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OECD organisation for economic cooperation and development
■ CSC commission syndicale consultative auprès de
OCDE l'organisation de coopération et de développement économiques

TUAC SUBMISSION FOR THE MEETING OF THE OECD COMMITTEE FOR SCIENTIFIC AND TECHNOLOGICAL POLICY (CSTP) AT MINISTERIAL LEVEL

Paris, 29 – 30 January 2004

Summary of policy recommendations

1. The objectives of innovation policy must go beyond increasing economic growth and international competitiveness to cover all the aspects of sustainable development. They must include social inclusion and equity and resolving problems related to pollution, energy and poverty. Innovation policy must encourage a dialogue on policy design, bringing together governments, business, trade unions and public research institutions.

2. It is important to take a closer look inside research institutions and business organisations so that more is known about the institutional arrangements of national innovation systems and the ways they govern the innovation process. In particular, further analytical work by the OECD must give attention to the role of social capital in the innovation process.

3. Employees and their trade unions have a strong interest in innovation and attach high importance to it. Improving living standards depend upon increasing productivity and innovation at the workplace so their involvement is crucial in any innovation strategy.

4. In order to spur organisational innovation, to boost productivity and to improve the quality of working life, governments must design and implement targeted policies aimed to:

- Promote new forms of working and work organisation, such as teamwork and high performance work systems;
- Contribute to the development and acquisition of management and co-operation skills;
- Develop human resources, with the aim of improving skills and to contribute to innovation;
- Tap the talents and skills of older workers in order to improve their employment opportunities.

5. TUAC urges governments to increase public investment in R&D in order to:

- Maintain and improve the research infrastructure;
- Broaden the portfolio of research in public institutions (universities, research centres);
- Ensure that fundamental, long-term research remains a priority;
- Pursue targeted policies in order to improve the contribution of R&D to sustainable development;
- Encourage businesses to increase their expenditure on R&D as well.

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6. The target for raising R&D expenditure to at least 3% of GDP by 2010, as announced at the Barcelona European Council in 2002, should provide a benchmark for national systems of innovation. Moreover, the OECD should analyse whether an R&D tax credit could provide an effective means of ensuring appropriate funding for R&D.

7. Innovation policy must strengthen the commitment and capabilities of firms for innovation. However, it is also vital to maintain the ability of universities and public research organizations to continue to undertake independent and long-term research, not directly linked to immediate needs of industry.

8. Science, technology and innovation policy should aim to enhance the benefits of research conducted by universities and public research organisations, namely:

- The production of new scientific knowledge;
- The education and training of skilled graduates;
- The support of science and innovation related networks;
- The creation of 'intermediate' organisations, such as technology transfer agencies and academic start-ups, facilitating the flow of knowledge between universities and industry and providing at the same time employment opportunities for university graduates.

9. In order to strengthen public confidence in science and technology, technology assessment (TA) must be developed as part of science, technology and innovation policy. Assessment must be made against the objective of sustainable development and must focus on:

- The issues at stake - the possibilities, risks and choices of scientific and technological applications;
- Alternative visions on these issues held by groups that are involved in or concerned with the development and application of science and technology;
- How to link the development and application of science and technology better to the goals of sustainable development.

10. Policies aiming to secure an appropriate long-term supply of graduates in science and technology must address concerns related to unemployment, the deterioration of working conditions and the growth of precarious work. Improved employment prospects and career paths as well as increased salaries in the public and the private sector will attract young people into science and technology. Moreover, gender mainstreaming must be pursued more actively in science and technology: Recruiting, retaining and promoting women in research must be put high on the agenda.

11. Science and technology policies aiming to increase the mobility of researchers must address in particular structural barriers impeding mobility. Moreover, firms must be encouraged to become more active in the exchange of personnel with universities and public research organizations.

12. Efforts to implement and emulate one particular model of market rules throughout the OECD are not necessarily conducive to competence building and innovation. The weakening of trust and social capital, that may be the result of such a process, could have a negative impact upon learning and competence building.

13. Against the background of both advances in science and technology as well as globalisation, more needs to understood about the social and economic effects of systems of protecting intellectual property rights (IPR). A key objective of future work of the OECD must be to examine the effects of systems of IPRs upon:

- The social costs of implementation, administration and enforcement of IPRs;
- Corporate strategies to invent and innovate their impact on concentration of corporate power and their effects on competition;
- Developing countries and less developed regions, their access to knowledge and technologies and strategies to address issues of poverty, health and environmental degradation;
- The interrelation between monopolistic protection and counterfeiting. Particular analysis should be undertaken into whether a reconsideration of pricing policies of producers of protected goods, including on-line and software producers, as well as steps to facilitate access to their products in developing countries could help to reduce counterfeiting and unauthorised copying.

14. The evaluation of policies and programmes must be seen as a way of achieving public accountability. Governments must continue to provide the means for the evaluation of their policies and programmes as well as for national innovation systems as a whole. At the same time they must extend the scope of evaluation. The same must apply to the work of international organizations like the OECD.

The Objectives of Science and Technology Policy – beyond "technological determinism"

15. The concept of technology-driven research, which may be described "technological determinism", must not be the sole guide to the promotion of R&D policy and innovation. Innovation, technology, design and creativity originate with people and the social shaping of innovation and technology plays a positive role in integrating economic and social concerns. An understanding of innovation as a complex process of social interaction must be taken as starting point for innovation policy, focusing on the institutional and organizational dimensions of innovation systems as well as on their contributions to the building of knowledge, expertise and organisational performance.

16. The objectives of innovation policy must go beyond increasing economic growth and international competitiveness to cover all the aspects of sustainable development. They must include social inclusion and equity and resolving problems related to pollution, energy and poverty. Innovation policy must encourage a dialogue on policy design, bringing together governments, business, trade unions and public research institutions. Such a dialogue must be part of a much wider economic and social debate on the priority given to science, technology and innovation as engines for sustainable growth, development and welfare.

A closer look inside research institutions and business organisations is required

17. Better understanding is needed of the ways institutions and organisations learn and improve and modify their capabilities over time. As knowledge is a fundamental determinant of innovation, growth, employment and sustainable development, it is important to achieve a better understanding of the ways replication and transferability of organisational capabilities is constrained by the tacit nature of knowledge underpinning problem solving and by the difficulty of separating highly inter-related tasks and pieces of knowledge. The "black-box" of technology needs to be opened to so as to make transparent both the socio-economic patterns embedded in the content of technologies and the processes of innovation. This can then be taken into account in policies designed to promote innovation.

18. The social environment of corporate innovation strategies needs to be better understood. The term 'social environment' refers to the ways corporate behaviour is shaped by factors such as local labour markets, work-force training, financial institutions, mechanisms governing the foundation and finance of new firms. Much more needs to be known about the various institutional arrangements that govern the innovation process.

A 'multi-dimensional' approach is of key importance to R&D and innovation.

19. Policies aiming to promote R&D, Technology and innovation must make a linkage between growth, development, sustainability, standards of living and trade. The primary innovation bottleneck is not the supply of new knowledge but external factors surrounding the process of innovation and technology transfer. Managing information overload, social acceptance of new technologies, environmental concerns, and the basic logistics of introducing change often pose a far greater challenge to businesses than the underlying innovations or technologies themselves.

20. Innovation requires the development of social capital and in particular trust between different social actors. That is another reason why workers and their representatives must be given a voice in the process of innovation and managing change. In order to better inform innovation policy, further analytical work of the OECD must give particular attention to the role of social capital in the process of innovation.

Trade unions have a vital interest in innovation and sustainable development

21 Trade unions have a strong interest in innovation and attach high importance to innovation policy. Numerous studies have noted that the relationship between skill development, working conditions, workplace organization, and investment in research, development and technology is vital to innovation and sustainable development. Companies implementing high-performance work systems are more successful when knowledge is shared with employees and when workers assume increased responsibility. Research has shown that workers in self-directed teams were able to eliminate bottlenecks and coordinate the work process. In task forces created to improve quality, they communicated with individuals outside their own work groups and were able to solve problems. Expensive equipment was operated with fewer interruptions, turnaround and labour costs were cut in a number of factories, and costly inventories of components and medical equipment were reduced.

22. Related surveys of employees have shown that jobs in participatory work systems often provide more challenging tasks and more opportunities for creativity. Employees working in high-performance work systems had higher hourly earnings and enjoyed higher job satisfaction. Workers in more participatory settings were no more likely than others to report heavy workloads. They were, however, more likely to be satisfied with their work.

23 In order to spur organisational innovation, to boost productivity and to improve the quality of working life, governments must design and implement targeted policies, aimed to:

- Promote new forms of working and work organization, such as teamwork high performance work systems;
- Contribute to the development and acquisition of management and co-operation skills;
- Develop human resources, with the aim of improving skills and to contribute to innovation;
- Tap the talents and skills that older workers have got and to improve their employment opportunities.

Funding of R&D: the gap between the rhetoric of the debate and the reality of research funding must be bridged

24. There is a growing consensus on the importance of both knowledge and innovation in order to achieve sustainable growth. At the same time, however, there is a gap between the rhetoric of the policy debate and the reality of spending on R&D. The combined effects of lower growth in many OECD countries over the last years and the cutbacks in public expenditure have meant that R&D expenditure in many countries has fallen as a share of GDP. Business R&D has also declined in a number of countries despite increased corporate profits. Business expenditure on R&D exceeds only in four out of 30 OECD countries the level of 2 per cent of GDP: Sweden, Finland, Japan and the US.

25. The current share of resources devoted to R&D, declining in a number of countries while almost stagnating at the OECD level, represents a threat to sustaining knowledge-based growth strategies. At the overall OECD level expenditure on R&D in 2001 was just 2.3 % of GDP. For the first time in more than a decade it exceeded the level of expenditure on R&D achieved in 1985 (2.26%).

26. Only few countries have managed to increase R&D expenditure further, among them were the US, Japan, Korea, Denmark, Iceland, Sweden and Finland. The latter are also the top three OECD countries in terms of R&D intensity. Other countries such as Germany, France and Switzerland have experienced a decline in R&D expenditure.

27. Insufficient expenditure on R&D not only hampers further advances in the production of knowledge required to promote sustainable development. It also puts the proper functioning of national innovation systems at risk. Insufficient public expenditure on R&D undermines education and training opportunities, it threatens the maintenance of an infrastructure conducive to science and research, and it limits both the portfolio and approaches regarding basic research. Moreover, inadequate levels of public expenditure on R&D discourage the private sector from investing in R&D.

28. It is against this background that TUAC urges governments to increase public spending on R&D so as to:

- Maintain and improve the research infrastructure;
- Broaden the scope of research in public institutions (universities, research centres);
- Ensure that fundamental, long-term research remains a priority;
- Pursue targeted policies in order to improve the contributions of R&D to sustainable development;
- Act as a catalyst for businesses to increase their expenditure on R&D.

29. The target for raising R&D investment to at least 3% of GDP by 2010, as announced at the European Council Meeting in Barcelona in 2002, should provide a benchmark for the OECD area as a whole. In addition, the OECD should analyse whether an R&D tax credit could provide a meaningful incentive ensuring appropriate funding for R&D.

Managing the interface between science and industry

30. New relationships between economic development, the production of knowledge and its transformation into new products and processes are exposing universities and public research organizations to a growing pressure to change. This applies in particular to the interaction between universities and the private sector. The conventional wisdom is that this co-cooperation has not been sufficiently developed and that it needs to be increased. Also universities are being called on to strengthen their direct contribution to a more dynamic development of industry.

31. However, the idea of the “entrepreneurial university“ which performs a central role in the process of innovation and carries a major responsibility for technology transfer to industry must be treated with caution. We do not argue nostalgically in favour of "an academic’s ivory-tower paradise". Nevertheless, there are serious concerns regarding the increasing

pressure upon universities and public research organizations as suppliers of knowledge to be commercialised. A massive subordination of universities to the market would undermine their ability to contribute to society and sustainable development. The ability of universities to provide critical science as an important element of democracy must be maintained. Moreover, the role of universities to provide talent to both the private and public sector must be maintained and strengthened.

32. Universities and public research organizations have become an important external source of information and knowledge used by firms to innovate. The range of interactions between universities and firms is considerable. However, policies designed to provide a well functioning interface between science and industry must take into account that a limited number of firms have direct links with the science base to support their innovation activities. The same applies to the fact that the contribution of universities and public research organizations to innovation is often indirect and not immediate.

33. The bulk of evidence suggests that the sub-optimal use of the science base for commercial ends lies less with universities but with firms who still under-invest in R&D and innovation. The science base is not the major impediment to innovation and so the outlook policies aimed at moving the science base closer to serving the innovation needs of industry is not encouraging.

34. Innovation policy must give priority to approaches aiming to strengthen the commitment of firms to innovation; their capabilities and ambitions to innovate in order to remain competitive must be targeted. However, it is also vital to maintain the ability of universities and public research organizations to continue to undertake independent and long-term oriented research beyond the current needs of industry.

35. Based on these considerations, science, technology and innovation policy should be targeted to maximise the benefits produced by research conducted by universities and public research organizations, through:

- The production of new scientific information;
- The education and training of skilled graduates;
- The support of new science and innovation related networks;
- The creation of ‘intermediate’ organisations, such as technology transfer agencies and academic start-ups, facilitating the flow of knowledge between universities and industry and providing at the same time employment opportunities for university graduates.

Strengthening Public Confidence in the Science and Technology System - the need for technology assessment and appropriate regulation

36. A lack of consensus on facts and values regarding the role of science and technology, and in particular some of its applications, is challenging the legitimacy of decisions and processes in the fields of science, technology and innovation policy. Technology assessment would provide policy makers with an improved basis for decision-making under the inevitable conditions of uncertainty. Moreover, it could contribute to a public debate and create openness and enhance the transparency of scientific and technological choices. Thus, the development of systems of technology assessment, based on a perspective of sustainable development, should focus on:

- Issues at stake, i.e. the possibilities, risks and choices of scientific and technological applications;
- Different visions on these issues held by groups that are involved in or concerned with the development and application of science and technology;
- How to link the development and application of science and technology better to sustainable development.

37. The public at large must be given the confidence that the results of R&D are going to contribute to general well being. This confidence is a necessary prerequisite to ensure further support for the public promotion of science, research and development. To build the required confidence, the relationship between the system of innovation and the society as a whole should be characterised by transparency, openness and constructive interchange. There is a need to include in the public decision-making processes surrounding science and technology policy not only the scientific community and business, but also wider stakeholders.

38. Ensuring appropriate and effective regulation must also be seen as a means to strengthen public confidence in science and technology. It is also an important tool to promote the process of shaping and diffusion of new technologies. The dynamic interplay between innovation and regulation can create powerful incentives to produce new knowledge and to transform it into new and improved products and processes contributing to sustainable development.

A reoriented R&D must contribute to the goal of sustainable development

39. Public confidence would also be improved by demonstrating that both public and private R&D is being reoriented to contribute to the goal of sustainable development in such areas as climate change. A central aim must be to reduce the consumption of non-renewable or polluting resources, supporting strategies of sustainable consumption and production. Beside appropriate regulatory frameworks, joint public-private sector partnerships are necessary to achieve this objective, with full account being taken of employment and social implications and with participation of trade unions and other stakeholders.

Improving employment perspectives, career prospects and working conditions for the workforce in science and technology – a prerequisite for mobility

40. In the year 2000, approximately 3.4 million persons in the OECD area were working in research and development and about two-thirds of them were employed in the business sector. In terms of research intensity and gender huge differences were observed. Among the major regions Japan had the highest number of researchers relative to employment (10.2 per thousand), followed by the US (8.6) and the EU (5.9). One of the striking characteristics of the science workforce is the fact, that women are seriously under-represented on all levels in science and technology. Despite the fact that they constitute half the undergraduate population, their proportion in senior positions in science has remained extremely small.

41. Another more recent concern is related to the fact that the number young people attracted to education and careers in science and research in a range of countries is decreasing. This may reflect concerns among the young regarding employment perspectives, career

prospects and working conditions that are less and less promising. In recent years young graduates have done well when it came to getting not just a job, but also a good job. This however, has changed after the burst of the 'dot.com' bubble. In a number of countries young graduates are experiencing increasingly unemployment during the transition from higher education into employment. Moreover, they have witnessed an ongoing change of the standard employment relation ship in since and technology. Due to budget constraints and cost containment in the public and private sector, the number of those working under precarious conditions (part time, temporary work) has increased, salaries have been frozen and career prospects have been deteriorated. A more recent development has added a further concern related to an increasingly dynamic process of outsourcing of high-skilled jobs to developing countries.

42. Policies aiming to secure an appropriate long-term supply of graduates in science and technology must address these concerns primarily by improving employment prospects, career paths and increasing salaries in the public and the private sector. Moreover, gender mainstreaming must be pursued more actively in science and technology. Recruiting, retaining and promoting women in research must be put high on the agenda.

43. In debates about the role of the science workforce concerns have been expressed regarding the mobility of scientists and researchers. Referring to OECD research it has been asserted that the mobility has remained low mainly due to administrative and regulatory barriers. Indeed, there appear to be barriers related to social security rights and fiscal issues. Structural barriers, however, appear to create a far more serious problem. Among them is the lack of organized information and assistance services to researchers, financial issues like a lack of funding, fellowships and re-integration grants. Finally there are issues related to return and to career development. In contrast to ongoing debates in science and technology policy, mobility is often not sufficiently appreciated. In this regard it is striking to observe that in a number of European countries for instance universities and public research organizations are seconding more researchers to firms than the other way round. Science and technology policies aiming to increase the mobility of researchers must address in particular structural barriers impeding mobility. Moreover, they should encourage firms to become more active in the exchange of personnel with universities and public research organizations.

44. The rhetoric of "labour market reform" aimed at paving the way for a higher mobility of the knowledge workforce, is too often narrowly focused on labour market deregulation, which has become synonymous with weakening trade unions and dismantling wage bargaining structures, reducing workers' employment protection and penalising the unemployed. A new approach is needed. It is essential to ensure that approaches to increase mobility of highly skilled workers do not violate or undermine international labour standards, national labour standards and existing collective bargaining agreements. At the same time it is important to combine flexibility and the motivation to innovate with the solidarity and collective sharing of risks that has been and still is a key element of national systems of innovation in Europe.

Globalisation, the Science and Technology System and Intellectual Property Rights – We need to know more

45. There is a need to improve regional and international co-operation on Science and Technology and R&D so as to maximise the efficient use of resources and to distribute knowledge more widely. However, as knowledge becomes a strategic resource the

monopolisation of intellectual property must be avoided, whilst individual researchers must have adequate protection to profit from the fruits of their research.

46. One of the emerging trends at the threshold of the 21st Century has been the tightening of the intellectual property right systems (IPRs). Extended areas of protection, the patentability of ideas and living organisms and increased periods of protection are the main characteristics of recent modifications. Moreover, financial capital has entered the world of production of knowledge. New kinds of financial markets, specialized in the commodification of IPRs, have been created. They have accelerated the transformation of knowledge into merchandise.

47. However, it can not taken for granted that IPRs are the cheapest and most effective way for society to provide incentives to invent, to disclose ideas, to reduce transaction costs and to invest in and further develop productive knowledge in order to secure a stream of innovations. It is also arguable that not enough inventions will be made without incentives like the ones provided by IPRs. Despite a general agreement on the desirability of inventions and innovations promoting sustainable development, there is less support for a textbook case of IPRs.

48. The functioning of existing IPRs raises concerns in both developed and developing countries. Particular concerns are related to the fact that the submission of patent applications has increased tremendously in recent years, reflecting strategies to extend monopoly power by establishing strategic patent positions. For example, patent walls are being built in order to help against imitators and to secure market shares, to avoid a rather narrow specialisation and to lock out competitors from developing products any further. Thus, companies may face considerable costs, in time and money, determining how or whether to conduct research without infringing upon other companies patent rights, or defending their own patent rights against competitors.

49. Moreover, the IP system does little to simulate research on diseases that particularly affect poor people. A crucial issue in this regard is not whether IPRs promotes trade or foreign investment, but how they help or hinder developing countries to gain access to technologies that are required for their development. In the recent past the global protection offered to suppliers of technology has been strengthened, but without any counterbalancing strengthening of competition policies globally.

50. The theoretical argument for IPR's takes into account neither the specific nature of productive knowledge nor the effects of strategic interaction and collaboration of firms in competitive markets or the role of power relationships in innovation related decision making. Therefore we need to know more about the social and economic effects of IPR systems. The need for better understanding the effects of IPRs derive both from advances in science and technology as well as from the process of globalisation. Thus, a key objective of future work of the OECD must be to contribute to a better understanding of the effects of exploiting current IPRs upon:

- Social costs related to the implementation, administration and enforcement management of IPRs;
- Corporate strategies to invent and innovate as well as upon corporate power and how they impact competition;

- Developing countries and less developed regions, their access to knowledge and technologies and strategies to address issues of poverty, health and environmental degradation;
- The interrelation between monopoly like protection and counterfeiting. The pricing policies of producers of protected goods, including on-line and software producers should be examined together with the steps to facilitate access to their products in developing countries so as to reduce counterfeiting and unauthorised copying.

Evaluation of policies and programmes: a way forward to accountability

51. The evaluation of science, technology and innovation policies is important in many respects. Because of limited R&D budgets, evaluation may help to justify funding of medium and long-term funding of research. It will also facilitate the shaping of new and reshaping of ongoing programmes and to increase the effectiveness of spending. In analysing failures it can provide new knowledge about how to avoid these in future policy approaches. Moreover, evaluation can also provide clarification of targets of programmes and policies as they proceed. Therefore, the focus of evaluation must go far beyond the effectiveness of R&D.

52. The evaluation of government programmes and has gained an increasing importance over the past decade. A wide variety of evaluation studies, focusing on individual projects or programmes with different objectives, approaches and methods have been conducted. They have

- Documented the experience with the use of various instruments promoting science, technology and innovation;
- Provided approaches and methods to test the efficiency of various tools of industrial technology policy, their strengths and weaknesses;
- Provided conclusions for the further development of policies promoting science, technology and innovation as well as for their subsequent evaluation.

53. Governments must continue to provide the means for the evaluation of their policies and programmes as well as for national innovation systems. At the same time they must extend the scope of evaluation. It is needless to say that the same applies to the work of international organizations like the OECD.