia, Industry, Venture Capitalists, Public Policy Experts
 - Focus on “best practice” to generate positive policy recommendations
- **Topics**
 - Drivers of cooperation among industry, government, and universities
 - Operational Assessments of Current Programs
 - Emerging Needs in Information Technology and Biotechnology
 - Changing Role of Government Laboratories, Universities, and other Research Organizations
- **Outputs**
 - Meetings, Workshops, and Conferences
 - 11 Major Reports



U.S. Public-private Partnerships

- U.S. has long benefited from cooperation between government and private firms
 - Muskets & Telegraph to Semiconductors and Computers
 - “Government has played an important role in the technology development and transfer in almost every U.S. industry that has become competitive on a global scale”—Vernon Ruttan



Drivers of Partnerships

- **Micro level Incentives...**
 - Obstacles to investments needed to bring forward promising technologies
 - Given risks, do firms expect to capture enough payoff from their investment? *The Appropriability Problem?*
 - What is the nature of the good--High Spillover?
 - What are the obstacles to knowledge coordination?
 - Is it difficult to assign and enforce intellectual property protection?



Drivers of Partnerships

- ...And Macro Outcomes
 - By helping firms to overcome various barriers to investment, public-private partnerships can contribute to the development of industrial processes, products, and services that might not otherwise emerge spontaneously
 - In this way, public-private partnership help address government missions and generate greater public welfare



Varieties of Partnerships

- Academy Study has focused on 3 types
 - **Industry Consortia**
 - **Innovation Funding**
 - **Laboratory-based S&T Clusters**
- **Pragmatic Approach**
 - Avoids ideological debates
 - Are partnerships shaped properly—at the program and aggregate levels—to achieve the desired benefits?



1. Industry Consortia

- In an R&D consortium, a certain portion and type of a participating company's R&D is funneled into a separate organization where it is carried out collectively, and where research results are shared among member firms.
 - Useful in high spillover technologies
 - Government role
 - legally enable cooperation
 - Limited funding is key for catalytic effect
 - Limits on time & amount
 - Example: SEMATECH, ATP



2. Innovation Funding

- **Awards help the early-stage funding requirements faced by firms in the innovation-to-market process.**
- **Imperfections in capital markets can sometimes pose major challenges to small firms trying to bring their innovations to market.**
 - **Small Business Innovation Research Program**
 - Largest U.S. Partnership Program (\$1.2 billion over 10 federal agencies)
 - **Advanced Technology Program**
 - Found to be one of the most effective major innovation funding partnerships today.



3. Laboratory-based S&T Clusters

- To promote innovation-led growth
by encouraging knowledge-based clusters
around the nucleus of national laboratories

Academy has studied

- Sandia S&T Park
- Ames-NASA S&T Park



Conditions for Successful Partnerships

- **At the policy level**
 - **Federal government policies shape the larger environment in which innovation takes place**
 - These relate to
 - Fiscal and Monetary Policy
 - Education and Training
 - Trade Promotion and Expansion
 - Regulatory Policy
 - Intellectual Property Protection
 - Government Procurement



Conditions for Successful Partnerships

- At the Operational Level:
 - Although partnerships vary in scale, mission, and scope, successful partnerships appear to share some similar broad characteristics:
 - Industry based Leadership
 - The relevance of Clear Goals, Metrics & Roadmaps
 - Shared Commitments & Costs
 - The importance of Regular Assessment



Industry Leadership

- **Industry-based leadership.**
 - Provides credibility & vital informal contacts.
 - Averts fragmentation over competing objectives.
 - Ensures that research agenda is valid and current.
 - Helps focus research by setting clear research objectives.
 - Willingness to change—Stop, Drop, and Recommit.
 - Can convey message of the partnership with one voice.
 - In the case of SEMATECH, the commitment of senior management of the participating firms was essential.



Roadmaps

- **Technology Roadmaps set out the basic relationships among science, technology, and applications, as a point of reference among researchers, technologists, project managers, suppliers, and users.**
 - Complex technologies offer multiple research trajectories.
 - Roadmaps anticipate problems of research coordination among multiple participants.
 - Example: SIA technology roadmaps.



Shared Commitments and Costs

- Having a sizeable stake in the outcome of the partnership enhances the motivation of those involved to succeed.
- Limited and defined public participation.
 - Not open-ended.
- Helps terminate efforts that are not meeting objectives.
 - Markets are the ultimate arbiter.
 - Helps avoid “friends of the minister” problems.
- **Example: matching requirement of ATP.**



Assessment

- **Ongoing assessment programs are an integral part of a well-constructed partnership.**
- **Need to clearly articulate goals & metrics of progress.**
 - How do we know we are succeeding?
- **Knowledge Generation: Need for institutional learning from evaluations.**
- **Example:**
 - ATP incorporates a rigorous competitive selection process with an independent evaluation of the project's technical and commercial merit, as well as the potential for broad-based economic benefits.
 - ATP awards are regularly followed and assessed.



Structuring Incentives Within the Context of a Partnership

Improving
Coordination

Improving
Motivation
Effective
Leadership

Improving
Knowledge
Roadmaps
& Metrics

Improving
Cooperation

Shared Costs
& Stakes

Evaluation
& Feedback



Main Lessons

- **Properly constructed, operated, and evaluated, partnerships can provide an effective means of accelerating the progress of technology from the laboratory to the market.**
 - They can play an instrumental role in accelerating the development of new technologies from idea to market.
 - They offer an institutional structure with financial and policy incentives within which firms, universities, and national laboratories can cooperate to advance the development of promising technologies.
 - Regular evaluations are essential for effective partnership.
 - Partnerships can contribute to the competitiveness of industry; however, partnerships are not a panacea.



International Benchmarking

- **In a Global Economy, What Others Do Matters**
 - It is important to:
 - Learn Scope and Focus of National Efforts
 - Learn Best Practice in Program Conception, Operation, and Evaluation
 - Seek Opportunities for Global Collaboration



Collaborative Conferences & Activities

- Institute of Enterprise and Innovation of the Nottingham University Business School : September 2000
- Otaniemi International Innovation Centre and the Helsinki University of Technology (HUT): September 2000
- German Federal Ministry of Economics and Technology, Berlin: May 2001
- Hamburg Institute of International Economics (HWWA), May 2001
- Swedish Foundation for Small Business Research (FSF): December 2001
- OECD Technology and Innovation Policy Working Group: December 2001
- French National Academy of Technology, Paris: March 2002
- J. K. Ing, International Business School and Vinnova, May 2002

And Upcoming...

- *Consejo Nacional de Ciencia y Tecnologia (CONACyT), Mexico: December 2002*
- *Ministry of Industry, France: January 2003*
- *DIW, Berlin: June 2003*