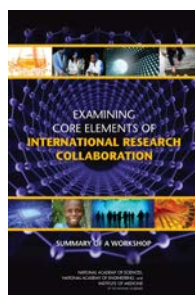


A PATENT SYSTEM FOR A NEW INNOVATION ECOSYSTEM

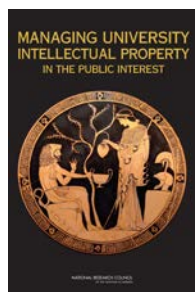
Government-University-Industry Research Roundtable
Select Reports from the National Academies

INTELLECTUAL PROPERTY

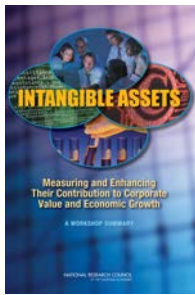


EXAMINING CORE ELEMENTS OF INTERNATIONAL RESEARCH COLLABORATION (2011) – The globalization of science, engineering, and medical research is proceeding rapidly. The globalization of research has important implications for the U.S. research enterprise, for the U.S. government agencies, academic institutions, and companies that support and perform research, and for the world at large. As science and technology capabilities grow around the world, U.S.-based organizations are finding that international collaborations and partnerships provide unique opportunities to enhance research and training. At the same time, significant obstacles exist to smooth collaboration across national borders. Enhancing international collaboration requires recognition of differences in culture, legitimate national security needs, and critical needs in education and training. One primary goal of the workshop is to better understand the risks involved in international research collaboration for organizations and individual participants, and the mechanisms that can be used to manage those risks.

ESTABLISHING PRECOMPETITIVE COLLABORATIONS TO STIMULATE GENOMICS-DRIVEN DRUG DEVELOPMENT: WORKSHOP SUMMARY (2011) – Despite the many basic research discoveries in genetics, relatively few gene-based treatments, drugs, or preventative measures have been developed. One way to bridge this gap may be for industry, academia, and government to develop partnerships that share resources while distributing risk. However, intellectual property protections and other barriers can inhibit collaborative efforts. The Institute of Medicine held a workshop on July 22, 2010, to explore these issues and develop solutions.



MANAGING UNIVERSITY INTELLECTUAL PROPERTY IN THE PUBLIC INTEREST (2010) – Thirty years ago federal policy underwent a major change through the Bayh-Dole Act of 1980, which fostered greater uniformity in the way research agencies treat inventions arising from the work they sponsor. Before the Act, if government agencies funded university research, the funding agency retained ownership of the knowledge and technologies that resulted. However, very little federally funded research was actually commercialized. As a result of the Act's passage, patenting and licensing activity from such research has accelerated. Although the system created by the Act has remained stable, it has generated debate about whether it might impede other forms of knowledge transfer. Concerns have also arisen that universities might prioritize commercialization at the expense of their traditional mission to pursue fundamental knowledge—for example, by steering research away from curiosity-driven topics toward applications that could yield financial returns. The present volume summarizes the committee's principal findings and recommendations.

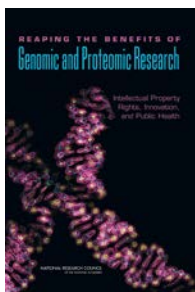
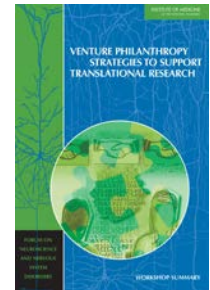


INTANGIBLE ASSETS: MEASURING AND ENHANCING THEIR CONTRIBUTION (2012)

Intangible assets--which include computer software, research and development (R&D), intellectual property, workforce training, and spending to raise the efficiency and brand identification of firms--comprise a subset of services, which, in turn, accounts for three-quarters of all economic activity. Increasingly, intangibles are a principal driver of the competitiveness of U.S.-based firms, economic growth, and opportunities for U.S. workers. Yet, despite these developments, many intangible assets are not reported by companies, and, in the national economic accounts, they are treated as expenses rather than investments. On June 23, 2008, a workshop was held to examine measurement of intangibles and their role in the U.S. and global economies. The workshop, summarized in the present volume, included discussions of a range of policy-relevant topics, including: what intangibles are and how they work; the variety and scale of emerging markets in intangibles; and what the government's role should be in supporting markets and promoting investment in intangibles.

VENTURE PHILANTHROPY STRATEGIES TO SUPPORT TRANSLATIONAL RESEARCH: WORKSHOP SUMMARY (2009)

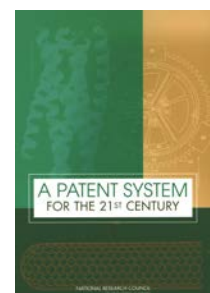
Many voluntary health organizations fund translational research. An increasing number of these organizations are looking at venture philanthropy as a critical way to advance their missions of helping patients and working to cure disease. A wide range of participants gathered on October 3, 2008 at the Beckman Center of the National Academies of Science for a workshop titled "Venture Philanthropy Strategies Used by Patient Organizations to Support Translational Research." Participants with experience in venture philanthropy shared their experiences and lessons learned in order to improve efficiency and effectiveness in translational research.



REAPING THE BENEFITS OF GENOMIC AND PROTEOMIC RESEARCH: INTELLECTUAL PROPERTY RIGHTS, INNOVATION, AND PUBLIC HEALTH (2006)

The patenting and licensing of human genetic material and proteins represents an extension of intellectual property (IP) rights to naturally occurring biological material and scientific information, much of it well upstream of drugs and other disease therapies. This report concludes that IP restrictions rarely impose significant burdens on biomedical research, but there are reasons to be apprehensive about their future impact on scientific advances in this area. The report recommends 13 actions that policy-makers, courts, universities, and health and patent officials should take to prevent the increasingly complex web of IP protections from getting in the way of potential breakthroughs in genomic and proteomic research. It endorses the National Institutes of Health guidelines for technology licensing, data sharing, and research material exchanges and says that oversight of compliance should be strengthened. It recommends enactment of a statutory exception from infringement liability for research on a patented invention and raising the bar somewhat to qualify for a patent on upstream research discoveries in biotechnology. With respect to genetic diagnostic tests to detect patient mutations associated with certain diseases, the report urges patent holders to allow others to perform the tests for purposes of verifying the results.

A PATENT SYSTEM IN THE 21ST CENTURY (2004) – The U.S. patent system is in an accelerating race with human ingenuity and investments in innovation. In many respects the system has responded with admirable flexibility, but the strain of continual technological change and the greater importance ascribed to patents in a knowledge economy are exposing weaknesses including questionable patent quality, rising transaction costs, impediments to the dissemination of information through patents, and international inconsistencies. A panel including a mix of legal expertise, economists, technologists, and university and corporate officials recommends significant changes in the way the patent system operates. The report urges creation of a mechanism for post-grant challenges to newly issued patents, reinvigoration of the non-obviousness standard to qualify for a patent, strengthening of the U.S. Patent and Trademark Office, simplified and less costly litigation, harmonization of the U.S., European, and Japanese examination process, and protection of some research from patent infringement liability.





PATENTS IN THE KNOWLEDGE-BASED ECONOMY (2003) – This volume assembles papers commissioned by the National Research Council’s Board on Science, Technology, and Economic Policy (STEP) to inform judgments about the significant institutional and policy changes in the patent system made over the past two decades. The chapters fall into three areas. The first four chapters consider the determinants and effects of changes in patent quality. Quality refers to whether patents issued by the U.S. Patent and Trademark Office (USPTO) meet the statutory standards of patentability, including novelty, nonobviousness, and utility. The fifth and sixth chapters consider the growth in patent litigation, which may itself be a function of changes in the quality of contested patents. The final three chapters explore controversies associated with the extension of patents into new domains of technology, including biomedicine, software, and business methods.

INNOVATION

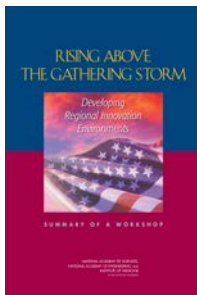
RISING TO THE CHALLENGE: U.S. INNOVATION POLICY FOR THE GLOBAL ECONOMY (2012) – *Rising to the Challenge: U.S. Innovation Policy for Global Economy* emphasizes the importance of sustaining global leadership in the commercialization of innovation which is vital to America's security, its role as a world power, and the welfare of its people. The second decade of the 21st century is witnessing the rise of a global competition that is based on innovative advantage. To this end, both advanced as well as emerging nations are developing and pursuing policies and programs that are in many cases less constrained by ideological limitations on the role of government and the concept of free market economics. The rapid transformation of the global innovation landscape presents tremendous challenges as well as important opportunities for the United States. This report argues that far more vigorous attention be paid to capturing the outputs of innovation - the commercial products, the industries, and particularly high-quality jobs to restore full employment. America's economic and national security future depends on our succeeding in this endeavor.



CONTINUING INNOVATION IN INFORMATION TECHNOLOGY (2012) – In 1995, the National Research Council's Computer Science and Telecommunications Board (CSTB) produced the report *Evolving the High Performance Computing and Communications Initiative to Support the Nation's Information Infrastructure*. A graphic in that report, often called the "tire tracks" diagram because of its appearance, produced an extraordinary response by clearly linking government investments in academic and industry research to the ultimate creation of new information technology industries with more than \$1 billion in annual revenue. Used in presentations to Congress and executive branch decision makers and discussed broadly in the research and innovation policy communities, the tire tracks figure dispelled the assumption that the commercially successful IT industry is self-sufficient, underscoring through long incubation periods of years and even decades. The figure was updated in 2002, 2003, and 2009 reports produced by the CSTB. With the support of the National Science Foundation, CSTB updated the tire tracks figure. *Continuing Innovation in Information Technology* includes the updated figure and a brief text based in large part on prior CSTB reports.

MEETING GLOBAL CHALLENGES – U.S.-GERMAN INNOVATION POLICY (2012) –The symposium was held in Berlin and organized jointly by the German Institute for Economic Research (DIW) and the U.S. National Academies with support of the German Federal Ministry for Education and Research (BMBF) and the American Embassy in Berlin. Both U.S. and German participants described common challenges on a wide variety of issues ranging from energy security and climate change to low-emissions transportation, early-stage financing, and workforce training. While recognizing their differences in approach to these challenges, participants on both sides drew out valuable lessons from each other's policies and practices.





RISING ABOVE THE GATHERING STORM: DEVELOPING REGIONAL INNOVATION ENVIRONMENTS: A WORKSHOP SUMMARY (2012) – *Rising Above the Gathering Storm* sparked intense discussion among policy makers, industrial leaders, and the general public. Five years after the release of the *Gathering Storm* report, a second report, *Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5*, assessed changes in America's competitive posture. This report concluded that "our nation's outlook has not improved, but rather has worsened" since the *Gathering Storm* report was released. The report noted examples of other nations that have upgraded their investments in education, technological infrastructure, and innovation systems to a greater extent than has the United States. The ability of the states to drive innovation was the impetus behind a major workshop held in Madison, Wisconsin, on September 20-22, 2011. Titled "Rising Above the Gathering Storm: Developing Regional Innovation Environments," the workshop brought together leaders in education, government, economic development, and industrial innovation to discuss state and regional initiatives to boost competitiveness through science, technology, and innovation. The conference was organized around four major themes: a) Revitalizing K-12 Science and Mathematics Education, b) Strengthening Undergraduate Education in Science and Engineering, c) Building Effective Partnerships Among Governments, Universities, Companies, and Other Stakeholders, d) Fostering Regional Technology Development and Entrepreneurship.

BUILDING THE ARKANSAS INNOVATION ECONOMY: SUMMARY OF A SYMPOSIUM (2012) – *Building the Arkansas Innovation Economy: Summary of a Symposium*, includes both efforts to strengthen existing industries as well as specific new technology focus areas such as nanotechnology, stem cells, and energy in order to better understand program goals, challenges, and accomplishments. As a part of this review, the committee is convening a series of public workshops and symposia involving responsible local, state, and federal officials and other stakeholders. These meetings and symposia will enable an exchange of views, information, experience, and analysis to identify best practice in the range of programs and incentives adopted. Drawing from discussions at these symposia, fact-finding meetings, and commissioned analyses of existing state and regional programs and technology focus areas, the committee will subsequently produce a final report with findings and recommendations focused on lessons, issues, and opportunities for complementary U.S. policies created by these state and regional initiatives.



CLUSTERING FOR 21ST CENTURY PROSPERITY: SUMMARY OF A SYMPOSIUM (2012) – *Clustering for 21st Century Prosperity* identifies best practices with regard to goals, structures, instruments, modes of operation, synergies across private and public programs, funding mechanisms and levels, and evaluation efforts. The committee, under the Board on Science, Technology, and Economic Policy (STEP) is reviewing selected state and regional efforts to capitalize on federal and state investments in areas of critical national needs. This review includes both efforts to strengthen existing industries as well as specific technology focus areas such as nanotechnology, stem cells, and advanced energy in order to better understand program goals, challenges, and accomplishments.

BUILDING HAWAII'S INNOVATION ECONOMY: SUMMARY OF A SYMPOSIUM (2012) – *Building Hawaii's Innovation Economy: Summary of a Symposium* explains the study of selected state and regional programs in order to identify best practices with regard to their goals, structures, instruments, modes of operation, synergies across private and public programs, funding mechanisms and levels, and evaluation efforts. This report reviews selected state and regional efforts to capitalize on federal and state investments in areas of critical national needs. *Building Hawaii's Innovation Economy* also reviews efforts to strengthen existing industries as well as specific new technology focus areas such as nanotechnology, stem cells, and energy in order to better understand program goals, challenges, and accomplishments.

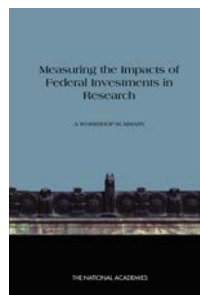
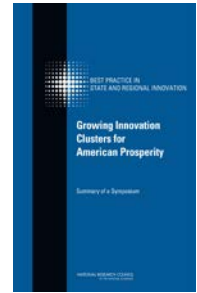




IMPROVING MEASURES OF SCIENCE, TECHNOLOGY, AND INNOVATION- INTERIM REPORT (2012) – *Improving Measures of Science, Technology and Innovation: Interim Report* examines the status of the NCSES's science, technology, and innovation (STI) indicators. This report assesses and provides recommendations regarding the need for revised, refocused, and newly developed indicators designed to better reflect fundamental and rapid changes that are reshaping global science, technology and innovation systems. The book also determines the international scope of STI indicators and the need for developing new indicators that measure developments in innovative activities in the United States and abroad, and Offers foresight on the types of data, metrics and indicators that will be particularly influential in evidentiary policy decision-making for years to come.

GROWING INNOVATION CLUSTERS FOR AMERICAN PROSPERITY: SUMMARY OF A SYMPOSIUM (2011)

– Responding to the challenges of fostering regional growth and employment in an increasingly competitive global economy, many U.S. states and regions have developed programs to attract and grow companies as well as attract the talent and resources necessary to develop innovation clusters. These state and regionally based initiatives have a broad range of goals and increasingly include significant resources, often with a sectoral focus and often in partnership with foundations and universities. These are being joined by recent initiatives to coordinate and concentrate investments from a variety of federal agencies that provide significant resources to develop regional centers of innovation, business incubators, and other strategies to encourage entrepreneurship and high-tech development. This has led to renewed interest in understanding the nature of innovation clusters and public policies associated with successful cluster development. *Growing Innovation Clusters for American Prosperity* captures the presentations and discussions of the 2009 STEP symposium on innovation clusters. It includes an overview highlighting key issues raised at the meeting and a summary of the meeting's presentations. This report has been prepared by the workshop rapporteur as a factual summary of what occurred at the workshop.



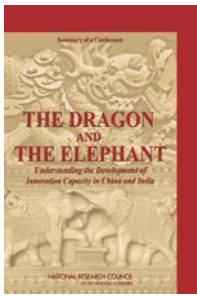
MEASURING THE IMPACTS OF FEDERAL INVESTMENTS IN RESEARCH: A WORKSHOP SUMMARY (2011)

– On April 18-19, 2011, the Board on Science, Technology and Economic Policy (STEP) and the Committee on Science, Engineering and Public Policy (COSEPUP) of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, held a workshop to examine this question. The workshop sought to assemble the range of work that has been done in measuring research outcomes and to provide a forum to discuss its method. The workshop was motivated by a 2009 letter from Congressman Rush Holt (D-New Jersey). He asked the National Academies to look into a variety of complex and interconnected issues, such as the short-term and long-term economic and non-economic impact of federal research funding, factors that determine whether federally funded research discoveries result in economic benefits, and quantification of the impacts of research on national security, the environment, health, education, public welfare, and decision making.

BUILDING THE 21ST CENTURY: U.S. CHINA COOPERATION ON SCIENCE, TECHNOLOGY, AND INNOVATIONS-SUMMARY OF A SYMPOSIUM (2011)

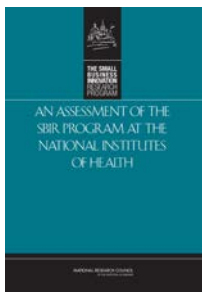
– Understanding the policies that other nations are pursuing to become more innovative and to what effect is essential to understanding how the nature and terms of economic competition are shifting. *Building the 21st Century U.S.-China Cooperation on Science, Technology, and Innovation* studies selected foreign innovation programs and comparing them with major U.S. programs. This analysis of Comparative Innovation Policy includes a review of the goals, concept, structure, operation, funding levels, and evaluation of foreign programs designed to advance the innovation capacity of national economies and enhance their international competitiveness. This analysis focuses on key areas of future growth, such as renewable energy, among others, to generate case-specific recommendations where appropriate.





THE DRAGON AND THE ELEPHANT: UNDERSTANDING THE DEVELOPMENT OF INNOVATION CAPACITY IN CHINA AND INDIA: SUMMARY OF A CONFERENCE (2010) – In the past two decades, China and India have liberalized internal economic policy, treatment of foreign investment, and trade, and have experienced economic growth at sustained high rates. From the point of view of the United States, however, the most important development in the Chinese and Indian economies in the long term may be the strides they are making in developing their own domestic innovation capacities. After a long period of underinvestment, both countries have committed to growing their science and education systems to bolster research and further economic expansion. Some observers of the recent growth have said that both countries are surging in their efforts to spur innovation; others have emphasized the potential of one country over the other; and still others have suggested that both China and India have a long way to go before achieving innovation-driven growth. With such a range of views, The National Academies set out to describe developments in both countries, in relation to each other and the rest of the world, by organizing a conference in Washington, D.C. The conference, summarized in this volume, discussed recent changes at both the macroeconomic level and also in selected industries, and explored the causes and implications of those changes.

21st CENTURY INNOVATION SYSTEMS FOR JAPAN AND THE UNITED STATES: LESSONS FROM A DECADE OF CHANGE: REPORT OF A SYMPOSIUM (2009) – The National Research Council's Board on Science, Technology, and Economic Policy (STEP) has embarked on a study of selected foreign innovation programs in comparison with major U.S. programs. The "21st Century Innovation Systems for the United States and Japan: Lessons from a Decade of Change" symposium reviewed government programs and initiatives to support the development of small- and medium-sized enterprises, government-university- industry collaboration and consortia, and the impact of the intellectual property regime on innovation. This book brings together the papers presented at the conference and provides a historical context of the issues discussed at the symposium.



AN ASSESSMENT OF THE SMALL BUSINESS INNOVATION RESEARCH PROGRAM AT THE NATIONAL INSTITUTES OF HEALTH (2009) – The SBIR program allocates 2.5 percent of 11 federal agencies' extramural R&D budgets to fund R&D projects by small businesses, providing approximately \$2 billion annually in competitive awards. At the request of Congress the National Academies conducted a comprehensive study of how the SBIR program has stimulated technological innovation and used small businesses to meet federal research and development needs. Drawing substantially on new data collection, this book examines the SBIR program at the National Institutes of Health and makes recommendations for improvements. Separate reports will assess the SBIR program at DOD, NSF, DOE, and NASA, respectively, along with a comprehensive report on the entire program.

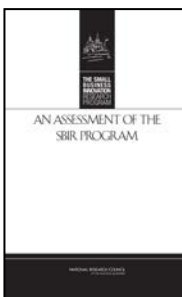
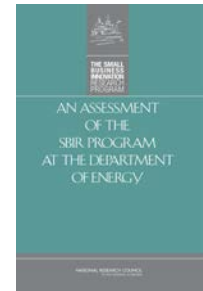
AN ASSESSMENT OF THE SMALL BUSINESS INNOVATION RESEARCH PROGRAM AT THE NATIONAL AERONAUTICS (2009) – The Small Business Innovation Research (SBIR) program is one of the largest examples of U.S. public-private partnerships. Founded in 1982, SBIR was designed to encourage small business to develop new processes and products and to provide quality research in support of the many missions of the U.S. government, including health, energy, the environment, and national defense. In response to a request from the U.S. Congress, the National Research Council assessed SBIR as administered by the five federal agencies that together make up 96 percent of program expenditures. This book, one of six in the series, reports on the SBIR program at the National Aeronautics and Space Administration, and finds that the program is making significant progress in achieving the Congressional goals for the program. Keeping in mind NASA's unique mission and the recent significant changes to the program, the committee found the SBIR program to be sound in concept and effective in practice at NASA.. The book recommends programmatic changes that should make the SBIR program even more effective in achieving its legislative goals.





AN ASSESSMENT OF THE SMALL BUSINESS INNOVATION RESEARCH PROGRAM AT THE DEPARTMENT OF DEFENSE (2009) – The SBIR program allocates 2.5 percent of 11 federal agencies' extramural R&D budgets to fund R&D projects by small businesses, providing approximately \$2 billion annually in competitive awards. At the request of Congress, the National Academies conducted a comprehensive study of how the SBIR program has stimulated technological innovation and used small businesses to meet federal research and development needs. Drawing substantially on new data collection, this book examines the SBIR program at the Department of Defense and makes recommendations for improvements. Separate reports will assess the SBIR program at NSF, NIH, DOE, and NASA, respectively, along with a comprehensive report on the entire program.

AN ASSESSMENT OF THE SMALL BUSINESS INNOVATION RESEARCH PROGRAM AT THE DEPARTMENT OF ENERGY (2008) – The Small Business Innovation Research (SBIR) program is one of the largest examples of U.S. public-private partnerships. Founded in 1982, SBIR was designed to encourage small business to develop new processes and products and to provide quality research in support of the many missions of the U.S. government, including health, energy, the environment, and national defense. In response to a request from the U.S. Congress, the National Research Council assessed SBIR as administered by the five federal agencies that together make up 96 percent of program expenditures. This book, one of six in the series, reports on the SBIR program at the Department of Energy. It finds that, in spite of resource constraints, the DoE has made significant progress in meeting the legislative objectives of SBIR and that the program is effectively addressing the mission of the Department of Energy. The book documents the achievements and challenges of the program and recommends programmatic changes to make the SBIR program even more effective in achieving its legislative goals.



AN ASSESSMENT OF THE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (2008) – The SBIR program allocates 2.5 percent of 11 federal agencies' extramural R&D budgets to fund R&D projects by small businesses, providing approximately \$2 billion annually in competitive awards. At the request of Congress, the National Academies conducted a comprehensive study of how the SBIR program has stimulated technological innovation and used small businesses to meet federal research and development needs. Drawing substantially on new data collection, this report provides a comprehensive overview of the SBIR program at the five agencies representing 96 percent of program expenditure--DOD, NIH, NSF, DOE, and NASA--and makes recommendations on improvements to the program. Separate books on each agency will also be issued.

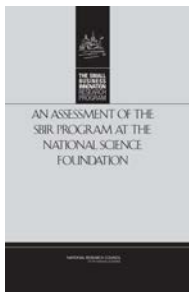
INNOVATIVE FLANDERS: INNOVATION POLICIES FOR THE 21ST CENTURY: REPORT OF A SYMPOSIUM (2008) – Recognizing that innovation is the key to international competitiveness in the 21st century, policymakers around the world are seeking more effective ways to translate scientific and technological knowledge into new products, processes, and businesses. They have initiated major programs, often with substantial funding, that are designed to attract, nurture, and support innovation and high-technology industries within their national economies. To help U.S. policymakers become more aware of these developments, a committee of the National Academies' Board on Science, Technology, and Economic Policy undertook a review of the goals, concept, structure, operation, funding levels, and evaluation efforts of significant innovation programs around the world. As a part of this effort, the committee identified Flanders, a region of Belgium with substantial autonomy, which is recognized for its comprehensive approach to innovation. Based on initial meetings in Washington and Brussels, and with the endorsement of Flanders Vice Minister-President Fientje Moerman, it was agreed to organize a conference that would review regional innovation policies in the context of the policies and programs of the Flanders government, and their interaction with those of the European Union. This book provides a summary of that symposium.





INNOVATION IN GLOBAL INDUSTRIES: U.S. FIRMS COMPETING IN A NEW WORLD (COLLECTED STUDIES) (2008) – The debate over offshoring of production, transfer of technological capabilities, and potential loss of U.S. competitiveness is a long-running one. Prevailing thinking is that the world is flat that is, innovative capacity is spreading uniformly; as new centers of manufacturing emerge, research and development and new product development follow. *Innovation in Global Industries* challenges this thinking. The book, a collection of individually authored studies, examines in detail structural changes in the innovation process in 10 service as well as manufacturing industries: personal computers; semiconductors; flat-panel displays; software; lighting; biotechnology; pharmaceuticals; financial services; logistics; and venture capital. There is no doubt that overall there has been an acceleration in global sourcing of innovation and an emergence of new locations of research capacity and advanced technical skills, but the patterns are highly variable.

INNOVATION POLICIES FOR THE 21ST CENTURY: REPORT OF A SYMPOSIUM (2008) – To mark the opening of a study of Comparative Innovation Policy: Best Practice for the 21st Century the Board on Science, Technology, and Economic Policy (STEP) convened a symposium providing an overview of areas to be examined in the study and topics requiring further policy attention. The event highlighted the policies and programs of leading nations and provided valuable insights into some of the common challenges of growing and supporting high-technology industry and the commercialization of public investments in R&D. This report contains a summary of the symposium proceedings and an introduction analyzing the issues and placing them in a broader policy context.



AN ASSESSMENT OF THE SMALL BUSINESS INNOVATION RESEARCH PROGRAM AT THE NATIONAL SCIENCE FOUNDATION (2009) – The SBIR program allocates 2.5 percent of 11 federal agencies' extramural R&D budgets to fund R&D projects by small businesses, providing approximately \$2 billion annually in competitive awards. At the request of Congress the National Academies conducted a comprehensive study of how the SBIR program has stimulated technological innovation and used small businesses to meet federal research and development needs. Drawing substantially on new data collection, this report examines the SBIR program at the National Science Foundation and makes recommendations for improvements. Separate reports will assess the SBIR program at DOD, NIH, DOE, and NASA, respectively, along with a comprehensive report on the entire program.

NOTE: The publications represented are a selection of National Academies' reports on intellectual property and innovation. For more publications on this topic and other areas, go to www.nap.edu.