OECD CSTP Meeting
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Background paper to BIAC proposals for future work

Last year, the BIAC Technology Committee published its Strategic Vision, which identified some of the substantial economic changes that are affecting value creation through R&D and innovation. We recommended that OECD adopt a cross-cutting approach to the task of understanding the factors that facilitate technological innovation, including:

- Value creation and economic growth in knowledge economies;
- Managing knowledge creation and knowledge use as global activities;
- The consequences of Open Innovation, particularly within Public-Private Partnerships;
- Flows of human capital as well as technology;
- Fostering a high-quality international system for IPR; and
- Analysing the innovation systems of the major emerging economies and their impact on OECD countries.

Such topics illustrate the growing internationalisation and changing nature of R&D, the interdependencies between public and private sectors in executing R&D, and the shift by industry towards supporting greater service content which makes use of new science and technology, as well as casting light on the supportive role that governments should now play in fostering a policy climate that encourages R&D and the commercialization of new innovative products.

We believe that the governments of all OECD countries recognise the importance of these trends and topics, but realise that it can be difficult to take a sufficiently forward-looking view while remaining firmly grounded in terms of key outcomes and benefits. For this reason, we encourage OECD DSTI, in coordination with other OECD directorates, to initiate new research projects that examine innovation policy in two key areas. One of these projects will look at science, technology and innovation in health, a subject which is central to the economic vitality and competitiveness of all developed nations. The second will look at innovation based on the new field of nanotechnology, which offers the prospect of substantial opportunities and benefits but also creates uncertainties in terms of public responses to its application.

Such work requires adequate resource and expert support, and BIAC calls on governments to provide these.

The proposed projects directly relate to the goal held by many OECD member governments of improving their economic competitiveness, strengthening their knowledge base, and attracting increased investment in high-technology sectors. Thus BIAC hopes and anticipates that OECD member governments will support these projects through their participation and funding. Work of this importance cannot be sponsored by BIAC alone, although we will provide all reasonable help in its execution.

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In constructing the projects, we wish to encourage an interdisciplinary, i.e. cross-cutting, approach within the OECD. The aim is to treat economic growth and social development through innovation as the objective, and seek to identify how overall policy packages can be constructed that support and facilitate these goals. We are aware of the difficulties of running cross-cutting projects. However, we feel that it is important to overcome them.

Current projects within the OECD DSTI remain important and of interest to the BIAC Technology Committee, and we will continue to monitor and provide input to them. The attached proposals for innovation in health care and nanotechnology should be read in conjunction with this note.

PART I

SCIENCE, TECHNOLOGY AND INNOVATION IN HEALTH

I. Introduction

OECD member states are concerned to identify and implement policy packages that will foster successful and sustainable economic and social development within increasingly knowledge-oriented societies. The required features include the need for a strong science base, well-educated workforces, and strong science-industry linkages, as well as markets, regulations, standards, and firm structures capable of supporting innovation.

It is also important to understand interdependencies, such as the role of public procurement alongside the commercial market place, the consequences of increasingly global innovation, and the implications of measuring performance or setting performance targets in different ways.

The required packages extend across most or all parts of the public policy arena. The work will have multiple objectives, as it is unlikely that optimal solutions will be found on a piecemeal basis.

This paper proposes that DSTI shall carry out a project to examine science, technology and innovation systems directed at applications in health, an area which is of key importance to all countries. The purpose of the project is to gauge the importance of health-related science, technology and innovation in OECD countries, and to assess the policy environments that these countries adopt in order to sustain the development of useful knowledge in this area. By fostering health-related science, technology and innovation, OECD countries can generate economic growth and better respond to social and health needs. In this respect, the OECD's work should examine factors relating to science education, the production and dissemination of knowledge by public and private institutions, international cooperation, entrepreneurial frameworks, and IP systems, with a special focus on health applications.

II. Background

Economic growth and development in OECD member countries depends increasingly on improved competitiveness and the development of a stronger knowledge base in an environment of accelerating innovation and globalization. A stronger knowledge base in the life sciences is an increasingly important prerequisite for economic competitiveness, in view of growing societal demands for health-related innovation. Recent advances in medical technologies have brought tangible benefits to patients in the form of longer lives with improved quality of life and reduced suffering. These benefits translate into more, rather than fewer, demands for improved health. At the same time, medical innovation plays an increasingly important role in fuelling economic growth through enhanced productivity, a fact demonstrated by numerous OECD research projects. However, the contribution of medical innovation to economic growth and competitiveness is not clearly understood, and its benefits are sometimes questioned. This DSTI project can permit a solid evaluation of the social and economic value of knowledge generation in the health-related science, technology and innovation systems of the OECD countries.

Medical innovation is also at the forefront of globalization. The research and development required to create new medical technologies is increasingly performed as a global activity. The largest research-based firms have R&D and manufacturing operations throughout the world, and conduct clinical research on virtually every continent. Such activities are an increasingly important mechanism for technology transfer between the industrialized world and middle-income and less-developed countries. R&D performed in one country has wide implications beyond its borders because of international interdependencies between public and private research institutes, large, medium and small firms, and mobility of labour, collaborations, and licensing. Science and innovation policies in the medical area provide an important case study of the internationalization

of public research institutions, and the transition to a more open system of innovation. While these changes need to be understood in order to improve science and technology policies, examining the proper social balance also ensures that these positive implications are not inadvertently countered by health policies.

While governments have strong social and economic incentives to encourage medical innovation, they are also understandably concerned about how to pay for the resulting new products. Policy makers in OECD member and non-member countries would benefit from greater understanding of the importance of medical innovation, the factors that make it possible, and the long-term benefits that it provides in terms of driving sustainable economic growth and competitiveness, attracting investment, assisting capital formation, improving labour productivity, generating high-value job creation, and allowing overall cost savings in the health sector. Because of its expertise in gathering and analyzing scientific and technological data, OECD/DSTI is well qualified to shed light on these important questions.

III. The Overall Approach

We propose that DSTI shall undertake a project addressing the growing importance of science, technology and innovation that is focused on health-related applications within the OECD S&T and innovation systems. Recognizing the importance of innovation to economic growth, the project will analyze the creation, diffusion and exploitation of scientific and technological knowledge for health-related activities, where the issues of science and technology policy are interconnected with public policy and social objectives. DSTI will provide a comprehensive overview of the policy environment for health innovation by focusing on selected areas that are representative of the full range of medical technologies.

The project will seek to identify important public policies and key features of national political and economic environments used to facilitate and improve the discovery, development, commercialization, and use of innovative medical technologies. Focus will be primarily on the cross-national aspects of conducting medical R&D.

The project will seek to identify appropriate methods of quantifying the benefits provided by science, technology and innovation in health-related applications, in terms of building a stronger technological and science base, the ability to attract additional R&D investment, the creation of high-value, high-skilled jobs, and, ultimately, in terms of social and health improvements.

DSTI's previous innovation work provides a good foundation for this new project. For example, DSTI has recently completed a report, *Policies to Improve Innovation Performance in OECD Countries*, prepared collaboratively with the OECD Economics Department, which was discussed at the recent meeting of the Committee for Scientific and Technological Policy. Major differences in the demand side factors, including the role of the public sector in health coverage and financing, make it a project of particular importance to OECD.

IV. Measuring the Economic Value of Health Related Research and Innovation: Proposed Phases

Health science and technology innovation is found across a broad range of discovery and application, from conceptualization through diffusion and uptake. These innovations can have various attributes. For example, they can relate to a process or technique, a research tool, an evaluation method, or even a method for improving the usefulness of a product or expanding access to it. In order to capture the overall benefits of science, technology and innovation in health, the projects should proceed in several phases.

Phase one would achieve a comprehensive understanding of the factors that generate knowledge creation, scientific advances, and innovation related to health. It would:

- Identify the broad range of actors whose work directly or indirectly contributes to health-related knowledge creation, technological advances, and innovation, including a description of institutions and organizational arrangements where these advances occur,

- Analyze the factors – especially related to public policy -- that either facilitate or impede advances in health-related science, technology, and innovation, and that increase or decrease access to the resulting consumer products in OECD countries.

Phase two would examine the availability and suitability of a broad range of measures to capture the economic benefits of health-related science, technology, and innovation, such as advances in overall economic growth and competitiveness, job creation and capital formation, increases in labour productivity, and expanded entrepreneurship.

Evaluating the social benefits of medical research and innovation is a particularly complex task, requiring interdisciplinary knowledge of technologies, treatments, epidemiology, demographics, and economics. Such studies are still in their infancy, especially in the context of international comparative statistics.

OECD countries would benefit greatly from research to assess the social value of increased longevity over the past several decades, and the value of potential future progress against various major diseases. Estimates of the demand for health innovation need to take into account the impact of current improvements in some areas (such as heart disease) on the demand for solutions in other areas, the role of growing incomes, and the need for new solutions and incentives. However difficult, such measures are increasingly important as countries invest substantial public and private resources in the generation of medical knowledge to maintain and improve health of their populations. Previous economic analyses indicate that the potential economic benefits are enormous, and that the current level of investment is insufficient to capture these benefits[1]. Although these issues should not be addressed by DSTI alone, that Directorate can initiate the work with an analysis of the health-related science and innovation complex, and then lead subsequent phases of the project with participation from other OECD bodies.

IV. DSTI Qualifications

The CSTP is the most appropriate OECD body to direct this work, in view of its considerable experience and skill in providing analytical support and advice to governments concerning the impact of science and technology to national economic growth, job creation, and social welfare. DSTI's core competences, the output from its existing work program, and its experience with high value-added innovation projects in other fields will provide the leadership needed to coordinate this high impact initiative. For example, all the principal components of DSTI -- including TIP, NESTI, WPB and S&T -- are likely to make significant, complementary contributions. In addition, many of the core CSTP/DSTI themes and issues are likely to be important elements for the health technology innovation initiative. These themes include the science-innovation interface, the globalization of R&D, new innovation models and public-private partnerships, intellectual property and intellectual assets for value creation, more sophisticated statistical and economic indicators, and human capital.

V. Role of the Private Sector

Because innovation in medical products is carried out overwhelmingly by the private sector, this new project would be enriched by encouraging appropriate participation from private-sector entities and organizations that are most knowledgeable about medical product innovation, the need for it, and the factors that encourage it.

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[1] Murphy, Kevin M, and Topel, Robert, The Economic Value of Medical Research, Thompson Lecture, Midwest Economic Association.

PART II

A PROACTIVE OECD ENGAGEMENT WITH NANOTECHNOLOGY INNOVATION

Introduction

Nanotechnology is rapidly emerging as a transformative and core foundation for economic growth and development. Applications based on various types of nanotechnology are proliferating, as rapid advances in the underlying science and technology intersect with significant new markets and business opportunities across multiple sectors. In reviewing the critical importance of nanotechnology to economic growth and technological development last year, the President's Committee on Science and Technology Policy (PCAST) in the United States found that nanotechnology is likely to play a leading role in more than 15 major business sectors, ranging from life sciences, electronics, energy and chemicals through to consumer products, textiles and cosmetics.[2] Assessments by the European Commission, Japan, and other OECD members are strikingly similar in stressing nanotechnology's core set of enabling technologies and its interdisciplinary or "converging" role in addressing key problems facing today's society. Some recent analyses foresee potential nanotechnology-related markets around the world reaching $1 trillion by 2015.

Most OECD members are investing heavily in nanotechnology to drive economic growth, to attract investment and promote capital formation, to meet a range of societal needs, and to create high-paying jobs and increase the stock of human capital. Total new investment in nanotechnology is expected to reach $10 billion in 2006 -- government R&D funding and other programs at national and regional levels total about $4.3 billion; the business community will spend more than $4.7 billion on nanotechnology in R&D; and venture capital and other new investments in nanotechnology will exceed $1 billion in 2006. These totals are expected to triple within five years.

Nanotechnology has arrived, and it is increasingly important for multiple business sectors and in all OECD member countries. For the business community, it represents not just a critical driver of innovation and economic growth in the 21st Century but also a potentially transformative and disruptive set of technologies with enormous economic, technological and societal promise. However, the complexity and dynamism of nanotechnology make it imperative that governments get the policy framework "right." It is here that we believe the OECD can play a critical role.

In its Strategic Vision last year, BIAC identified some of the substantial economic changes that are affecting value creation through R&D and innovation and recommended that OECD adopts a truly cross-cutting approach to the task of understanding the factors that facilitate technological innovation.

As a result of the broader goals that were identified, BIAC proposes that the OECD adopt a proactive global leadership role in nanotechnology based on its unique strengths and skill sets, and its broad experience with other core, emerging technologies such as information technologies and biotechnology. We believe that OECD can play a critical role in realizing the enormous promise of nanotechnology for driving economic growth and development:

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[2] The U.S. review found that the 15 target industries that already are deploying nanotechnology and that are most likely to drive nanotechnology commercialization in the years ahead are: life sciences -- biotechnology, biomedical tools and applications, and pharmaceuticals; chemicals/plastics; semiconductors/integrated circuits; telecommunications and advanced information technologies; optical and imaging; new materials and materials science; consumer products; advanced manufacturing; films; defense/security; textiles; cosmetics; energy; environment; and transportation.

(1) by assessing the key emerging trends and policy challenges,
(2) by developing high value-added policy tools that help governments and other stakeholders "stay ahead of the curve",
(3) by using its strengths in economic analysis and statistics to understand the nature and direction of the profound changes associated with nanotechnology,
(4) by helping to create the research and innovation frameworks that will enable nanotechnology's development and diffusion,
(5) by ensuring effective and efficient regulatory frameworks governing nanotechnology, including those relating to environmental, health and safety issues, and
(6) by integrating nanotechnology in the OECD's new outreach efforts with transition economies.

BIAC proposes a seven-part nanotechnology innovation action agenda for the OECD over the next three years in areas where the OECD can add significant "value added" with high policy salience.

1. Establish a CSTP Working Party on Nanotechnology

BIAC strongly supports the U.S. proposal to create a Working Party on Nanotechnology (WPN) within the Committee for Scientific and Technological Policy. It also believes the Swiss and U.S. offer to convene a Workshop in June 2006 would be timely and desirable. The OECD's expertise and global leadership role with other transformative, emerging technologies with broad economic implications (such as new information technologies and biotechnology) makes this a compelling case.

By reflecting a rapidly proliferating set of technologies across multiple sectors, work on nanotechnology creates an opportunity for the OECD to provide a leadership role that will have high policy impact and visibility, and stimulate further value-added activities. No other international organization is as well-equipped to provide this role. The CSTP's principal policy and analytical themes and objectives, both in the current work program and in the proposed 2007-2008 biennium, dovetail with many of the needs for nanotechnology innovation.

The OECD plays an increasingly important role as a facilitator for dialogue, a convener of key players, a hub for new ideas, and an initiator of outreach activities; nanotechnology policy can benefit from all of those roles. Finally, OECD generally and the CSTP, specifically, offer an excellent mix of experience, skill sets, and high quality policy-relevant work that can benefit OECD members as they increasingly focus on nanotechnology innovation as a critical issue for competitiveness, economic growth, job creation and societal needs.

2. Begin to Provide the Economic Statistics, Indicators, Methodologies and Metrics Required by Government Policymakers and Other Stakeholders

There exists an unfulfilled, core need to develop common sets of data and new nanotechnology indicators, methodologies, metrics and economic analysis. Government policymakers and the business community need them to satisfactorily measure, understand, and assess the economic impacts of nanotechnology innovation and to track technological developments and the impacts of nanotechnology through the well-known S-curve, that the OECD has previously applied to e-commerce and to biotechnology.

The OECD's experience and skill sets in assessing the readiness, intensity and impact of new technological innovations, such as nanotechnology, are ideally suited to meet this unmet challenge. BIAC recommends that NESTI work with the WPN and other relevant parts of the OECD to develop new statistical measures for nanotechnology, much as it has done in the past with information technology and with biotechnology. We recommend that NESTI and CSTP work to develop a Framework for Nanotechnology Statistics and a Nanotechnology statistics conceptual model.

3. Undertake an Initial Project Aimed at Understanding and Creating the Enabling Framework Conditions for Innovation in Nanotechnology

BIAC strongly supports the general thrust and recommendations in the Secretariat's discussion document on nanotechnology. In addition to the scope and direction of the CSTP activities outlines in that proposal, BIAC recommends a broader agenda that also includes the following additional elements that link directly to existing CSTP work and themes:

- the importance of fundamental research and new approaches to international concerns in a cooperative multilateral research environment, including the increasing globalization of research universities and public research entities;
- the science-innovation interface in nanotechnology;
- the creation of new public-private partnerships and other new research models for nanotechnology that seek to maximize the interdisciplinary and convergent nature of many nanotechnology developments;
- the critical role that intellectual property will play in nanotechnology, including the appropriate policy framework and IPR standards, the critical role of IPR incentives and technology markets in nanotechnology innovation, and the need to develop sensible access and diffusion policies for a set of cumulative technologies with broad pre-competitive, cross-disciplinary, and cross-sectoral implications;
- the importance of human capital in enabling nanotechnology developments; and
- the implications of the globalization of R&D and international value chains for nanotechnology.

4. Focus on the Development of Common International Standards and Nomenclature for Nanotechnology

As advancements are made in the manufacture and applications of nanoscale materials, common standards increasingly are needed to facilitate continued progress and the commercialization of the many uses of nanotechnology. BIAC proposes that the OECD closely monitor and coordinate with the appropriate national standards setting bodies and with the International Organization for Standardization (ISO) to promote the international development of voluntary, consensus standards for different nanotechnology applications. This would include the standardization of nanotechnology nomenclature and terminology; materials properties; and accepted testing, measurement and characterization procedures.

This effort can work closely with ISO Technical Committee 220 that has created three working groups to advance ISO standardization in nomenclature, metrology and characterization, and EHS issues. It also should coordinate with, and draw heavily on, the EHS-related efforts in this area that have been proposed for the OECD Working Group on the Health and Environmental Implications of Manufactured Nanomaterials.

5. Ensure Effective and Efficient Regulatory Frameworks for Nanotechnology

The recent recommendation in February 2006 at the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology to establish a Working Party on Health and Environmental Safety Implications of Manufactured Nanomaterials and to adopt Draft Terms of Reference generally provides a good starting point for advising on priorities for addressing environmental, health and safety (EHS) issues related to manufactured nanomaterials. BIAC proposes developing the EHS issues as model for how the OECD can ensure effective, efficient and proportionate regulatory frameworks for nanotechnology without losing sight of the broader picture of innovation, economic growth, and structural adjustment.

BIAC, therefore, believes that it is essential that the OECD not look at these issues in isolation but consider them in the broader context. This also includes regulatory frameworks applicable to

nanotechnology that extend beyond the EHS issues, such as international security and export controls, competition policy, and the governance of research. In considering regulatory frameworks applicable to nanotechnology - and their impact on innovation, the OECD should ensure balanced and proportionate approaches that are based on a holistic or systemic approach in order to realize nanotechnology's promise for promoting economic growth and development through innovation, for addressing and solving important societal needs, and for enabling beneficial structural adjustments and sustainable growth.

6. Use the International Futures Programme to "Get Ahead of the Curve" and to Anticipate Key, Broad Trends and Issues for Policymakers Related to Nanotechnology in the Medium- and Longer-Term

The OECD enjoys a unique resource in the high-quality projects and analysis undertaken by the International Futures Programme (IFP). BIAC recommends that the OECD use the Futures Programme to structure and coordinate a horizontal project within the OECD to anticipate emerging trends and issues in nanotechnology that will be important to policymakers over the next 5-20 years. The objective is for the OECD to assist policymakers and other stakeholders to "get ahead of the curve" by anticipating important new trends and developments so that they proactively can help shape future directions in nanotechnology rather than finding themselves reacting to them. In particular, we believe a very valuable initial IFP project would focus on the growing "convergence" of nanotechnology in the medium-term with the other key technological drivers for economic growth in the 21st Century such as biotechnology, information technology, security technologies, the environment and, possibly, neuroscience.

7. Integrate Nanotechnology As an Important Element of Ongoing and Future OECD Outreach Priorities

BIAC believes that work on nanotechnology can be integrated as a major component of the OECD's and CSTP's growing outreach activities with major transition economies. China and India are already becoming major global players in nanotechnology. Other BRICs and OECD observer nations are viewing nanotechnology as a critical emerging issue for their own development and for their integration into the global economy. As illustration, recent studies show that, on an adjusted basis, China already is the fourth largest global investor in nanotechnology and that level of activity will grow significantly in the next decade.

BIAC proposes that the OECD's ongoing comprehensive innovation review with China, for instance, should include some work related to nanotechnology. Outreach activities related to intellectual property, to innovation policies with other transition economies, and to human capital for science and technology can all benefit significantly by ensuring that nanotechnology is integrated into those ongoing efforts.