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Innovation Policy in Six Candidate Countries: the Challenges

CYPRUS, CZECH REPUBLIC, ESTONIA, HUNGARY, POLAND AND SLOVENIA

Final Report

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Executive Summary

Innovation policy in the European Union (EU) has developed strongly since the mid-1990s following a period of awareness raising prompted by studies illustrating the relative gap - "the innovation deficit" - in performance between the EU and its main competitors (notably the United States).

The aim was to: "examine and analyse the current framework conditions for selected innovation issues in six candidate states".

Given the EU policy context, the question of how the countries applying for admission to the Union are faring in terms of developing and implementing an innovation policy is clearly of considerable importance. Accordingly, in May 2000, DG Enterprise commissioned a study on Innovation Policy in six candidate countries: the challenges. The aim was to: "examine and analyse the current framework conditions for selected innovation issues in six candidate states", namely Cyprus, the Czech Republic, Estonia, Hungary, Poland and Slovenia (hereinafter referred to as CC6).

The technical specifications for the study set out nine issues, summarised in the box below, for examination. For each of these issues, the study team were asked to analyse available information for each country and undertake a comparative analysis identifying the main trends and challenges.

The study was implemented over a 16 month period, by a core team composed of the co-ordinator Aide à la Décision Economique (ADE) S.A., Belgium, supported by two sub-contractors:

- the Maastricht Economic Research Institute on Innovation and Technology (MERIT, University of Maastricht, the Netherlands);
- the School of Slavonic and East European Studies, University College London (SSEES, University College London, UK);
- and a network of national experts[1].

[1] Dr Bernard Musyck & Mr Sophoclis Georgiou, Cyprus; Dr Karel Mueller, Czech Republic; Dr Erik Terk & Ms Silja Kurik, Estonia; Dr Attila Havas, Hungary; Dr Jan Kozlowski, Poland; Dr Maja Bucar & Dr Metka Stare, Slovenia

Priority issues of the study

1. The Innovation Policy framework

1.1 Identification of the major players involved in the design and implementation of innovation measures.

1.2 Assessment of policy developments.

1.3 Data sources on innovation and analysis of key indicators.

1.4 Legal and administrative rules for creating companies, company tax incentives, etc.

2. Selected measures to foster human resources for innovation

2.1 Teaching programmes and training aimed at fostering an innovation and enterprise culture.

2.2 Awareness and use of Innovation Management Tools.

3. Business innovation and support measures

3.1 Co-operation between the research community and industry.

3.2 Support for start-up and development of technology-based firms.

3.3 Business support networks for innovation (sub-contracting; foreign investors).

The final report seeks to offer a response to the nine priority issues, which can be summarised in the form of six general questions:

- How has the transition process influenced the potential for businesses to innovate?
- Where do the candidate countries stand in terms of innovation performance?
- Is there a suitably competitive legal and institutional environment conducive to stimulating innovative activity?
- Who is responsible for innovation policy matters in the candidate countries?
- To what extent have these countries developed an innovation policy?
- What types of initiatives have been taken in specific areas of innovation policy?

The report concludes by identifying five challenges for developing innovation policy in the CC6 and suggests a number of options open to policy-makers.

How has the transition process influenced the potential for businesses to innovate ?

Section 2.1 of the report looked at key economic data on the candidate countries and identified how trends in productivity, macroeconomic stabilisation, trade, privatisation, foreign direct investment and new firm creation have influenced the environment for business innovation. Despite considerable economic progress and regulatory frameworks increasingly conducive to competitive markets, three main challenges remain by 2000 for the CC6 in terms of creating innovative economies.

The cohesion of an enlarged EU will depend on the economies of the CC6 being able to sustain high rates of growth through increased technological change.

Economic growth cannot be sustained by the same factors (reorientation of markets, low-cost base for FDI serving EU markets, etc.) as during the nineties. Both longer-term macro-economic scenarios and trends in labour productivity suggest that the cohesion of an enlarged EU will depend on the economies of the CC6 being able to sustain high rates of growth through increased technological change rather than through non-investment factors. New mechanisms for supporting innovation and industrial upgrading will be needed if productivity growth is to be maintained.

New firm creation although brisk, and led in the main by highly educated people, does not seem to be creating a strong dynamic of investment and high-growth firms. Barriers to growth are in part due to the under-developed financial system but, relative to the EU, more attention needs to be paid to reducing other forms of uncertainty that hinder investment and risk-taking.

A dual economy situation of profitable, highly productive foreign investment enterprises on the one hand; and domestic firms which struggle to remain competitive on the other.

Restructuring of the enterprise sector has been led in the majority of the six countries by foreign direct investment. This has created a dual economy situation of profitable, highly productive foreign investment enterprises on the one hand; and domestic firms which struggle to remain competitive on the other. Attracting (high-tech) FDI remains a key priority of most governments but the scope for intervention will be limited by the enforcement of EU state aid rules. More attention is needed to encouraging spillovers from FDI towards local firms.

Where do the candidate countries stand in terms of innovation performance ?

Section 2.2 underlined the relative lack of survey data on innovation performance in the six candidate countries suggesting that policy choices are being made on the basis of very partial and untried indicators. Three major conclusions can be drawn from the analysis:

- Education and training systems produce employees who are not creative or flexible enough for the needs of industry and high-valued added services. The bias of the education systems of the five central European and Baltic candidate countries (hereinafter referred to as CC5) towards secondary vocational education and lower proportions employees with post-secondary level education lead to the paradox of skills shortages (particularly in IT) alongside high levels of unemployment. In the case of Cyprus, there is a need for a general upgrading of skills levels rather than the retraining needed in the CC5.

The potential for catching up based on new technologies is severely restricted by weak demand for R&D by business sectors.

- Despite a relatively high share of employment in high-tech manufacturing and average-to-good levels of ICT penetration in the economy, the potential for catching up based on new technologies is severely restricted by weak demand for R&D by business sectors. This is in part explained by the fact that high-tech industries are specialised for the time being in low value-added segments, which do not require high R&D intensity. However, the relatively significant proportion of industry in the economic structures of the CC5 suggests that knowledge creation via R&D will be crucial for future technology upgrading.

Available innovation surveys lead to the conclusion that, compared to the EU, there are fewer innovative small firms in the CC6.

- Available innovation surveys lead to the conclusion that, compared to the EU, there are fewer innovative small firms in the CC6. Those firms that do innovate do so more intensely than in the EU suggesting strong competitive pressure in certain sectors. At the same time, there are weaknesses in the ability to generate enough venture capital that would support an increase in the number of innovative small firms, in part due to the limited size of the stock markets for subsequent initial public offerings (IPOs).

Is the legal and institutional environment conducive to stimulating innovative activity ?

Since 1998, **the issue of administrative simplification has become a policy priority** in most countries. However, it has not always been tackled in an efficient manner, particularly in countries where this is identified as a major problem (Poland, Slovenia). Lessons from initiatives in other countries (such as the "pre-company" status in Hungary or the computerisation of government departments in Estonia) may be worth investigating for the other candidate countries.

In 2000 only Poland and Hungary offered fiscal incentives to companies to undertake R&D or innovation projects.

Tax benefits in favour of industrial investment exist in most of the CC6, but in 2000 only Poland and Hungary offered fiscal incentives to companies to undertake R&D or innovation projects. The reasons for the reluctance to introduce such incentives are partly technical, a trend towards neutral tax systems, and partly due to doubts about their efficiency and effectiveness compared to direct incentives.

Competition policy and state aids regimes are a key concern of the Commission authorities. In some respects, innovation policy could expect to gain from the enforcement of EU rules since it falls technically under the heading of horizontal support for industrial R&D. Nevertheless, **due attention will need to be paid to the extent to which such schemes deliver the right incentives to companies to undertake risky projects that would otherwise not have left the drawing board**. Currently, many innovation and technology measures, particularly loan schemes, appear to be only of interest to medium-to-large firms with projects that are relatively risk-free.

Who is responsible for innovation policy matters in the candidate countries ?

Even where there are specific departments of ministries with a remit for innovation and technology policy, they do not play a role in co-ordinating innovation policy matters.

Defining who is responsible for innovation policy in the CC6 is not easy. Broadly speaking, in most of the countries governments attribute innovation to the ministry with responsibility for economic affairs or industry (four out of six countries). However, even where there are specific departments of ministries with a remit for innovation and technology policy (the case in Estonia and Slovenia), they do not play a role in co-ordinating innovation policy matters across ministries. Funding of industrial R&D and innovation is often delivered on a sectoral basis (ministries of economic affairs, education health, transport, regional development etc.).

Innovation or technology agencies responsible for delivering funding to firms exist in Cyprus, Estonia and Poland. In Hungary, this role used to be played by a quasi-autonomous agency but since 2000 this agency has become the R&D division of the Ministry of Education. Plans in the second half of the nineties for an innovation agency in Slovenia were not implemented due to funding difficulties.

Reorganisation of ministerial responsibilities and implementation agencies have been a feature of the institutional framework in half of the countries, namely Estonia, Hungary and Slovenia, during the period 1999-2001. This appears to reflect, at least in the first two cases, concerns about the effectiveness of delivery of support to enterprises.

Although advisory and consultative structures are weak, those which do exist are generally government science and research councils with limited business representation. At the same time, an increasing number of stakeholders have developed an interest in or been created with a view to pursuing topics related to innovation. In part, these organisations are intermediaries, with some – like the Innovation Relay Centres being EU funded – and have a direct interest in promoting innovation policy objectives. That said, the science or research "lobby" remains better placed to influence policy debates on the allocation of limited financial resources.

To what extent have the candidate countries developed an innovation policy ?

Broadly speaking, the findings of this study indicate that none of the six candidate countries can be considered to have developed a fully-fledged innovation policy. On a scale of sophistication (number and range of instruments, longevity), however, it seems fair to conclude that **Hungary is somewhat ahead of the other countries**. Hungary's policy, although not codified in a single policy document, is characterised by a significant range of instruments funded over a number of years.

Estonia's policy is driven by a relatively high awareness of innovation priorities in policy circles and by the long-standing existence of an implementation agency. Since 1999, various initiatives have been taken to promote innovation and the information society, although it is too early to say whether new programmes of a relatively novel type (such as innovation management) will meet with success.

Poland and **Slovenia** made the earliest efforts in terms of adopting policy guidelines for innovation and are the only countries to have implemented innovation surveys in the enterprise sector (using the Community Innovation Survey methodology). In Slovenia, however, policy implementation is limited to a number of funding programmes based on loans and grants delivered by line ministries. Various ambitious plans for new schemes have yet to be implemented owing to funding difficulties.

Poland, as the largest country, also presents one of the most complex policy frameworks. Sharing responsibility between the Ministry of Economy and the State Committee for Scientific Research (KBN) does not necessarily appear conducive to either a clear policy message or effective implementation. Both the main players have produced innovation policy documents covering the period 2000-2002 and their success will which depend on the action and budgets of other ministries.

The **Czech Republic** has traditionally focused on science and research policy; and innovation tends to be equated with technological development by many policy-makers. Support for innovation matters, and more precisely industrial R&D, is spread across a number of line ministries. A perceptible reorientation of this policy has been under way since 1999, geared to greater support for research-industry relations and creating spillover effects from the presence of foreign investors.

In **Cyprus**, it is difficult to speak about a wide spread awareness of innovation policy matters and the only initiatives have been ad hoc and relatively small scale (such as the design and launching of high-tech incubators during 2000-2001).

The existence of government policy documents or even funding agencies and programmes are no guarantee of either the availability of government funding for innovation policy initiatives or the effective disbursement of funds.

To compound the conceptual weakness of innovation policy in the CC6, the existence of government policy documents or even funding agencies and programmes are no guarantee of either the availability of government funding for innovation policy initiatives or the effective disbursement of funds. **The national reports threw up numerous examples where laws or programmes had been adopted but do not receive (adequate) funding.** This is notably due to the allocation of uncertain privatisation revenues, for instance in Estonia and Slovenia, to such initiatives. Another indication of some confusion in policy priorities is where innovation related programmes or agencies are given ambitious objectives while funding is reduced (Czech Republic, Estonia).

There are clear signs that funding mechanisms are not meeting targets or are failing to provide the correct incentives for companies to innovate.

In almost all countries, there are clear signs that funding mechanisms are not meeting targets or are failing to provide the correct incentives for companies to innovate. This is often due to inappropriate rules such as the conditions attached to loans for industrial R&D (e.g. in Hungary or Poland), which means that only larger firms with relatively risk-free projects are interested in applying.

Appraising the effectiveness of innovation support structures does not appear to be a priority for the governments of the CC6. Hungary the only country undertaking relatively systematic evaluations, in which EU experts have been also involved, of programmes funded in favour of applied R&D programmes.

What types of initiatives have been taken in specific areas of innovation policy ?

Training for innovation

The evidence presented suggests that deficiencies at the level of managerial and skilled employment remain substantial in part owing to the weight given to specialised vocational training in the education system. In policy terms, most countries suffer from a lack of capacity in terms of anticipating skills needs, and links between training providers and industry are weak. The level of development of innovation and technology management courses in higher education is uneven across the CC6 (Hungary, the Czech Republic and Slovenia appear to be further advanced). Most initiatives concentrate on generic management training rather than innovation management.

Awareness of innovation management tools

Use of innovation management tools[2] is not yet widespread in the economies of the CC6, although FDI appears to have been important in the dissemination of a number of techniques. The only available data relates to quality certification and suggest that there are two groups of countries in terms of penetration of ISO certification: Hungary, Slovenia and the Czech Republic have achieved a high rate, while Cyprus, Poland and Estonia are lagging considerably behind. This said, average growth rates in all countries have been higher during the second half of the nineties than in the EU.

Innovation management tools have not been the focus of any significant policy initiatives in the CC6. The first funding programmes in this direction are being planned in Estonia as of 2002.

Measures for business innovation interfaces and new technology based firms

Policy activity in the area of research-industry relations has been intense in most of the CC6 in the latter part of the nineties.

Policy activity in the area of research-industry relations has been intense in most of the CC6 in the latter part of the nineties. A range of policy instruments has been created to address the perceived weaknesses in business/research relationships. The picture differs from one country to another. The two largest countries, **Poland** and **Hungary**, have responded by creating structures such as centres of excellence favouring co-operation between existing R&D players (centres and firms). The Estonian approach is characterised by a strong emphasis on the stimulation of spin-off companies from research, but a structuring of research around strategic centres of competence is also present. In the Czech Republic, the government has taken a series of initiatives since 1999 in the shape of specific schemes intended to stimulate research-industry relationships and new "business impact' criteria for grants funding R&D institutes. Policy support is less well developed in Slovenia until now, while Cyprus is lagging behind the other countries in addressing this question.

[2] Examples of IMTs include value analysis, benchmarking, technology watch, quality management, creativity tools, etc. See European Commission "Innovation Management tools: a review of selected methodologies, Office for Official Publications of the European Communities, 1997.

Considerable effort has been made to support business development and incubator structures for new firms in all countries. The objectives range from a research spin-off approach (Estonia), to helping newly created firms to develop innovation plans (Hungary), and stimulating the creation of higher value-added entrepreneurial activities (Cyprus). Poland has created a large number of business development and start-up support intermediaries. Slovenia and the Czech Republic have a less clearly focused approach, the former developing technology parks and financing mechanisms and the latter focusing on attracting FDI to stimulate local supplier growth.

What is not evident is whether the measures adopted are entirely in line with the potential of the country (for instance, high-tech incubators in Cyprus which lacks a research base). Moreover, **the sustainability of many of these intermediary structures is not guaranteed.**

Business networking (subcontracting networks and cluster support) is a relatively new development and Hungary and the Czech Republic have been pioneers in this field. This may offer a medium-term solution to the question of how to involve a larger number of smaller firms in innovation activity.

Challenges and policy options

Drawing on the five objectives of the 2000 Communication from the Commission on *Innovation in a knowledge-driven economy*[3] as a reference, five key challenges faced by the candidate countries have been identified. Clearly, the economic context, differences in framework conditions and the level of innovation policy development mean that the relative priorities and the possible actions required differ from those applicable to the current EU Member States.

For each challenge a number of policy options are proposed. These are addressed in the main to the governments of the countries concerned although there is a rationale in a number of cases for joint actions between these governments and the European Commission services.

[3] COM(2000)567, 20/9/2000. The document can be downloaded from http://www.cordis.lu/innovation-smes/communication2000/home.html

Challenge 1
Promote a culture open to innovation and creativity

Policy options for the candidate countries:

- Undertake a review of the teaching of creativity and innovation in education systems (from primary to higher and continuing education levels) by 2003, with a view to amending teaching practices and course materials by 2005;
- Assess needs in the enterprise sector in terms of innovation awareness and management. Develop programmes to disseminate innovation management techniques by 2004;
- Identify exemplars of innovative behaviour in enterprises and promote them through Innovation Awards or similar public awareness raising techniques (annual basis).
- Develop new forums in which enterprises can engage with training bodies in defining skills needs. Stimulate enterprises through specific funding schemes to develop training plans related to technological change and skills needs.

Policy options for the Commission:

- Ensure that the planned 'Innobarometer' survey covers the candidate countries as well with a view to stimulating a public debate on differing perceptions of innovation and their source in national cultural or institutional frameworks;
- In co-operation with the candidate countries launch a series of in-depth studies to review and analyse specific factors (education, corporate structures, fiscal environments, etc.) affecting innovation performance;
- Promote a special innovation award for firms from candidate countries at a major media event before end 2003.

Challenge 2
Place innovation at the heart of further reforms to the legal and regulatory environment

Policy options for the candidate countries:

- Establish a review procedure for existing and planned legislation with a view to assessing its impact on business innovation. Ensure that the multiplication of legislation at decentralised levels of government is avoided;
- Draw on European best practice with a view to revising procedures and structures for company registration, accounting practices related to innovation and research activities, etc.;
- Investigate the importance of laws governing ownership of IPR and procedures and costs of protecting IPR as a deterrent to increased industrial research or the spread of knowledge.
- Appraise, in line with EU state aid rules, the possibility of introducing tax incentives to enterprises for undertaking R&D or hiring additional technical or research staff;

Policy options for the Commission:

- Building on the extension, at the beginning of 2001, of the Business Environment Simplification Task Force (BEST) to the candidate countries ('CC BEST'), support the candidate countries in establishing funded action programmes to tackle key obstacles to business innovation in their current regulatory environments.

Challenge 3
Increase the number of smaller innovative enterprises

Policy options for the candidate countries:

- With a view to stimulating more new technology based firms strengthen or create both seed and venture capital funds, linked to centres of research excellence, technology parks or incubators.
- Consider the possibility of reducing financial risks, particularly given the uncertain nature of the business environment, for innovators through mechanisms such as guarantee funds;
- Develop measures assisting enterprises to recruit additional innovation personnel, particularly graduates. The recruitment of such additional personnel should be combined with assistance, through mentoring for instance, in defining innovation projects in firms to ensure such "knowledge carriers" are effective.
- Increase funding for inter-disciplinary education and training (e.g. science – management) and innovation management courses.

Policy options for the Commission:

- Investigate the possibility of developing a specific initiative in favour of high-technology start-ups in candidate countries.

Challenge 4
Strengthen diffusion of knowledge and technology in the economy

Policy options for the candidate countries:

- Review funding mechanisms for encouraging technology absorption in order to allow small firms greater access to publicly funded research organisations;
- Revise award criteria for pre-competitive research grants in order to place greater stress on exploitation of results towards the industrial sector;
- Adapt performance criteria and target setting for industrial research organisations and centres of excellence to ensure a more pro-active approach towards small firms
- Expand or create initiatives in favour of industrial clusters or sub-contracting chains, in particular linked to foreign investment enterprises.

Policy options for the Commission:

- With a view to an active participation of CC6 research centres and enterprises in the 6th RTD Framework Programme (2002-2006), support preparatory actions enabling the constitution of centres of excellence and the identification of specific research projects in key manufacturing technologies relevant to the candidate countries.

Challenge 5
Establish a policy-making process conducive to creating an innovation policy

Policy options for the candidate countries:

- Organise and implement a candidate country innovation survey ('CC-CIS) allowing comparison with the Community Innovation Survey results by 2003;
- Establish innovation policy units with a remit to monitor and evaluate current instruments and structures promoting innovation or technological development. Publish an annual review of the scale and effectiveness of measures taken to increase innovation in enterprises;
- Provide financial or logistical support for business led forums in which innovation issues can be debated and appropriate solutions brought forward;
- Undertake technology foresight or similar exercises with a view to better defining technology trends and needs in the economy.

Policy options for the Commission:

- Part-fund and/or provide technical assistance to the appropriate institutions in each candidate country for the "CC-CIS". Create a task force bringing together representatives of Eurostat, national statistical offices etc. in order to coordinate the implementation of the survey;
- Allocate pre-accession funding for pilot actions arising from Regional Innovation Strategy ('RIS/RITTS') initiatives implemented in the candidate countries, following an external review of the quality of the plans.

INNOVATION POLICY PROFILES FOR THE SIX CANDIDATE COUNTRIES

In the following pages, the six national reports (see full list of working papers in annex) that constituted the basis for this synthesis report are each summarised in a two page "innovation profile". Copies of these reports can be downloaded from the following web-site :

http://www.cordis.lu/innovation-smes/src/studies.htm;

or requested by e-mail from the Innovation helpdesk:

innovation@cec.eu.int

Economic context & Competitiveness factors

Assets	Challenges
■ Stable macroeconomic environment, growing living standards ■ Strong growth of tertiary sector –regional business service centre ■ Growth of capital assets of firms (mostly family-run) ■ Slow increase in foreign direct investment (FDI) in recent years ■ Favourable off-shore regime for companies (to be removed by 2005), ■ Simple framework for company registration; ■ High quality of life (desirable location); ■ Geographical position at the crossroads between Europe and the Middle East.	■ Need to overcome the mentality of "sheltered island economy" i.e. globalisation is the challenge; ■ Further privatisation and deregulation needed; ■ Need to restructure the manufacturing sector and diversify economic base; ■ Boom and collapse of stock exchange - development of financial market serving national economy; ■ Over-dependence on tourism (potentially dangerous); ■ Inefficient public sector (over-staffed and under-performing); ■ Large public deficit.
■ High level of education of the population (tertiary education) ■ Relative low level of labour costs but rising fast	■ Skilled labour shortages; ■ Weak vocational training structures.
■ Diaspora of Cypriot scientists and talent abroad.	■ Very low R&D capacity – industrial research virtually absent ■ Lack of an open and sufficiently competitive environment for science and research.

CYPRUS

Innovation Performance

Innovation drivers & resources	Innovation constraints
■ Existence of a few successful cases of innovative companies	■ Cultural barriers: mentality of family entrepreneurship ■ Lack of trust between firms – Barriers to cooperation ■ Little awareness of innovation management techniques; ■ Low level of technological development in manufacturing; ■ Lack of qualified technical workers and lack of "new skills"; ■ No financial incentives for R&D; ■ Lack of venture capital
■ Recent moves towards more business orientation at HEI ■ Several training actions financed by the Human Resources Development Authorities	■ Isolation from R&D networks in EU ■ Fragmented innovation system: lack of industry-science relationships

Main Innovation Challenges for companies

1. Develop strategies oriented to new products or new services creation with a view to shifting away from low cost, low quality manufacturing;
2. Diversify activity in the service sector towards higher value added tradeable services to diminish the dependence on tourism
3. Develop external linkages to innovation service providers and other firms.

CYPRUS

Innovation Policy

Main characteristics of Innovation Policy

- Innovation policy is in its infancy (elements of it contained in "New Industrial Policy"
- R&D and Information Society brought to the fore in Accession Negotiations
- Lack of public debate on innovation – lack of consensus on innovation concept
- Main responsibility in Ministry of Commerce, Industry and Tourism (and Planning Bureau)

Main policy initiatives for innovation

Creation of an innovation support infrastructure:

- Incubators as a key instrument;
- Plans for Technology Parks;
- One-stop-shop for investors;
- Plans for Research, Technology and Development centre for industry;
- Growing role of Research Promotion Foundation:
- Higher Technical Institute's training programmes.

Programmes and instruments in favour of innovation :

- Incubator scheme and attempt to attract high-tech FDI to the incubators;
- Incentives for introduction of new technologies in firms;
- Guarantee Schemes for loans to SMEs;
- Young Inventors Fair and Competition;
- Business Development programme financed by Human Resources Development Authority;
- Subsidised consultancy services at Institute of Technology;
- Discussion on a ten-year tax holiday for new products

Policy challenges

- Establish an open debate on innovation and innovation policy;
- Monitor efficiency of incubators;
- Envisage incentives for R&D and innovation in firms (fiscal or other);
- Sponsor awareness-raising campaigns for innovation;
- Develop statistics and indicators to monitor innovation.

Economic context & Competitiveness factors

Assets	Challenges
■ Favourable legal framework and liberal environment for firm creation; ■ Industrial strengths in branches with high-intensity in technology; ■ Growth of high-tech sectors; ■ FDI intensity low until mid-nineties, strong growth afterwards; ■ Decrease in company taxation rate; ■ Export intensive country.	■ Rise in unemployment; ■ Unsuccessful privatisation of large enterprises; ■ Lack of a dynamic SMEs sector; ■ Reform of legal institutions lagging behind; ■ Complex and changing regulatory framework for the extension and operation of firms.
■ Relatively high levels of skilled technology workers; ■ Strong position of engineering in education system; ■ Monitoring of labour market needs and active employment policy.	■ Need to adapt further the workforce to new types of activities; ■ Need to increase scale and flexibility of higher education system.
■ Major share of total expenditure on R&D is in business sector (60%) – growing since mid 1990s; ■ Growing public R&D funding in second half of nineties	■ Privatisation of industrial research institutes in 1993-95 led to sharp decline in R&D capacities geared towards industry needs ■ Relatively low levels of patenting activity.

CZECH REPUBLIC

Innovation Performance

Innovation drivers & resources	Innovation constraints
■ Tradition of production co-operation in industry ■ FDI plays a role in providing advanced learning opportunities of workforce ■ Fair offer of innovation management training, co-ordinated by the Association of Innovative Entrepreneurship ■ Industry-science relationships exist and are growing in recent years : • active participation of industrialists in higher education institutes; • joint academic-industrial research centres. ■ Industrial Research Institutes, funded by contract research; ■ Positive, indirect role played by non-governmental organisations (awareness-raising, public debates) ■ Growing supply of risk capital.	■ View on innovation restricted to technology development ■ Technology spin-offs from foreign-owned firms are limited – fragile networks with domestic firms ■ Lack of bridges between academic and industrial sectors

Main Innovation Challenges for companies

1. Create stable linkages with foreign-owned firms and innovation-oriented networks;
2. Develop relationships with R&D base, particularly for foreign-controlled firms;
3. Broaden "technology-push" view of innovation by including commercial and organisational aspects.

CZECH REPUBLIC

Innovation Policy

Main characteristics of Innovation Policy

- There is no innovation policy as such, but a set of instruments under other policies (SME development, FDI attraction, R&D policy)
- Main responsibility lies with the Ministry of Industry and Trade

Main policy initiatives for innovation

New organizations in the innovation support infrastructure:

- Research centres at universities, consortia between Academy of Science, universities and industrial R&D labs (and NTBFs)
- Industrial zones (for FDI attraction);
- Business interfaces at universities;
- Regional Consulting and Information Centres.

Programmes and instruments in favour of innovation:

- Support for industry restructuring: loans for business development plus Revitalisation Agency (investment incentives);
- Support for sub-contracting linkages and inter-company co-operation
- Inclusion of "industrial impact criteria" in public research funding, CONSORTIA programme
- Domestic R&D funding programmes
- Change of status of HEI towards more autonomy and better possibilities to link with industry

Policy challenges

- Establish an integrated policy framework for policy
- Develop a legal framework favouring linkages and spin-off effects in the system
- Develop incentives for new firm creation
- Move from structural funding towards project funding
- Secure budget resources for policy programmes
- Introduce tax incentives for R&D and innovation

Economic context & Competitiveness factors

Assets	Challenges
■ Rapid pace of reform during transition; ■ Stable business environment ■ Simple and transparent tax system ■ Successful privatisation; ■ FDI as a driver for growth and restructuring and shift towards more high-tech activities since 1997; ■ Growing electronics and engineering sectors – promising local cluster of IT firms ■ Export orientation (62% of GDP).	■ Restructuring productive capacities towards less traditional, more value-added products; ■ Small size of enterprises; ■ Reducing administrative burden for company creation; ■ Reducing administrative burden for export activities.
■ High general education level of population ■ Strong awareness and use of new information technologies	■ Overcoming rigidity of education system; ■ Solving mismatch between and supply-demand of labour.
■ Recent rising trend for private R&D capacities.	■ Reinforcing R&D capacities (closure of R&D labs during transition); ■ Growing share of business in R&D activities (from only 38%); ■ Simplifying patent application procedures.

ESTONIA

Innovation Performance

Innovation drivers & resources

- FDI brings in new technologies;
- Some clusters do exist, with varying degree of interactions – existence of private spontaneous clusters;
- Firms recognise the value of quality certification;
- Training and awareness actions provided by some IT firms to population.
- Proactive moves of universities towards innovation: innovation centres, spin-off programmes.
- Positive experience of spin-off creation at Tartu University and Tallinn Technical University
- Knowledge resources: new Competence Centres
- Co-operative structure for regional innovation co-operation (CARIN).

Innovation constraints

- Lack of capital is a main barrier: weak venture capital supply, lack of start-up funds;
- "Short-term" mentality in businesses – low awareness of importance of technology development and patenting;
- Lack of IT specialists and engineers;
- Need to match technical and managerial skills;
- Lack of innovation training.
- R&D capacities mostly turned to basic science, few links with industrial needs;
- Business support organisations not geared towards innovation;
- Variety of support structures but lack of co-operation between them.

Main Innovation Challenges for companies

1. Move towards own products creation rather than use of foreign solutions;
2. Access to an adapted labour force with IT and engineering skills as well as managerial skills;
3. Access to adequate supply of (risk) capital for development of new products and processes.

ESTONIA

Innovation Policy

Main characteristics of Innovation Policy

- Awareness of innovation has grown in policy circles since the end of the nineties – a range of initiatives are being launched during 2000-2003;
- Policy context is liberal and in favour of attracting FDI: support to SMEs and new technology based firms (NTBFs) is indirect;
- Responsibility shared between Ministry of Economic Affairs and Ministry of Education;
- Strong focus on Information Society.

Main policy initiatives for innovation

Creation of an innovation support infrastructure :

- New Business Development Foundation "Enterprise Estonia" (an effort to rationalise and integrate support infrastructure);
- Strategic Competence Centres at universities (biotech, materials, environment);
- Technology Parks;
- New IT college.

Programmes and instruments in favour of innovation :

- Key body : Estonian Technology Agency delivers grants and loans to companies and institutions and manages programmes :
  - Inno-awareness
  - Spin-off
  - Innovation management

  (training and hiring of R&D specialists in firms)
- Tax deductions for hiring of R&D staff, under discussion
- Investment of State in Venture Capital Fund foreseen for 2002
- Quality Promotion Programme
- Promotion of Information Society (Tigers' Leap, SMELINK e.g.).

Policy challenges

- Provide funding of support structures and Estonian Technology Agency to match ambitions;
- Ensure efficiency and foster more co-operation between support structures;
- Respond to specific needs of new-technology based firms (NTBFs);
- Adapt IPR regulations for spin-off firms;
- Develop a statistical database for policy monitoring (foreseen to start in 2001).

HUNGARY INNOVATION PROFILE

Economic context & Competitiveness factors	
Assets	**Challenges**
■ Favourable macro-economic conditions since 1997; ■ Successful privatisation and economic and financial reforms; ■ Growth induced by FDI – highest rate of FDI among CC6; ■ Growing industrial productivity; ■ Restructuring of exports markets towards products with higher value added; ■ Favourable framework for company creation.	■ High inflation rate ■ Slowing down of FDI in-flows
■ Skilled and relatively low cost labour force; ■ Growth in number of students in third level education; ■ Stress on life-long learning and training of the unemployed; ■ Training offered by foreign investment enterprises (FIEs).	■ Education system not sufficiently adapted to the development of learning and creative capacities.
■ Relatively high patenting rate in CC6	■ Dramatic decrease in R&D activities – recent recovery; ■ Poor attraction of R&D careers

HUNGARY

Innovation Performance

Innovation drivers & resources	Innovation constraints
■ FDI brings in new products and processes as well as new management methods leading to a pressure to introduce organisational innovations; ■ Suppliers networks around foreign investment enterprises (FIEs) help upgrade domestic firms; ■ Availability of skilled people for industrial activities; ■ Fair use of quality management techniques; ■ Improving relationships between research sector and industry, through several mechanisms ■ Technology management and innovation courses	■ Foreign-controlled firms rely on developments in parent company ■ Lack of people skilled for "the new economy" ■ Lack of venture capital activities

Main Innovation Challenges for companies

1. Develop domestic innovation capacities – upgrade suppliers to increase value-added (knowledge content) of their activities and for some of them to become producers of own products;
2. Access to adequate sources of finance.

HUNGARY

Innovation Policy

Main characteristics of Innovation Policy

- Absence of an integrated innovation policy but evolution towards a more "modern" view of innovation in policy lately
- Main orientation is towards attraction of knowledge intensive and high value added activities;
- Experience of programme evaluation since 1995;
- Responsibility shared between Ministry of Education and Economic Affairs.

Main policy initiatives for innovation

Improvement of the innovation support infrastructure :

- Creation of Co-operative Research Centres (2000)
- Regional Human Resources and Development & Training centres
- Active role played by Business Associations

Programmes and instruments in favour of innovation :

- Széchenyi Plan is the framework policy (2001): includes a number of SMEs support schemes
- KMUFA fund for applied research supports a number of schemes including a preferential scheme for start-ups TECH-START (1999) and the INTEGRATOR programme to support supply networks
- Plan for a broad technology development, spin-off and cluster programme in 2002
- Venture Capital Act
- Tax deduction for R&D investments or R&D purchase
- Foresight consultative exercise

Policy challenges

- Increase acceptance of innovation in policy circles;
- Secure funding for applied R&D;
- Streamline SMEs support schemes and improve transparency;
- Maintain innovation focus in programmes (e.g. Integrator);
- Monitor efficiency of Co-operative Research Centres (broad mission);
- Envisage fiscal incentives for start-ups;
- Ensure effective take off of venture capital supply;
- Develop monitoring and evaluation tools and practices in policy;
- Deepen consultation processes in policy design.

Economic context & Competitiveness factors

Assets	Challenges
■ Favourable framework for company creation and general improvement of business environment, such as the 1999 law on Business Activity ■ Planned decrease in company taxation; ■ Early openness of the country; ■ Vibrant SMEs sector and presence of some new technology based firms (NTBFs); ■ FDI has been an important factor in economic recovery.	■ Low GDP per capita and continuing structural macroeconomic difficulties (high foreign debt, high unemployment rate, budget deficit and real interest rates); ■ Changing and incomplete legal framework allied to poor administration and legal systems (lengthy procedures etc.). ■ Little foreign capital in high-technology activities; ■ Incomplete privatisation; ■ Low Internet penetration rate.
■ Low wages ■ Increase in high level education ■ Relative share of youth in population considered as the "Polish hidden potential"; ■ Growing interest in continuing adult education..	■ High social costs and inflexible labour regulations: ■ Low productivity rates; ■ Higher education and vocational training structures not adapted to new economic conditions.
■ Industrial Research Units	■ Relative shortage of private R&D ■ Public research not linked to industrial needs

POLAND

Innovation Performance

Innovation drivers & resources	Innovation constraints
■ Long tradition of small scale entrepreneurship ■ Growing innovation in manufacturing sector, mainly through acquisition of disembodied technology	■ Short term approach in business; ■ Main barrier is access to capital (rigidity of banking system); ■ Investments oriented to material rather than immaterial factors; ■ Low diffusion of quality and innovation management techniques ■ Human resources are not recognised as the key for innovation in firms ■ Danger of becoming a "branch plant" economy with few foreign owned companies locating research or strategic management functions.
■ Large availability of business support organisations	■ Venture capital mainly accessible for large projects; ■ Relatively few links between research organisations and firms.

Main Innovation Challenges for companies

Moving from a "low productivity-low cost" economy towards a more value-added and quality – oriented economy

POLAND

Innovation Policy

Main characteristics of Innovation Policy

- Awareness of innovation is growing in policy circles;
- Innovation policy documents do exist, but amount to a series of intentions rather than a fully funded programme of actions;
- Policy design skills are lacking and no clear priorities are set;
- Main responsibilities lie with the Ministry of Economy and State Committee for Scientific Research.

Main policy initiatives for innovation

Creation of an innovation support infrastructure :

- Very large number of business support centres :
  - 250 Centres for Innovation and Entrepreneurship : 142 training and advisory centres, 20 technology transfer centres, 42 entrepreneurship centres, 3 incubators, 57 local loans and guarantee funds, etc.
    - 115 Industrial Research Units
    - Regional Development Agencies
    - National Services System
- Consortia Academy of Science-University-Industry
- Centres of Excellence

Programmes and instruments in favour of innovation :

- Technology Agency (loans and credits to firms)
- Polish Agency for Enterprise Development
- Programmes of assistance for SMEs with foreign funding
- Cluster programme: funding for network brokers
- Tax deduction for innovation

Policy challenges

- Develop policy monitoring and evaluation practices
- Rationalise innovation support infrastructure, improve transparency and ensure market verification and sustainability
- Support labour market training

SLOVENIA INNOVATION PROFILE

Economic context & Competitiveness factors

Assets	Challenges
■ Stable macroeconomic conditions ■ Highest GDP in CC6; ■ Favourable legal and tax framework for business activity; ■ Growing FDI flows, but lower than in other countries, with recent policy shift to favour FDI attraction (1999)	■ Specialisation in low- and medium-technology production ■ Administrative burden in business activity ■ Sticky labour legislation ■ Delays in privatisation
■ Awareness of life long learning needs;	■ Lack of interest for technology faculties
■ Good public R&D endowments.	■ (Important) decrease in public research resources ■ Focus of public R&D on basic research, poor no linkages with business issues

SLOVENIA

Innovation Performance

Innovation drivers & resources	Innovation constraints
■ Shift from defensive to offensive restructuring at the end of '90s ■ Innovation performance of large firms ■ Interesting in-company experience of innovation management ■ Application of New EU state aid Rules will favour funding to development and R&D.	■ Lack of entrepreneurial spirit and deficient innovation culture; ■ Financial markets are not geared to innovative companies' needs; limited venture capital; ■ No single information source on innovation support measures; ■ Technical skills not matched by managerial competences; ■ Cost of patenting, particularly for concerns SMEs allied to low awareness of importance of IPR.
■ Management training in HEI, innovation studies in universities ■ Business Advisory centres and Chambers of Commerce (e.g. innovation awareness activities, networking between enterprises) ■ Venture capital funds in infancy	■ Relationships between science and industry are sub-optimal (wrong incentives on the science side – low demand from industry) ■ Confusion and lack of transparency of role of business support organisations for innovation

Main Innovation Challenges for companies

1. Develop an innovation spirit – match technical and managerial skills;
2. Improve access to adequate finance sources
3. Strengthen capacity of smaller and traditional firms to absorb new technologies and know-how.

SLOVENIA

Innovation Policy

Main characteristics of Innovation Policy

- Poor record of implementing laws and policy decisions on innovation issues;
- Technological development appears for the fist time as a priority in 2000 budget;
- Promoting industry-science relationships is a key policy objective;
- SME policy is a priority in accession negotiations;
- Responsibility for innovation policy shifted to Ministry of Economy.

Main policy initiatives for innovation	Policy challenges
Creation of an innovation support infrastructure : ■ Technology Parks ■ Plans for One-stop-shops for entrepreneurs ■ Small Business Innovation Network ■ Slovenian Innovation Agency : failed attempt ■ Slovenian Institute for Lifelong Learning *Programmes and instruments in favour of innovation :* ■ Financing of R&D in enterprises ■ Credit lines of Slovenian development Corporation ■ Support to clusters (network costs); ■ Support to collaborative R&D projects; ■ Support to regional and branch technology centres, ■ Financing of researchers in companies; ■ Plans for scheme for start-ups by researchers ■ Innovativeness for Youth initiative; ■ Anti-Bureaucracy Programme	■ Address lack of viable mechanisms for cooperation between science and industry; ■ Stimulate more transparency and efficiency of business support infrastructure; ■ A key priority should be to secure budgets for implementing policy programmes; ■ Reach a policy consensus across ministries ■ Overcome bureaucratic burden; ■ Envisage fiscal incentives for R&D and innovation; ■ Support innovation awareness actions.

Chapter 1 Introduction

Innovation policy in the European Union (EU) has developed strongly since the mid-1990s following a period of awareness raising prompted by studies illustrating the relative gap - 'the innovation deficit' - in performance between the EU and its main competitors (notably the United States).

At the Lisbon European Council meeting in March 2000, the promotion of innovation as key factor in economic growth and competitiveness was placed firmly on the policy agenda of the EU. This message was reinforced, in September 2000, by the European Commission's *Communication on Innovation in a knowledge-driven economy*[4]. The Communication underlined the significant progress made by the 15 EU Member states, since the adoption of the 1996 *First Action Plan for Innovation in Europe*. Innovation policy has become a new horizontal policy linking traditional areas such as economic, industrial and research policies.

The Communication also set out five objectives for enhancing innovation in Europe. These are:

- Coherence of innovation policies;
- A regulatory framework conducive to innovation;
- Encourage the creation and growth of innovative enterprises;
- Improving key interfaces in the innovation system; and
- A society open to innovation.

1.1 Enlargement & Innovation

Given the EU policy context, the question of how the countries applying for admission to the Union are faring in terms of developing and implementing an innovation policy is clearly of considerable importance. Accordingly, in May 2000, DG Enterprise[5] commissioned a study on **Innovation Policy in six candidate countries: the challenges**. The aim was to: *"examine and analyse*

[4] COM(2000)567, 20/9/2000. The document can be downloaded from http://www.cordis.lu/innovation-smes/communication2000/home.html

[5] Within the European Commission, innovation policy is the responsibility of the Directorate-General for Enterprise (DG Enterprise).

the current framework conditions for selected innovation issues in six candidate states", namely **Cyprus, the Czech Republic, Estonia, Hungary, Poland and Slovenia** (hereinafter referred to as CC6)[6].

During 2000-2001, the CC6 were in the midst of negotiations with the Commission on the various chapters of the accession process. By end June 2001, the CC6 had closed between 16 (Poland) to 21 (Cyprus) chapters out of 30. Of the chapters which most directly concern innovation policy (since there is not a chapter specifically devoted to this policy field), all six countries had closed the industrial, SME and science and research chapters by June 2001.

In contrast, the key competition policy chapter remained under discussion in all six countries (with the objective being to close this chapter during the Belgian Presidency of the EU during the second semester of 2001)[7]. Issues related to the enforcement of both anti-trust and, in particular, state aid rules are particularly sensitive given current practices in certain of the CC6.

However, preparation for accession goes far beyond simply harmonising legal frameworks with the Union's 'acquis' and closing chapters in the negotiation process. The extent to which the economies of the CC6 are approaching a degree of structural reform which allows them to face up to increased competition within the Single Market of the enlarged EU is also crucial.

Enlargement requires that the economies of the CC6 adapt to the pressures and opportunities of increased competition and interaction with the technologically more advanced economies of the EU.

The economic criteria for accession, as defined by the 1993 Copenhagen European Council, are: the existence of a functioning market economy'; and the *"capacity to withstand competitive pressure and market forces within the Union."* The November 2000 *Regular Reports on progress to accession*[8] of the Commission found that all of the CC6 meet the first of these criteria but that only Cyprus is considered able to withstand immediately the competitive pressures of accession to the EU. Estonia, Hungary and Poland fall into a second group expected to reach this level in the near term assuming they maintain their current reform path; while the Czech Republic and Slovenia are required to implement and complete remaining reforms.

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[6] The other candidate countries are Bulgaria, Latvia, Lithuania, Malta, Slovakia, Romania and Turkey. These seven countries will be the subject of a second study due to be completed by end 2002.

[7] For the full timetable, see the Strategy Paper of the Regular Report from the Commission on Progress towards Accession, November 2000.
http://europa.eu.int/comm/enlargement/report_11_00/index.htm

[8] Available from the DG Enlargement web site :
http://europa.eu.int/comm/enlargement/report_11_00/index.htm

Hence, enlargement requires that the economies and societies of the candidate countries evolve and adapt to the pressures and opportunities of increased competition and interaction with the technologically more advanced economies of the EU. Innovation has logically a key role to play in this process.

1.2 Objectives and methodology

The technical specifications for the study (see page 183 in annex) set out nine issues, summarised in box 1 below, for examination. For each of these issues, the study team were asked to analyse available information for each country and undertake a comparative analysis identifying main trends and challenges.

Box 1 Priority issues of the study

1. The Innovation Policy framework

1.5 Identification of the major players in the design and implementation of innovation measures.
1.6 Assessment of policy developments.
1.7 Data sources on innovation and analysis of key indicators.
1.8 Legal and administrative rules for creating companies, company tax incentives, etc.

2. Selected measures to foster human resources for innovation

2.3 Teaching programmes and training aimed at fostering an innovation and enterprise culture.
2.4 Awareness and use of Innovation Management Tools.

3. Business innovation and support measures

3.1 Co-operation between the research community and industry.
3.2 Support for start-up and development of technology-based firms.
3.3 Business support networks for innovation (sub-contracting; foreign investors).

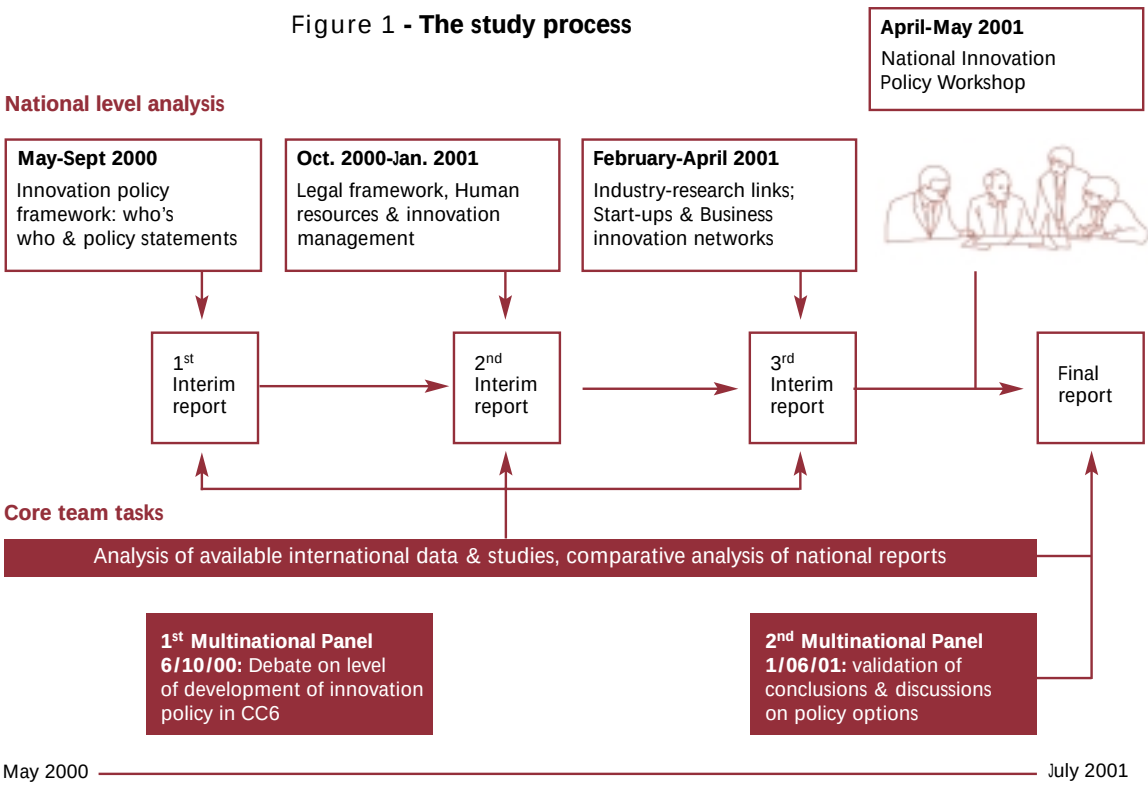
The study was implemented over a 16-month period, by a core team consisting of the co-ordinator Aide à la Décision Economique S.A. (ADE), Belgium, supported by two sub-contractors:

- the *Maastricht Economic Research Institute on Innovation and Technology* (MERIT, University of Maastricht, the Netherlands),
- the *School of Slavonic and East European Studies of University College London* (SSEES-UCL, UK);
- and a network of national experts (see complete list of study team members in annex on page 176).

This final synthesis report presents the complete comparative analysis for all six countries. It has been drawn up on the basis of: the *Innovation Policy Profiles* compiled for each country; and an analysis of internationally comparable data available for the CC6 (see list of working papers of the study in annex on page 179).

The diagram summarises the study process indicating the timing of the national research on each issue, the phasing of the corresponding comparative analysis and the deadlines of deliverables (interim and final reports).

Figure 1 **- The study process**



In addition to carrying out a documentary analysis, the national experts conducted a series of face to face interviews with policy-makers, business representatives, entrepreneurs, and representatives of innovation support organisations. Moreover, an innovation policy workshop was organised in each country, during April and May 2001. The purpose of these workshops was to provide a forum for debate on the initial conclusions of the national reporting and to gather opinions on how best to foster innovation.

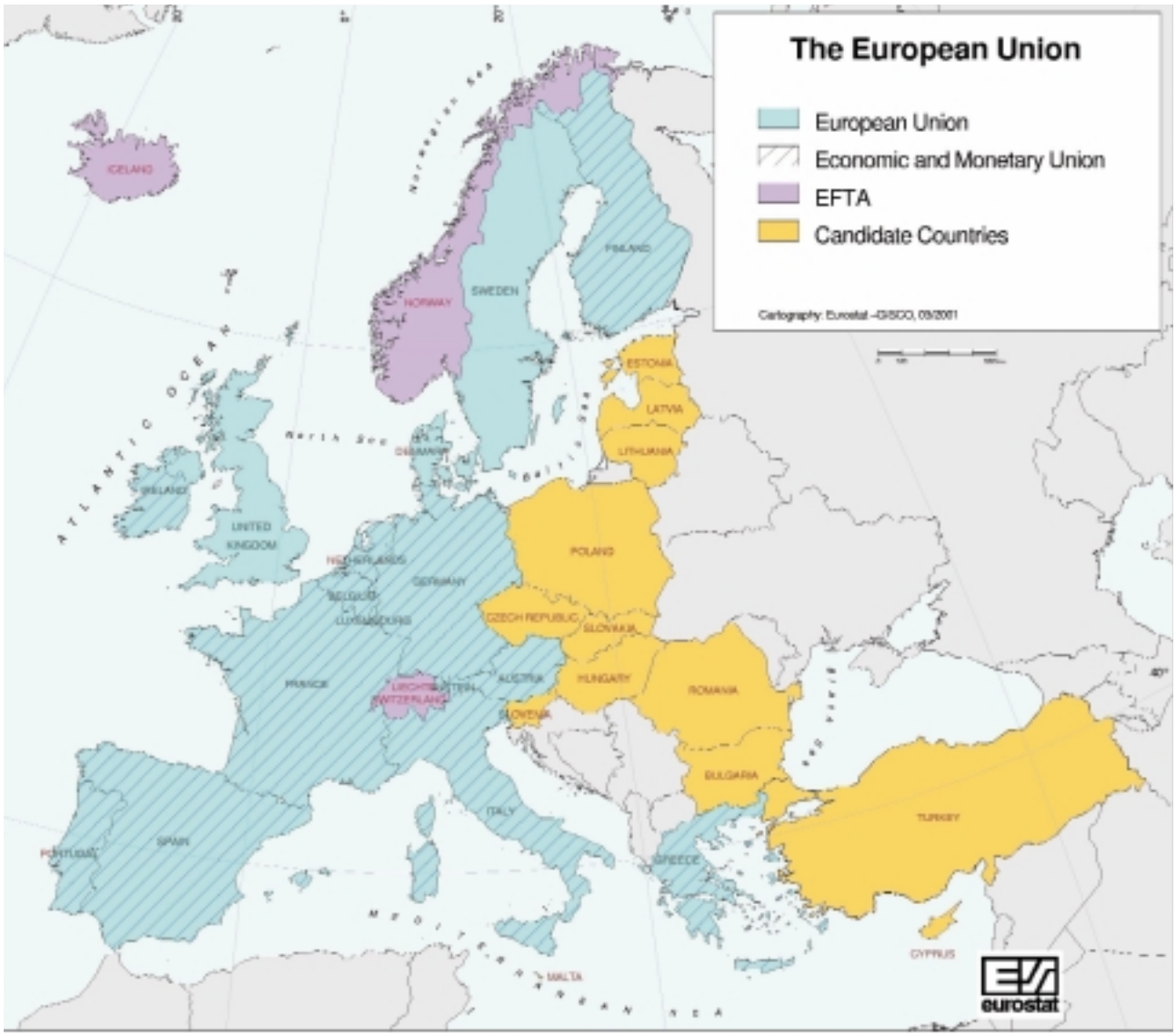
Finally, a multinational expert panel (see composition of panel in annex on page 177) met twice during the course of the study. The first meeting in October 2000 allowed a discussion on the development of innovation policy in each country and the availability of data on innovation in enterprises. The second meeting, on 1 June 2001, had the objective of validating the conclusions of the study and debating possible options for innovation policy in the six countries.

1.3 Structure of the report

This final report study seeks to offer a response to the nine priority issues which can be summarised in the form of six general questions (as a guide to the reader, the link between the question, the issues and the chapter of the report is indicated):

- **How has the transition process influenced the potential for businesses to innovate ?**
  Issue 1.3 - Chapter 2.1
- **Where do the candidate countries stand in terms of innovation performance ?**
  Issue 1.5 - Chapter 2.2
- **Is there an appropriately competitive legal and institutional environment conducive to stimulating innovative activity ?**
  Issue 1.4 - Chapter 2.3
- **Who is responsible for innovation policy matters in the applicant countries ?**
  Issue 1.1 - Chapter 4.1
- **To what extent have the candidate countries developed an innovation policy ?**
  Issues 1.2 - Chapter 4.2
- **What types of initiatives have been taken in specific areas of innovation policy ?**
  Issues 2.1 - 2.2 Chapter 4 & Issues 3.1 to 3.3 Chapter 5

The final chapter identifies a number of **challenges for developing innovation policy in the CC6 and puts forwards a series of options for consideration by policy-makers** and the wider constituency of stakeholders (business, research community, etc.) in each country.



Chapter 2 The environment for innovation in the six candidate countries

A review of innovation matters in the candidate countries must take into account the major structural reforms which took place in the business environment during the 1990s.

During the 1990s, the six candidate countries implemented major structural reforms (price and trade liberalisation, privatisation, etc.) with a view to creating more open and market-based economies. The reforms were driven by the need to redirect economic resources (notably human and financial capital) towards activities that would allow these economies to achieve greater integration with the industrialised world. The prospect of accession to the EU and the obligations arising from the *Europe Agreements*[9] has contributed significantly to the continued pace of reform.

The transition to market economic structures in the five central European and Baltic candidate countries (hereinafter referred to as CC5) could not have taken place without fundamental reforms to the legal system for doing business (company law, bankruptcy, competition policy, etc.); and the effective enforcement of such new legislation. Even in Cyprus, which was already largely a market based economy, increased trade liberalisation, privatisation and deregulation posed significant structural challenges.

The development of innovation policy in the CC6 cannot be examined independently from these major transformations in the business environment. In order to assess the changing environment for innovation in the candidate countries, this chapter address three key issues:

- the impact of structural reforms on economic performance and the growth of enterprises (section 2.1);
- the innovation potential of the six countries compared to the EU through the analysis of a series of key indicators related to the environment for innovation (section 2.2);
- the influence of the legal and regulatory systems of the CC6 on the potential for enterprises to innovate (section 2.3).

[9] The Europe Agreements provide the framework for bilateral relations between the European Union and its Member States on the one hand and the partner countries on the other. The Agreements cover trade-related issues, political dialogue, legal approximation and other areas of co-operation, including industry, environment, transport and customs. The Agreements have become the framework within which the candidate countries are preparing for membership and are thus a key component of the Pre-Accession Strategies. For further information. see: http://www.europa.eu.int/comm/enlargement/pas/europe_agr.htm

2.1 How has the transition process influenced innovation in enterprises?[10]

The aim of this section is to identify drivers and barriers to innovation in enterprises which derive from the level of development of the CC6 economies and hence **may require policy orientations distinctive from those applicable in the current EU member states**.

The CC6 countries are compared, wherever possible, to two groups of EU countries: the EU *Cohesion Countries* (Greece, Ireland, Portugal and Spain); as well as to four selected *High Income* EU economies (Denmark, Germany, Netherlands and the UK).

The cohesion countries represent the natural reference point for the CC6. For example, in terms of Gross domestic product (GDP) per capita these two groups, with the exception of Ireland, are the closest to each other. In terms of population, the candidate countries fall into three subgroups broadly comparable to one or more of the four Cohesion Countries:

- three small (0.76 to 2 million inhabitants) countries (Cyprus, Estonia and Slovenia), closest in size to Ireland;
- two medium sized countries, the Czech Republic and Hungary, which are of similar size to Greece and Portugal. All four have approximately 10 million citizens; and,
- one large country, Poland, which is of similar size to Spain; with a population close to 40 million.

In addition to cross-country comparisons, the evolution over time is analysed whenever data allows. Owing to data availability, the comparison and analysis for Cyprus is not as rich as for the five other countries.

2.1.1 Economic reforms, growth and productivity

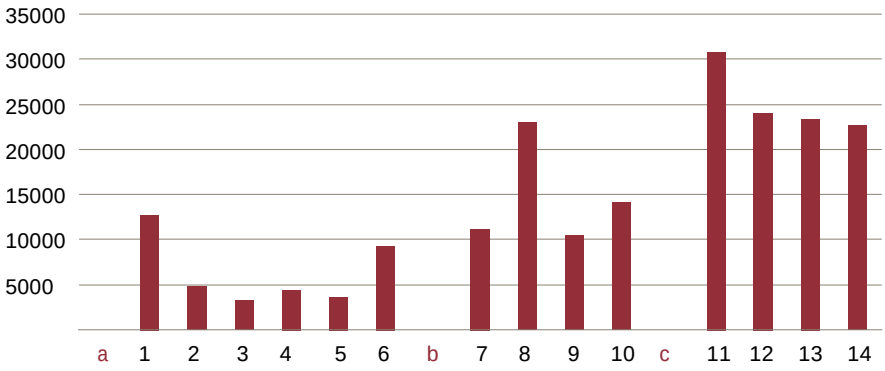
In the CC5, the speed of transition from a centrally-planned to a market economy has differed. However, a common pattern was a sharp recession in the first two to three years of transition, reflecting the costs of the structural reform process (in terms of closures of non-competitive firms, etc.).

[10] Sections 2.1 and 2.2 of this report are based on a working paper prepared by Slavo Radosevic and Tomasz Mickiewicz of SSEES-UCL entitled: Innovation Capabilities of the six EU candidate countries: comparative data based analysis.

Thereafter, growth rates recovered from 1993 onwards. Indeed, **Poland managed to become the second fastest growing European economy in the 1990s**, although the Polish rate of 4.5% lags significantly behind the phenomenal average growth rate of 6.9% achieved by Ireland. Slovenia's average growth, at 2.4%, was also impressive, given initial recession and additional disruption caused by breaking links with federal Yugoslavia after independence. Due to additional periods of recession or austerity measures to resolve macroeconomic imbalances, average rates for 1990-99 varied from -1.3% in Estonia to around 1% for the Czech Republic and Hungary.

Yet by 1999 the CC6 remained at the lower end of the EU ranking in terms of GDP per capita, even using the purchasing power parity measure[11]. The Czech Republic, Hungary, Estonia and Poland with incomes per capita in the range of Euro 3,300-4,800 are below the levels of the two least-favoured EU economies (Greece and Portugal). Only Slovenia and Cyprus come close to or surpass the level of Greece, Portugal and Spain.

Figure 2 - **GDP per capita PPP, EURO 1999**



a. Candidate Countries
- Cyprus
- Czech Republic
- Estonia
- Hungary
- Poland
- Slovenia

b. Cohesion Countries
- Greece
- Ireland
- Portugal
- Spain

c. High Income Countries
- Denmark
- Germany
- Netherlands
- UK

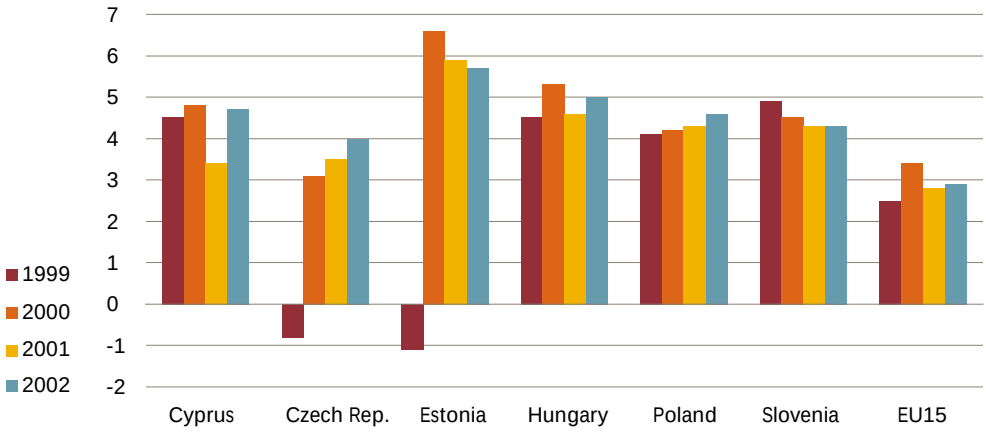
Source: Eurostat, Yearbook 2001.

[11] PPP provides an assessment of the real income gap between countries by taking into account the ratio between nominal incomes and nominal prices, i.e. purchasing power of incomes.

Maintaining momentum in growth rates higher than the EU average will be essential for the cohesion of an enlarged EU

These income differences suggest that **maintaining momentum in growth rates higher than the EU** average will be essential for the cohesion of an enlarged EU. In the case of a persistent slowdown in growth, the pressure for budgetary transfers to the relatively poor CC5 economies is likely to increase pressure for from the EC, which could have major implications not only for economic cohesion but also for European social stability. Thus, the speed of convergence matters greatly.

Figure 3 - **GDP growth rates and forecasts 2000-2002 (annual percentage change)**



Source: DG Economic and Financial Affairs. Economic Reform Monitor. Spring 2001 Forecasts. http://europea.eu.int/economy_finance

By 2000 growth rates of GDP were comparable or higher to the rates prevailing in EU15. Forecasts by the Commission services[12] suggests that growth rates will continue to be between 1 and 2 percentage points higher than the average for the EU15 during the period 2001-2002. Especially strong growth is forecast in Estonia, Hungary and the Czech Republic, essentially driven by domestic demand rather than exports. In the case of Cyprus the long-run growth potential depends crucially upon whether or not the dependence upon tourism is reduced through a diversification into other service-related activities.

Longer term growth prospects are hard to quantify. However, a June 2001 study carried out by the European Commission[13] set out a number of scenarios for growth rates in the candidate countries over the period 2000-2009.

[12] DG Economic and Financial Affairs. Economic Reform Monitor. Spring 2001. Forecasts. http://europea.eu.int/economy_finance

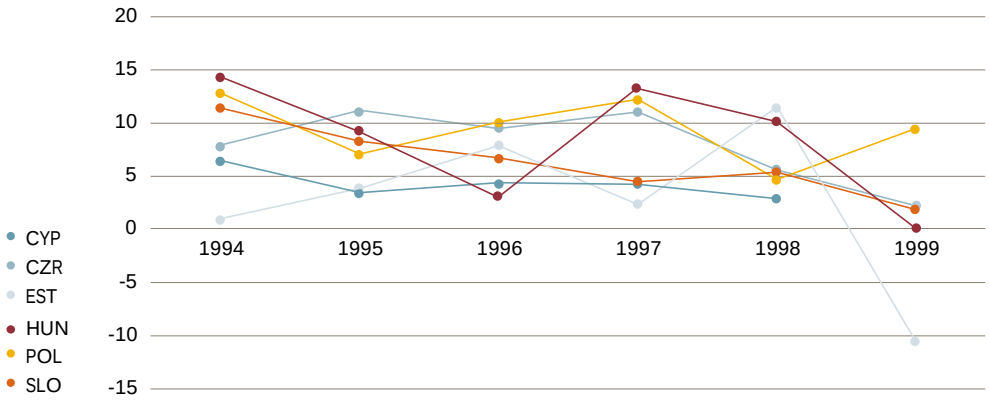
[13] European Commission. Directorate-General for Economic and financial Affairs (2001b). The economic impact of enlargement. Enlargement papers n°4, June 2001. http://europea.eu.int/economy_finance

The Commission services suggest three scenarios the most optimistic of which would allow an average growth rate of 5.1% (for the leading eight candidate countries) over the period 2000-2009. This growth rate is 1.5 to 2% higher than the baseline and central scenarios which assume continued commitment to reform but no dramatic changes in policy. Crucially, **the optimistic scenario assumes** increased total factor productivity (technical change) due to a comprehensive package of pro-growth policies, including a clearly focussed investment strategy and **a business environment that fosters innovation and entrepreneurship.**

Fluctuation in rates of labour productivity suggests that improvements are still driven more by layoffs and closure of unproductive production lines than by continuous technological improvements

Analysis of labour productivity rates suggests that when GDP growth resumed in the CC5 economies, it was accompanied by high rates of labour productivity growth (above 5%). However, strong fluctuations in these rates suggests that improvements are not yet homogenous and are **still driven more by layoffs and closure of unproductive lines of businesses than by continuous technological improvements.**

Figure 4 - **Annual % change in labour productivity in manufacturing**



Source: EBRD Transition reports 1999, 2000.

The issue of technical change as the major source of long-term and sustainable growth is becoming a key challenge for the CC5.

Moreover, similar to the experience of east Germany after unification, all CC5 have recorded decreasing rates of growth of labour productivity. This suggests that the initial sources of increased productivity (cost cutting, labour shedding, etc.) may soon be exhausted and that the issue of technical change as the major source of long-term and sustainable growth is becoming a key challenge for the CC5.

2.1.2 The macroeconomic and financial environment

Economic policy in the CC5 was strongly focused during the 1990s on achieving macroeconomic stability essential for the successful operation of newly introduced market mechanisms, as well as for attracting foreign direct investments. In the CC5, the cost of the reform is visible in the dramatic increase of inflation rates in the early nineties, after price liberalisation. All countries were able to reverse this unfavourable trend during the decade, with **inflation rates** in the CC5 all below 10% by 2000. Research shows that inflation at this level does not have a negative impact on economic growth.

The inability of a government to contain pubic expenditure within manageable boundaries is a continuous source of instability for the business environment and increases the general cost of finance. In this respect, CC5 economies have attained levels of **government deficit** similar to those experienced by EU economies prior to joining the Economic and Monetary Union. Although, the structure of public expenditures continue to cause concern in the Czech Republic[14].

High **unemployment** shows to what extent human resources in an economy are under-utilised. In addition to its significant human costs it also has an impact on the economic situation through the fiscal burden it imposes. Reducing unemployment can be considered as an indirect objective of innovation policy, primarily through support on the dissemination of new technologies and their effect on employment generation. **Unemployment** rates followed a similar pattern to those of inflation with a significant increase in the first half of the nineties followed by stabilisation and then a reduction resulting. By the end of the decade, unemployment rates in the CC5 were comparable, if still higher, to those prevailing in EU countries. This said, **high unemployment rates remain a serious challenge in Poland.**

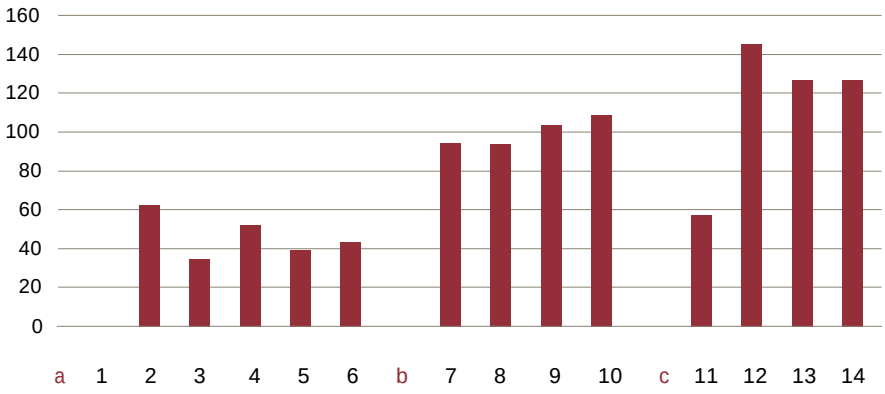
[14] European Commission. Directorate-General for Economic and Financial Affairs (2001b). The economic impact of enlargement. Enlargement Papers n°4, June 2001. http://europa.eu.int/economy_finance

Cyprus, although starting from a more market based economy, has also undergone tremendous changes, with a strong trend towards a transformation into a service economy. The macroeconomic environment is stable, with minimum unemployment and low inflation, but the fiscal deficit remains a risk for the development of the economy.

In all six countries, significant progress has been made in banking reform and interest rates liberalisation – with Hungary's taxation and banking systems closest to EU standards. The securities market has increased substantially in most countries, and other financial institutions (investment funds, private insurance and pension funds, leasing companies) are beginning to emerge[15].

However, in terms of the effective development of a domestic financial system (measured by the amounts of domestic credit provided by the banking sector), the CC5 are still significantly behind EU economies (see figure below). Privatisation of banking through investment by foreign banks, again Hungary is best placed, may change this situation in the future by transferring know-how in terms of enterprise investment.

Figure 5 - **Domestic credit provided by banking sector as % of GDP, 1999**



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c. High Income Countries
Denmark
Germany
Netherlands
UK

Source: World Bank, World development indicators, 2000.
NB: data for Cyprus not available.

[15] EBRD, Transition Report 1999. See http://www.ebrd.org/

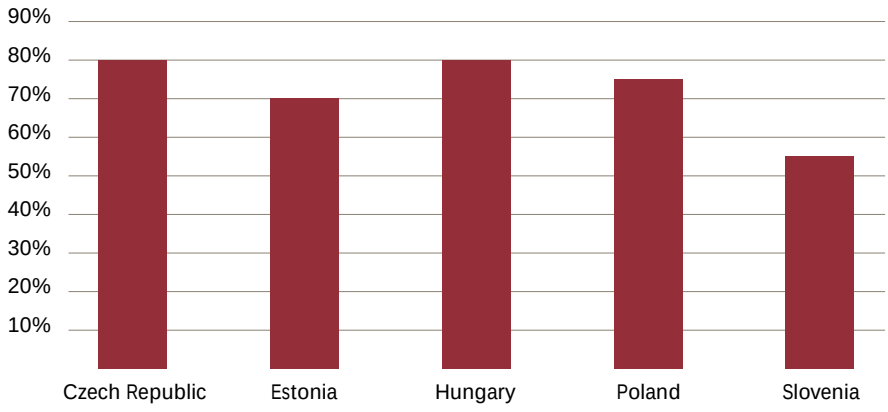
Due to undeveloped financial systems, the cost of finance in the CC5 is comparatively high. Interest rate spreads (difference between lending rates and deposit rates) are in all countries, except Hungary, above the EU levels.

Stock market capitalisation in the CC5 is still small and these economies are clearly at the bottom of European rankings in this respect. The Polish stock market is the most developed with market capitalisation in 1999 of €30bn, which is half the size of the Portuguese stock market; the smallest EU stock market. The Cyprus stock market, which has a relatively high capitalisation with respect to population, is still dominated by traditional companies and no small technology based firms had by 2000 raised capital on the market.

2.1.3 Privatisation: effects on innovation performance

Privatisation, while generally no longer top of the agenda in EU member states, remains an important influence on the economic performance of the candidate countries. **All countries, with the exception of Slovenia, have made considerable progress in completing their privatisation process** and this is reflected in the share of the private sector in GDP.

Figure 6 – **Private Sector Share in GDP (mid-2000)**



Source: EBRD Transition Report 2000. Estimates EBRD mid-2000.

According to the privatisation indicators of the EBRD *(EBRD 2000)*, the Czech Republic, Estonia and Hungary score particularly highly with over 50% of large state-owned enterprises now in private ownership and no state ownership of small enterprises.

There remains a need to ensure that financial and human resources are not denied to new technology based or high growth smaller firms by a less than transparent business environment resulting from privatisation.

The 2000 Regular Report from the Commission confirms this progress made in privatisation of large enterprises, notably in Hungary, the Czech Republic and Estonia, and to a lesser extent in Poland and Slovenia. However, the report warns that the privatisation methods chosen have often facilitated the emergence of a new business elite often stemming from the key players of the former system. Thus there remains a need to ensure that financial and human resources are not denied to new technology based or high growth smaller firms by a less than transparent business environment resulting from privatisation.

The completion of the privatisation process can be expected to have a number of potential effects on the innovation potential of enterprises in the candidate countries. A study for the EBRD suggests that "'strategic' "restructuring would require profit-orientation most likely delivered by private ownership with effective corporate governance…observable indicators of deep restructuring are usually taken to be investment in fixed capital or human capital or in R&D". This was confirmed by a comparative survey of Polish and Spanish firms[16] which found that privatised and newly created Polish firms, in contrast to state-owned firms, are investing in R&D and training at levels similar to those of Spanish firms. Hence, **with the completion of the privatisation process, it could be expected that innovation activity in firms will increase.**

[16] See : Carlin Wendy, Saul Estrin and Mark Schaffer (1999). Measuring progress in transition and towards EU accession: a comparison of manufacturing firms in Poland, Romania and Spain. EBRD Working paper n°40. Based on a survey of approximately 200 manufacturing firms in each of Poland, Romania and Spain carried out June-September 1998.

2.1.4 Internationalisation of trade: a shift to higher technology content exports

The opening up of the CC5 economies to **international trade** led to the loss of captive markets which compounded a lack of competitiveness of a large part of production on national markets in the face of imports. The main challenge faced by firms in the CC5 during the 1990s was thus to restructure their production in the direction of goods that are competitive on export markets. Initially this restructuring was carried out on through cost reduction (notably labour shedding) and rationalisation of production (defensive restructuring); but by the second half of the nineties companies have begun to focus on quality improvements and new products (offensive restructuring).

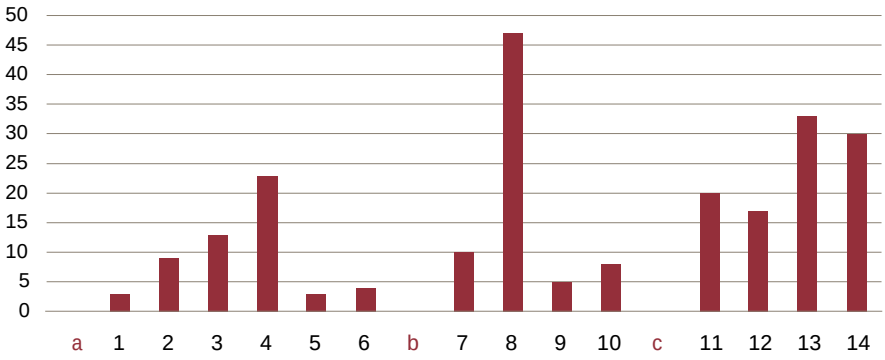
A basic indicator for the successful internationalisation of output is export performance (more developed countries tend to have greater links with the world economy). Across the CC5, the rates of growth of exports have been high, but unstable, during the 1990s while in Cyprus, they remain low.

The shares of high-tech exports in manufacturing range from 3% (Poland) to 9% (Estonia), comparable to that of the southern EU member states

Figures on trade as a percentage of GDP, in 1999, indicate that Poland, despite an unprecedented increase in exports during the 1990s, was still significantly less integrated in the world economy than Spain. However, the Czech Republic and Hungary have higher levels of trade in goods than Portugal or Greece, while Estonia and Slovenia are the most open economies among the CC5. The relatively higher share of industry in the economic activities of the CC5 is reflected in an export structure dominated by manufacturing exports. The opposite is true in Cyprus which has a low share of manufacturing exports coherent with its specialisation in services and a weak industrial sector.

Foreign trade statistics of CC5 shows significant improvements in terms of competitiveness through increase in unit prices. During the early 1990s, the structure of export has initially moved to labour intensive industry products. However, since 1995 this trend has been reversed and the share of skill, capital and technology intensive products has increased.

Figure 7 - **High-tech exports as % of manufacturing exports, 1999**



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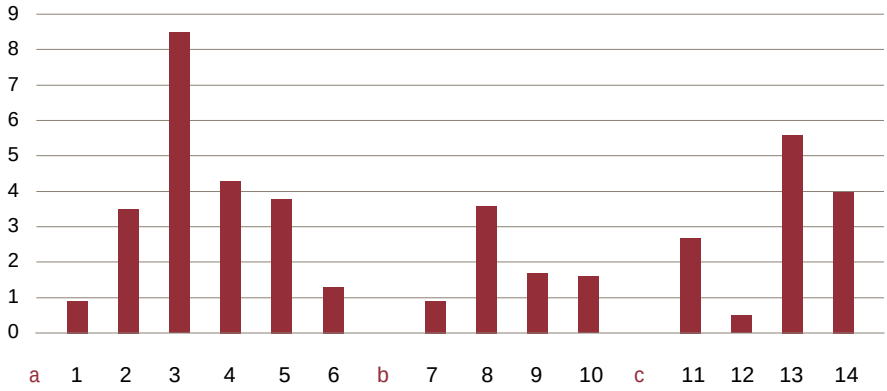
Source: World Bank, CDROM World Development Indicators 2000.

By 1999, **the shares of high-tech exports in manufacturing range from 3% (Poland) to 9% (Estonia), comparable to that of the southern EU member states.** Hungary is a clear outlier with the share of high-tech exports amounting to 21% of manufactured exports, higher than the German or Danish corresponding figure (14% and 18% respectively). However, this performance is almost entirely driven by FDI companies.

2.1.5 Foreign direct investment: an important driver of productivity and technological change

A third key element in the renewal of the economies of the CC6 has been an influx of **foreign direct investment**. Studies conducted at the end of the nineties, underline that FDI has played a key role in the privatisation and restructuring process of the former centrally-planned economies[17]. Indeed, with the exception of Slovenia and Cyprus, the share of FDI in GDP in the CC6 at the end of the nineties, is comparable to the highest rates in Europe.

Figure 8 - **FDI inflow as % of GDP, average 1997-1998**



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Source: World Bank, CDROM World Development Indicators 2000.

[17] LANDESMANN Michael (2000). **Structural change in the Transition Economies,** 1989-1999; in United Nations Economic Commission for Europe (2000)

The impact in terms of innovation of FDI for the CC6 lies in an evolution from cost-related motivations towards the production of higher value-added goods which requires interactions with local research and a network of higher technology sub-contractors

FDI brings capital but also transfer assets from less to more efficient owners. This latter aspect is very important in the CC5, where foreign owners have advantages in terms of corporate governance as well as in terms of easier access to capital markets and technology[18]. The result is **a large difference in terms of productivity between domestic and foreign owned firms in all CC5.** Labour productivity in foreign investment enterprises varied from 150% (Estonia) to almost 300% (Hungary) of that of domestic enterprises in 1998. Hence, FDI play a very positive direct role in these economies, indeed productivity in foreign owned firms in Hungary is now higher than in Austria.

In terms of innovation, the importance of FDI lies in an evolution from cost- or market- related motivations from investing (e.g. access to a relatively skilled but cheaper labour force) towards the production of higher value-added goods leading to the transfer of technology from foreign investment enterprises (FIE) towards a network of local sub-contractors; and the carrying out of industrial research or design in the host country.

Box 2 FDI, Ownership and R&D in Estonia

The head offices of most enterprises are in Stockholm or elsewhere and the R&D activity is there as well. Here there are only subsidiaries or branches and the local owners somehow are not interested or cannot organise development here. This shows what has happened with the privatisation by buy-outs by foreign firms – value-added development takes place outside Estonia. This is one of the answers to why the private sector does not invest enough in R&D – in foreign-owned firms the R&D activity takes place outside Estonia. Head of the Board of the first private R&D institute in Estonia, taking part in the Innovation policy workshop in Estonia, 9 May 2001.

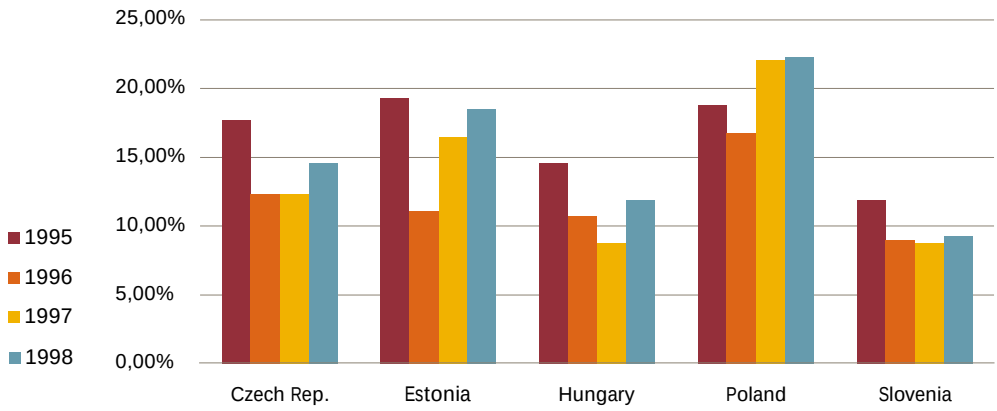
[18] See: Berend Ivan (2000). From Regime Chance to Sustained Growth in Central and Eastern Europe; in United Nations Economic Commission for Europe (2000). He notes that the scale of effects on the manufacturing sector might be lower than expected at the start of the transition period, since FDI tended to be concentrated in utilities and service sectors (notably telecommunications) until the mid-1990s This is especially true for Estonia, Poland and Cyprus.

2.1.6 New firm creation: evidence from the candidate countries

The fourth key factor is the establishment of new enterprises which can be a decisive factor driving the growth of new, technologically advanced sectors in candidate countries.

According to a 1998 EUROSTAT survey[19], Poland has the highest rates of creation of new enterprises amongst the Central European economies. This has been characterised by a fast rate of employment creation in 'new' economic sectors, particularly services. Yet, more detailed analysis qualifies these findings. First, only between 30 and 45 per cent, on average, of new (active) enterprises were capable and willing to invest one year after they were founded. The share of investing firms is on average the lowest in Poland (32%).

Figure 9 – **Rate of creation of new enterprise (1995-98)**



Source: Eurostat, "New Enterprises in Central European Countries in 1998".

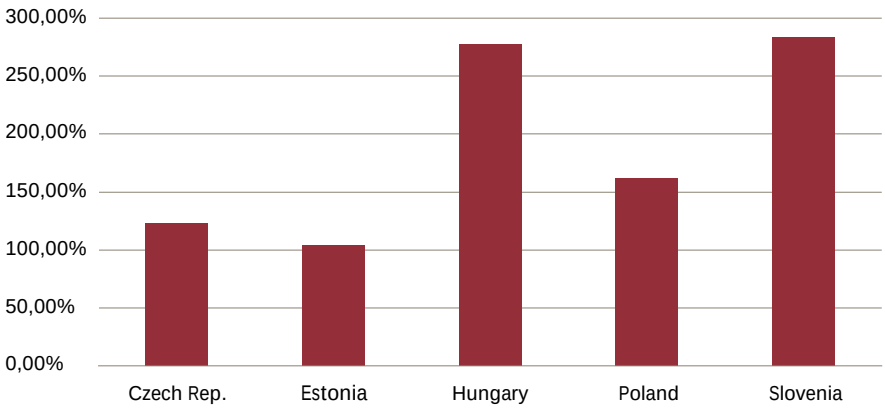
Besides this measure of the gross creation rates, it is also important to consider the nature of the firms created (are they participating to renewal of production structure and increased innovativeness of business sector, etc.) and their chance of survival and growth.

[19] Eurostat (1998) New Enterprises in Central European Countries in 1998.

People with higher education establish a disproportionate number, relative to their weight in the population, of new enterprises in all five Central European economies.

The 1998 survey from EUROSTAT also underlines the significance of education for entrepreneurship. People with higher education establish a disproportionate number, relative to their weight in the population, of new enterprises in all five Central European economies. The overrepresentation of people with higher education among new entrepreneurs is particularly impressive in both Hungary and Slovenia, which may indicate a higher innovative potential of new firms in these two countries.

Figure 10 - **Relative importance of new enterprises founded by entrepreneurs with higher education, 1998[20]**

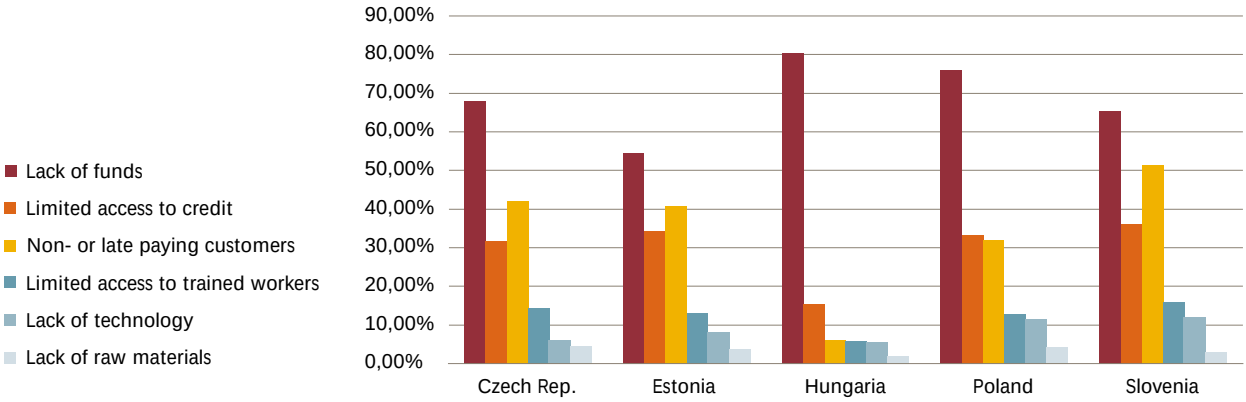


Source: Eurostat, "New Enterprises in Central European Countries in 1998".

However, the impact of education on propensity to organise new businesses is not linear, i.e. a tendency to start own enterprises is relatively high at both ends of the spectrum, amongst both least and most educated. The record of people with secondary level education is uneven. This result is coherent with the over-specialisation of the vocational education systems discussed in section 2.2.1 below.

[20] Percentage of enterprises/percentage of economically active population for a given educational group. 100% would indicate a share of enterprises equal to the weight of the educational group in the population.

Figure 11 - **Supply side difficulties as perceived by new active enterprises. Average 1995-1998**



Source: Eurostat, "New Enterprises in Central European Countries in 1998".

According to the EUROSTAT survey, barriers to growth of firms that are related to technology and to the level of training are low, compared with purely financial constraints. Hungary scores best in terms of both access to technology and skills – both are less important barriers as compared with the other countries.

The analysis of supply- and demand-side barriers to new firms creation underlines two main challenges :

- Financial constraints are the most compelling barriers to new firms survival and growth;
- Intense competitive pressures is the most important challenge faced by these firms, suggesting that they face difficulties in creating niche markets with specialised products.

2.1.7 Conclusions

The economic restructuring of the business sector in the CC6 has taken place in a framework of growing macro-economic stability during the 1990s. Growth and productivity increases have been impressive but needs to be sustained at rates higher than the average for the current 15 EU member states if economic and social cohesion in the enlarged EU is to be attained.

The analysis suggests that the first sources of productivity gains (the closure of non-competitive units and labour shedding, shifts of labour between sectors, etc.) are now exhausted. Hence, more offensive business strategies based on

technological change and increased knowledge content are needed to achieve competitiveness in the EU's Single Market.

Governments will be required to give a much greater policy emphasis to measures in support of innovation, technological change and productivity in order to sustain competitiveness and hence growth of the CC6.

In the coming five years, Governments will be required to give a much greater policy emphasis to measures in support of innovation, technological change and productivity in order to sustain competitiveness and hence growth of the CC6. The cohesion of an enlarged EU will depend on such "pro-growth" policies.

In terms of the enterprise sector, the main impediment to growth of new firms in the CC5 is clearly access to finance at a cost that is affordable. This is not a novel conclusion since all major observers of these economies are aware of the fragility of the financial sectors. In terms of innovation policy, the major issue is whether new innovative firms are able to obtain finance for the start-up and early growth phase of their existence. There is also a risk that short-term financial difficulties (non-payment by customers, etc.) diminish the capacity of firms to devote the necessary management time to strategic planning. Hence, **innovation finance, in the broadest sense, must be a priority for CC5 governments.** The Cypriot financial sector is clearly more sophisticated but much of the activity is internationally orientated and a greater focus on internal needs seems appropriate.

Foreign direct investment has played an important role in the restructuring process of the CC6 countries but has led to a situation where differences in productivity and profitability between foreign and local owned firms are large. Hungary stands out from the five other countries in terms of the penetration of FDI in its economy which accounts for a strong performance in high-tech exports. It can be expected that as FDI continues to penetrate the other CC6 economies this will improve the technological structure of their exports (at least in terms of introducing more medium technology products) which may feed back to growth. However, **in the medium term it is also essential to nurture spillovers from exports and foreign investors to domestic producers.** Moreover, policies in favour of FDI have been often driven by subsidy regimes which are incompatible with EU state aid rules and without much attention to technology content of investments.

2.2 Assessing innovation performance in the candidate countries

An adequate measurement of innovation performance would cover issues such as product, process and organisational innovations in firms, trends in new-technology-based firms and spin-offs, etc.. While this is still difficult in the EU countries, the situation is even less favourable in the CC6. Available data concentrate on knowledge creation (R&D, patents and publications) rather than on innovation in the business sector.

However, **some indicators are available, albeit of a non-comparable nature**, that help characterise innovation in the countries studied here. This section provides an overview of key indicators in terms of four factors influencing innovation:

- Human resources (structure of qualifications and structural features of employment),
- Knowledge creation and investment in broad sense (R&D expenditures, research output - patents and scientific papers; investment – tangible, intangible, innovation finance),
- Transmission and application of knowledge
- Framework conditions : innovation finance, information technology diffusion, etc.

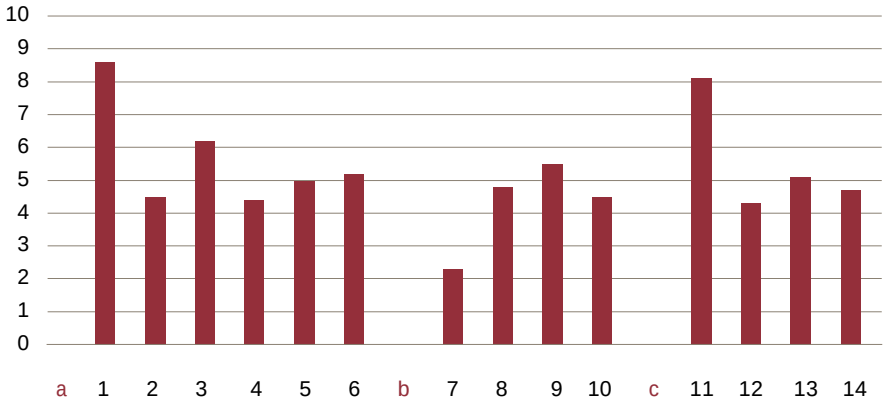
2.2.1 Human resources for innovation

The levels of investment in education have not been reduced during the transition period, except in Hungary

In a knowledge-based economy, the availability of well-qualified human resources is a key factor for the restructuring process of transition economies. Levels of investment in education are a key indicator of government commitment but the resulting levels of quality and the skills of the active population as well as life-long learning provision are equally important.

Relative levels of investment in education have not been reduced during the transition period, except in Hungary. At the end of the '90s, they are either at the EU average or, as in the cases of Estonia and Poland, with expenditure above 7% of GDP, among the highest in Europe. This is also reflected in the share of education expenditure in total government expenditures which in Estonia and Poland are among the highest in Europe. The total expenditure on education is lower in Cyprus, but steadily growing.

Figure 12 - **Total expenditure on education as a percentage of GDP (1999)**



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Source: : World Bank, 2001 World Development Indicators. For Cyprus, Statistical Services.

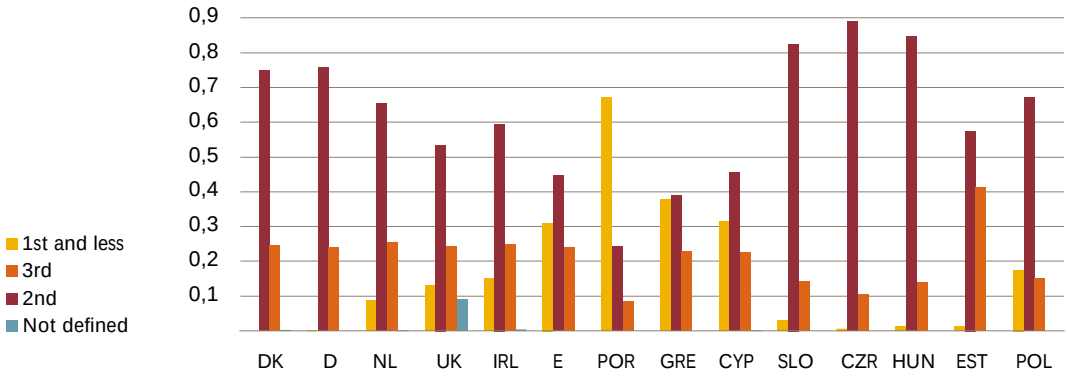
With the exception of Estonia, the candidate countries have a low share of population with 3rd level of education

The result of such expenditure is that the education systems in the CC5 are relatively strong and better developed compared to the average for countries with similar levels of GDP per capita, notably the Cohesion Countries[21]. However, since 1990, education systems have expanded in terms of student numbers as a way to resolve unemployment without a corresponding increase in quality. As will be discussed in chapter 4 below, higher education systems have not been fully restructured while training systems remain weak.

Moreover, despite levels of educational investment, **the CC6, with the exception of Estonia, have a low share of population with 3rd level of education** of the order of magnitude of 10%-15% (22% for Cyprus), while in the cohesion countries this figure usually exceeds 20%, and is in the range of 25% in high-income countries of the EU. This is compensated in some respects by a very high share of the economically active population with second level second stage education.

[21] This makes the situation of CC5 resemble that of Ireland during its early years of EU membership. At the time, the Irish government gave a clear priority to its education system, at the cost of social welfare, the health system, and infrastructure development.

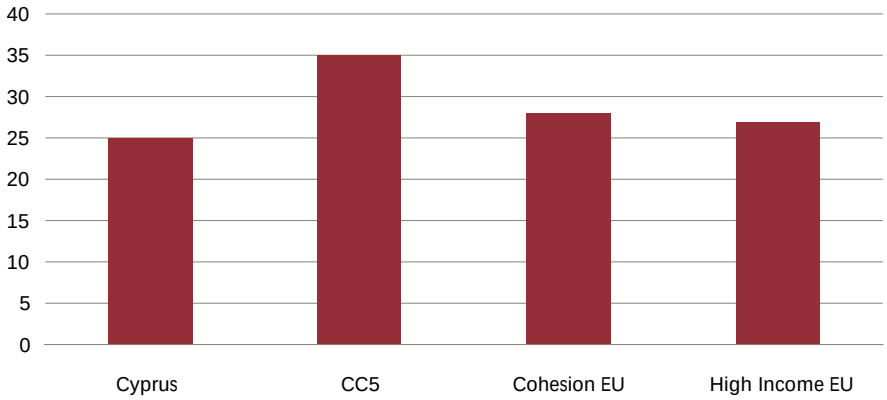
Figure 13 - **Economically active population by level of education (1999)**



Source: International Labour Office (Statistical yearbook 2000). Data for Cyprus, Poland, Greece, Portugal, Denmark, Netherlands for 1998.

As noted in section 2.1, privatisation, FDI and new firm growth have all led to a significant scaling back of non-competitive industrial activities and an expansion of the service sector. Despite these changes, the level of industrial employment as a share of total employment in the CC5 remains above that of both the EU Cohesion and High Income economies. The structure of industry in Cyprus is similar to Greece with a high share of small service firms and agriculture.

Figure 14 - **Share of industry in employment 1999**



Source: International Labour Office (Statistical yearbook 2000).

"From the industry point of view, a major problem lies in education system, since the best students are not encouraged to go to technology faculties and there is a lack of creativity in technological development as a result".

Innovation Policy Workshop, Ljubljana, March 2001

The structure of qualifications arising from the current orientation of the education and training systems has several implications for training carried out with a view to supporting the innovative activities of enterprises in the CC5.

First, the lower shares of the population with high level qualifications[22] leads to difficulties in the absorption and diffusion of new information technologies in services and industry, particularly in the adoption of IT, but less in the use. Indeed, the European Training Foundation's Key indicators report for 1999[23] underlines that "Relatively lower unemployment rates of better-educated young people show that (at least in some countries such as Hungary, the Czech Republic, Latvia and Poland) there is a high demand for higher level skills".

"…Our scientists, engineers and technicians are well trained and creative but their knowledge in finances, management and foreign languages are below the European average".

Opinion of the Hungarian Innovation Association, May 2001.

Second, an important share of the population with secondary level education in CC5 have undergone vocational education. This means that their skills are relatively specialised which may present problems in economy-wide restructuring. The ETF noted that "High unemployment rates among young people demonstrate a low demand for labour and skill mismatches. In this context, modernisation of curricula and efforts to bring vocational training closer to the demands of the labour market must continue"[24].

Third, the generally favourable level of education in the CC5 obscures the lack of preparation of many workers for the requirements of the market economy and hence the need for training and retraining programmes. According to a survey of foreign managers carried out for the EBRD, on average, workers of FIEs in the CC5 would need around 6 months of training to achieve a level of productivity comparable to Western European workers. They lack general adaptability and flexibility, which higher levels of education develop. Also, their technical and IT education is considered as insufficient[25].

In contrast to foreign investors, domestic enterprises and public institutions have not been able so far to promote retraining activities to the extent required by the scale of restructuring challenges.

[22] High level qualification are classified as including the ISCED'76 levels 5 to 7 (higher education non-university degree to post-graduate education).

[23] Available at : http://www.etf.eu.int/

[24] European Training Foundation. (1999) Vocational education and training in Central and Eastern Europe: key indicators.

[25] See EBRD Transition Report 2000; available at www.ebrd.org

The educational structure of the economically active population of Cyprus is very similar to that of Greece (see figure above). In this respect, the policy implications are different than for the CC5: the focus of innovation-oriented training policy in Cyprus should be much more on general upgrading of skill levels than on the restructuring and retraining needed in the CC5. Indeed, the European Training Foundation underlines the need for Cyprus to increase the number of semi-skilled workers with a view to supporting the upgrading of the traditional manufacturing firms.

In conclusion, it would appear that **increasing the flexibility and adaptability of human resources in enterprises to changing business conditions is a main challenge faced by policy-makers in charge of developing human resource.**

This translates notably in a general need for more managerial (core skills) and IT skills in the workforce[26]. Recognition of the mismatch in skills and its implications is progressing, however unevenly, among the six countries, as testified by a number of conclusions arising from the country reports for this study (see box).

[26] A second more detailed survey (of 300 domestic firms) carried out in Hungary by the EBRD comes to the same types of conclusions, in particular: "Over 40 per cent of manufacturing firms considered themselves to fall below the desired staffing levels of skilled workers…despite being the leading reformer, between 30 and 40 per cent of respondents in Hungary cited lack of worker adaptability as a substantial obstacle. Similarly, inadequate IT knowledge was seen by roughly a third of [Hungarian] firms as being a major impediment.

Box 3 Skills deficits in IT and policy responses

Skills deficits and mismatches in the economies of the six candidate countries are relatively important. As in Western Europe, particularly acute shortages are reported in terms of information technology graduates. Both the public and private sectors have been taking initiatives to resolves these difficulties. The country reports for this study offer two examples from Estonia and Hungary.

In Estonia, engineers and IT specialists are in particularly short supply. The Estonian Association of Information Technology has estimated that over the period 2000-2002, the IT industry will need to recruit some 1200 people; while some 12000 other IT specialists are required in other spheres of business. The current number of graduates in IT falls well short of these estimates. In response to such analysis, the Government has funded a new IT college which opened in September 2000. However, the annual intake of 200 students will only go a small way to closing the gap.

A structural mismatch between supply and demand for IT specialists characterise human resources for innovation in Hungary. According to experts' opinions, the shortage of 3000 and 3500 IT engineers experienced in 1998 and 1999 respectively, will grow to 9500 for the country in 2002. To address this mismatch, (foreign-owned) ICT firms are developing linkages with education institutions, in order to secure an appropriate supply of graduates. They offer part-time jobs for students running regular shuttle services between their plants and campuses. In this way they are able not only to ease the shortage, but also "test" their would-be employees before entering into binding contracts.

Source: Innovation Policy Profiles Estonia and Hungary. See list of working papers in annex.

2.2.2 Knowledge creation

In Estonia, Poland and Hungary, relative expenditures on R&D are similar to levels of the EU Cohesion Countries countries at the end of the 1990's. Slovenia and Czech Republic have R&D expenditures closer to the EU average

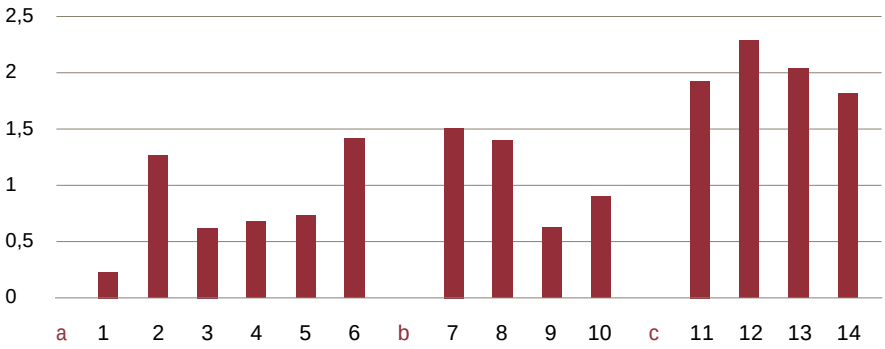
The R&D system in the former centrally-planned economies was characterised by R&D activities carried out mainly in public industrial research centres, while firms concentrated on production. Although the activities of the research centres were intended to support the development of specific industrial branches, there was little interaction with industry during the pre-production research.

Both public and private budgets for R&D were drastically reduced at the beginning of the nineties. An assumption was made in government circles that industrial R&D would be funded out of enterprises' own resources, while the role of the State would be limited to the financing of basic research. However, the dramatic decline of markets for a majority of enterprises and the restructuring of large firms who were the main customers for R&D, led to a decline in business expenditure on R&D (BERD). This was compounded by the closure or restructuring of industrial R&D institutes, many of which sought out new sources of revenue in short term services.

Public and private R&D expenditure declined markedly before picking up again towards the end of the 1990s

These trends are illustrated by the sharp decrease in expenditures on R&D experienced in all CC5, with the exception of Slovenia, until 1994-1995. Since then, R&D expenditure has either stabilised or even grown. In Estonia, Poland and Hungary, relative expenditures on R&D were similar to levels of the Cohesion countries at the end of the 1990's. Slovenia and the Czech Republic have R&D expenditures (measured as a share of GNP) closer to the EU average.

Figure 15 - **Share of Gross Expenditure on R&D in GNP, 1998**



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Source: Eurostat, OECD, Cyprus Statistical Services. Latest available year for each country.

In terms of relative number of researchers, CC5 countries are also at the level of Cohesion EU economies, with the exception of Slovenia and Estonia who managed to preserve their research potential at the level of the EU average. Cyprus has the lowest number of researcher per head of population (approximately a third the level of Greece, which is the weakest of the EU Member states).

"The Government must invest more in research. The funding of research in Cyprus through participation in EU research programmes, could prove to be a catalyst to promote a more professional, efficient, and competitive allocation of funds at the national level."

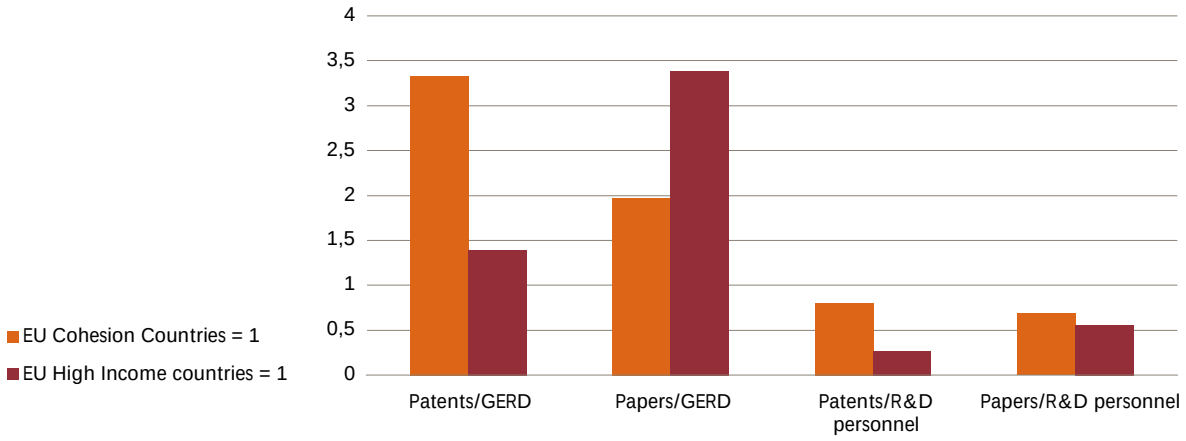
Cyprus Innovation Policy Workshop, April 2001.

In Cyprus, both the public, and in particular, the industrial research expenditure are at extremely low levels. The Government has envisaged a number of policy options to improve this situation (including the creation of an industrial R&D centre). There is a growing awareness and consensus in this country, on the need for a strong national public support for R&D.

The output of R&D activities has clearly been affected by the decline of R&D expenditure; the number of resident patents fell sharply in the beginning of the transition period. However, by 1998, the number of resident patents per 10,000 population for the CC5 was 0.7 compared to 0.3 for the three southern Cohesion economies (Slovenia outperforms the other candidate countries with 1.4). Hence, **domestic technological activity is relatively more developed in the CC5 than in the Greece, Portugal and Spain. However, the international relevance of these innovation activities is rather limited, since** US patenting is very marginal in both the CC5 and in the three southern EU countries.

It should also be underlined that, in terms of 'productivity' of their R&D systems, the CC5 countries are not lagging behind as was often assumed at the outset of transition. Given their expenditures on R&D and number of researchers, their R&D systems are producing relative levels of outputs broadly comparable to the EU Cohesion Countries. This in particularly applies if account is taken of differences in income levels, which inevitably affect the capital intensity of countries' R&D systems and hence the quality and number of R&D outputs.

Figure 16 - **Relative orientation of R&D systems of CC5.**



Source: Based on WB CDROM World Development Indicators 2001, OECD MSTI 2000.
NB: The figure compares the ratio of the productivity indices for the group of five candidate countries countries (excluding Cyprus) against those of the groups of cohesion and high income EU countries. For example, the ratio for patents GERD suggests that the candidate countries produce three times as many patents per Euro of GERD as the cohesion countries.

Moreover, the figure above, illustrates that in relation to the Cohesion Countries, the R&D systems of the CC5 are relatively more oriented towards industrial technology as their relative productivity in terms of patents is better than in terms of papers. This applies in terms of both GERD and R&D personnel. The opposite is true when CC5 are compared to high-income EU economies. Hence, **the CC5 R&D systems fall somewhere between the EU Cohesion Countries (science) and the EU High Income (technology) orientations.** This intermediate position of their R&D is coherent with an industrial structure that is also between that of the EU High Income and Cohesion Countries[27].

"There may be 41% of people with university education in Estonia but a majority are in humanities. When establishing an institution you may find 100 directors and a single engineer. However engineers are the basis of innovation".
Estonian Innovation Policy workshop, May 2001.

Comparable data on Cyprus are not available. However, very low levels of patenting compared to journal articles suggest that its R&D system is relatively more oriented towards research than to innovation. In that respect, the Cypriot R&D system shares features of the EU Cohesion Countries.

Another problem which some CC5 countries have to face seems to be a specialisation of research staff in basic science, rather than in fields with application in industry, like engineering and computer science, This is the case notably in Estonia, where it has been calculated that 150-160 new PhD graduates in technical science and technology would be needed each year, while the education system produces only 10% of this figure, with 10-15 graduates. In contrast, in the Czech Republic, the long industrial tradition brought a positive legacy in terms of qualifications, with a strong engineering education at secondary and third levels.

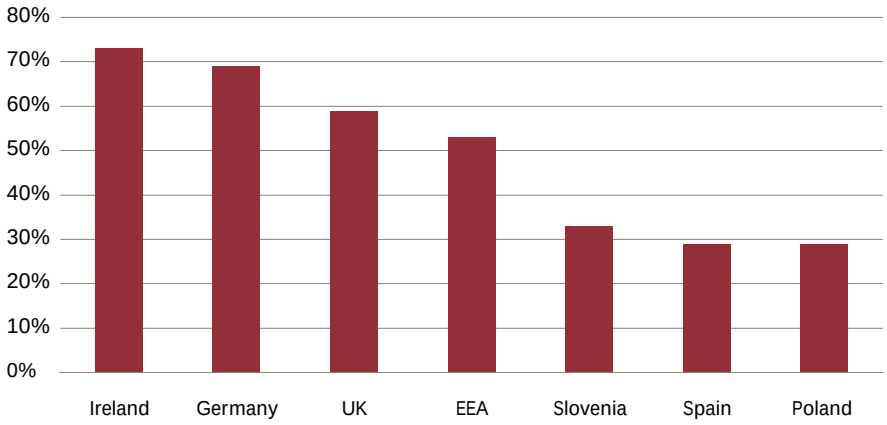
[27] Urban, Waltraut (1999) Patterns of Structural Change in Manufacturing Industry in Central and Eastern Europe.

2.2.3 Transmission and application of knowledge

The only means for measuring and comparing across countries the levels of innovative activities is through surveys such as the Community Innovation Survey (CIS). Results of surveys based on the CIS approach are only available for Poland and Slovenia. Since the degree of comparability of data obtained through these surveys is quite low, quantified results have to be considered with extreme caution. Nevertheless, the data indicates that these two candidate countries have:

- a share of innovative firms below the average for the European Economic Area (EEA) but comparable to Spain;
- a higher share of innovative firms in large than in smaller firms (this is a finding consistent with results observed in the EU);
- A ratio of innovation expenditures on sales revenue of enterprises, higher than the average of EEA countries;
- For innovating firms, a comparatively high share of sales generated by new or improved products in firms' turnover.

Figure 17 - **Share of innovative firms in manufacturing**

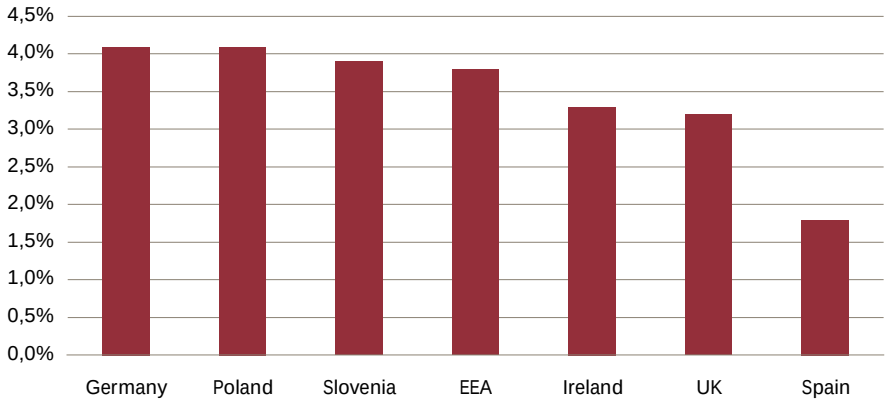


Notes: For European Economic Area (here: EU+ Norway) 1994-96(1995-97); for Slovenia 1998; for Poland 1997-98.
Sources: Eurostat (1999): Statistics in Focus, Theme 2-2/; Community Innovation Survey, 1997/98; Polish Statistical Office (2000) Report on S&T in Poland 1999, Warsaw; Statistical Office of Slovenia, (2000): R&D, S&T, Rapid Reports, No 81.

The CC6 lack the technology-oriented, segment of small firms that feed the innovation dynamics in the more advanced EU countries.

From this data, it is possible to state that innovation activities in Poland and Slovenia are more concentrated in large firms than in EEA countries. Although it is difficult to generalise, the CC6 lack the technology-oriented, segment of small firms that feed the innovation dynamics in the more advanced EU countries.

Figure 18 - **Intensity of innovation activity. The share of innovation expenditure in the sales revenue of enterprises**



Source: Eurostat (1999): Statistics in Focus, Theme 2-2/; Community Innovation Survey, 1997/98; Polish Statistical Office (2000) Report on S&T in Poland 1999, Warsaw; Statistical Office of Slovenia, (2000): R&D, S&T, Rapid Reports, No 81.

Secondly, those firms that innovate in Poland and Slovenia do so more intensively than the average for EEA countries, indicating a strong pressure to undertake innovation activities.

A few firms are investing heavily in innovation, while the overwhelming majority of SMES, are not undertaking innovation

As a whole, this suggests a dual picture where **a few firms are heavily investing in innovation activities, while the overwhelming majority of other companies, especially SMES, are not undertaking innovation.** It would seem that the problem in these countries concern thus diffusion and utilisation, on a broad basis, of new technologies for economically profitable outputs.

Concerning the sources of innovation, firms in Poland and Slovenia rely mostly on internal resources and customers, as is the case in EEA, but:

- Purchase more embodied technology;
- Undertake less R&D and engineering activities.

This is consistent with a business environment in the CC6, where R&D comes mostly for external sources, especially foreign ones, rather than from internal R&D.

Concerning the objectives of innovation, Polish and Slovenian firms share with EEA firms a main concern to increase or maintain markets shares and extend their product range, but:

- Place higher the objective of creation of new markets;
- Target reduction of material and energy consumption more than the reduction of wage shares[28].

Innovation policy will need to strike a balance between support to SMEs and to large firms, in particular to their role as organisers of sub-contracting networks or clusters of activity.

The latter point can be further illustrated in the light of available data on energy efficiency, measured by the ratio of GDP per oil equivalent. All CC6 countries rank lower than EU countries on this indicator, indicating both their specialisation in energy-intensive industries but also their lower energy efficiency. Such a situation suggests that the importance of process innovation is higher for the former countries.

In conclusion, despite expectations that large enterprises would be replaced by new innovation-oriented SMEs, **large firms continue to undertake the majority of innovation activities in CC5**. Hence, innovation policy needs to strike a balance between support to SMEs and to large firms. In particular, appropriate measures to support the role of large firms as organisers of sub-contracting networks or clusters of activity are required.

In the absence of reliable data, policy decisions are more likely to be influenced by pressure groups and political considerations than by well-identified needs of enterprises

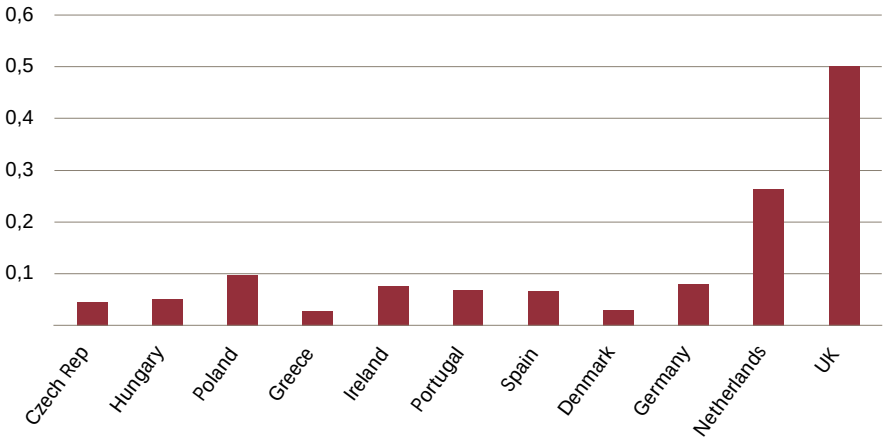
A second major issue for policy-makers is the **lack of available reliable and internationally comparable survey data on innovation performance**. Few firm conclusions can be reached either in terms of internal patterns of innovation or how countries are performing in comparison to their neighbours and future partners in the EU. In the absence of reliable data, policy decisions are more likely to be influenced by pressure groups and political considerations than by well-identified needs of enterprises.

[28] See Slavo Radosevic. Patterns of Innovative activities in countries of central and eastern Europe: an analysis based on comparison of innovation surveys. SPRU Working Paper. www.sussex.ac.uk/spru

2.2.4 Framework conditions for innovation : finance and information technologies

Venture capital is an important mechanism for channelling investment into new technological and growth areas like those related to IT, software and Internet. When compared to EU countries, a 2000 OECD study[29] underlined that, the venture capital market in candidate countries, with the exception of Poland, is relatively undeveloped (see figure below) Measured in terms of the importance of funds raised with respect to GDP, the candidate countries are roughly level with the cohesion countries.

Figure 19 - **Venture capital as a percentage of GDP 1995-99**[30]



Source: Günseli Baygan and Michael Freudenberg, The Internationalisation of Venture Capital Activity in OECD Countries: Implications for Measurement and Policy, STI Working Papers, 7/2000, OECD.

[29] Baygan Günseli and Michael Freudenberg (2000), The Internationalisation of Venture Capital Activity in OECD Countries: Implications for Measurement and Policy, STI Working Papers, 7/2000. http://www.oecd.org/dsti/sti/prod/sti_wp.htm

[30] Data for the Czech Republic, Hungary and Poland are preliminary pilot data for 1998-1999 only. Data generally refer to the "country of management" approach, i.e. according to the geographic location of the managing venture capital firms that raise and invest these funds.

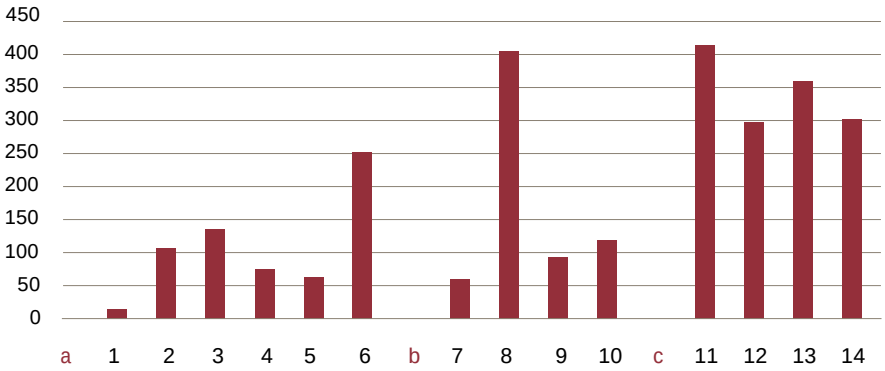
"We have a good product and now we need €60 million to take this product to the world. You just don't find that sort of money anywhere in Estonia".

Estonian Innovation policy workshop, May 2001

One main barrier for the increase of innovative activities lies in the **under-development of the financial and banking sector**, still lagging behind EU conditions. For the time being, the financial system still lacks mechanisms for supporting technological developments and the introduction of **innovation in enterprises.**

The gap in diffusion of **IT and telecommunications** between CC5 and EU was huge in the early 1990s. Due to privatisation and deregulation, growth prospects and local demand driven by foreign investments, this gap has decreased but is still substantial.

Figure 20 - **Personal computers per 1,000 people, 1999**



a. Candidate Countries
- Cyprus
- Czech Republic
- Estonia
- Hungary
- Poland
- Slovenia

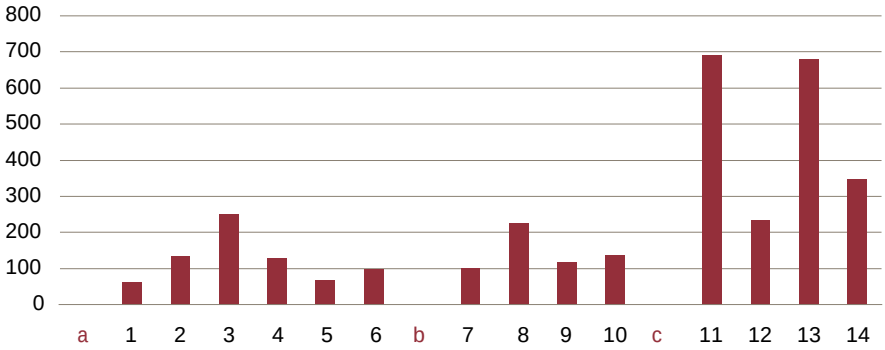
b. Cohesion Countries
- Greece
- Ireland
- Portugal
- Spain

c. High Income Countries
- Denmark
- Germany
- Netherlands
- UK

Source: World Telecommunications Development Report 2000; European IT Observatory 2000.

Apart from Slovenia, the number of personal computers per capita in CC5 and Cyprus is broadly similar to the relative penetration rates of the Cohesion Countries.. Low levels of income play an inhibiting role in diffusion of PCs as well as in diffusion of Internet services. The gap between CC5 and the Cohesion Countries, on one hand, and high income EU, on the other, is large and shows that **the problem of a digital divide will increase in enlarged EU.**

Figure 21 - **Internet hosts per 10,000 people, July 2000**



a. Candidate Countries
Cyprus
Czech Republic
Estonia
Hungary
Poland
Slovenia

b. Cohesion Countries
Greece
Ireland
Portugal
Spain

c. High Income Countries
Denmark
Germany
Netherlands
UK

Source: World Telecommunications Development Report 2000.

A relatively low number of internet hosts, lower incomes and higher access charges are likely to hinder the development of knowledge based services.

As development of knowledge based services increasingly depends on the Internet, the number of Internet hosts is important to this process. With the positive exception of Estonia, the number of Internet hosts in CC5 is similar to those of the Cohesion Countries. An important factor, which hinders further diffusion of Internet in the CC5, is the cost of access to Internet; the Czech Republic, Hungary and Poland having the most expensive in the OECD in 2000. This, combined with low income, generates **a vicious circle between supply and demand for new information technologies which innovation policy-makers in the CC6 should aim to resolve.**

In terms of policy responses, since 1998, Estonia, influenced by the Finnish model, has devoted much policy attention to the development of the ICT sector, including the creation of the already mentioned IT college; while in Slovenia, a Minister for Information Society was appointed in 2000. By the summer of 2001, it was too early to judge the impact of such policy choices.

Table 1 - **"Innovation Scoreboard" 2001 for the CC6**

No.	Indicator
Human resources	
1.1	S&E graduates/20-29 year old population
1.2.	% economically actvive pop. whith 3rd level education
1.3	% working pop. in life-long learning
1.4	% employment in high-tech manufacturing
1.5	% employment in high-tech services
Knowledge creation	
2.1	Public R&D funding/GDP
2.2	Business expenditure R&D/GDP
2.3	EPO high-tech patents/pop
2.4	USPTO high-tech patents/pop
Transmission and application of knowledge	
3.1	% SMEs innovating in-house
3.2	% SMEs in co-operative innovation
3.3	% innovation expenditure/total sales
Innovation finance, output and markets	
4.1	% venture capital/GDP
4.2	% new capital/GDP
4.3	% new-to-market products/total sales
4.4	Home internet access
4.5	% ICT markets/GDP
4.6	Change 1993-97 high-tech/value added
	Available Indicators
	Indicators above EU average

Source: See list of definitions in annex.
Calculations of study team based on available data.

Year	Cyprus	Czech Rep	Estonia	Hungary	Poland	Slovenia	EU
							9.32
1999	22.60	11.30	40.80	15.60	14.80	15.90	23.25
							9.65
1999	1.85	10.63	5.71	8.49	7.54	10.18	6.29
							3.27
1999	0.18	0.47	0.48	0.37	0.44	0.64	0.62
1999	0.03	0.82	0.12	0.26	0.30	0.75	1.14
							19.14
1998	0	0	0	2.08	0	1.52	11.65
					4.1	16.9	41.01
							15.42
					4.1	3.9	3.41
1999		0.021		0.016	0.045		0.09
1999					0.24	0.15	1.53
							5.40
							33.40
1999		8.49		6.42	4.9	4.31	5.86
							9.50
	5	**7**	**5**	**7**	**10**	**9**	
	0	**2**	**1**	**2**	**2**	**3**	

2.2.5 Towards an innovation scoreboard for the CC6

In order to arrive at as complete a comparative picture as possible of the innovation potential of the CC6, this section bring together the data presented above and expands it with several new indicators with the aim of simulating an innovation scoreboard, based on the model of the European Innovation Trend Chart (http://trendchart.cordis.lu).

The table above summarises the situation across the CC6 compared to the EU average for each indicator (full definitions of each indicator can be found in annex on page 175). As can be seen :

- in terms of availability of data, Poland and Slovenia are significantly better placed with nine and 10 indicators out 17; followed by the Czech Republic and Hungary with seven; and Cyprus and Estonia with five;
- in terms of indicators above the EU average, Slovenia is best placed with three and Cyprus in worst place with none.

Given the relatively limited number of indicators per candidate country, it was not meaningful to construct a summary index. However, even partial data, when organised in several groups, enables a number of interesting conclusions to be drawn.

Firstly, the CC6 are lagging least in terms of human resources (indicators 1.1 to 1.5) and then knowledge creation (2.1 to 2.3). **Their biggest gaps are in the transmission and application of knowledge (3.1. to 3.3), that is, in issues related to the overall connections between various players of the 'national systems of innovation' (firms, research centres, etc.).**

Second, a relatively high share of employment in high-tech manufacturing, except in Cyprus, and varying ICT intensity of GDP, except in the Czech Republic and Hungary, suggest that **the CC6 have a good potential for catching up based on new technologies.** A high share of trade with the EU and relatively favourable skills structure of human resources suggest that foreign investors have managed to tap the labour pool in the region.

The key issue is the dynamic potential of this initially favourable situation. **Indicators of knowledge creation show that the potential for dynamism is severely restricted by weak demand for R&D by business sectors** and is confined to possibly one or two of the six economies. This applies especially to high-tech activities (patenting). Though nominally a significant share of employment and export in CC5 is in high-tech industries detailed country

data shows that they are specialised for the time being in low value-added segments, which do not require high R&D intensity. However, the significant share of industry and an industrial structure biased towards engineering sectors in the CC5 economies suggest that the knowledge creation via R&D will remain significant and important for future technology upgrading.

Third, a small number of innovative small firms and innovative activity confined to a few large firms suggest that there are serious weaknesses in the innovative potential of the CC6 economies. Innovative small firms have a higher innovation intensity (high share of innovation expenditure in sales) than the EU average. However, **there is large gulf between this group of firms and the majority of small firms.**

Fourth, there are serious weaknesses in the ability to generate venture capital that would support an increase in the number of innovative small firms. **A financial system geared towards innovation is one of the key challenges of innovation policy in the CC6.**

Finally, relatively high ICT intensity of some of the CC6 (Czech Republic and Hungary) and lags of other countries are difficult to interpret. They may represent a source of the emerging long-term differences but also of different patterns of use and production of ICT.

2.3 The legal and administrative environment for innovation

Numerous studies have underlined the importance of the institutional environment, and in particular how legislation and administrative procedures can create obstacles to or facilitate innovation in enterprises. Attention is generally focused on:

- factors hindering the creation of firms (time and cost of registration procedures, competition law);
- the influence of bankruptcy law and procedures on an efficient reallocation of resources (human and financial) within the economy;
- the daily administrative burden related to obtaining licences, fulfilling company taxation or social security obligations, etc. which may distract managers from longer term development projects; and
- the adequacy of intellectual property law both in terms of ensuring appropriate protection for IPR (and hence stimulating the private incentive to invest in R&D) and facilitating the commercial exploitation.

Since the 1995 Green Paper on Innovation, the issues surrounding these non-technological barriers to innovation have gained higher prominence. Despite various initiatives at both EU and member state levels, the Commission Communication on Innovation in a knowledge-driven economy' (DG Enterprise, 2000) underlines that the complexity of administrative and regulatory procedures continues to be a serious obstacle to the creation of businesses. It also affects their capacity to innovate, for example approval procedures for new products, raises development costs and increases time to market.

The Communication urges the Member States to take further steps to simplify the administrative procedures faced by innovative enterprises. A second line of action promoted by the Communication is the use of taxation and other indirect methods to encourage innovation and research.

The objective of this section is to assess whether the legal and administrative environment in the CC6 favours or hinders the development of enterprises, in general, and innovation activities, more specifically. The main sources of information on trends in the legal and regulatory environment and their influence on enterprise development are the European Commission's Regular Reports on progress towards accession, published on an annual basis; and the European Bank for Reconstruction and Development (EBRD) surveys of the institutional performance of the central and eastern European countries published on an annual basis since 1994.

None of these surveys specifically consider the impact of the legal environment on innovation, or legal issues directly relevant to innovation such as intellectual property rights.

Neither of these surveys specifically consider the impact of the legal environment on innovation, or legal issues directly relevant to innovation such as intellectual property rights. This said, they do clearly identify specific strengths and weaknesses of the legislative and administrative environment that, indirectly, influence the capacity of enterprises to undertake innovation[31].

2.3.1 Institutional and regulatory changes in the six countries: an overview

In the CC5, during the early to mid 1990s, the difficulties faced by enterprises with respect to the legal environment for doing business were considerably

[31] For instance, bankruptcy law are important for innovation in as much as they safeguard creditors rights and hence ensure the availability of loan finance at lower costs of lending allowing new product development projects, etc. to go ahead. See Law in Transition, Spring 2000. EBRD, London. Special issue on Insolvency Law and practice: "Bankruptcy is a defining characteristic of a market economy. It establishes the limits and priority of credit extension and entrepreneurial venture capital and allocates risk".

more important than a need for administrative simplification. At the outset, the basic legal provisions and institutions for the development of private enterprises were lacking. Therefore, the accent was placed on the building of the key market institutions in all countries: company law, bankruptcy law, regulatory and financial supervision, and competition policy.

In reviewing progress during the first ten years of transition (1989-99), the EBRD concluded that the variation is considerable, both in the extent and the quality of legal provisions and noted that the **development of institutions that support markets and private enterprises has lagged behind progress in liberalisation and privatisation.**

Table 2 - **Summary of EBRD selected institutional and legal transition indicators (2000)**

Country	Institutional performance	Commercial law	Financial regulations	Competition policy	Governance & enterprise restructuring	Private sector share of GDP in %
Hungary	3.5	4-	4	3	3+	80
Poland	3.3	4-	4	3	3	70
Czech Republic	3.2	3+	3+	3	3+	80
Estonia	3.1	4-	3+	3-	3	75
Slovenia	2.8	4-	4	3-	3-	55

Source: EBRD Transition Report 2000. Scale 1 to 4 (1= lowest performance). Private sector share of GDP, mid-2000, EBRD estimate. A '+' indicates that the country is within a few points of reaching the next category; a '-' indicates a country that is at the bottom of the category and where a significant improvement is required.

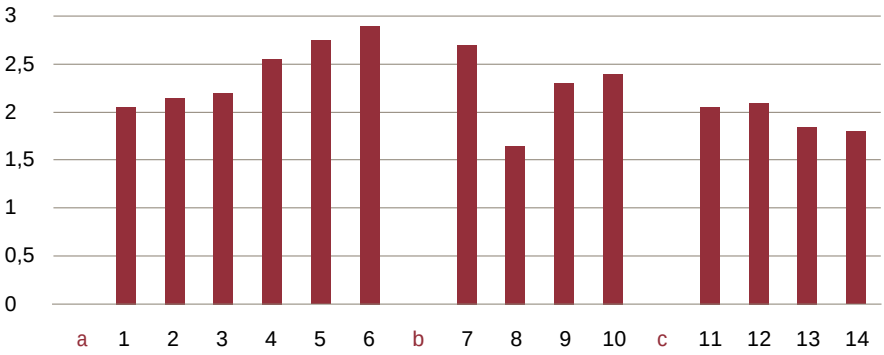
Broadly speaking, by 2000, the CC5 are all considered by the EBRD to be close to attaining the level of reform required to allow private enterprise development to take place without major institutional obstacles.

The table above summarises the key indicators produced by the EBRD (for 2000) including a composite 'institutional performance' indicator[32]. The CC5 are all ranked in the top six of the transition countries with a score (on a scale from 1 to 4) ranging from 3.5 in Hungary to 2.8 in Slovenia (in comparison other candidate countries such as Bulgaria and Romania receive scores closer to 2). Broadly speaking, by 2000, the CC5 are all considered by the EBRD to be close to attaining the level of reform required to allow private enterprise development to take place without major institutional obstacles.

[32] Defined as "the unweighted average of transition indicators in 2000 for banking sector, non-banking financial institutions, competition policy and enterprise reform and corporate governance".

A complementary, if somewhat less in-depth review, is produced by the US based "Heritage Foundation". The 2001 "Index of Economic Freedom[33]" ranks the six candidate countries (on a scale from 1 to 5, a lower score indicating "greater freedom")[34]. As compared to the EBRD approach (which focuses more on the effectiveness of the institutions required for a market economy), this composite indicator focuses on the liberal character of the economy, i.e. it attempts to measures obstacles to the functioning of a 'free market'.

Figure 22 - **Importance of Barriers to Economic Freedom (2001) (Scale 1 to 5, 1= lowest barriers)**



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- Spain

c. High Income Countries
- Denmark
- Germany
- Netherlands
- UK

Source:Heritage Foundation (www.heritage.org), Index of Economic Freedom, 2001.

According to this indicator, the CC6 are ranked in the "mostly free" zone (rank between 2 and 3). In terms of a comparison with selected EU Member States, Ireland, one of the cohesion countries, leads the field, being ranked as "free", followed by the four high income countries. The ranking of Greece is similar to that of Poland and Slovenia.

[33] Economic freedom is defined as the absence of government coercion or constraint on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself

[34] The overall score reported here is an aggregate of 10 sub-indicators covering the following issues: trade policy, fiscal burden and government expenditures, public share in the economy, monetary policy (inflation rate), foreign investment and freedom of capital flows, banking and finance, property rights, regulation, wage and prices and black market.

Hungary and Poland, the countries ranked more favourably by the EBRD for their appropriate institutional and legal environment, are ranked less favourably under this Index of Economic Freedom, mainly because of their high fiscal burden and inflation rates, incomplete price and wage liberalisation in Poland, and lack of transparency in the application of regulations in Hungary. Estonia, on the contrary, ranks better because of its completely open trade policy, full openness to foreign investors, and low government intervention in the economy. Slovenia consistently scores least well among the CC6, as concerns both institutional change and degree of liberalisation of the economy.

2.3.2 The legal environment for business

The Commission's Regular Reports on progress to accession for 2000[35] underlines that that there remain significant differences in the level of adaptation of the legal and administrative policy frameworks for enterprise development. The environments for enterprise development in **Cyprus** and **Estonia** appear to be broadly the most favourable with the procedure for company registration being particularly efficient, in the former.

In **Hungary**, the legal and administrative environment is also largely positive, especially for the creation of new companies, although bankruptcy procedures are singled out as requiring attention; and differences in the treatment of foreign and domestic owned companies (i.e. for tax) are also viewed negatively.

In the three other countries, specific problems remain to be resolved most notably in the **Czech Republic** (registration of business activities, enforcement of legal decisions and bankruptcy procedures) and **Slovenia** (bureaucratic procedures for permits; bankruptcy procedures and access to finance). The legal environment for business in **Poland** is generally positive except for difficulties with bureaucratic procedures and the enforcement of court decisions on contracts.

Commercial and corporate laws and financial regulations play a direct influence on the daily life of enterprises, and thus may exert a deterring or facilitating effect on their innovative practices. The EBRD Legal Indicators survey gathers on an annual basis the opinions of private law firms, academics and other experts in the transition countries. As far as commercial law (pledge, bankruptcy and company law) are concerned, the results for 2000 (see table above) suggest that, with the exception of the Czech Republic, the CC5 have in place a comprehensive and reasonably clear set of legislation in at least two

[35] See http://europa.eu.int/comm/enlargement/report_11_00/index.htm

of the three areas (extensiveness); while in terms of effectiveness, administrative and judicial procedures remain somewhat inadequate notably in the Czech Republic and Estonia. Aside from the conformity of specific laws with 'good practice' as judged from a Western European viewpoint, the issue of the frequency of changes in laws or administrative practices, or a low degree of effective enforcement of laws, can also pose problems for companies. For instance, in the Czech Republic, "since 1991, there have been more than ten amendments to the [bankruptcy] law. The frequent amendments have created a perception that the bankruptcy law is ineffective".[36]

2.3.3 Competition and state aid policy

Competition policy (anti-trust and state aids), is important to for innovation in as much as it prevents both the abuse of dominant position which can stifle the creation or growth of new firms; and since it ensures that financial resources are allocated in a manner which provide the correct incentives for investment.

A suitably competitive environment can increase innovation in the candidate countries. Firms with no main competitors in the candidate countries are less likely to be engaged in new product development.

Studies suggest that a suitably competitive environment can increase innovation in the candidate countries. According to EBRD's 1999 Business Environment and Enterprise Performance Survey firms with no main competitors were less likely to be engaged in new product development. Similar findings apply to the likelihood that firms engage in restructuring of their organisation. Other factors influencing organisational restructuring are hard budget constraints (enforcement of tax and creditors rights) and ownership (foreign owners or new entrants are more likely to restructure).

Equally, the EBRD 2000 Transition Report has underlined that none of the countries appears to devote enough attention to ensuring that all enterprises (and start-ups in particular) have unimpeded access to all essential business service. Hence, **one key aspect of a more effective competition policy is to improve access to business services for all firms.**

As part of the accession process, the European Commission is scheduled to negotiate the competition policy chapter with the six countries covered by this study during the second half of 2001. In its November 2000 progress report, the Commission underlined that **"regarding the application of competition and state aid rules…progress is not yet sufficient"**. At the 7th

[36] More generally, the EBRD Transition Report 2000 cites research which finds that "legal effectiveness is much more important for economic outcomes (in financial market development and the functioning of competition) than the extensiveness of the legal framework".

Annual Competition Conference between candidate countries, held in June 2001, the Commissioner for Competition Policy, Mario Monti, stressed the importance of the enforcement aspect of competition policy legislation generally, and state aid regulations more specifically.

While the enforcement situation for state aid seems to have improved, **certain candidate countries continue to operate incompatible fiscal aid regimes that are used to attract foreign investments** (e.g. special economic zones with 20 year tax breaks for investing companies in Poland) or keep non-viable businesses alive. The issue of how to restructure state aid incentives to comply with EU regulations is likely to become a top agenda item of the candidate countries during the period 2001-2004. In this respect, horizontal measures in favour of industrial research and development while technically more in line with EU regulations need to be designed carefully if they are not to run foul of EU state aids rules (see box below).

Box 4 Adapting state aids to EU regulations in Hungary

The annual report of the Hungarian state aid Monitoring Office suggests that some 1.25% of GDP is allocated by the State to the manufacturing sector. As a comparison, the aid per person employed is around half the EU average for the period 1996-98. Aid for horizontal measures for R&D amounted to €8.44 million accounted in 1998 or 1.6% of the total aid. This compares with an EU average of 11% for 1996-1998. However, R&D support is also eligible under regional aid schemes in Hungary. The latter accounts for some 80% of total state aid in 1998 and remains something of a black box. In addition, funding for business incubators should fall under the de minimis rule.

As far as state aid for enterprises carrying out research and development are concerned, an assessment carried out in 2000 found that R&D schemes promoted by the former OMFB agency (now part of the Ministry of Education) included procedures which reduced the incentive effect, a cornerstone of EU regulations governing aids to R&D, by only paying a "loan" after the costs had been realised (thereby reducing the likelihood that firms will undertake riskier projects). The report recommended that the Hungarian authorities should improve the compatibility of R&D schemes by:

- **explaining more clearly within schemes which stages of R&D are eligible (industrial basic research or pre-competitive activities;**
- **fixing aid intensities according to the stage of R&D, etc.**
- **separating general investment aid from R&D aid.**

Source: Annual Report of Hungarian State Aid Monitoring Office.
Interviews with SAMO officials, May 2001.

Administrative simplification

Administrative simplification would appear to be gaining ground as a policy priority in the six candidate countries

Administrative simplification is gaining ground as a policy priority in the CC6. As the basic legal foundations of a market economy have become well established, a certain flux in the legislative and regulatory environment has begun to draw the attention of policy-makers to the need to simplify and reduce the number of obligations on enterprises, particularly "start-ups". Another factor adding to the complexity of doing business has been the decentralisation of administrative procedures and of certain economic development powers, notably in Poland.

Policy responses are still early but a number of examples are readily identifiable including "anti-bureaucracy task forces" (Poland, Slovenia); one-stop shops for business formalities (Cyprus, Hungary); pre-company status allowing operations to begin before full official registration (Hungary), etc.

The absence of administrative barriers to entry and the availability of finance for new firms would seem to be particularly important pre-conditions for improving the rate of innovation in candidate countries.

A good example of simplified procedures for establishing businesses is Cyprus where *"a single number is given to each company registered and all companies are listed in an easy to handle computerised catalogue. In the registration procedure, there is no involvement of any other government department apart from the Department of the Registrar of Companies and Official Receiver"*[37].

Allied to the lack of barriers to entry assured by effective competition policy, rapid and relatively low cost procedures for the creation of new enterprises can be crucial in allow such firms to generate profits from new products or services. Indeed, a 1999 EBRD survey of businesses in transition countries found that: *"new private entrants are able to create at least transitory profits from their innovative activities, while this is less evident in state-owned and privatised enterprises".*

Hence, the absence of administrative or regulatory barriers to entry and the availability of finance for new firms would seem to be particularly important pre-conditions for improving the rate of innovation in candidate countries.

[37] European Commission. Directorate-General for Enlargement (2000). Regular Report on progress towards accession, November 2000. http://europa.eu.int/comm/enlargement/report_11_00/index.htm

Corporate taxation

No studies of the role of corporate taxation in stimulating innovation in the CC6 countries have been identified although more general summaries of the incidence of taxation (levels and procedures) on enterprises are available[38]. The table below summarises the situation in terms of tax rates and tax breaks for investment/R&D in the six candidate countries[39].

There is a trend to either equalise access for SMEs and foreign investors to tax incentives or eliminate such incentives in order to increase the neutrality of the tax system

As far as the overall burden of corporate taxation is concerned, there is some evidence (notably for Hungary and more recently the Czech Republic) that smaller companies and start-ups face a heavier tax burden than larger companies (both foreign direct investment and remaining large state owned companies)[40]. For instance, in the case of Hungary, the Commission's 2000 Progress Report on Accession noted many small and medium enterprises face a higher tax burden relative to foreign firms, since many of the tax incentives offered to foreign firms are not available to domestically owned firms[41]. However, there is a trend to either equalise access for SMEs and foreign investors to tax incentives or eliminate such incentives in order to increase the neutrality of the tax system[42].

In other countries, it appears to be the complexity of tax regulations rather than the inequality of the tax burden that seems to pose problems. For instance, a survey of 200 manufacturing firms in Poland found that *"focus for complaint…was the inconsistent, complex and unpredictable nature of taxation…(not the level)…It is striking that it was only the privatised and ab initio firms that identified taxation as a serious problem…the results here suggest that Polish private firms are very concerned with this issue"*[43]. Again, the evidence

[38] See for instance the EBRD Transition Report 1999 Chapter 8.4 on SME Taxation.

[39] Only Poland appears to offer a special tax regime for SMES with tax being imputed, based on revenues.

[40] However, the real distinction is between businesses registered as sole proprietors who face the top marginal income tax rate and other forms of companies.

[41] This conclusion is confirmed by a recent study which found that "foreign affiliates produce 86% of the pre-tax profit but pay only 59% of the corporate tax. This is partly the result of policy preference provided to large investors, partly the result of tax holidays provided to foreign investors before 1996". Gábor Hunya. International competitiveness Impacts of FDI in CEECs. Mimeo, 2000.

[42] OECD. Reviews of Foreign Direct Investment. Hungary (2000)

[43] Carlin et al (1999), op. cit. Another survey of some 300 firms in Poland found that: "Managers of start-ups report higher tax rates than managers of spin-offs in all the countries…consistent with greater profitability of start-ups". 'Entrepreneurs and the ordering of institutional reform: Poland, Romania, Russia, the Slovak Republic and the Ukraine compared'. Simon Johnson, John McMillan and Christopher Woodruff. EBRD Working Paper n°44, October 1999. Another issue is that in all countries, with the exception of Poland, businesses registered as sole proprietors are subject to personal income tax rather than corporate profit tax, the former being generally considerably higher than the latter.

here is rather limited and most government, including the Polish one, are taking measures to alleviate tax related problems for SMEs and new start-ups[44].

Table 3 - **Corporate taxation in the six candidate countries**

Country	Number of principal l nationa taxes	Maximum rate profit (income) tax	Standard rate vat (%)	Tax breaks for new investments	Tax breaks for industrial R&D/IPR
Cyprus	5	28 (40)	10%	Tax breaks for investment in new equipment in manufacturing industry	Proposal for 10-year tax relief on profits from the production of new products
Czech Republic	5	35 (40)	22	5 year exemption for investments over US$10 million	None
Estonia	4	26 flat	18	0% rate for reinvested profits	None
Hungary	3	18 (42)	25	Tax reductions for investments over US$ 5 million	Tax deduction of R&D activities – increased to 100% of total expenses in 2001
Poland	3	34 (40)	22	Investment tax credits – deduction of up to 50% of eligible capital expenditure	Tax allowances for patents and R&D projects – abolished as of 2000
Slovenia	4	25 (50)	20	40% of investments in fixed assets are deductible	None

Sources: EBRD Transition Report 1999, pg.157; Country reports European Trend Chart on Innovation; Country reports of this study. IMF Staff Country Report Cyprus September 2000. OECD Small and Medium Enterprise Outlook 2000

[44] EBRD Transition Report 1999. Pg. 156. The use of presumptive taxation is favoured.

In terms of incentives, it is noteworthy that while all six countries have some form of tax reduction scheme for general investment, only two (Hungary and Poland) had a special tax deduction for industrial R&D investments in 2000. Moreover, in the case of Poland, the tax relief for R&D was discontinued as of 2000 as part of the overall tax reform process[45]. In Cyprus, a proposal for a 10 year tax holiday on profits derived from the production of new products is being discussed by government. In the Czech Republic, the act on investment incentives, which entered into force in May 2000, introduced tax incentives for already existing companies that plan expansion. The package of investment incentives contains the possibility of up to 10 years tax holiday on technology imports.

The issue of tax relief for innovation or R&D projects in enterprises seems to be given a low emphasis in a wider process of simplification of the taxations systems

In summary, the issue of tax relief for innovation or R&D projects in enterprises seems to be given a low emphasis in a wider process of simplification of taxation systems, with a trend towards the elimination of tax relief in order to improve the neutrality of the system[46].

This said, the discussions during the Innovation Policy Workshops organised for this study, suggest that there is clearly a debate about the most effective way in which to encourage investment by enterprises in innovation and R&D. A good example is the Czech workshop where it was emphasised that the tax system needed to be adapted to the situation of innovating firms: "indirect (tax) provisions have been applied in the field of investments; a similar provision is advisable for industrial research even if the Ministry of Finance is reluctant to apply such measure (because of the danger of misuse)[47].

The use and effectiveness of tax benefits to stimulate R&D is not a clear cut case and deserves greater study and reflection by the governments of the CC6, notably taking into account EU experience.

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[45] "Until 2000, companies that incurred investment expenditure on the purchase and installation of machines or devices connected with implementation of licenses, patents and results of domestic development projects could deduct the investment costs from the taxable revenue up to 30% of this revenue. As of 2000, this tax relief has been abolished in view of the current taxation policy that aims to gradually reduce the corporate tax rate over the next 4 years to 22% in 2004. As the falling general tax rate is expected to stimulate innovation and modernisation expenditure, the tax relief for investment is seen as unnecessary". European Trend Chart on Innovation, Country Report Poland, November 2000.

[46] "the introduction of tax-reliefs and tax exemptions to encourage the creation of start-ups is problematic since these measures often assist firms that would have been created without these incentives". (See EBRD Transition Report 1999, pg.156)

[47] During that same workshop, it was noted that accounting procedures needed also to take account of the specific nature of R&D activities, and the long time span between expenses and return.

Intellectual Property Rights

Intellectual property rights, an key issue for innovation, remain largely ignored as a policy issue in the CC6 countries. There are as far as we could identify no studies on the legal framework for the protection of IPR in the six candidate countries. Some support has been provided through the Phare programme for legislative reform or reorganisation of patents offices. Cyprus is the only country out of the six candidates which is a member of the European Patent Office. At the same time, foreign direct investors in the region, for instance General Electric in Hungary, have drawn attention to the unfavourable legislative rules on IPR (e.g. ambiguity of ownership of R&D results carried out by an employee of a firm). Similarly, the innovation policy workshop organised in Slovenia, also pointed to problems in this area including: excessive costs for patenting, no IPR support services in universities, and lack of awareness from smaller firms of the need to protect know-how.

Conclusion on the legal and administrative environment: issues and challenges for candidate countries

During the 1990s, governments in the CC5 have focused their efforts on the creation of a suitable legal and regulatory environment for the development of a market economy: corporate law, bankruptcy law, competition policy, etc. The remaining weaknesses of the legal systems of the CC5 are related to the complexity of legislation, the ineffective implementation and protection of the rights of commercial entities. **The challenge ahead for the CC5 is to ensure an effective and efficient implementation of the legal framework.**

Rules and regulations have been framed with a view to providing a framework for business activities, not at directly facilitating or alleviating barriers to innovation.

However, rules and regulations have been framed with a view to providing a framework for business activities, **not at directly facilitating or alleviating barriers to innovation**. As a result, it is difficult to appreciate their influence on innovation, particularly as there are few studies or surveys which tackle this specific question. Indeed, a large question mark remains as to whether innovation policy measures (direct and indirect, such as taxation) can compensate continuing barriers arising from legal and administrative frameworks. The legal environment for business in Cyprus is broadly speaking comparable to those of EU Member states in terms of its coverage and effectiveness. In particular, procedures for the establishment of firms are simple and rapid. Competition policy, and in particular state aid regimes, remains a key issue that will need to be tackled before accession. **The need to develop new forms of incentive compatible with EU rules should be the occasion for CC6 governments to reflect on a reorientation towards horizontal measures in favour of innovation and industrial R&D.**

Chapter 3 Is there an innovation policy in the candidate countries ?

An innovation policy cannot be equated with a number of disparate initiatives promoted by government ministries or agencies. The definition adopted by this study is **a set of policy actions to raise the quantity and efficiency of innovative activities where 'innovative activities' refers to the creation, adaptation and adoption of new or improved products, processes, or services .**[48]

This requires on the one hand, that policy-makers are informed and aware of the level of innovation activities in firms; and on the other hand, that a coherent set of instruments are developed, and implemented, with their effectiveness in fostering innovation being evaluated over time.

This chapter appraises, in a first instance, the institutions of innovation policy in each of the candidate countries both in terms of policy development and implementation. In a second section, a series of conclusions are drawn about the current way in which governments in the CC6 are giving priority to innovation issues.

3.1 The institutional framework for innovation policy matters

Two main questions are addressed in this section:

- Which government department(s) or bodies is (are) responsible for innovation policy at national level?
- Which organisations (public, semi-public, non-profit, private) can be considered as being important participants in the process of developing innovation policy?

For each country a short analysis of the main executive bodies (government ministries, etc;), implementing agencies and stakeholders is provided. This analysis is complemented by an institutional framework diagram per country

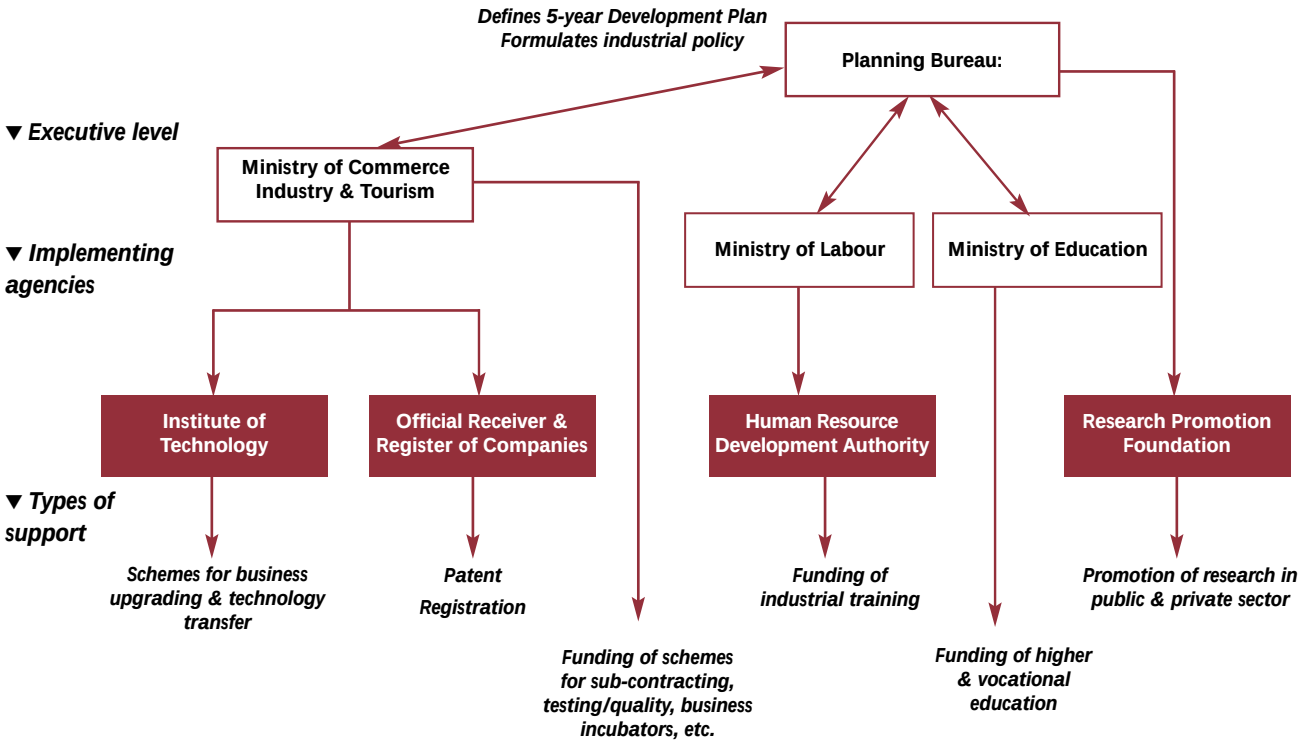
[48] Innovation Policy in a knowledge-based economy. A MERIT study commissioned by the European Commission. DG Enterprise. Luxembourg. June 2000. Available at: http://www.cordis.lu/innovation-smes/src/studies.htm

which illustrates in a schematic manner the main players designing or delivering support in the field of innovation.

In Cyprus, there is no single department with a designated competence for the design and implementation of innovation policy. However, the Ministry of Commerce, Industry and Tourism appears to take a leading role in areas related to industrial innovation. The **Department of Industry, through the promotion of business incubators, funding of the Institute of Technology and responsibility for patents registration covers a relatively broad part of innovation policy issues currently promoted by Government.**

The Planning Bureau (a government agency) fulfils an important role in the co-ordination of government policy in the sense that it prepares the five-year development plans and monitors the allocation of funds. Indeed, the Planning Bureau, through these plans, has traditionally formulated industrial development policies in Cyprus.

Figure 23 - **Institutional framework: Cyprus**



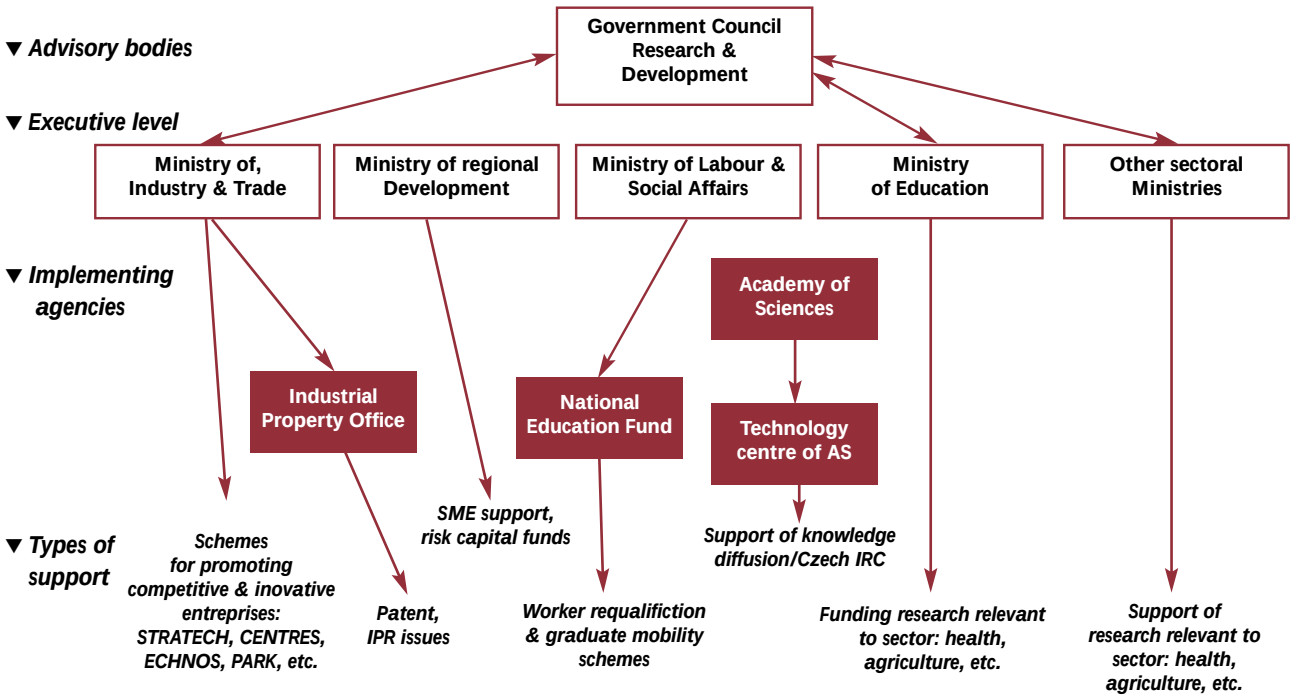
Given the size of the country, there are only a limited number of key organisations playing an active role in one or more areas related to innovation policy. Stakeholders representing the enterprise sector, such as the Cyprus Employers and Industrialists Federation, the Cyprus Chamber of Commerce and Industry and sectoral organisations (e.g. clothing and footwear), play an active role. Notably by working with governmental organisations and agencies (Institute of Technology, Institute of Fashion, etc.) to develop initiatives and acting as a pressure group with respect to government policies in the field of innovation (e.g. for the creation of business incubators).

In the Czech Republic, there is no single government agency specialised for the co-ordination and regulation of innovation issues.

In the **Czech Republic**, there is no single government agency specialised for the co-ordination and regulation of innovation issues. The Government Council for R&D plays an advisory role and co-ordinates the R&D activities of Governmental agencies (ministries, funding agencies). In the area of innovation, there is no such co-ordinating body, with innovation issues being dealt with according to the specific sectoral competencies of different ministries. **This sectoral structure is an obstacle for the co-ordination of innovation related projects.** This said, the Ministry of Industry and Trade has the greatest influence on innovation related issues via its programmes.

The R&D system was decentralised at the beginning of the 1990s. As a result of the reform, the basic features of the system are now as follows. Research institutes of the Academy of Science and in the Higher Education system display comparatively strong research capacities in basic disciplines, while industrial research is mostly dependent on the R&D funds of businesses (which are demanding short term expert services rather than research output). In the national innovation system there is now not only **a functional gap in the sphere of industrial research but also under-funding of as well as under-representation of industrial players** in the executive and public R&D funding agencies.

Figure 24 - **Institutional framework: Czech Republix**



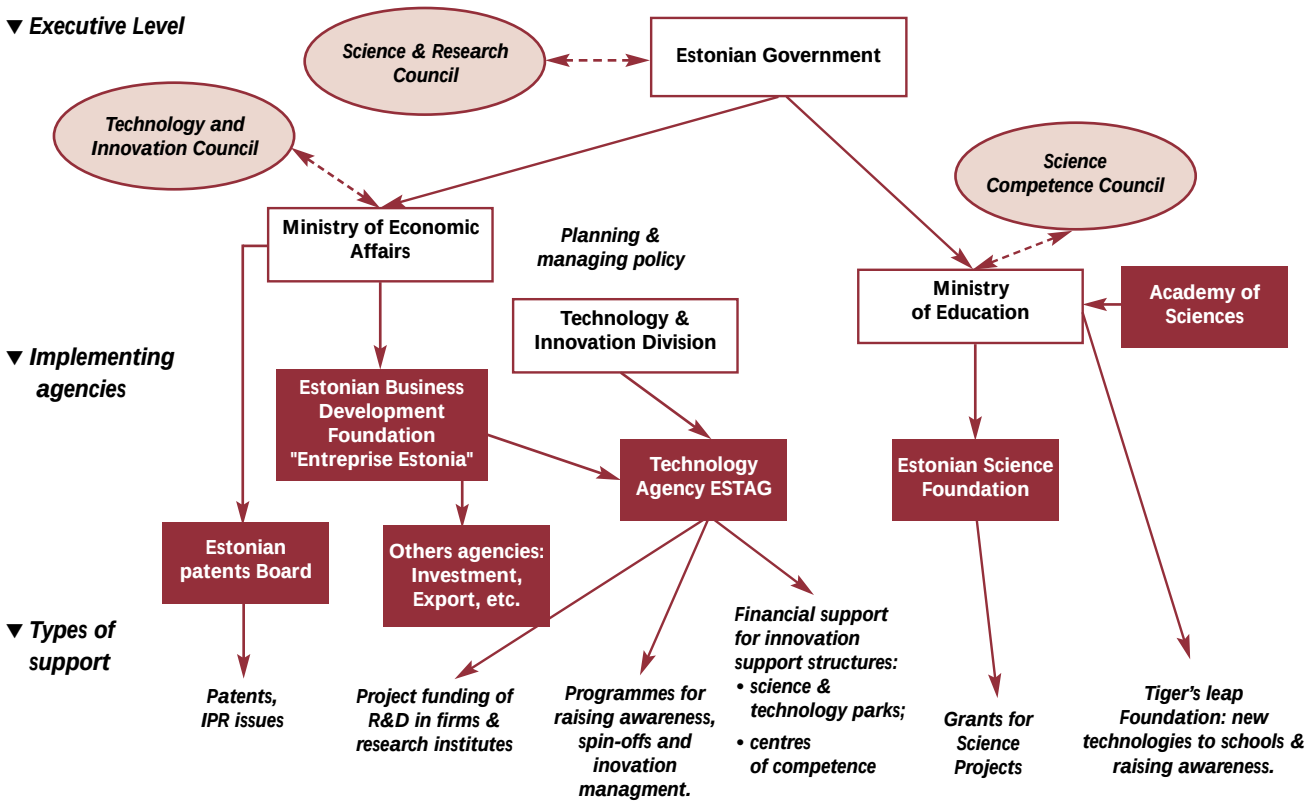
A re-organisation of government agencies promoting business development and innovation occurred in Estonia during 2000.

Other stakeholders in the innovation policy community include a series of associations representing respectively "innovative enterprises", risk capital providers, industrial R&D organisations, etc. The first association has been created by a number of public (non-governmental) organisations working in the field of innovation and technology in particular the association of scientific and technological parks and the association for technology transfer. These organisations play an active consulting and lobbying role in relation to Parliament, Government and other public as well as private bodies.

A re-organisation of the government agencies supporting business development and innovation took place in **Estonia** during 2000. This reorganisation concerned principally the government consultative body (the Research and Development Council) and the "Foundations" that serve to implement much of public policy in the country. These changes took effect during 2001.

At the level of the government, **the Ministry of Economic Affairs is legally responsible for "technological development issues" and hence play a central role in innovation policy**. The Ministry has taken action to consolidate its position with the creation of **a Technology and Innovation Division** (3-4 employees) under the Department of Industry at the beginning of 1999. This Division is responsible for planning technology policy, managing technology development and for supervising the funding agency, the Technology Agency (formerly Innovation Foundation).

Figure 25 - **Institutional framework: Estonia**



The Innovation Foundation, created in 1991 was responsible until end 2000 for delivering RTD financing on a project basis to firms, research institutes and research units in universities. It also gave support to organisations such as science parks, competence centres and innovation centres. The most important organisational changes related to innovation policy is the **reorganisation of the foundations system**. On the basis of the government's plan the Innovation Foundation (renamed the Technology Agency – ESTAG) together with other foundations (Estonian Investments Agency, Estonian Exports Agency, etc.) was merged **into a single Estonian Business Development Foundation (BDF).**

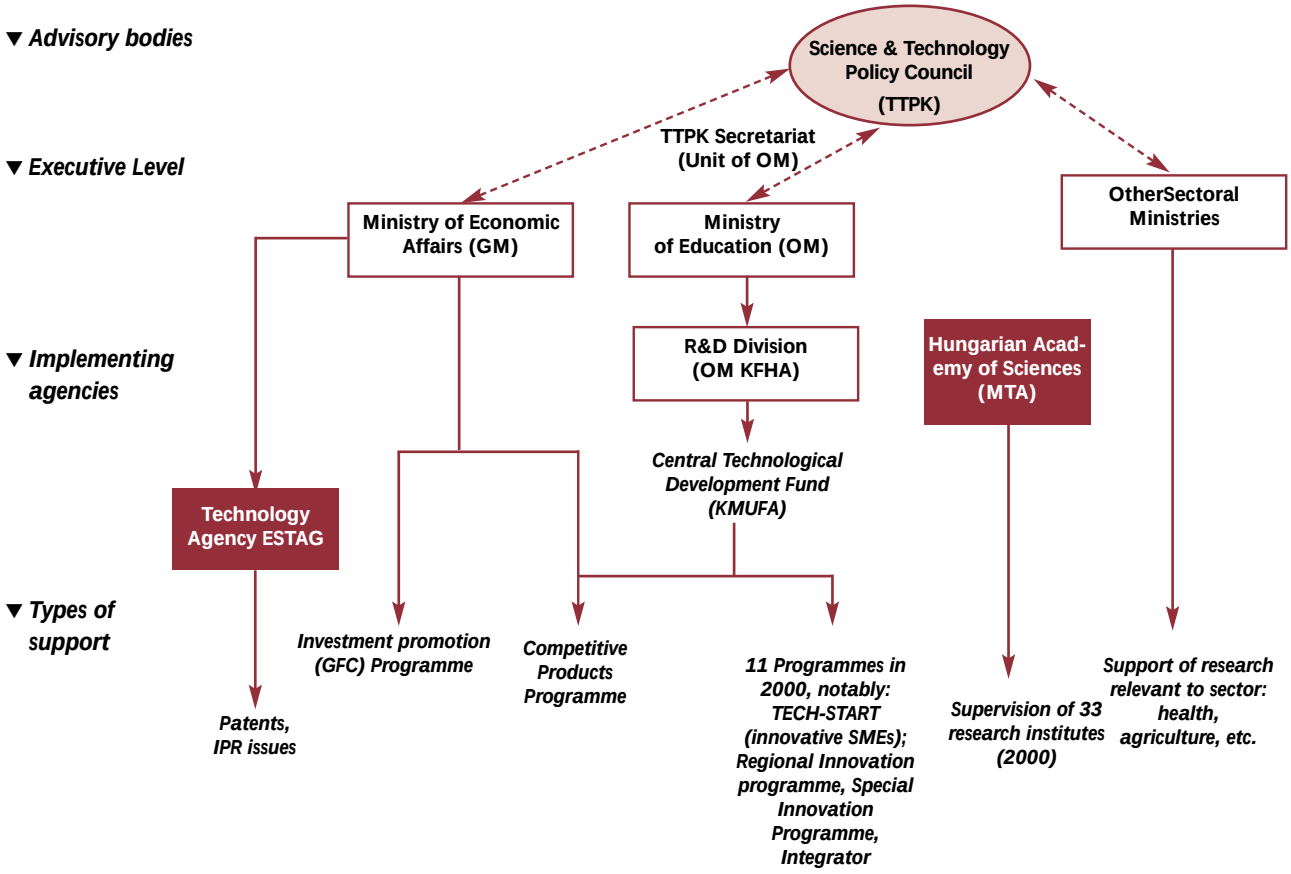
The plans for the new Technology Agency are rather ambitious but contrast with a decrease in available funding and organisational status. The TA is expected to develop a more strategic basis for giving loans and grants with some hints that this new approach will be modelled on that of the Finnish technology agency TEKES.

Plans to reform the Research and Development Council which is the highest-level government advisory body include an increase in the number of business representatives on the Council (currently only having two representatives out of 23 members come from business). The aim of the reform is to increase the role of the council as a long-term strategic decision-maker through the strengthening of permanent commissions. A "Technology and Innovation" Council has been established to advise the Ministry of Economic Affairs in technological development issues and EU related questions in this area.

In Hungary, responsibility for technology and innovation policy issues is shared between the ministries of Education and Economy

Government level responsibilities for innovation related issues in **Hungary** also underwent important changes in 2000. Until the end of 1999, the National Committee for Technological Development (OMFB) was the government agency responsible for strategy development and programmes in the field of technological development and innovation. Its Council effectively acted as an advisory body to Government on innovation issues. It was dissolved in January 2000 and merged into the Ministry for Education where it became the Research and Development Division. The new division, being the legal successor of OMFB, is responsible for the government's policy for R&D and innovation programmes. The other ministry with an important role in areas related to innovation policy is the Ministry of Economy which supervises the government offices responsible for quality management, intellectual property, standardisation, etc. in addition to being responsible for SME policy.

Figure 26 - **Institutional framework: Hungary**



A Science and Technology Policy Council (TTPK) is the highest level consultative and co-ordination body in the government. The Science and Technology Policy advisor of the Prime Minister chairs the TTPK. The council assists the government in science and technology policy issues and in the preparation of strategic decisions. The TTPK is a unit of the Ministry of Education and is supported by an expert committee (TTT). At parliamentary level, the education and science committee of the Parliament is the highest-level political representative of science and innovation in Hungary.

In addition, to this formal institution, a series of other stakeholders influence government policy, in particular organisations such as the Higher Education and Scientific Council (FTT) which is an advisory body with representatives from government, professional organisations and employers; associations such as the Association of Technical and Science organisations, the Hungarian Chamber of Engineers, the Association of Industrialists, the Chambers of Commerce, etc.

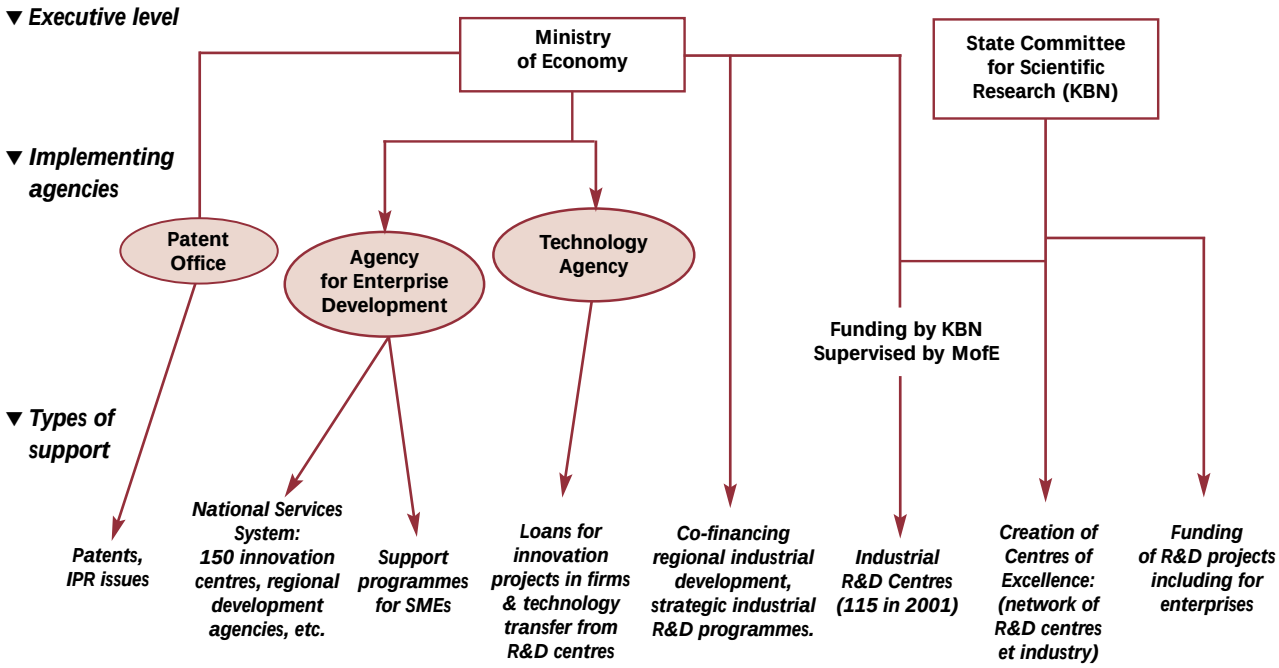
The design and implementation of innovation policy in Poland has been effectively driven during the 1990s by two state bodies the State Committee for Scientific Research (KBN) and the Ministry of Economy.

A number of organisations pursue the goal of promoting entrepreneurship most notably the Hungarian Entrepreneurship Development Foundation, established in 1991 with the aid of the Phare programme which has created an active and dense network of consulting and information offices. Finally, the activities of the Hungarian Innovation Association (Magyar Innovációs Szövetség, MISZ), a business led organisation, are noteworthy. MIZS runs its own incubator and publishes a weekly magazine on innovation-related questions.

The design and implementation of innovation policy in **Poland** has been effectively driven during the 1990s by two state bodies the State Committee for Scientific Research (KBN) and the Ministry of Economy. These two bodies have been responsible for the major government policy documents in the field of innovation policy. **An inter-ministerial approach to developing new policy documents and programmes is also often favoured**. In addition, the Economic Commission of the Parliament is responsible for preparing new laws and formulating opinions on innovation and R&D in industry.

The Ministry of the Economy has wide-ranging powers in terms of industrial policy, SME development, management of some 68 technical research institutes, etc. The Ministry also oversees the work of two foundations related to enterprise policy notably the Agency for Technology, which supports high-tech companies and technology transfer in industry, and the Polish Foundation for Small and Medium Enterprise Promotion and Development.

Figure 27 - **Institutional framework: Poland**



KBN is a governmental body set up by Parliament in 1991. In a narrow sense it is consultative body chaired by the Minister of Science consisting of 19 persons (none from business) of which 13 are elected from the research community and the Minister designates the remainder. The governing body includes all the main ministers who thus have an influence on KBN's decisions. In a wider sense it is also a government department (about 250 civil servants) with a series of commissions and sections consisting of other representatives of the research community. Each Ministry receives from KBN funds for expert studies and conferences and may apply for so called strategic grants.

Poland as a large country has a wide range of other stakeholders operating at both national and regional level and directly or indirectly concerned by aspects of innovation policy. For instance, at the end of 1999, there were some 49 business incubators and technological centres and three technology parks in existence. A key aspect, related to the size of the country are the number of networking initiatives between business and innovation intermediaries.

In terms of the enterprise sector, in addition to the Polish Chamber of Commerce, with some half-million member companies, the "Business Centre Club", the most prestigious of the business organisations and some think tanks, such as the Market Economy Research Institute in Gdansk, are key contributors to the policy debate. Other players include the "Polish Union of Associations of Inventors and thinkers", a registered national federation of scientific and technical associations (active in intellectual property field).

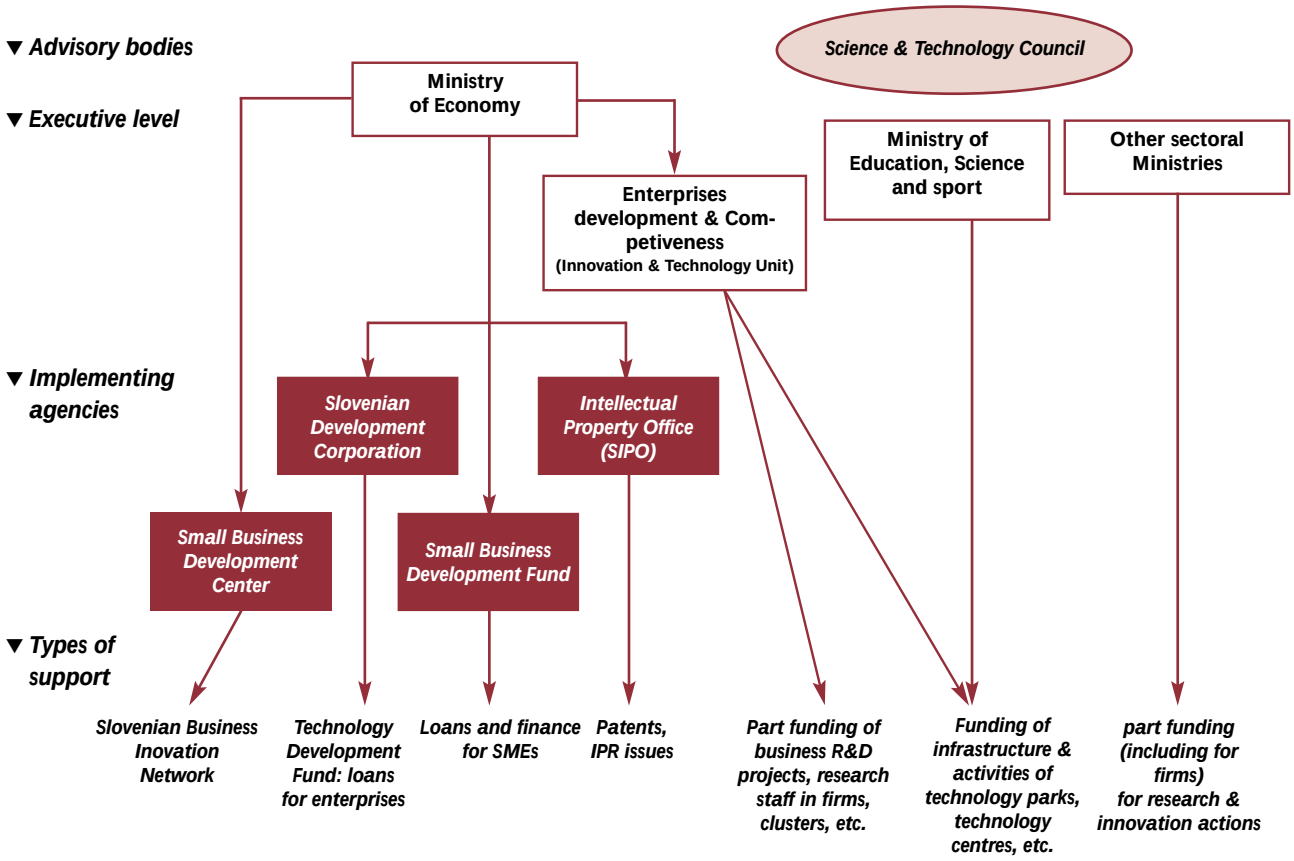
In Slovenia, until 2000, a Ministry for Science and Technology (MST) was the principal actor responsible for designing technology and innovation policy (launch of technology development fund; part-financing of technology parks and centres, etc.). In 1999, a State Secretary was appointed for Technology and Innovation Policy and a special Office for Innovation was set up.

In Slovenia, the Ministry for Science and Technology (MST) is the principal actor responsible for designing technology and innovation policy

However, during the summer of 2000, the government began to debate the restructuring of the ministries. This led to the splitting of the MST in two: the science related components being integrated into the Ministry of Education. **Innovation related issues were transferred to an expanded Ministry of Economy. which also gained responsibility for enterprise (SME) policy**.

The main implementation mechanisms include a Technology (loan) Fund as well as a Small Business Development Fund. The Ministry of Economy's Enterprise Development and Competitiveness Department administers both funding for business R&D and infrastructure funding for technology parks, etc.

Figure 28 - **Institutional framework: Slovenia**



At Parliamentary level, a Committee on Science, Technology and Development oversees science and technology policy in terms of legislative developments while another committee oversees industrial and SME policy. A Science and Technology Council acts as an advisory body to the Government; the idea of a Technology Development Council proposed by the former MST has not been implemented.

Within the other stakeholders, the most influential in public is the Chamber of Economy, which participates in the debate on innovation policy framework, stressing the need for more development oriented economic policy to help enterprises restructure not only in terms of ownership but with new technologies, products and marketing methods. Various other associations, (association of innovators, of engineers, etc.) also play a catalytic role in policy development and help promote the establishment of links between R&D and industry.

Conclusions

In all countries, except Poland, one Ministry has a leading role in innovation matters at policy level, namely :

- in four cases, the Ministry responsible has the competence for economic and/or industrial affairs (Cyprus, Czech Republic, Estonia and Slovenia);
- in the case of Hungary, innovation and R&D falls under the remit of the Ministry of Education;
- finally, in the case of Poland, a dual responsibility exists with policy making and funding being split between the Ministry of Economy and the State Committee for Scientific Research.

Although there is almost always a lead Ministry in policy terms, funding of innovation and industrial R&D is generally drawn from several sources depending on the types of actions. This sectoral approach to policy and funding is most pronounced in the Czech Republic and Slovenia; and leads to a certain difficulty in ensuring policy co-ordination.

The preferred method of delivering support differs with a dedicated agency for innovation and technology only existing in Estonia. In several countries, technology funds managed by intermediaries are preferred. Funding for industrial R&D centres or centres of excellence comes as often from ministries for science and education as from ministries for industry.

Parliamentary bodies or extra-governmental councils for science and technology do not appear to play a significant role in innovation policy formulation. They tend to be focussed more on science and research issues and business representation on such councils is usually limited.

In all six countries, **the period 1995-2000 has witnessed the emergence of new stakeholders concerned by issues related to innovation and technology transfer.** These organisations range from associations of entrepreneurs or innovators; to business clubs or associations; to specialised institutes or technology parks. This has led to a gradual acknowledgement by governments of the importance of innovation as a policy theme. Poland, perhaps due to its relative size, is characterised by a number of networking initiatives for intermediaries for innovation and development.

The process of EU accession and funding from the Phare or RTD Framework programmes has increased the visibility of certain stakeholders (e.g. organisations benefiting from the IRC label) and their ability to influence the policy debate.

3.2 Developments in innovation policy

As noted above, an innovation policy requires a certain coherence and range of instruments in order to be effective. A natural starting point for examining the level of understanding of innovation policy issues in the candidate countries, are official government documents (green papers, policy statements, laws, etc.) concerning either one or more issues related to innovation.

Focusing solely on whether a "coherent" innovation policy exists in official texts risks to give a distorted picture of the extent of support for innovation. Policy may have developed in a piecemeal manner through specific government programmes. Such measures could be argued to constitute a "de facto" policy framework. Accordingly attention is also given to specific measures taken by governments in the discussion of each national situation.

The time line diagram below provides a simplified and visual presentation of the major policy documents, identified by the national experts, in each of the candidate countries and adopted by governments during the second half of the nineties. In the discussion, that follows, the orientation and objectives of these policy documents are discussed in more detail.

Figure 29 - **Timeline of selected official "innovation policy" developments**

	< 1995	1996	1997
Cyprus			
Czech Republic			Main principles in the field Action of R&D (1997)
Estonia			
Hungary			
Poland	Guidelines for Innovation Policy in Poland (1994)	Industrial Policy Programme (1995-97)	
Slovenia	Technology Policy of the Republic of Slovenia (1994)		Strategy for increasing competitiveness of Slovenian Industry (1997)

1998	1999	2000	2001 >
	New industrial Policy (1999)	Strategic Development Plan 1999-2003	
	Action plan on supporting competitive ability of Czech industry (1999)		National Policy of research and development 2000-02
Estonian Innovation Programme (1998)			National development Plan (2000-2002)
	Innovation Strategy for Competitiveness (1999)	Science & Technology Policy 2000	
	Direction of innovation Policy until 2002 (1999)	Increasing the innovativeness of the Polish Economy until 2006	
	Law on Support for enterprises in the development of new technologies 2002-2003 (1999)		

Cyprus: from "off-shore" island to high-tech haven?

A policy debate around creating high-tech incubators and increasing high-tech FDI has also been launched with some benchmarking analysis to learn from good practice (Greece, Ireland and Israel).

Since 1996, in **Cyprus**, there has been a change in government priorities for economic development that reflects both the need to adapt the legislative base to the 'acquis communautaire' and the gradual opening of its economy to competitive pressures. The accession process would appear to have been instrumental in bringing new issues such as innovation to the fore of public thinking. The awareness of the need to increase competitiveness of the Cypriot economy, and in particular the manufacturing sector, has been fuelled by a number of reports commissioned by the Government to assess the status of the manufacturing sector and make suggestions for its restructuring. A policy debate around creating high-tech incubators and increasing high-tech FDI was also launched with some benchmarking analysis to learn from good practice (Greece, Ireland and Israel).

Current government policy is essentially encapsulated in the **"New Strategic Development Plan"** covering the period 1999-2003 which was adopted by the Council of Ministers in 1999. The main focus of the plan is on the adaptation of the economy are on promoting a restructuring of Cypriot industry and a diversification toward information technologies.

Two main objectives influence indirectly the field of innovation policy: the first being to increase GERD from 0.36% of GDP to 0.5%; the second being related to the information society and the aim to "transform Cyprus into an international IT centre". From a practical point of view, the Plan includes, for instance, provision for the promotion of innovation through structures such as the IRC in co-operation with the Greek Centre Praxis.

While there is no explicit government policy or document addressing the issue of innovation as a horizontal policy there are indications of increased awareness of the importance of innovation and promoting new high-technology firms.

During 1999, the Ministry of Commerce, Industry and Tourism developed a programme of incentives and support schemes under the heading of "the New Industrial Policy" with 12 strategic chapters. In total, five of these chapters can be considered as directly or indirectly addressing the issue of innovation, namely through the support for: new business incubators (with an emphasis on high-technology firms); the establishment of a Research, Technology and Development Centre for applied research in areas of special interest (i.e. high-tech areas in which Cyprus may have a competitive advantage); industrial testing and metrology, subsidies for specialised software in industry; and incentives for upgrading and introducing new technologies in industry.

Hence, while there is no explicit government policy or document addressing the issue of innovation as a horizontal policy there are indications of increased awareness of the importance of innovation and promoting new high-technology firms. The main focus of Government policy is directed at increasing competitiveness and boosting the currently low levels of public and industrial R&D on the island.

Box 5 Issues for innovation policy in Cyprus

- **Conflict between aim to increase funding levels for R&D and innovation versus macroeconomic and budgetary constraints.**
- **Focus of Government effort on increasing high-tech component of Cypriot industry through developing endogenous potential (incubators) and attracting FDI.**
- **Increasing importance placed on developing Cyprus as an international IT centre and hence on integrating ICTs and promoting information society developments.**

Czech Republic: establishing bridges between public R&D and the business sector

Innovation policy developments in the **Czech Republic** can be characterised with respect to two distinct periods during the 1990s. The first half of the decade essentially saw a focus of the government effort on "research" with an emphasis on structuring relationships between public research institutes and increasing the R&D capacities of universities. This is exemplified by the fact that direct government financial support for business innovation was limited to a minimum. There was an expectation that rapid transition to a private capital based system, allied to a deliberate under-valuation of the currency, inducing a reorientation of exports to western markets, would lead to a corresponding increase in business R&D and innovation activities in order to meet competitive pressures.

Accordingly, only 5% of public R&D funding was targeted at the development of new products in industry. This reflected the fact that, unlike in the other candidate countries, Czech industry continued to invest relatively strongly in R&D. **The share of the business sector in GERD at 63.1% is among the highest in OECD countries.** This can be explained in part by a continuing investment in R&D and innovation by large firms, which were not been broken up through the privatisation process. However, many of these firms remain the subject of government restructuring programmes.

The main focus has been on increased public funding for industrial research and a new set of incentives aimed at attracting FDI with a higher technological content.

Since 1995-96, the Government has re-orientated its effort, in response to persistent difficulties in terms of restructuring of domestic firms, under-funding of industrial R&D, relatively low levels of FDI, etc.. In comparison with the first half of the nineties, there is a stronger attempt to build "bridges" between the R&D community and industry. The main focus has been on increased public funding for industrial research and a new set of incentives aimed at attracting FDI with a higher technological content.

From the side of industrial policy, the Ministry of Industry and Trade has developed a number of policy documents and programme notably an **Action Plan for Supporting the Competitive Ability of Czech Industry (1999)** and two related **programmes for Support of Enterprise Activities (1999 & 2000).**

However, it appears that there is no significant co-ordination between these policies and no distinct innovation policy. A focus on research policy, with only limited attention to commercialisation aspects, has been uppermost in terms of public awareness and policy thinking.

The need for an improvement of co-ordination between the ministries with responsibilities in innovation support, was a major theme in the innovation policy workshop in the Czech Republic : *"it has been stressed that the ministries which are taking part in the support of R&D, the promotion of international R&D co-operation, and the transfer of its results into manufacturing, are improving their regulatory capacities in the assessment of R&D and its practical effects. Some agencies have been also established to foster relationship between R&D and Industry, and between foreign and domestic R&D and innovation players. However, the co-ordination among them is rather low. Consequently, firms claim that they are losing a lot of time in identifying sources of possible public support and presenting adequate proposals".*

It was also considered that moving towards interactions in the innovation system would benefit policy, as opposed to the current linear view in force : *"it has been suggested that closer attention should be paid to spin-off effects, both in the case of domestic universities in relation to domestic manufacturing, and in the case of FDI in relation to domestic knowledge and industrial infrastructure (R&D, education, vocational training, networking among producers and suppliers etc.)"*[49].

[49] Conclusions of the Czech Innovation Policy Workshop, held on 15 May 2001

Box 6 Issues for innovation policy in the Czech Republic

- **Early political expectations that research policy should be the only area of responsibility of the government while private sector would be take care of commercial R&D has not been fulfilled.**
- **Trend from emphasis on public/academic R&D in first half of decade towards a stronger emphasis on public support to industrial research and FDI as sources of new growth.**
- **Continued restructuring of large firms, responsible for much of industrial R&D, poses a new challenge for government policy. There is a corresponding need to stimulate innovation in small to medium sized firms.**

Estonia: organising the search for a "local Nokia"

In Estonia, government policy until the end of the nineties was dominated by the point of view that the liberalisation of the economy would result in investment being channelled efficiently into new or existing sectors able to sustain growth. Government intervention in favour of one technological option or sector was thus avoided. In the last years of the decade, this point of view changed somewhat as the importance of new product development and access to new technologies for the competitive performance of Estonian companies became an issue. **Estonian President Lennart Meri argued that there was a need to find an "Estonian Nokia"; whilst the Government began to underline the importance of ICTs and biotechnology.**

The "Estonian National Innovation Programme," adopted by the Government in June 1998, exemplifies a trend towards a more active and explicit innovation policy.

The "Estonian National Innovation Programme," adopted by the Government as early as June 1998, exemplifies this trend towards a more active and explicit innovation policy. This programme set out a series of general priorities that included: improvement of the quality of products and services; development of innovative products based on local R&D; creation of innovation networks. The programme has come in for some criticism notably in terms of its "shopping list" nature and the lack of an accompanying government budget line (apparently reflecting the lack of a wider consultation process at the political level) which to all intents and purposes has meant that the programme has not been implemented.

This view is supported by an evaluation of the Estonian Innovation System carried out, in 2000[50]. This study found that the initial innovation programme has mainly served as a baseline or reference document for further

[50] Hernseniemi, Hannu (2000) Evaluation of Estonian Innovation System. Study funded by the EU PHARE funded project: Support to European Integration Process.

developments. The evaluation also criticised the functioning of the Innovation Foundation which was the main instrument for distributing public funding for industrial R&D, etc.. As noted above, the Innovation Foundation has since been replaced by a Technology agency as part of a wider overhaul of the business support system.

The National Development Plan 2000-2002, (adopted by the Government in 1999) has provided a broad basis for the implementation of "operational programmes" in key fields of government policy. This plan, formulated to pre-accession funding from the EU, sets out a number of medium to long term priorities in the field of R&D and innovation including: improving co-operation between the R&D community and the business sector; fostering business activities in sectors generating high added value and adopting innovative technology; and, aligning the priorities of R&D and innovation with EU guidelines.

The industry chapter of the National Development Plan defines a series of measures for fostering innovation and introduction of new technologies. The Ministry of Economic Affairs is preparing two programmes related to the National Development Plan. scheduled to start in 2001 and to be managed by the new Technology Agency, concern:

- Inno-awareness – aimed at raising awareness of innovation issues amongst the general public; and
- Spin-off programme – aimed at commercialising the results of university research.
- From 2002, a third, pilot, programme will start on Raising competence in innovation management.

Box 7 issues for innovation policy in Estonia

- **Aim of increasing funding levels for R&D and innovation versus macroeconomic and budgetary constraints (aim is to increase state financing of innovation to match funds allocated to basic research (0.6% of GDP) by the year 2002).**
- **Government policy making and institutional (foundation based) support system under-going restructuring and rationalisation.**
- **Relatively early move to define an innovation policy framework but few concrete measures implemented due to an absence of provision in the government budget.**

Hungary: institutional difficulties in adopting a broad innovation policy

In **Hungary**, it can be argued that **no systematic technology or innovation policies have been implemented since reform began in the early 1990s.** This is not to say that no thought has been given to formulating such policies, however, it would appear that a combination of difficult macroeconomic and budgetary conditions (up until 1996) and several organisational changes in government institutions has resulted in a number of "consultative papers" being passed over before concrete measures have been taken.

Most recently, in January 1999, the Minister of the Economy entrusted the president of the National Committee for Technological Development (OMFB) with the task of elaborating an innovation policy. Following several months of collecting opinions and analysing the policies of a dozen advanced countries, a policy document, "Innovation Strategy for competitiveness", was completed in November 1999. At this stage, the OMFB was merged into the Ministry of Education (where it became the R&D division of the Ministry) and the Innovation Strategy was not pursued beyond printing and limited circulation.

'Science and Technology Policy 2000'. places a stronger emphasis on academic research (science) than on technology and the actual commercial exploitation of research results.

The latest policy document of the Government in terms of R&D is set out in a document entitled "Science and Technology Policy 2000". This document, drafted by the Ministry of Education and approved by the Science and Technology Policy Council in March 2000, places a stronger emphasis on academic research (science) than on technology and the actual commercial exploitation of research results. This document provided the basis for a chapter in the **new National Development Strategy, the Széchenyi Plan. The second of the seven priorities of this plan is entitled Research, Development and Innovation**. Preliminary versions of the plan suggest a move towards a broader concept of innovation although innovation remains linked to R&D. According to the opinion of the Hungarian Innovation Association, "the new incentives and programmes of the Széchenyi Plan bring favourable changes for innovation and for the innovative companies."[51].

In summary, there appears to be a difficult in reaching a broad political consensus on the content and management of innovation policy in Hungary. This contrasts with the existence of a number of specific programmes launched by the former OMFB; and the relatively well developed infrastructure for innovation support in the country.

[51] Opinion formulated by the Board meeting of the Association, held on 3 May.

Box 8 Issues for innovation policy in Hungary

- **Innovation and technological development remains a subsidiary issue of research and development in most policy documents despite efforts to follow and introduce policy trends and tools from other countries.**
- **Political priority for innovation appears low with a number of innovation or technological development consultative papers have been shelved before implementation since 1995. Contrasts with relatively strong 'innovation performance' of the country and large number of mechanisms and programmes launched to support innovation.**
- **Recent changes to government agency responsible for innovation with absorption of former National Committee for Technological Development into Ministry of Education – remit for innovation split between this Ministry and the Ministry of Economy.**

Poland: innovation viewed as a key component of competitiveness

Two major innovation policy documents have been issued by government agencies or ministries and adopted by the Polish Government since December 1999.

While innovation policy has been on the agenda of government thinking since the mid-1990s, two major innovation policy documents have been issued by government agencies or ministries and adopted by the Polish Government since December 1999. The first was that of the State Committee for Scientific Research (KBN) which was adopted by the Council of Ministers on 6 December 1999 and entitled "Directions of National Innovation Policy till 2002'. The second entitled 'Increasing the Innovativeness of the Polish Economy until the year 2006' was prepared by the Ministry of Economy, Department of Economic Strategy, and was approved by the Council of Ministers on 11 July 2000. The latter document is intended to constitute a part of the National Development Plan required by the EU for access to pre-accession funding and future Structural Fund support.

The Ministry of Economy document makes explicit reference to the KBN "directions" and considers that they are complementary. The KBN document lists 19 priority tasks while the Ministry of Economy divides its programme into four priorities and 20 corresponding measures. Broadly speaking, the KBN document focuses more on measures in the area of science and technology (increasing the GERD/GDP ratio; new legal arrangements for R&D units, tax exemption for organisations whose statutory aim is to carry out scientific activities, etc.) with some emphasis on new criteria for funding R&D with a greater weight for technological development related to increasing competitiveness.

The Ministry of Economy document provides an opening section summarising the current level of innovation activity in Poland (although available CIS type data is not presented) and the strengths and weakness of the national system of innovation. The four priorities enumerated by the document are:

- Creation of mechanisms and structures conducive to innovation.
- Stimulating innovative attitudes.
- Increasing the efficiency of implementing modern technologies in the economy.
- Making consumption standards and production models in Poland more favourable for long-term sustainable growth.

In both documents, **the need for tasks and measures to be part-funded by or requiring collaboration between competent ministries and other bodies** (including the regional level of government) **is underlined**. Both programmes appear ambitious and the Ministry of Economy document in particular is wide-ranging (from raising public awareness of science, technology and engineering careers to creating conditions favourable to venture capital). Although neither document mentions EU innovation policy guidelines, both EU and OECD type thinking appear to have a strong influence.

Box 9 Issues for innovation policy in Poland

- **Policy-makers appear aware and concerned about level of innovation in Polish economy – a number of government documents have addressed the issue – the first being as early as 1994.**
- **Innovation issues being championed from two directions – a more formal R&D stimulation and exploitation angle by KBN; and a broader approach more akin to the EU action plan type priorities by the Ministry of Economy.**
- **Large number of programmes and ad hoc initiatives appear to raise question of co-ordination and networking of innovation support mechanisms.**
- **Funding for innovation related programmes and activities likely to be a main priority of pre-accession Structural Fund type instruments.**

Slovenia: technological development of enterprises - a political priority ?

In Slovenia the theme of supporting the technological development of enterprises has been on the policy agenda since as early as 1994 due to an acknowledged technology gap between Slovenian firms and EU competitors.

In Slovenia the theme of supporting the technological development of enterprises has been on the policy agenda since as early as 1994 due to an acknowledged technology gap between Slovenian firms and EU competitors. The low levels of FDI and the only recent switch to more offensive restructuring, leading to an increase in business research, have compounded problems.

The difficulty in implementing even well intentioned policies is however apparent here as in most of the other candidate countries. The 1994 Government policy document entitled "Technology Policy of the Republic of Slovenia", and the accompanying "Programme of Support to Technological Development up to the Year 2000", fixed as an objective that the funds for technological development would grow by 10% a year between 1995 and 2000. The outcome was an overall decrease in the share of science and technology in the State budget. The initial programme had foreseen co-operation between various ministries in implementing the Policy however in the end only the Ministry of Economic Affairs developed further actions through a 1997 policy document entitled **"Strategy for Increasing the Competitiveness of Slovenian Industry".**

In 1998, a project proposal for Slovenian Innovation Agency (SIA), as defined by a PHARE funded project, was presented to the Ministry of Science and Technology (MST) with detailed mechanisms, instruments and financial resources required for stimulating innovation. The main programmes backed by the SIA referred to technology development, stimulating e-commerce and Internet, stimulation of entrepreneurship, stimulation of innovation, stimulation of internationalisation. The MST chose not to pursue funding for the SIA partly due to lack of consensus on the status of SIA and the need for an integrated support from more than just one ministry. This would seem to be further evidence of the **difficulties in reaching inter-ministerial consensus on policy instruments to support innovation.**

A law was adopted, end 1999, providing for increased financial support to enterprises and co-ordinating the programmes of eight ministries.

A 'Law on Support for Enterprises in the Development of New Technologies and Establishment and Operation of their R&D units in the period from 2000-2003' was adopted end 1999. It provides for increased financial support to enterprises and co-ordinating the programmes of eight ministries. Representatives of the Chamber of Commerce and Industry, the Chamber of Crafts and the Slovenian Development Corporation are reported to have been involved in the preparation of the programme. However, its implementation will require the adoption of another law, submitted to Parliament in January 2000, on the organisation and funding of research and development that foresees the **creation of an Agency for Development and Technological Research** responsible for government programmes in this field. The issue of whether budgetary resources will be made available, contrary to the experience of the 1995-2000 programme, to implement this radical change in policy remains open.

During the innovation policy workshop held in March 2001, the question of whether there is an innovation policy in Slovenia provoked a lively debate. On the one hand, some participants felt, that there exists no framework for innovation policy in Slovenia. Since the re-organisation at the end of 2000, three ministries (Ministry of Economy, Ministry of Education & Science and the newly created Ministry for Information Society) effectively have some influence over innovation policy, but no clear message on what the priorities of the policy is to be have yet been announced.

Box 10 Issues for innovation policy in Slovenia

- **Early move to define technological development priorities (as of 1994) but not matched by budgetary commitment and accompanied by overall drop in GERD in the subsequent years.**
- **Detailed proposals for a Slovenian Innovation Agency were shelved due to apparent difficulties in co-ordinating inter-ministerial support.**
- **New law on support for technological development of enterprises is again seeking to ensure a co-ordinated approach to funding of technology and innovation across ministries.**
- **Re-organisation of ministries and implementing agencies concerned by innovation policy during 2000.**

On the other hand it was argued that in fact Slovenia has all the mechanisms and measures commonly proposed for support of innovation on paper (technology parks, venture capital funds, technology foresight, subsidies, etc.). However, there was a general acceptance also in the government circles that too much attention had been paid to writing policy and not enough to concrete implementation. It was also noted that changes in Slovenian policy related to R&D and innovation are many and frequent, while implementation is poor and no evaluation of effects of different policies is undertaken. The issue of insufficient public resources for implementation was an important concern in the debate.

Chapter 4 Strengthening human resources for enterprise innovation

4.1 Training and human resources programmes in favour of innovation

The population of the six candidate countries possess generally a high level of basic education, but available data and analysis also point to a mismatch between the skills developed and the needs of the enterprises (see section 2.2). The importance of appropriate training in new technologies and new organisational and management skills as a factor in sustaining the innovative capacities of enterprises is well recognised. This section seeks to identify recent trends in developing such initiatives in the CC6

4.1.1 Training systems and enterprise development

Issues surrounding training for innovation or innovation management are always secondary to broader aspects of entrepreneurship.

As has been noted above, before 1990, the candidate countries of central and Eastern Europe tended to have a high level of expenditure on education. However, even at this time, the vocational (or work related skills) education and training (VET) system had significant weaknesses: *"Under the former system, vocational education and training was tailored to the needs of large companies employing large numbers of staff, with low levels of innovation and productivity, following a tayloristic scheme of work organisation… Training was very often directed towards a life-time job. Crafts trades and service professions were seriously neglected. Standards of equipment in vocational education institutions reflected the poor technological standards of industry itself*[52]. One of the positive elements of the system prior to transition were the strong links between schools and large state enterprises however these were rapidly dismantled as restructuring and cost shedding took place. As was the case for available literature on the legal and administrative environment, issues surrounding training for innovation or innovation management are always secondary to broader aspects of entrepreneurship or training system reform (curriculum, funding, etc.). Innovation management as a technique is not considered and skills-needs relating to technological adaptation are not assessed except in the broadest terms.

[52] Transnational analysis of vocational education and training reforms in Central and Eastern Europe, European Training Foundation, 1999

Table 4 - **Key findings of ETF analysis relevant to enterprise or innovation policy**

Country	Issues
Cyprus	■ Present VET arrangements have functioned well in an economic context of booming tourism and service industry, but manufacturing faces structural problems. ■ As third level education gradually becomes mass education, there is a risk that graduate unemployment and underemployment will increase and already existing shortages of semi-skilled labour may rise even further. ■ Need to radically improve the attractiveness and quality of initial technical and vocational education, especially for new types and forms of employment.
Czech Republic	■ A national policy framework for continuing vocational training is lacking that could allow for a more flexible adjustment to labour market demands. ■ Currently, there is no system to stimulate co-operation between employer's organisations and vocational schools school; nor is there a dual system of apprenticeship training. ■ A wide range of institutions offers management training but structured measures to develop this area in a systematic way are lacking.
Estonia	■ Formerly well-established links between VET schools and employers have vanished. There is no apprenticeship system. ■ Except for a few bigger companies, rates of investment in human resource development have remained low. ■ State incentives for training are not granted to employers.
Hungary	■ A Vocational Training Fund based on a levy paid by employers contributes (20% of total budget) to the funding of secondary vocational schools. ■ Hungary has developed tri-partite social dialogue on VET at both national and local level; but there is scope for further development within companies in the area of promoting continuing updating of skills by all employees. ■ Management training is concentrated on personnel of multinationals and large domestic firms; and management for start-up companies. There is a market gap in management training for SMEs.

Country	Issues
Poland	■ Tax incentives are granted to both employers and individuals for training. ■ There is no formal structure for co-operation between education authorities and employers. Employers' organisations have reported difficulties in influencing training policies. Co-operation between vocational schools and enterprises is generally weak. ■ Numerous university-industry co-operation units have been set up within universities that aim at improving co-operation with the private sector.
Slovenia	■ The success of the dual (apprenticeship) system will be determined by employer's contributions – employers are pressing for state funds to assist; ■ With only a few exceptions, links between schools and enterprises are weak with the latter being only to a marginal extent involved in the planning and delivery of training. ■ There is no information available on how much employers spend annually on apprenticeships and training.

Source: Review of progress in vocational education and training reform of the candidate countries for accession to the European Union in the light of developments in European policy on vocation training. European Training Foundation, October 1999. Transnational analysis of vocational education and training reforms in Central and Eastern Europe, European Training Foundation, 1999.

Despite significant investment by the PHARE programme, and other donors during the 1990s[53]; the European Training Foundation's (ETF) analysis of VET reforms underlines a series of weaknesses in terms of tailoring vocational and continuing (life-long) education and training to the needs of enterprises in the candidate countries. **The ETF concluded that the contribution of the vocational education and training system to innovation, mainly within companies, is still poor.**

4.1.2 Key issues arising from country analysis

Complementing the broader ETF findings, the analysis conducted by the country experts for this study highlight four main trends in policy related to business education and training, in general and innovation related training.

Policy responses and co-ordination efforts with respect to human resources for innovation remain insufficient

While most governments are taking measures within the framework of the reform of education policy or active labour market policies, for instance in the Czech Republic, to support business related training and re-training, issues related to the broad re-qualification of the workforce go beyond the remit of this study. However, the development of forecasting techniques for qualifications and skills can have important effects on the potential of enterprises to find the required personnel on the labour market.

In this respect, the institutional capacities of the candidate countries appear relatively weak. The ETF has found that *"Most countries suffer from a lack of capacity, in terms of institutions or appropriate know-how, as regards the forward-looking and qualitative analysis of labour market developments and their potential implications for the content and methodology of the learning process. In addition, capacity in vocational education and training research is seriously limited due to financial constraints; there is a lack of qualified personnel oriented to modern challenges."*

[53] According to the ETF, between 1990 and 1998, CEEC countries received EUR80 million from the European Union's Phare budget to reform their vocational education and training systems. However, "…One of the main drawbacks of the first phase of vocational education and training reforms…is the fact that reform programmes were generally launched with little labour market information. Countries are only now gradually changing the nature of curricular reforms from being education-driven to being more demand-driven, involving industry representatives in a systematic way."

Box 11 Cyprus: co-ordination of monitoring and analysis of training needs.

In Cyprus, all human resources development and training issues are centrally managed by the Human Resources Development Authority (HRDA, jointly managed by the government, employers and unions' representatives). It is responsible for analysis of the labour market situation, for the definition of policy orientations, and for the management of support schemes. Some areas related to innovation activities are promoted, such as SME-specific training, use of ICT, product design, use of new technologies, etc.

The HRDA schemes are financed by a general 0.5% levy on wages in the private sector. They have sponsored the creation of a multitude of players involved on human resources development activities, and cover a wide range of activities including: training in companies; placement schemes for graduates; consultancy services on human resources.

Source: : Innovation Policy Profile Cyprus. See list of working papers in annex.

As is the case in the innovation field, policy co-ordination amongst the various ministries with competence for vocational and continuing training is weak. Some countries (the Czech Republic, **Cyprus**) have felt a need to co-ordinate their human resources development actions, either through semi-governmental agencies (like the Human Resources Development Agency in Cyprus) or through private bodies (the Czech Association of Innovative Entrepreneurship). Such organisations are then in position to study the labour market situation and advise on policy response to the identified problems. In other countries, **there is a lack of appropriate data on demand and supply of human resources for innovation.**

Some ad hoc initiatives have been taken in certain of the candidate countries to investigate issues surrounding human resource needs for innovation. For instance, in **Hungary**, innovation was a main concern of the "Human Resources" panel of the Technology Foresight exercise. In its conclusion, it stressed the need to introduce greater emphasis on a series of issues related to innovation including creativity; recognising and solving complex problems; learning skills (learning by doing, by interacting, by using ICT and traditional means, etc.), etc.. Another policy response in some of the candidate countries is awareness-raising activities related to innovation and technology careers. For instance: in **Estonia** annual innovation and technology fairs are held and the Government is set to launch an "inno-awareness" campaign in 2001.

Finally, initiatives in favour of the promotion of life-long learning are relatively scarce with **Slovenia** being a notable exception, an annual "life-long learning week" being held since 1996.

The level of development of innovation and technology management courses in higher education is unequal across the six candidate countries

In almost all the candidate countries, links between higher education and industry are being slowly rebuilt. This has resulted in the joint development of a number of courses or programmes in most countries but problems including the availability of funding or suitably trained lecturers (e.g. in Estonia) persist.

In **Cyprus**, higher education institutes provide no innovation management type degree courses but more traditional engineering management courses do exist. New courses related to both the technical and organisational aspects of engineering are relatively well developed in higher education in the **Czech Republic** (see box).

Box 12 Czech Republic: innovation related courses in higher education

Since 1997, Czech universities and higher education faculties have developed a range of study programmes related to both the technical and organisational aspects of innovation. A good example of the first type is the Masters programme in Production and Innovation Engineering at Czech Technical University in Prague. The course covers both production/technology processes and management issues such as: management and transfer of technology, innovation concepts; specific methods of analysis (benchmarking, value analysis, expert systems); intellectual property (patenting practices, international patenting systems); and entrepreneurship (SME, support systems, legal aspects).

Within economic and business faculties, specific courses concerning management of innovation, management of change, quality management, etc. have also been developed to complement traditional degree course programmes.

A third type of teaching programmes has been developed by regional universities as joint programmes for students of both the faculties of technology or engineering and faculty of management. Such teaching programs can be found at Technical university in Brno, regional Technological Faculty and Faculty of Management and Economics in Zlin and West Bohemian University in Plzen. The latter has developed a course about innovation in modular form called PRISMA (Projects-Innovation-Strategies-Management).

Source: Innovation Policy Profile Czech Republic. See list of working papers in annex.

In **Estonia**, innovation and technology management are taught as subjects within more traditional degree courses although both Tartu and Tallinn University are taking initiatives to develop separate degree courses in these subjects. Moreover, the need for closer co-operation between the education sector and business has been recognised in the National Development Plan. A number of agreements between universities and firms have been signed and represent first steps in such a direction.

The majority of higher education institutes (HEI) in **Hungary** have introduced courses aimed at developing human resources for innovation, especially in technology management, quality control and IT. There are also close contacts between such establishments and businesses, notably via: the constitution of advisory bodies for HEI with the participation of businesses, co-operation or even integration of private R&D labs with university labs, joint curriculum development and PhD, etc.

In **Poland**, a range of initiatives have been taken to develop human resources for innovation through co-operation initiatives between high schools, universities, industry, local authorities, private investors and foreign donors co-operation. They take the form of innovation management courses taught at universities, student exchanges between HEI and firms, etc.

A broad range of management related education and training provision has been developed during the 1990s in **Slovenia** by both universities and the private sector. Generally speaking innovation is treated as a topic within more general MBA type courses. However, innovation studies per se at the M.A. level are part of the curriculum at the Faculty of Economics and Business at the University of Maribor. Also, a strong focus on a multi-disciplinary curriculum and on innovation studies as a special segment is given at Politehnika, a higher education institute financed in part by scholarships provided by the business sector.

Box 13 Examples of foreign donor support for innovation related studies

In Hungary, a PHARE project, entitled Technological Development and Quality Management (TDQM), has been instrumental in developing innovation related courses: 16 textbooks have been written in Hungarian for universities and colleges on economics of innovation, technology management, intellectual property rights, etc. These textbooks are also used in various further education courses run by other organisations.

In Poland two initiatives are worth highlighting:

- **The PHARE-funded SCI-TECH programme has initiated a number of courses and developed training material, in the area of technology audit and technology investment analysis tools, management and Internet issues.**
- **A USAID-funded programme (FABRYKAT 2000) has assisted in the preparation of technology management courses in three Polish high education institutes. The new courses are based on the results of a series of technology audits in SMEs**

In Slovenia, action to support raising awareness of the importance of innovation at an early stage of education has been taken through the creation of a handbook "Innovativeness for the Youth" during 2000. This PHARE-funded initiative provides the building blocks of a culture of innovation for a target audience of elementary school teachers. The aim is to promote a culture of innovation throughout the entire education process.

Source: Innovation Policy Profiles for Hungary, Poland and Slovenia. See list of working papers in annex.

Foreign donor support for reviewing higher education programmes and developing new courses and materials would appear to have been relatively important (see box)[54] . However, the financial sustainability of such new programmes does not always seem to have been sufficient to ensure long-term effects (for example, a teaching programme on innovation management developed at Warsaw Technological University with the support of Phare funds was discontinued at the end of the period of EU support).

[54] The ETF considers that: One of the key areas, which Phare vocational education and training reform programmes have focused on, is the development of new curricula, including for the acquisition of core skills…The development of programmes to promote the delivery of managerial and entrepreneurial skills has been initiated mainly by the universities or specific business centres. In particular, the TEMPUS programme has initiated a number of promising activities between universities and companies."

Effort to develop vocational and in-company training systems focus on entrepreneurship with limited evidence of innovation management training.

The main players in innovation related training for enterprises identified by the country studies of this report are intermediary organisations such as technology parks, incubators and business associations. Much of this activity is delivered at local or regional level and question marks over co-ordination and effectiveness can be raised.

The focus of training is related to broader concepts of entrepreneurship or to issues such as quality management rather than specific skills or techniques related to innovation or technology management.

As a general rule, the focus of training is related to broader concepts of entrepreneurship or to issues such as quality management rather than specific skills or techniques related to innovation or technology management. At the same time, training in core skills of business management can be an important foundation for further learning related to innovation. An example is the Business Development Programme run by the HDRA in Cyprus. This 18-month programme, organised as a series of residential weekends, was developed on the basis of an Irish training model and is geared towards the development of learning capacities and a team approach. These aspects are generally missing from the more standard training courses in Cyprus.

Another issue, in the case of the intermediary bodies, is that training is only one part of their service provision and their own skills to deliver such training are not always adequate[55]. One response to this is the development of training for staff of intermediary bodies (e.g. science and technology parks or business innovation centres). An example is the three-year part-time course on innovation management proposed by the Czech "Association of Innovative Entrepreneurship". The course covers subjects such as: foundations of innovative enterprising, technology transfer, project planning in innovative firms, etc.

A weak priority of the private sector to training

The European Training Foundation's comparative analysis of candidate countries concludes that: *"With the exception of some countries in which enterprises appears to dedicate significant resources to the continuing training of their employees (e.g. in Hungary companies spend about 2 to 2.5% of the total payroll for training; this rate is about 1.5% in the Czech Republic), the data available indicates that participation of workers in continuing training is still very low. However, most countries do not possess any information system, capable of providing regular and reliable data on the participation of the working population in employment-oriented continuing training"*.

[55] This issue is discussed in "Entrepreneurial Training for the growth of small and medium-sized enterprises". European Training Foundation. 2000

This said, given the limited public budgets for training, firms are increasingly expected to contribute to funding both company specific training and general systems. Most country reports underline the role of firms themselves, and of foreign-owned companies in particular, with regard to human resource development and training. However, there is apparently no data and few studies which attempt to analyse trends in this direction and which could assist in clarifying the capacity of firms to foster the much needed evolution of the workforce towards more flexibility, more adaptability, and more creativity.

4.2 Awareness and use of innovation management techniques (IMT)

4.2.1 Innovation management and enterprise development

In the European Union, IMT are defined as *"those methodological approaches currently being tested in SMEs and available to firms internally or through external specialised advisors: some attempting to make an overall diagnosis of the firms' innovation practices, and others focusing on specific themes to align business strategies with technological competencies and challenges"*[56]. The types of techniques covered by the IMT label vary according to the types of enterprises they address, the process they deal with, the nature of their methodology and whether they are designed for self-use or use by specialised consultants. Examples of IMT methods available for firms in the EU include[57]: value analysis, business process re-engineering, project development and management, benchmarking of competitive capacity of the company, technology watch, quality management techniques, tools to foster creativity, etc..

An overview[58] of the use of IMT in the European Union has shown that one main benefit is to forge a closer link between technology and business strategy. The use of IMT pushes companies to develop more forward-looking attitudes, and to place more emphasis on human resources, technology and markets. The best results are achieved when the tools are applied with the support of an external adviser, consultant and facilitator. The study highlighted however an inadequate awareness of the diversity of IMTs available among firms, intermediaries and even consultants and policy-makers. A sec-

[56] European Commission "Innovation Management: Building competitive skills in SMEs" Luxembourg, Office for Official Publications of the European Communities, 1999.

[57] European Commission "Innovation Management tools: a review of selected methodologies, Office for Official Publications of the European Communities, 1997.

[58] See European Commission, 1997, op. cit.

ond barrier to the dissemination of IMT is that often firms, and especially SMEs, do not have the resources or know-how to think in strategic terms. There are however examples of simplified business audit techniques that stimulate an appetite for more developed innovation management techniques. Linking support in IMT with other support for innovation, like technology development, is another topics of debate in EU policy circles

Awareness and take –up of IMT in the business sector

Average rates of growth during the 1994-1999 period of ISO certifications in the candidate countries were significantly higher than rates of growth in selected EU high income and cohesion countries

No reliable international statistics exist for the take-up and use of the various IMTs. However, the International Standards Organisation does publish annual figures on the number of ISO9000 (quality) and ISO14000 (environmental) certifications per country. The table below shows the number of ISO900 certificates issued in selected group of countries in 1999 and the average rate of growth in 1994-1999 period. Average rates of growth during the 1994-1999 period of ISO certifications in the candidate countries (235% annually) were significantly higher than rates of growth in EU high income (134.7%) and cohesion countries (154.7%).

However, annual growth figures suggests that awareness of the importance of ISO9000 certification in the six candidate countries lags behind that of the Ireland and Spain. The latter countries experienced particularly rapid growth in ISO certifications as early as 1993-94 (with a second spurt of certifications in Spain in 1997); while Greece experienced relatively consistent growth with however large increases in 1997 and 1999.

There would appear to be a two to four year lag between take-up of ISO9000 between the three EU cohesion Member States and the six candidate countries

The largest year on year increases in the number of certifications in the candidate countries were experienced during the period 1996 to 1998, with the exceptions of Cyprus and Estonia, which lagged behind with a rise in certifications only occurring in 1998-99. In contrast, Hungary seems to have experienced particularly strong growth in ISO certification, which would appear to be linked to the high rate of foreign direct investment. Hence, there would appear to be a two to four year lag between take-up of ISO9000 between the three EU cohesion Member States and the six candidate countries.

Table 5 - **ISO Standard certification in selected countries (1994-99)**

	ISO9000 certificates 1999	Average. Rate 1994-99	ISO14000 1999
Candidate countries	235.0%		
Cyprus	184	238.5%	60
Czech Rep	1500	209.0%	60
Estonia	77	238.4%	4
Hungary	3282	228.6%	121
Poland	1012	316.9%	72
Slovenia	521	178.7%	19
Cohesion countries	154.7%		
Greece	1050	168.4%	20
Ireland	3100	123.1%	115
Portugal	1131	153.9%	28
Spain	8699	173.4%	573
High Income	134.7%		
Denmark	1962	121.6%	430
Germany	30150	164.3%	962
Netherlands	10620	138.5%	403
UK	63700	114.6%	1492

Source: ISO9000 and ISO14000 in brief, International Standards Organisations. ww.iso.ch

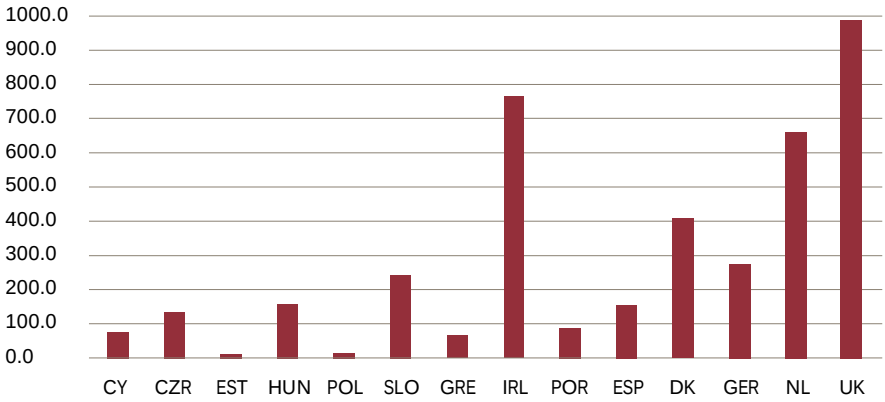
Ideally, the figures on ISO certifications should be weighted against the number of potential ISO certifiable enterprises in each country, and by industry structure of enterprises, in order to ascertain the degree of diffusion within the economy.

In terms of relative penetration of ISO900 standards there are significant differences among candidate countries. In both, per capita and per GNP terms Slovenia, Czech Republic and Hungary are ahead of Poland and Estonia with Cyprus in intermediate position.

However, in terms of relative penetration of ISO900 standards there are significant differences among candidate countries. In both, per capita and per GNP terms Slovenia, Czech Republic and Hungary are ahead of Poland and Estonia with Cyprus in intermediate position. Also, when compared to southern EU cohesion economies the diffusion of ISO900 certifications is comparable or higher in the top three candidate countries.

Dissemination of the ISO1400 standard is much more recent and cumulative numbers in candidate countries have only recently started to surpass 100. Hungary has an early start in this respect, which probably reflects the fact that 85% of Hungarian exports are driven by foreign direct investments.

Figure 30 - **Iso 9000 certificates per 1 mn population, 1998**



Source: International Standards Organisations www.iso.ch. Population figures World Bank Development Indicators 2000.

The conclusions which can be drawn from the international comparable data can be complemented by some indications of the relative importance and awareness of production certification requirements for exports to the EU and ISO certification in Poland and Spain. An EBRD sponsored survey[59] carried out amongst 200 manufacturing firms in both countries found that *"Spanish firms were significantly more likely to have ISO9000 certification with nearly two-thirds of firms complying. By contrast, less than a quarter of firms in Poland and Romania had ISO certification… one intriguing pattern does emerge. In both Poland and Romania, there is a tendency for firms that dominate their market (i.e. that identify no competitors for their main product) to be more likely to have ISO certification."*

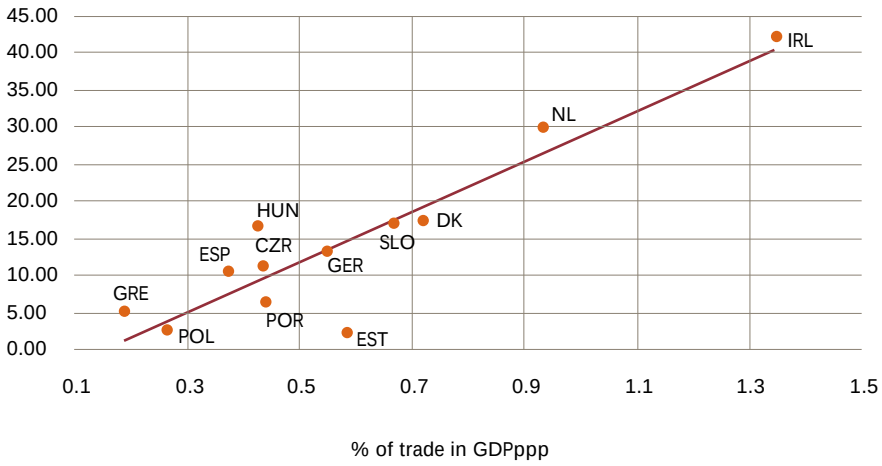
It would appear, that ISO certification may be a driver for change and potentially innovation within firms in the candidate countries.

The survey also provides evidence of the potential knock-on effects in terms of organisational and technological change within firms that have undertaken certification since the Polish firms with ISO certification *"virtually all mentioned the need for increased training with about half noting the need for new investment and changes in the production process."* It would appear, that ISO certification may be a driver for change and potentially innovation within firms in the candidate countries.

Moreover, data suggests that trade openness can explain the greatest part of variations in the diffusion quality management among individual economies.

[59] Carlin Wendy, Saul Estrin and Mark Schaffer (1999). Measuring progress in transition and towards EU accession: a comparison of manufacturing firms in Poland, Romania and Spain. EBRD Working paper n°40.

Figure 31 - **Iso 9000 certificates per GNPppp and Trade Openness**



Source: International Standards Organisations www.iso.ch. Population figures World Bank Development Indicators 2000.

The figure above shows that there is a strong correlation between trade openness and ISO900 certificates per GNP countries. More than 80% of inter-country variation in the diffusion of ISO900 standards can be explained by trade openness suggesting that generic standards, like ISO900, have become a prerequisite for successful exporting. This finding further reinforces **the importance of public programmes in candidate countries to disseminate innovation management techniques which can strengthen the competitive position of enterprises in the candidate countries in the run up to accession.**

4.2.2 Key issues arising from country reports

Academic research has been carried out in **Cyprus**, that touched on the issue of awareness of IMT in firms: the results showed that even innovative firms are not fully aware of the potential and array of IMT available. Management methods are informal, and the small size and family character of many firms also hamper their access to codified IMT techniques. There are only few isolated examples of firms using more sophisticated IMT techniques, such as benchmarking, value analysis, or technology evaluation. The adoption of quality standards by firms is in progress, while environmental assessment and registration is in its infancy.

In the **Czech Republic**, the importance of the management aspects of innovation, as opposed to the technological ones, are underestimated in the business sector, and more so in domestic firms, which are not export-oriented. Firms are however very active in acquisition of ISO certificates and in implementing TQM practices. Studies suggest that take up of new management techniques related to project management and product development and design are progressing, particularly in foreign owned firms or exporting firms. However, the relative uncertainty of the legal environment and the current level of restructuring in the Czech Republic, are considered to act as obstacles to the application of other more innovative techniques such as value analysis and benchmarking.

As elsewhere, increasing production quality is a key issue in **Estonia** with a survey of firms quality management activities showing that 35% had developed a quality system. Main obstacles to the development of quality control cited by the firms surveyed were the relatively high-cost of certification services (31%); outdated equipment (29%) and low qualification of the workforce (25%). The latter perceived obstacle is somewhat surprising given the relatively strong educational profile of the Estonian population, however it may be a further indication of a skills mismatch. As noted above, the level of implementation internationally recognised quality standards, in companies is still low. As regards innovation management techniques, this does not appear as a priority issue, but no studies have been conducted to assess their level of use in companies.

As can be noted from the table above, take up of ISO 9000 certification in **Hungary** has increased dramatically since 1995. Moreover, a Hungarian Quality Award, based on the model of the European Quality Award, was founded in 1996. In the first four years 62 companies applied for the Hungarian Quality Award, which suggests a significant interest in the competition.

Aside from quality management, there is no reliable source on the level of take up of IMT in the business sector of Hungary. However, experts and academic studies suggest that large foreign-owned companies play an important role in bringing IMTs into the country and in disseminating them within the local firms involved in their supply-chains.

Available evidence on business practices suggest that the management of innovation in **Poland** is carried out on the basis of intuitive principles and in a learning-by-doing framework, rather than by application of formal IMT techniques. Polish SMEs are in their overwhelming majority not aware of the usefulness and range of the techniques available.

Awareness of IMT in the **Slovenian** business sector is rated as good when privatised firms are taken into account. However, the use of IMT is to a large extent restricted to quality certification procedures. Technology audits, e.g., are rarely performed in firms. An analysis of the introduction of ISO standards in Slovenian SMEs shows, first that the prevalence of ISO standards and TQM practices is high in the country (enterprises which have been certified to ISO standards represents one third of employment in the corporate sector), and second, that their diffusion constitute a good building block for the introduction of other IMT.

4.2.3 Support for IMT acquisition in the business sector

A lower level of development does thus not seem to constitute a barrier for giving appropriate weight to innovation management issues in policy-making.

For the candidate countries, the issue of raising awareness of IMT, but also of tailoring the existing techniques to national and local characteristic – which requires also training and information for consultants and intermediaries – should be high on the policy agenda. Interestingly, an EU-wide overview of policy instruments to foster organisational and management practices in companies, carried out in the framework of the European Trend Chart on Innovation project of the European Commission, shows that the less developed countries of the EU do not lag behind others in this respect. For example, Portugal has developed several instruments, among which demonstration actions, which act as diffusion mechanisms for good practices in business and innovation management approaches. Greece has taken steps to enlarge the market for consulting companies offering support in business plans and re-engineering. In the latter country as well as in Spain, Community initiatives have introduced new organisational techniques. A lower level of development does thus not seem to constitute a barrier for giving appropriate weight to innovation management issues in policy-making.

Much has been written about the role of foreign multinationals in terms of the transfer of technology and know-how to local suppliers in the candidate countries. The role of foreign multinationals in supporting IMT transfer is less clear although the previously cited survey of manufacturing firms in Poland[60]

[60] Carlin Wendy, Saul Estrin and Mark Schaffer (1999). Measuring progress in transition and towards EU accession: a comparison of manufacturing firms in Poland, Romania and Spain. EBRD Working paper n°40.

found, "for the achievement of ISO certification…about half of Polish firms reporting outside assistance, most often from a foreign customer, partner or owner. There was sparse mention of government help."

According to the findings of the country reports (see list of working papers in annex), all governments have put in place programmes and organisations to promote quality certifications procedures, and support companies directly to do so. However, the country experts have not identified broader attempts, aside from these quality management programmes, to stimulate improved innovation management procedures.

From discussions with incubator managers and government officials policy awareness about the importance of IMT would seems to be low in **Cyprus**. As outlined earlier in this report, the main policy instrument of the Cypriot Government's New Industrial Policy aimed at (indirectly) supporting innovation is business incubators. Although these structures are expected to provide advice and training related to entrepreneurship, no explicit mention is made of supporting the application of innovation management tools.

University curricula do not include topics related to IMT. Private training provision is not only hampered by a lack of demand, but also by a lack of qualified trainers able to link the techniques with the national context. The Chamber of Commerce and other business support organisations have mainly concentrated on the promotion of quality certification. A number of one-off or experimental actions can however be highlighted:

- The Human Resources Development Authority has organised a few seminars on creativity enhancement.
- The Institute of Technology has participated in a two-year project, in co-operation with the Federation of Industrialist, and Greek and Czech partners, aiming at exchanging experience and best practice on innovation management.
- Some seminars relating to innovation management have been organised at national level by government bodies but have tended to attract only the larger more sophisticated firms.

The **Czech Republic** has developed a National Plan for Quality Support, in 2000, aiming at promoting the issue of quality control in the business sector. A Council for Quality is advising the government on those issues and co-ordinating activities of bodies in charge of quality control. The Ministry of Industry and Trade also supports the diffusion and implementation of innovation management, through subsidising consulting activities in firms,

by Business Innovation Centres and Regional Consulting and Information Centres.

University courses including IMT aspects are developed in engineering, technology and economic faculties, addressing not only students but also firms' staff. A private consulting supply, covering IMT issues, is available to firms, with the advantage that an accreditation system has been put in place to guarantee the quality of services.

In **Estonia**, the Ministry of Economic Affairs is preparing plans, with the support of the Phare programme, to launch a Quality Programme and a Quality Promotion Centre. A Quality Award pilot project should also be launched during 2000/2001.

The new Technology Agency will launch, as of 2002, the project "Raising competence in Innovation Management", which will include training of development managers in enterprises on strategic planning and development and technology auditing issues.

In the education sector, despite a long tradition in management studies, the subject of innovation management is not yet taken into account in curricula development.

The **Hungarian** government has taken initiatives to promote quality development in the business sector, through the establishment of the Hungarian Quality Development Centre and the launching of a National Quality Award programme (on the model of European Quality Awards), which is attracting much interest from the business sector.

The PHARE programme has also contributed to a Technical Development and Quality Management Programme, in which experts have developed a curriculum on quality issues for the higher education sector and firms, and a Regional Programme on Quality Insurance, which aimed at transferring Western practices and methods in the country and help adapting Hungarian legislation. More than 500 persons have been trained through the latter programme.

IMT services are not identified as such in the **Polish** support system, however the Centres of Technology Transfer and some incubators offer support such as innovation value estimation, identification of technology needs and partners (technology suppliers or buyers), and various consulting services touch on IMT directly or indirectly.

The relatively early increase in the rates of ISO900 certification in **Slovenia** can be in part attributed to the need to rapidly re-orientate exports to western markets (as is suggested by the analysis of the links between trade openness and certification above). However, the Chambers of Commerce and Industry and the relevant government Ministries have played a proactive role by providing finance, support and training, to companies wishing to acquire quality certification or take part in European Quality Award schemes. A Slovenian Award of Business Excellence was also established to further promote the quality concept. In addition, universities have developed courses on quality management and innovation.

During 2000, and based on survey results from a questionnaire on innovation activity sent to 500 firms (response rate of 27%), the technology department of the Chamber of Commerce has decided to re-direct its efforts from quality standards to raising awareness on innovation practice and techniques. A first workshop organised by the department suggests that firms are most interested in benchmarking activities (successful cases of innovative enterprises) while the survey underlined the need for training on innovation and support for the creation of co-operation for innovation.

Conclusion on innovation management tools: issues and challenges for transition countries

The analysis carried out for this study, both in terms of the findings at country level and internationally comparable data, suggest that in terms of quality certification, the six candidate countries can be divided into two groups. The first group composed of Hungary, Slovenia and the Czech Republic (in that order) have achieved a higher rate of penetration of ISO certification; while the second, Cyprus, Poland and Estonia are lagging considerably behind. This said, average rates of growth of ISO certification have been significantly higher for all of the CC6 than for the EU cohesion or high income countries.

Some survey evidence would suggest that ISO certification can stimulate demand for training and process innovation as well as technological upgrading

Although all countries have launched programmes and initiatives in favour of quality management, there appears to be a strong correlation between the importance of trade in terms of GDP and the level of ISO certification. This finding based on international data adds to country level evidence on the importance of ISO certification for exporting firms. In addition, FDI and subcontracting links have played an important role in disseminating quality management tools and there is some evidence, from the Czech Republic and Hungary, that other techniques are beginning to be applied with the support of foreign investors.

The majority of efforts undertaken by companies, and of support provided through policy instruments, concern quality certification procedures. Some survey evidence would suggest that ISO certification can stimulate demand for training and process innovation as well as technological upgrading.

There is at present little recognition of innovation management techniques as important ingredients in the innovation process.

Beyond quality management, evidence is extremely limited as to the take-up of innovation management tools in the candidate countries. At both the enterprise level and in policy-making circles, there is at present little recognition of innovation management techniques as important ingredients in the innovation process.

Given that data on ISO9000 certifications suggest a two to four year lag between the candidate countries and the EU cohesion member states in terms of the diffusion of quality management techniques: initiatives to support an earlier diffusion and application of IMT in the candidate countries would be advisable. This is particularly the case since the competitive pressures of ISO certification, where the gaining of a 'label' can facilitate market access, are less evident with other IMT tools which essentially improve internal management of the innovation process with more medium term results in terms of new product development, etc.

Chapter 5 Business innovation interfaces and support measures

Promoting the creation and a smooth functioning of interfaces between various players in the innovation system has been given high priority in the EU during the 1990s. This issue was again highlighted in the Commission's 2000 Communication on Innovation in a knowledge-driven economy, as one of the five objectives necessary to reduce the innovation deficit in the European Union: ***improving key interfaces in the innovation system***. At the Lisbon summit in 2000, specific attention was given to interfaces between firms and research institutions, and the necessity for these interfaces to work efficiently so that new knowledge is disseminated into the business sector. To what extent has action been taken in this direction in the candidate countries is the topic of the first section of this chapter.

A dynamic innovation system is characterised by its capacity to generate new activities, in existing firms but also through the creation of new firms. This theme forms another topic of the Commission Communication cited above, which calls for the creation of a favourable environment for such new firms to emerge. In transition countries, the creation of new firms, and especially new-technology-based firms, is a key factor in introducing more diversity and flexibility in the production base. This question will be reviewed in section 5.2.

Finally, current understanding of the innovation process emphasise the importance of diffusion and absorption of knowledge in the production system. While diffusion of codified knowledge is best captured by the exchange of R&D results or technology transfer practices, diffusion of tacit knowledge (the sort of knowledge that is embedded in people) takes place most easily through face-to-face interactions. Attention paid to the latter form of knowledge diffusion means that firm-to-firm interactions come at the forefront of innovation policy. As innovation surveys consistently show that firms learn best from other firms, business networks and clusters can be considered as relevant targets for innovation policy. This topic will be covered in the last section of this chapter (section 5.3).

5.1 Research community - industry co-operation

There are no comparable and reliable data available to assess the extent of interactions between business and public research in the CC6. However, the country report and policy workshops for this study permit a more qualitative assessment of the factors blocking such relationships:

On the business side, the need to access R&D results and incorporate knowledge from research players into the production process is not generally seen as a priority.

On the business side, the need to access R&D results and incorporate knowledge from research players into the production process is not generally seen as a priority. Even for the companies that recognise this need, the loss of former protected markets and shrinking revenues prevent them from generating the necessary funds to undertake or access R&D. Finally, those companies that have become subsidiaries of foreign-owned firms (notably the case in Hungary) generally rely on R&D and technology development carried out by their parent companies or other foreign partners in subcontracting agreement.

On the research side, three main problems are reported. First, universities often act in a very traditional manner: *"the current system of incentives/ evaluation procedures does not encourage researchers to work with industry"*[61] *and "when publications and scientific titles and degrees really matter, professors do not see advantages of working in or for industry"*[62] .

Second, industrial research centres have lost a large share of their public funding during transition, and have consequently re-organised their activities around short-term services to companies neglecting longer term pre-competitive research (this is a particular problem in the Czech Republic). Third, there is limited consultation with industry on the choice of topics elected for research in industrial basic research.

The development of relationships between the research community and the business sector is an issue on the policy agenda for all countries under study; with the exception of Cyprus. In policy circles, it is understood that establishing or reinforcing such linkages can help form one response to the challenges posed by the recent opening of these economies to global competition.

In the **Czech Republic** research-industry co-operation was hampered by a choice made at the start of the transition period, whereby all industrial research organi-

[61] National innovation policy workshop in Slovenia, 16 March 2001

[62] Results of business interviews in Poland, May 2001.
This point is also supported by the conclusion of the policy workshop in the Czech Republic and in the national study of Cyprus

sations were privatised. At the time, it was thought that such a move would automatically bring firms and research bodies closer together, because of the need for private financing of the latter. This happened, but with the consequence that the R&D emphasis was lost, and that the centres were transformed into service providers in response to short term problems and immediate needs of companies. The gap with academia became even larger as a result.

The need for another policy approach was acknowledged at the end of the nineties and a range of incentives were developed in order the aim to re-create networks between research and industry. These include:

- the CONSORTIA programme, that offers subsidies for joint projects between domestic R&D organisations and firms;
- the inclusion of industrialists in higher education training programmes;
- new "business impact" criteria included in the delivery of grants to R&D institutions;
- a priority given to research-industry co-operation in such grants, etc..

The new technology foresight exercise, launched by the Ministry of Education, Youth and Sports in 2001, should help define priorities for industrial R&D and may suggest useful criteria for the orientation and distribution of public R&D funding. In the Czech Republic, the role of foreign firms is considered as important in this area, since cases of those firms investing in the domestic science and R&D base exist.

The **Estonian** policy approach to fostering research-industry relationship is focused on, but not limited to, the stimulation of university spin-offs. The Tallinn Technical University (TTU) has launched such a programme in 1999, while Tartu University is planning one (see next section). Science and Technology Parks have also been established with a mission to connect industry and university.

Another policy response is through the establishment of technology competence centres at the two universities, with the aim to build lasting relationships between academics and businessmen. However the latter brought disappointing results until now. As in Poland, attention is paid to the functioning of regional networks of technology and innovation support organizations, notably the CARIN network in Tartu, but fragmentation is visible in the fact that, e.g. Business Advisory Services and Entrepreneurship Centres are weakly connected to the university world. The Estonian Technology Agency is planning to support co-operative R&D projects between public R&D units and industry from 2001 onwards.

Box 14 A successful strategy of co-operation between science and industry: As Silmet group in Estonia

AS Silmet Group, a firm producing rare earth metals, refers to its production as mass high-technology production. It invested 32 Million EEK (€2.05 million) in 2000 for development, and counts 26 persons involved in R&D, out of a total of 750 employees. The number of R&D employees has grown quickly, as there were only 18 in 1999. Mr Pilv, member of the Supervisory Board of the company, states :

"Last year, our output grew by 70%. This was thanks to high-technological value-added. In the use of the R&D potential we cooperate with Japanese, US, Western European, Russian institutes, but we have also found research potential in Estonia. Last year we signed framework agreements with the Tartu University and TTU. We have some more advanced cooperation with the TU chemistry specialists. And I am glad to point out that the Technology Agency is ready to support that cooperation.I have a message for entrepreneurs: it is possible to find good researchers in Estonia and not only in the known IT and gene technology fields. As for innovation in the enterprise, we restored the Technical council, where there is more liberated technological thought. We have been operating as the new owners for three and a half years, two of which were used on saving the firm, then the results and the rapid development have come especially from R&D activities and cooperation in that sphere. This is real cooperation, with concrete framework agreements, projects, where we hire new researchers."

Source : Innovation Policy workshop in Estonia, May 2001.

In **Hungary** also, the main policy approach to foster industry-research inter-linkages is through the establishment of structures offering a stable platform for players involved in this co-operation: the **Co-operative Research Centres** (CRC), launched in 1999. The CRC aim at stimulating longer term co-operative linkages between higher education institutions, R&D centres and businesses. The mandate of CRC is very wide, since it encompasses the fostering of entrepreneurial attitudes in HEI, the integration of business orientations in HEI curricula, the joint development of R&D activities for new products and processes creation in view of fostering competitiveness in firms, the generation of technological breakthrough with commercial application, the creation of appropriate jobs for graduates and post-graduates, etc. The CRC can thus be seen as a multifaceted instrument able to act on many aspects of the industry-research linkages. By 2001, five CRC were operational in Hungary.

Within the overall regulatory framework, one favourable provision reported above in section 2.3, is a 100% tax reduction for R&D expenses incurred by a company in the cases where the research is carried out in a public research institution. HEI-business relationships are also relatively well developed in Hungary (see box below).

Box 15 Examples of foreign donor support for innovation related studies

In Hungary, there are close contacts between Higher Education Institutes and business, both for professional and financial reasons. Some examples of these relationships are:

- **Universities organise "senates" or roundtables of business leaders as advisory bodies in order to regularly discuss curricula, initiate joint research and PhD projects, and secure extra funding from firms (e.g. Budapest Technical University);**
- **R&D labs of firms are established at universities or close co-operation between firms' R&D units and university labs, sometimes involving several firms, e.g. Ericcson, Nokia, Westel (all telecom), Sony (electronics), Knorr-Bremse (automotive) at the Budapest Technical University, EGIS lab (pharmaceuticals) at the Semmelweis University;**
- **Joint curriculum development, e.g. Gábor Dénes College (distance learning HE) and Matávcom (telecom), Széchenyi College and Rába (automotive, both partners are located in Győr), Kandó Kálmán College and Siemens, Budapest Technical University and MOL (oil);**
- **Limited duration (six-month maximum) on-the-job training is organised with firms, e.g. Dunaferr (steal) and Budapest Technical University, Bábolna (agribusiness) and Modern Business Studies College;**
- **Jointly selected PhD projects are professionally supported and co-funded by firms, practically at all universities.**

Source: Innovation Policy Profile for Hungary. See list of working papers in annex.

In **Poland**, a policy response was developed in 2000 in the form of the creation of Centres of Excellence, complementing the existing PAN-University-Industry scheme, launched in 1998. The Centres of Excellence, conceived in line with the European Research Area (ERA) concept, aim at establishing pool of R&D competence around specific questions defined by the end users (business sector) and of interest for the science sector at the same time. Five pilot centres have been established in 2000, under the leadership of R&D institutes and with the participation of industrial users. The Centres of Excel-

lence will give more impetus to lasting collaborations, already started between universities, industry, and academy of science, in the PAN-University-Industry collaborative schemes. These schemes, launched in 1998, support collaborative R&D projects leading to new products and methods, adaptation of curricula in universities, and demonstration effects for the whole community.

At the regional level, networks of business support organisations have been created, in order to improve co-ordination with all players offering services, including R&D activities, to companies. The players in those networks cover a wide area of activities, from training activities, the delivery of consulting services, technology audits, creation of firms networks, development of course material, or establishment of directories of organisations. Overall, there are thus a large number of organisations attempting to play an interface role between research and industry in Poland. No assessment of their effectiveness is available, although business people interviewed in the framework of the study have claimed that "science-industry interface institutions are not efficient enough because of the lack of government/regional/local support... also there is insufficient co-operation between them".

The case of **Slovenia** differs from those above, not because the issue is considered as irrelevant but because policy instruments are still at the design stage and not effectively implemented. The establishment of interfaces and subsidies to co-operative projects, are instruments mentioned in the new law in support of business, but the implementation of these instruments is still unsure due to budgetary limitations. At the same time, it is recognised that inappropriate evaluation systems in academic institutions, and defensive attitudes in industry, constitute strong blocking factors that are not likely to be addressed even if the planned measures would come into life : *"the two universities work on the basis of old fashioned model in terms of staff appointment and industrial liaison. They have not developed a technology transfer or IPR service and lack a strategic view on how to commercialise research results"*[63].

[63] Innovation policy workshop, Slovenia, March 2001.

Finally, **Cyprus** is a different case, as mentioned above. Because of the limited scale of its research base, the question of developing research-industry linkages has not been given high priority. The two main research institutions, the University of Cyprus and the Cyprus Institute of Neurology and Genetics, have not entered into the development of mechanisms that would enhance such linkages : "academic research is not geared towards problem solving services to the Cypriot industry. Industry-research links are virtually non-existent and should be promoted"[64]. No policy instruments exist in the country that address this issue directly.

5.2 Support for start-ups and new technology based firms

New firm creation, and more particularly the creation of firms with an advanced technological base (New Technology Based Firms, NTBFs) and an openness to global markets, are particularly important factors in the restructuring of the economies of the CC6. As has been outlined in section 2.2 above, **the number of dynamic innovative firms in the CC6 appears to be relatively limited compared to the EU.**

Stimulating the creation of new firms, and particularly high-tech ones, is an important component of the emerging innovation policies in the CC6.

Stimulating the creation of new firms, and particularly high-tech ones, is an important component of the emerging innovation policies in the CC6. Many instruments are created with this aim in mind but the lack of a policy tradition in this an area makes the composition of an adequate portfolio of measures difficult. Also, national economic contexts are important, and each country addresses this issue, starting from its own vision of the phenomenon.

Public authorities in **Cyprus** have chosen high-tech business incubators as a major plank of their industrial policy. The purpose of these incubators is to stimulate higher value-added entrepreneurial activities. Their design has been inspired by an examination of similar schemes in Ireland, Israel and the US. Two incubators were functioning by the spring of 2001, but they had failed to attract a significant number of proposals from would-be entrepreneurs. Whether this approach is adequate for the stimulation of the emergence of new technology based firms companies in Cyprus, remains to be proven. During the innovation policy workshop participants were of the opinion that "ready made solutions from abroad may not deliver the expected results and suggested that the government should allow foreign researchers or qualified individuals to compete for places in incubators".

[64] Innovation policy workshop, Cyprus, April 2001

The accent in the **Czech Republic** is more on the creation of new firms in the wake of foreign-owned firms, rather than on the stimulation of purely endogenous firms. It has been recognised that, across all types of new SMEs, the most competitive ones are those that are directly linked to global markets through their close relationships with multinational firms established in the country. Therefore, the challenge of NTBF creation in the Czech republic is translated into one of attracting multinational investments, this being a key positive factor for the creation of technology spin-offs. Policy support programmes search to reinforce the foreign-controlled part of the industrial fabric - support is given for : the development of sub-contracting relationships between domestic firms to foreign-owned ones, and increased subsidies for the location of multinational firms in industrial zones. Concerning local firms, a very liberal framework is in place for the start-up of new firms, but legal and administrative problems faced by the new entrepreneurs are numerous, as developed in section 2.3 above. The government's Resolution on the support of enterprising SMES has the short term goal of improving access to venture capital and credits, protection against unfair competition, simplification of accounting and favourable taxation of innovation.

As already mentioned above, the creation of new technology-based firms is an important issue in **Estonia** : the phenomenon is visible through the existence of spin-off firms in proximity to the Universities of Tartu and Tallinn, and a number of instruments and measures exist to favour their development. In Tartu, training and consultancy is delivered to spin-off entrepreneurs, commercialisation of research results is favoured, as is the dissemination of science-based services. In Tallinn Technical University, the Innovation Centre delivers services in support of the commercialisation of research results such as: patent search, negotiation with industrial partners, consultations on IPR, participation in the definition of exploitation projects, etc. Plans are being developed for the implementation of incubators in the near future.

By the second half of 2001, the Estonian Technology Agency should have implemented specific support measures for spin-off firms. Students competition for new firm creation projects are run in Estonia, under the leadership of large firms. The absence of venture capital sources in the country is identified as a gap in the system, but here too, there are projects in this area within the Estonian Technology Agency. The need for better regulation in the area of IPR has also been mentioned as an area for improvement. Estonia is thus in the middle of a policy design process aimed at creating a favourable environment for the establishment of new firms; and especially of firms directly linked to the science and technology base of the country.

Recent policy initiatives in **Hungary** suggests that the issue of NTBF is of growing importance. The policy approach is to introduce specific incentives and support for this category of firms, in the wider context of general support to SMEs development. The TECH-START programme, launched in 1999, is such a specific initiative. It aims at supporting new firms in the formulation of their innovation plans. This scheme will later be integrated into a larger regional innovation, start-up and cluster framework programme, to be implemented in 2002. The Government's Szechenyi Plan proposes the creation of a wide range of incentives for SMEs (support for consultancy services, investment, etc.) but these are not specifically geared towards high-tech firms. A government strategy for the development of micro, small and medium-size companies was in preparation during the first half of 2001, and should reinforce the general support available to start-ups and NTBFs.

An endogenous approach to NTBFs and start-ups stimulation seem to be also present in **Poland**, a country that has developed a wide range of support organisations able to act on the creation of high-tech firms. No less than 264 organisations have been identified, that can be classified in various categories according to their main activities : training and advisory centres, technology transfer centres, organisations delivering loans or providing guarantees (often at local level), entrepreneurship and incubator centres offering space and services to firms. The extent to which their services are adapted, and specifically geared to NTBFs is however more difficult to gauge. Polish business leaders interviewed in the framework of the study indicated that *"innovation incentives are lacking. There are only business incentives. There are no incentives for inventors/spin-offs from public science institutions".*

A well-known problem in the EU, that of survival of intermediary organisations after a period of initial public funding, started to appear in Poland at the end of the nineties. It is likely that the support system will evolve substantially, when placed in a more market-driven environment. The first innovation and entrepreneurship centres established between 1990 and 1992, on the basis of foreign experience, are already facing important difficulties to survive.

Slovenia, which had the lowest rate of creation of new firms during the period 1995-98, is currently drafting a strategy for SMEs and Entrepreneurship for the period 2001-2005. However the creation of new enterprises has been a long-standing is a subject of policy interest with the early adoption in 1990 of a new company law framework. In addition to a favourable legal environment, the creation of two technology parks and the launch of two venture capital companies geared towards the support of new technol-

ogy –based firms, reflect a willingness to go further in NTBFs stimulation. The limits of other support instruments are however recognised: there are very few projects that qualify to access to favourable loans offered by the Slovenian Development Corporation to innovative firms, and the "soft" support (advice, mentorship, etc.) proposed by the Slovenian Business Innovation Network does not seem to be particularly adapted to the specific case of start-ups.

5.3 Business networks for innovation

Support for the development of business networks is a relatively novel idea. The Czech Republic and Hungary are pioneers in this field.

While improving research-industry linkages and supporting the creation of start-ups have become established intervention areas in almost all of the CC6 by 2001, support for the development of business networks seems to be a relatively new policy concept in the CC6. Hungary and the Czech Republic appear as pioneers in translating such a concept into policy instruments. In both cases, the emphasis is on promoting supply chains between large (foreign owned) firms and SMEs. Poland has set up instruments for the support of clusters but with a broader focus. In the three other countries, Cyprus, Estonia and Slovenia, business networks are not (yet) the target of policy.

Hungary deals with the issue of business networks through one main policy initiative: the INTEGRATOR scheme, launched in 1999, whereby a vertical network consisting of a large company and its network of suppliers is entitled to receive a grant to reinforce the linkages between its members. The network has to be structured around a technological development project. The general idea of the policy scheme is to reinforce the capacity of domestic firms to become suppliers of large (multinational) companies, the subsidised project being a first step in a longer collaboration process. This is seen as a means of placing the domestic firms on a learning curve, provoking the upgrading of their production process and of their managerial practices, and easing their access to global markets. By 2001, 26 INTEGRATOR projects were running in Hungary.

A similar approach is followed in the **Czech Republic**, where vertical networks are supported by government subsidies for subcontracting relationships. As already mentioned above, the approach in this country is very much focused on the development of linkages between domestic firms and foreign-owned affiliates. Existing cases of networks fall within this pattern, with for example the successful case of the creation of a network of domestic suppliers for the VW/SKODA manufacturer. In the latter case, the supply-chain network has

proven to have a strong element of technological upgrading and innovation for its members. Purely domestic networks do not exist to a significant extent.

Box 16 Vertical network relationships in the Czech Republic : the case of VW/SKODA

The network of domestic suppliers to SKODA/VW is a good case of the positive impact of advanced foreign producer on the domestic suppliers in the Czech Republic. The obligation of foreign company to address domestic suppliers was of the contract between the state and VW. Indeed, the firm developed a demanding scheme for domestic suppliers which had to improve radically the quality of products, observe strictly delivery terms and decrease costs. The domestic suppliers responded well to such demands: out of a total of 416 SKODA/VW suppliers, domestic ones amounted to 205, Slovak ones to 18 firms and the rest (193 firms) were of foreign origin. However, for the production of the new model of SKODA/VW passenger car (OCTAVIA), many domestic suppliers could not maintain their contracts with SKODA/VW: some of them due to limited production capacities, some of them due uncompetitive quality and price. On the other hand, some of them gained status of reliable component supplier and extended their production through contracts with other foreign motor car companies.

Source: Innovation Policy Profile Czech Republic.

In **Poland**, a policy concern about clusters and network is still under development. Nevertheless, some initiatives are already underway. The regional innovation support network Innowacje/REKIN offers support for business clusters, organised on a territorial or sector basis, and with a technology transfer or innovation component. Such clusters also often involve government agencies and/or public R&D units and they extent to which such networks are business-driven is not clear. A PHARE-funded programme has been implemented in 1997-1998, using Danish, Italian and Dutch models, to train 15 persons as network brokers. Cases of purely bottom-up cluster creation, without government intervention are also reported such as. the Plastic Valley in Tarnow. The main aim of this initiative is to facilitate co-operation between existing plastic firms in the area and to attract further investment in the same sector. A 'broker' company has been created to stimulate the co-operation between firms, but also with scientific and ecological institutions.

In **Estonia**, research institutes play an attraction role towards firms with an interest in their own area of action. Especially in the IT sector, this phenomenon is visible, with private research firms acting as main drivers of the agglomerations. More traditional clusters do exist too, e.g. in the wood industry. International firms networks are also present. In this country, a liberal policy framework is probably the reason behind the absence of policy instruments aiming to act on clusters and network formation.

Despite difficulties, there were positive opinions heard on the potential role of business networks, expressed during the national policy workshop in Estonia : *"Small companies can do a lot. Co-operation mechanisms should be developed for this…A large enterprise will not make small things itself, but co-operation with small firms for the improvement of its product is very much welcome. A successful large enterprise can thus involve a number of small ones"*[65].

The Slovenian authorities (Ministry of Economy) plan to launch a cluster programme in 2001. Whether this initiative will address the fundamental conditions for relations of trust to appear between companies, remains to be seen. Regional technology centres and sector technology centres exist throughout the country, which could have a role in the formation of business networks or clusters in the future.

Finally, in Cyprus, no networking or cluster policy initiatives are reported, but the lack of geographical and industrial concentration of activity on the island does not favour such a policy option. In addition, the innovation policy workshop highlighted another barrier : *"before the government considers the promotion of business clusters, it must create the awareness of the potential benefits from cooperation/collaborations between firms. At the moment, there is still a lot of mistrust between entrepreneurs"*. The creation of the "A to Z" furniture consortium might however constitute a sign that this option should perhaps not be disregarded entirely.

[65] Head of a medium sized enterprise, Estonian Innovation Policy Workshop, May 2001

Box 17 The "A to Z" furniture consortium in Cyprus

A legacy of a 1989 UNDP/UNIDO study on an industrial strategy for Cyprus was the creation of the "A to Z" furniture consortium. With the support of the Cyprus Development Bank, a group of 13 furniture makers agreed to open a joint retail shop, for which they would produce newly-designed products on a specialised basis (one firm would be specialised in kitchen furniture, another in children's furniture etc.). The members of the consortium kept their own retail shops and their lines of production, but the specialised furniture were sold in the joint shop.

The system provided for immediate economies: firstly the unit costs in the specialised furniture fell dramatically as the result of longer runs and manufacturers invested in new lines and larger facilities. Secondly, the consortium offered clear retail economies including the services of a specialist interior designer, a wider variety of products, availability of dedicated marketing staff in charge of new product development, the establishment of a joint delivery system and greater advertising possibilities. It became evident that these economies could be extended back into production and purchasing. The results of the exercise have been positive and the consortium has opened several shops in major towns in Cyprus. After more than 12 years of existence, the venture still continues.

Source: Innovation Policy Profile Cyprus.

Conclusions on business innovation interfaces and support measures

During the second half of the 1990's, **policy activity in support of research-industry co-operation and NTBFs creation has grown rapidly** in the CC6. This is particularly true in Poland, Hungary, Estonia and the Czech Republic. These topics are clearly on the policy agenda, and many structures or schemes have been, or are in the process of being, created. A majority resemble existing formulas in the west such as the technology parks, incubators, centres of excellence, etc.; due in large part to initial expertise and funding from EU or US programmes.

Policy activity in support of research-industry co-operation and NTBFs creation has grown rapidly…it remains to be seen whether new measures will be effective in the economic and institutional context of the candidate countries

Given the relatively limited time scale, many organisations exist for only 2 or 3 years, **it remains to be seen whether these measures will be effective in the economic and institutional context of the candidate countries**. Further efforts seem to be needed to fully transform formulas inspired by foreign experience, into instruments fine-tuned to the reality of the CC6 situation.

Experience in the European Union underlines the importance of the prior analysis of needs, clear and well defined missions (avoiding overlapping or multiplication of schemes or organisations), and regular monitoring and evaluation. The transparency and clarity of the overall support system is an equally important element. In this respect, the situation in Poland where there is a multiplication of competing business and innovation intermediaries gives some cause for concern. A partial response in this case has been the creation of networks for these structures.

There were indications that a number of instruments have been set up with a focus on end results to be obtained (NTBF creation, relationship between university and industry), without however sufficient consideration being paid to improving pre-conditions for the phenomenon to appear. The cluster programme of Slovenia, the entrepreneurship centres in Poland, or the incubators of Cyprus, are among such initiatives that might encounter difficulties in reaching their goals, if complementary measures are not in place that act on motivations and barriers faced by entrepreneurs.

Analysis also highlights that many policy instruments target "top level" firms, the few that are externally-oriented, and have developed a certain degree of innovation awareness. The question is thus posed as to **how innovation could be promoted with the vast majority of "ordinary" companies in the CC6**, "these small firms, which survive from one payment date till another. Supporting the creation of business networks might be one answer, but innovation-awareness raising approaches, notably at schools, is certainly another option to consider for incorporation into innovation policy in the CC6.

Finally, **the diversity of policy approaches taken by the CC6 in addressing the three issues of industry-research relationships, NTBFs** and business networks creation, has been highlighted throughout this chapter. While some countries, such as the Czech Republic, place an emphasis on the role of foreign investors, others like Estonia are focusing their efforts mainly on endogenous high-technology firms creation in relationship with domestic universities. Care should therefore be taken in drawing conclusions on policy options for all six countries, as these will probably cover a range of diverse options suited to the individual economic context.

Chapter 6 Challenges for innovation policy in the candidate countries

This study had the objective of identifying a series of challenges for innovation policy in six candidate countries to the EU. This has been done at the level of each country through the systematic analysis of nine key issues and by the collection, through interviews and policy workshops, of the opinions of a series of key policy-makers, business leaders, and research and technology interface managers. In addition, the core study team has undertaken an analysis of internationally comparable data and of relevant background studies concerning several or all of the CC6, in order to complement the national studies.

In this concluding chapter, the aim is to highlight a number of challenges influencing innovation matters which are common to the context all six countries. As was outlined at the beginning, the difference in size of the countries alone, never mind economic structures, means that there are limits to the degree to which one-fits-all conclusions can be drawn. The key conclusion of the comparative analysis are presented in section 6.2 below.

Similarly, readers of this report from the six countries concerned should take care to interpret the challenges and policy options (see section 6.3) in their national context, both economic and institutional.

First, however, section 6.1 presents the findings of a query raised in discussions during the national innovation policy workshops.

6.1 A culture of innovation ?

In the EU, the importance of the general openness of the society towards innovation was recognised explicitly, first in the 1995 *Green paper on Innovation*, and then in the 2000 *Communication on Innovation in a knowledge-driven society*. One of the five objectives set by the latter was *"a society open to innovation"*. The need for the development of a broad dialogue with science, business and the general public on the opportunities and risks of new technologies and innovation was hence given priority. Moreover, enterprises are encouraged to devote efforts to foster innovation at the workplace.

The overall aim is, in the words of the Commission, to *"boost public confidence in innovation"* and move towards *"a well-informed European society, capable of mature debate on innovative developments, and not handicapped in discussing innovation, or in applying innovative developments, by a weak understanding of science, technology and change"*.

This topic, very much related to cultural aspects, was not defined as one of the explicit themes to be covered in the present study. Partly this is due to the difficulty in measuring "innovation-awareness" of a particular population, partly because the human aspect of innovation is implicit in all facets of policy.

However, a clear message arose from the opinion gathering exercise undertaken as part of the study (through interviews and workshops, multinational expert panel) **that innovation, in its broadest sense, remains a poorly understood, and even accepted, concept.** Although this is in part a 'hangover' from central-planning, in part due to continuing economic difficulties, the CC6 face certain barriers to innovation which relate as much to culture as institutions.

In Slovenia, a **negative view of entrepreneurship** was highlighted during the discussions that took place in the policy workshop organised in March 2001. Two examples were given to illustrate this problem:

- first, the Slovenian Human Development Report found that parents and teachers considered obedience as the number one priority for education of children, and placed creativity in last place;
- Second, it was mentioned that tax authorities had visited each of the winning companies of the "Entrepreneur of the year" award shortly after the announcement of the prize.

In Estonia or Cyprus, where entrepreneurship is better perceived, the problem relates more to a **lack of drive towards innovation from businessmen:**

- *"the main interest of the owners of SMEs is a rapid increase in turnover"*[66]*);*
- *"the culture in the business community is very much influenced by a short-term approach to investment"*[67]*; and*
- *"enterprises needs a change of culture of thought, which would breed innovation and constant development of their products"*[68]*.*

[66] representative of financial organisation, Estonian Workshop, May 2001

[67] conclusion of the Cyprus Workshop, April 2001

[68] representative of the Tallin Technical University Innovation Centre, Estonian workshop

The explanation for such cultural aspects was often laid at the door of the education system which is considered to bear an important responsibility to promote, from a very young age, an innovative spirit in the population.

The Polish case also bears out the difficulties that many business people have on focusing on innovation in **an economic system which does not necessarily reward innovators:**

- *"Very often the business community in Poland is concerned about such prosaic problems as labour costs, fight for survival etc. Innovations are put aside for 'better time'; and*
- *"One of the most important obstacles of innovation in Poland is low quality of social capital (e.g. jealousy, corruption)"*[69]

The **lack of experience with the market rules** was also reported as a particular difficulty for the transition countries: *"the basic capitalist philosophy of market as the key regulator of the success is not present in the minds of the people. It is still expected that the state will take care of innovation policy, while in fact the businesses exposed to international competition have already learned that innovation is a key to their survival."*[70]

This lack of exposure to the global market is also found to act negatively on the country as a whole (especially for the smaller ones), because of the problem of *"the lack of name and recognition : the issue is recognition and this what Estonia hasn't got yet… ten years has been too short a time for that image to emerge"*[71] .

The discussions at the workshop also brought up a key challenge faced by all innovators : successful innovation is a function of the combination of three competencies: technological, managerial and organisational[72]. While a lot of attention is traditionally paid to improving the access of companies to new technology development, marketing and organisational skills are subject from much scarcer attention. The combination of the various competencies is even less recognised as a key to innovation process.

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[69] President and Director of high-tech companies taking part in the innovation policy workshop in Poland, May 2001)

[70] Innovation Policy Workshop, Slovenia, March 2001

[71] Innovation policy workshop, Estonia, May 2001

[72] Cobbenhagen, J (1999), Managing Innovation at the Company Level, Universitaire Pers Maastricht.. "Innovative success is not the result of doing one or a few things extremely well, but rather of doing many interrelated things well. It thus appears that frontrunners (in innovation) not only differ from pack members in terms of technological competence but also and primarily in terms of organisational and marketing competence".

As an example of this, it is interesting to note that much of the discussion of the policy workshop organised in Estonia was on **a perceived opposition between engineering/technical skills and other "softer" skills like marketing**, rather than on the need to combine the two. Businessmen from more advanced companies in the CC6 are aware of their limitations in terms of the commercial and managerial competencies for innovation:

- *"There are no resources or experiences for putting the product on the global market"*[73]*;*
- *"there is not a lack of innovative ideas or funds, but a lack of managerial and business knowledge to commercially implement them"*[74]*;*
- *"our scientists, engineers and technician are well trained and creative but their knowledge in finances, management and foreign languages are below the European average"*[75]*;*
- *"the management of newly established domestic firms or successfully re-organised firms is already aware of the advanced concept of innovation (that is the role of diffusion and commercialisation of the innovation components)"*[76]*;*
- *"In Poland technological research is carried in separation from the market"*[77]

Box 18 Innovation as an integrated function in companies - ETI in Slovenia

One example of a CC6 company that has taken steps to develop organisational skills for innovation is ETI, a fast growing company in the electronics sector in Slovenia.

At ETI, a distinction is made between two types of innovation activities: mass innovation, on the one hand, which corresponds with the idea that all workers are encouraged to make suggestions about how to improve products or production process, and professional innovation, on the other hand, which correspond to industrial R&D, technology transfer from Western clients/suppliers; and transfer to subsidiaries in Hungary, Bosnia, co-operation with outside research, etc.

Mass innovation is something ETI is proud of since the number of ideas, proposals, and suggestions is continuously growing and is bringing important commercial results. Innovation is a planned activity with a professional "promoter" appointed for this task within the company.

Source : Innovation Policy Profile Slovenia.

[73] Manager of an IT company at the innovation policy workshop in Estonia, May 2001
[74] Conclusion of the innovation policy workshop in Slovenia, March 2001
[75] Statement of the Board of the Hungarian Innovation Association, May 2001
[76] Czech innovation policy workshop, May 2001
[77] Polish Managers of high-tech companies taking part in policy discussions, May 2001

Despite such "cultural" impediments, experience of successful innovators in the CC6 (see boxed example of ETI from Slovenia) suggests that **the key characteristics of successful innovating enterprises are broadly similar to those in more developed economies.** Namely, innovation activity is strongly supported by management, the focus is not only on radical technical innovation, but includes all incremental innovations of any type (technical, organisational, etc.) and the activity is promoted by an employee, dedicated solely to this task.

6.2 Key conclusions

How has the transition process influenced the potential for businesses to innovate ?

Section 2.1 of the report looked at key economic data on the candidate countries and identified how trends in productivity, macroeconomic stabilisation, trade, privatisation, foreign direct investment and new firm creation have influenced the environment for business innovation. Despite considerable economic progress and regulatory frameworks increasingly conducive to competitive markets, three main challenges remain by 2000 for the CC6 in terms of creating innovative economies.

Economic growth cannot be sustained by the same factors (reorientation of markets, low-cost base for FDI serving EU markets, etc.) as during the nineties. Both longer-term macro-economic scenarios and trends in labour productivity suggest that the cohesion of an enlarged EU will depend on the economies of the CC6 being able to sustain high rates of growth through increased technological change rather than through non-investment factors. New mechanisms for supporting innovation and industrial upgrading will be needed if productivity growth is to be maintained.

New firm creation although brisk, and led in the main by highly educated people, does not seem to be creating a strong dynamic of investment and high-growth firms. Barriers to growth are in part due to the under-developed financial system but, relative to the EU, more attention needs to be paid to reducing other forms of uncertainty that hinder investment and risk-taking.

Restructuring of the enterprise sector has been led in the majority of the six countries by foreign direct investment. This has created a dual economy situation of profitable, highly productive foreign investment enterprises on the one hand; and domestic firms which struggle to remain competitive on the other.

Attracting (high-tech) FDI remains a key priority of most governments but the scope for intervention will be limited by the enforcement of EU state aid rules. More attention is needed to encouraging spillovers from FDI towards local firms.

Where do the candidate countries stand in terms of innovation performance ?

Section 2.2 underlined the **relative lack of survey data on innovation performance in the six candidate countries** suggesting that policy choices are being made on the basis of very partial and untried indicators. Three major conclusions can be drawn from the analysis:

- **Education and training systems produce employees who are not creative or flexible enough for the needs of industry and high-valued added services.** The bias of the education systems of the five central European and Baltic candidate countries (hereinafter referred to as CC5) towards secondary vocational education and lower proportions employees with post-secondary level education lead to the paradox of skills shortages (particularly in IT) alongside high levels of unemployment. In the case of Cyprus, there is a need for a general upgrading of skills levels rather than the retraining needed in the CC5.
- Despite a relatively high share of employment in high-tech manufacturing and average-to-good levels of ICT penetration in the economy, the **potential for catching up based on new technologies is severely restricted by weak demand for R&D by business sectors.** This is in part explained by the fact that high-tech industries are specialised for the time being in low value-added segments, which do not require high R&D intensity. However, the relatively significant proportion of industry in the economic structures of the CC5 suggests that knowledge creation via R&D will be crucial for future technology upgrading.
- Available innovation surveys lead to the conclusion that, compared to the EU, **there are fewer innovative small firms in the CC6**. Those firms that do innovate do so more intensely than in the EU suggesting strong competitive pressure in certain sectors. At the same time, there are **weaknesses in the ability to generate enough venture capital that would support an increase in the number of innovative small firms**, in part due to the limited size of the stock markets for subsequent initial public offerings (IPOs).

Is the legal and institutional environment conducive to stimulating innovative activity ?

Since 1998, **the issue of administrative simplification, has become a policy priority** in most countries. However, it has not always been tackled in an efficient manner, particularly in countries where this is identified as a major problem (Poland, Slovenia). Lessons from initiatives in other countries (such as the "pre-company" status in Hungary or the digitalisation of government services in Estonia) may be worth investigating for the other candidate countries.

Tax benefits in favour of industrial investment exist in most of the CC6, in the fiscal system but, in 2000, only Poland and Hungary **offered fiscal incentives to companies to undertake R&D or innovation projects**. The reasons for the reluctance to introduce such incentives are partly technical, a trend towards neutral tax systems, and partly due to doubts about their efficiency and effectiveness vis-à-vis direct incentives.

Competition policy and state aides regimes are a key concern of the Commission authorities. In some respects, innovation policy could expect to gain from the enforcement of EU rules since horizontal support for industrial R&D is technically eligible. Nevertheless, **due attention will need to be paid to the extent to which such schemes deliver the correct incentives to companies to undertake risky projects that would otherwise not have left the drawing board.** Currently, many innovation and technology measures, particularly loan schemes, appear to be only of interest to medium- to large-firms with projects that are relatively certain.

Who is responsible for innovation policy matters in the candidate countries ?

Characterising policy responsibility for innovation in the CC6 is not easy; although broadly speaking the majority of governments attribute innovation to the ministry with responsibility for economic affairs or industry (four out of six countries). However, even where specific departments of ministries exist with a remit for innovation and technology policy (the case in Estonia and Slovenia), they do not play a role in co-ordinating innovation policy matters across ministries. Funding of industrial R&D and innovation is often delivered on a sectoral basis (ministries covering economy, education health, transport, regional development, etc.).

Innovation or technology agencies responsible for delivering funding to firms exist in Cyprus, Estonia and Poland. In Hungary, this role used to be played by a quasi-autonomous agency but since 2000, this agency has become the R&D division of the Ministry of Education. Plans in the second half of the nineties for an innovation agency in Slovenia were not implemented due to funding difficulties.

Reorganisation of ministerial responsibilities and implementation agencies have been a feature of the institutional framework in half of the countries, namely Estonia, Hungary and Slovenia, during the period 1999-2001. This appears to reflect, at least in the first two cases, concerns about the effectiveness of delivery of support to enterprises.

Although advisory and consultative structures are weak, those that do exist are generally government science and research councils with limited business representation, an increasing number of stakeholders have developed an interest in or been created with a view to pursuing topics related to innovation. In part, these organisations are intermediaries, with some such as the Innovation Relay Centres being EU funded, with a direct interest in promoting innovation policy objectives. This said, **the science or research 'lobby' remains better placed to influence policy debates on the allocation of limited financial resources.**

To what extent have the candidate countries developed an innovation policy ?

Broadly speaking the findings of this study indicate that none of the six candidate countries can be considered to have developed a fully fledged innovation policy. On a scale of sophistication (number and range of instruments, longevity), however, it seems fair to conclude that **Hungary is somewhat ahead of the other countries**. Hungarian policy, although not codified in a single policy document, is characterised by a significant range of instruments funded over a number of years.

Estonian policy is driven by a relatively high awareness of innovation priorities in policy circles and by the long-standing existence of an implementation agency. Since 1999, various initiatives in favour of innovation, and the information society, have been taken, although it is too early to say whether new programmes of a relatively novel type (such as innovation management) will meet with success.

Poland and **Slovenia** made the earliest efforts in terms of adopting policy orientations for innovation and are the only countries to have implemented innovation surveys in the enterprise sector (using the Community Innovation Survey methodology). In Slovenia, however, policy implementation is limited to a number of funding programmes based on loans and grants delivered by line ministries. Various ambitious plans for new schemes have yet to be implemented due to funding difficulties.

Poland, as the largest country, also presents one of the most complex policy frameworks. The dual mandate between the Ministry of Economy and the KBN does not necessarily appear to favour either a clear policy message nor effective implementation. Both the main players have produced innovation policy documents cover the period 2000-2002 which depend on the action, and budgets, of other ministries to succeed.

The **Czech Republic** has traditionally focused on science and research policy; and innovation tends to equated with technological development by many policy-makers. Support for innovation matters, and more precisely industrial R&D, is spread across a number of line ministries. A reorientation of policy towards greater support for research-industry relations and creating spillover effects from the presence of foreign investors is perceptible since 1999.

In **Cyprus**, it is difficult to speak even about awareness of innovation policy and, to date, the only initiatives have been ad hoc and relatively small scale (such as the incubators initiative).

To compound the conceptual weakness of innovation policy in the CC6, the existence of government policy documents or even funding agencies and programmes are no guarantee of either the availability of government funding for such initiatives or the effective disbursement of funds. **The national reports threw up numerous examples where laws or programmes had been adopted but fail to receive (adequate) funding.** This is notably due to the allocation of uncertain privatisation revenues, for instance in Estonia and Slovenia, to such initiatives. Another indication of some confusion in policy priorities is where innovation related programmes or agencies are given ambitious objectives while funding is reduced (Czech Republic, Estonia).

In almost all countries, there are clear signs that funding mechanisms are not meeting targets or failing to provide the correct incentives for companies to innovate. This is often due to inappropriate rules such as the conditions attached to loans for industrial R&D (e.g. in Hungary or Poland)

which mean that only larger firms with relatively sure projects are interested to apply.

Appraising the effectiveness of innovation support structures does not appear to be a priority for the governments of the CC6. Hungary is unique in undertaking relatively systematic evaluations of programmes funded in favour of applied R&D programmes, including with the involvement of EU experts.

What types of initiatives have been taken in specific areas of innovation policy ?

Training for innovation

The evidence presented suggests that deficiencies at the level of managerial and skilled employment remain substantial in part due to the weight of specialised vocational training in the education system. In policy terms, most countries suffer from a lack of capacity in terms of anticipating skills needs, and links between training providers and industry are weak. The level of development of innovation and technology management courses in higher education is uneven across the CC6 (Hungary, the Czech Republic and Slovenia appear to be further advanced). Generic management training rather than innovation management is the focus of most initiatives.

Awareness of innovation management tools

Use of innovation management tools is not yet widespread in the economies of the CC6; although FDI appears to have been important in disseminating a number of techniques. The only available data concerns quality certification and suggest that there are two groups in terms of penetration of ISO certification: Hungary, Slovenia and the Czech Republic have achieved a high rate; while Cyprus, Poland and Estonia are lagging considerably behind. This said, average growth rates in all countries are higher than in the EU Cohesion or High Income countries.

Innovation management tools have not been the focus of significant policy initiatives in the CC6. The first funding programmes in this direction are being planned in Estonia as of 2002.

Measures in favour of business innovation interfaces and new technology based firms

Policy activity in the area of research-industry relations has been intense in most of the CC6 in the last years of the nineties. A range of policy instruments has been created to address the perceived weaknesses in business-research world relationships. The picture differs however, across countries. The two largest countries, **Poland** and **Hungary**, have responded by the creation of structures such as centres of excellence favouring co-operation between existing R&D players (centres and firms). The Estonian approach is characterised by a strong accent on the stimulation of spin-off companies from research, but a structuring of research around strategic competence centres is present too. In the Czech Republic, a series of initiatives have been taken by the government since 1999 to focused schemes that public authorities intend to
stimulate the research-industry relationships. Policy support is less developed in Slovenia until now, while Cyprus is lagging behind the other countries in addressing this question.

The analysis suggests that there has been considerable effort made to support business development and incubator structures for new firms in all countries. The objectives vary from a research spin-off approach (Estonia), to supporting newly created firm in developing innovation plans (Hungary), to stimulating the creation of higher value-added entrepreneurial activities (Cyprus). Poland has created a large number of business development and start-up support intermediaries. Slovenia and the Czech Republic have a less clearly focused approached the former developing technology parks and financing mechansims; the latter focusing on attracting FDI to stimulate local supplier growth.

What is not always evident is whether the approaches adopted are entirely in line with the potential of the country (high-tech incubators in Cyprus which lacks a research base). Moreover, **the sustainability of many intermediary structures is not assured.**

Business networking (subcontracting networks and cluster support) are a relatively new development; and Hungary and the Czech Republic have been pioneers in this field. They may offer a medium-term solution to involving a larger number of smaller firms in innovation activity.

6.3 Challenges and policy options

At the beginning of this report, reference was made to the five objectives set out by the 2000 Communication from the Commission on *Innovation in a knowledge-driven economy*. In many respects, this document represents the Union's *'acquis'* in innovation policy against which the candidate countries can appraise their own policy frameworks. Hence, it seems appropriate to use the five EU objectives as a reference for the challenges faced by the candidate countries. Clearly, however, the economic context, differences in framework conditions and the level of innovation policy development mean that the relative priorities and the possible actions required differ from those applicable to the current EU members.

Challenge 1
Promote a culture open to innovation and creativity

In the EU, the need to promote a society open to innovation remains a key objective of the Commission and the Member States. This objective applies perfectly to the CC6 but the starting level of awareness about innovation matters is significantly lower as was clearly expressed during the innovation policy workshops. There is a serious lack of understanding of what innovation entails, not only in the general public, but also in policy circles and the enterprise sector. Openness to risk taking and longer-term strategic vision needs to be fostered. In addition, the education systems in the CC6 appear to be inadequately focused on developing creative and flexible employees for business.

Policy options for the candidate countries

- Undertake a review of the teaching of creativity and innovation in education systems (from primary to higher and continuing education levels) by 2003, with a view to amending teaching practices and course materials by 2005;
- Assess needs in the enterprise sector in terms of innovation awareness and management. Develop programmes to disseminate innovation management techniques by 2004;
- Identify exemplars of innovative behaviour in enterprises and promote them through Innovation Awards or similar public awareness raising techniques (annual basis).
- Develop new forums in which enterprises can engage with training bodies in defining skills needs. Stimulate enterprises through specific funding schemes to develop training plans related to technological change and skills needs.

Policy options for the Commission

- Ensure that the planned 'Innobarometer' survey covers the candidate countries as well with a view to stimulating a public debate on differing perceptions of innovation and their source in national cultural or institutional frameworks;
- In co-operation with the candidate countries launch a series of in-depth studies to review and analyse specific factors (education, corporate structures, fiscal environments, etc.) affecting innovation performance;
- Promote a special innovation award for firms from candidate countries at a major media event before end 2003.

Challenge 2
Place innovation at the heart of further reforms to the legal and regulatory environment

In the EU, the creation of a regulatory framework conducive to innovation has been a long-standing commitment. The line between action taken to create an 'enterprise friendly' environment and those that promote innovation is naturally thin here. In the CC6, much of the attention to date in reforming the legal environment has been to comply with the Union's 'acquis' or in function of the guidelines of international institutions.

Now that this process is largely complete, there is a need to redirect further reforms to ensuring that the legal system is innovation friendly. The potential for innovation in enterprises continues to be diminished by an uncertain legal framework (e.g. frequent changes to company law in the Czech Republic), by over-regulation (e.g. in Poland); and by fiscal and intellectual property frameworks which do not provide the correct incentives to companies to take risks.

Policy options for the candidate countries

- Establish a review procedure for existing and planned legislation with a view to assessing its impact on business innovation. Ensure that the multiplication of legislation at decentralised levels of government is avoided;
- Draw on European best practice with a view to revising procedures and structures for company registration, accounting practices related to innovation and research activities, etc.;
- Investigate the importance of laws governing ownership of IPR and procedures and costs of protecting IPR as a deterrent to increased industrial research or the spread of knowledge.
- Appraise, in line with EU state aid rules, the possibility of introducing tax incentives to enterprises for undertaking R&D or hiring additional technical or research staff;

Policy options for the Commission

- Building on the extension, at the beginning of 2001, of the Business Environment Simplification Task Force (BEST) to the candidate countries ('CC BEST'), support the candidate countries in establishing funded action programmes to tackle key obstacles to business innovation in their current regulatory environments.

Challenge 3
Increase the number of smaller innovative enterprises

The multitude of initiatives at EU and member state level in favour of support for high-tech firms have borne some fruit in recent years. However, EU experience suggests that no single measure can stimulate new technology based firms and faster growth and that increasing financial resources alone is not enough.

Available evidence suggests that innovation activity is concentrated more in large firms and a relatively lower number of smaller firms in the CC6. Two key factors appear to be most important in explaining this situation:

- access to finance is considered by firms in the CC6 to be the most important barrier to their development;
- skills gaps and limited management skills lead to a lack of internal capacity of many firms to manage the innovation process.

Policy options for the candidate countries

- With a view to stimulating more new technology based firms strengthen or create both seed and venture capital funds, linked to centres of research excellence, technology parks or incubators.
- Consider the possibility of reducing financial risks, particularly given the uncertain nature of the business environment, for innovators through mechanisms such as guarantee funds;
- Develop measures assisting enterprises to recruit additional innovation personnel, particularly graduates. The recruitment of such additional personnel should be combined with assistance, through mentoring for instance, in defining innovation projects in firms to ensure such "knowledge carriers" are effective.
- Increase funding for inter-disciplinary education and training (e.g. science – management) and innovation management courses.

Policy options for the Commission:

- Investigate the possibility of developing a specific initiative in favour of high-technology start-ups in candidate countries.

Challenge 4
Strengthen diffusion of knowledge and technology in the economy

At European level, the importance of improving key interfaces in the innovation system has been given high priority by the Commission. This includes structures supporting research-industry relations, increased mobility of researchers to firms, inter-firm co-operation and non-research aspects of innovation. Compared to the EU Cohesion Countries, the CC5 are better placed in terms of an industrially orientated research infrastructure. Lower levels of public investment in such infrastructure will be required than was the case in the Cohesion Countries through the Structural Funds. As noted above, the CC6 have in the main taken initiatives to support interactions between both research organisations and industry. A trend to developing centres of excellence (regrouping existing research structures) is also visible. However, most of these initiatives appear to be orientated towards existing innovators (larger firms) with a strong research potential. Given the relatively important share of industry in the economies of the CC5, a greater focus on technology and skills upgrading aimed at increasing manufacturing productivity and the level of value-added should be given priority.
In addition, while foreign direct investment firms have often acted as important stimuli for technological change and the introduction of new management techniques, the effect of their intervention is only felt on a limited number of local suppliers.

Policy options for the candidate countries

- Review funding mechanisms for encouraging technology absorption in order to allow small firms greater access to publicly funded research organisations;
- Revise award criteria for pre-competitive research grants in order to place greater stress on exploitation of results towards the industrial sector;
- Adapt performance criteria and target setting for industrial research organisations and centres of excellence to ensure a more pro-active approach towards small firms
- Expand or create initiatives in favour of industrial clusters or sub-contracting chains, in particular linked to foreign investment enterprises.

Policy options for the Commission:

- With a view to an active participation of CC6 research centres and enterprises in the 6th RTD Framework Programme (2002-2006), support preparatory actions enabling the constitution of centres of excellence and the identification of specific research projects in key manufacturing technologies relevant to the candidate countries.

Challenge 5
Establish a policy-making process conducive to creating an innovation policy

In the EU, a key objective is to increase the coherence of innovation policies through: benchmarking of best-practice; measuring trends in performance indicators; development of a framework for dialogue on innovation (at national and Union levels), establishing etc. In the CC6, such tools, although potentially useful, would be rather precocious given the quasi absence of an innovation policy in most of the countries.

A clear challenge for all six countries is to rationalise and co-ordinate diverse initiatives currently taken by various ministries to promote industrial R&D, innovation and technological development, training and education related to innovation, finance, etc. A significant qualitative increase in terms of both the policy-making process and the inputs to this process (statistics on innovation) is required.

Policy options for the candidate countries

- Organise and implement a candidate country innovation survey ('CC-CIS) allowing comparison with the Community Innovation Survey results by 2003;
- Establish innovation policy units with a remit to monitor and evaluate current instruments and structures promoting innovation or technological development. Publish an annual review of the scale and effectiveness of measures taken to increase innovation in enterprises;
- Provide financial or logistical support for business led forums in which innovation issues can be debated and appropriate solutions brought forward;
- Undertake technology foresight or similar exercises with a view to better defining technology trends and needs in the economy.

Policy options for the Commission

- Part-fund and/or provide technical assistance to the appropriate institutions in each candidate country for the "CC-CIS". Create a task force bringing together representatives of Eurostat, national statistical offices etc. in order to coordinate the implementation of the survey;
- Allocate pre-accession funding for pilot actions arising from Regional Innovation Strategy ('RIS/RITTS') initiatives implemented in the candidate countries, following an external review of the quality of the plans.

Annexes

Innovation scoreboard – definitions

N°	Short description of indicator
1.	**Human resources**
1.1	New Science & Engineering graduates as a ‰ of the 20 - 29 year old population (ISCED classes 5a and above in ISC 42, 44, 46, 48, 52, 54, 58)
1.2	Percent of working age population (25-64) with a tertiary education (ISCED 5 to 7 inclusive)
1.3	Percent working age population in education or training (life-long learning)
1.4	Percent of total employment in medium-high and hi-tech manufacturing (NACE 24, 30-35)
1.5	Percent of total employment in high-tech services (NACE 64, 72-73)
2.	**Knowledge creation**
2.1	Public R&D funding as % of GDP (public funding relates to governments and higher education institutions)
2.2	Business expenditures on R&D as a percentage of GDP (business sector relates to manufacturing and services)
2.3	Number of EPO patent applications in high-tech classes per million population (pharmaceuticals, biotechnology, information technology and aerospace)
2.3a	Number of USPTO patent applications in high-tech classes per million population (same categories as in 2.3)
3.	**Transmission and application of knowledge**
3.1	Percent of manufacturing SMEs that innovate in-house or in combination with other

3.2	Percent of manufacturing SMEs involved in co-operative innovation
3.3	Total innovation expenditures in the manufacturing sector as a percent of total turnover
4.	**Innovation finance, output and markets**
4.1	Venture capital investment in technology firms as a percent of GDP
4.2	New capital raised on stock markets as a percent of GDP
4.3	Sales share of products 'new to the market' in the manufacturing sector
4.4	Home Internet access
4.5	Share of ICT markets as a percent of GDP (total expenditure on ICT as a % of GDP)
4.6	Change in share of TRIAD value-added in hi-tech sectors (1993-97)

Source: : European Trend Chart on Innovation 2001. http://trendchart.cordis.lu

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These working papers are available through the CORDIS site at: http://www.cordis.lu/innovation-smes/src/studies.htm ***or can be requested from the Innovation helpdesk :*** innovation@cec.eu.int

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Technical Specifications

1. Title

Innovation policy issues in six applicant countries: the challenges

2. Background/rationale

The European Union is currently negotiating terms of membership with the associated Central and Eastern European Countries (CEEC). A single framework provides for the programming of priorities and the financial resources for the pre-accession strategy[1].
The European Commission sponsors a number of measures and studies designed to examine and review the challenges facing these countries in the context of their future membership of the EU, with its competitive, single-market environment. With regard to Research and Technological Development (RTD), a recent Commission study[2] has reviewed the current RTD environment and the challenges facing the CEEC countries. As regards innovation policy[3], however, no global picture is available related to the situation in these countries.

Furthermore, the Commission's Communication to the Council and Parliament, "Reinforcing Cohesion and Competitiveness through Research, Technological Development and Innovation"[4], calls on each CEEC country plus Cyprus to develop, inter alia, an appropriate innovation strategy. The purpose of this study is to contribute to that exercise.

For the sake of convenience, research at this stage will focus on six applicant countries (Hungary, Poland, Czech Republic, Slovenia, Estonia and Cyprus). In the light of the results achieved, the other applicants may be the subject of a review in a later Call for tenders for innovation studies.

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[1] Council Regulation (EC) No 622/98 of 16 March 1998 on assistance to the applicant States in the framework of the pre-accession strategy, and in particular on the establishment of Accession Partnerships. (OJ L85, 20.03.1998)

[2] Study "Impact of the enlargement of the European Union towards the associated central and eastern European countries on RTD-innovation and structural policies". ISBN 92-828-4675-X Office for Official Publications of the EC, 1999.

[3] Community innovation policy is articulated in the Action Plan for Innovation (COM (96) 589 final).

[4] COM (1998) 275 final.

The study should examine and analyse the current framework conditions for selected innovation issues as indicated in section 4 (Terms of reference), in the six applicant states. The study should also address the views and policies of these countries' public authorities responsible for promoting innovation among enterprises, especially SMEs, and the opinions of a representative group of private operators (large enterprises and SMEs).
The study will also analyse the opinion of a representative group of private market operators on the innovation framework and trends in investments by Community firms in these countries and in Central and Eastern Europe as a whole.

Although the study is not intended to put forward specific policy recommendations, the conclusions should provide hypotheses and suggestions on the orientations in the policy areas concerned, pointing out the potential risks and benefits inherent in alternative courses of action.

The **target group** for this study comprises national policy-makers, enterprises, researchers and parties with an interest in innovation and competitiveness in both the European Union and the applicant countries.

3. Budget

By way of guideline, a budget of EUR 200 000 has been provisionally allocated to this study lot.

4. Terms of reference

4.1 The study will cover the following tasks for the six countries:

- Identification of **major players in the design and implementation of innovation measures affecting enterprises**. Review of their remit and activities. Particular attention should be given to government units focusing on innovation issues which cross departmental boundaries, fostering a global framework for innovation, and to units developing new approaches to policy on and management of innovation issues.

- Examination of **teaching programmes and methods** and the **training** of instructors with a view to fostering **an innovation and enterprise culture**. This examination should focus on university and higher education and life long learning education.

- Review of existing schemes to encourage the **secondment of (young) researchers and engineers to businesses**, to help with their innovation and technology transfer projects.

- Analysis of firms' awareness and practical use of **innovation management techniques**, such as total quality management, industrial design, reengineering, etc.

- Review the legal and administrative framework including **competition rules and their application, administrative procedures to create companies, etc. in an innovation policy framework.**

- Review of measures aimed at promoting the **start-up and development of technology-based firms**, including financial support (venture capital, loans and grants).

Examination of **company tax incentives to promote investments in innovation** (technology and intangible) by companies.

- **Co-operation between the research community and industry.** Review of the current situation.

Data sources and methodology for the period **1996 to 1999**.

Bidders should describe how they propose to collect the necessary information and perform the necessary analyses. Where appropriate, the bidder should describe what methodology he intends to use to address problems of possible non conformity of relevant data collected in this fields to international standards, non availability of data and any other problems specific to some or all of the Member States to be covered by his bid. **Bidders should also specify the data sources they intend to use. Data sources used should be those which provide the most up to date, harmonised and internationally comparable data.** As a general rule data from standard international sources such as Eurostat, OECD, IMF, World Bank, ILO should be used when they have the necessary data available.

4.2 Systematic analysis and comparison of the information collected

As a first step, the study will set out and analyse the findings for each of the six applicant countries referred to above. As a second step, the research will involve a comparative analysis, at country level, of the available information. It should establish the main trends which emerge from the comparison, describe possible common approaches and angles of perception, and report on policy discussions in this area.

The study will highlight public policy issues with a bearing on innovation as shown by debates in Parliaments, industry, the trade unions, the scientific community etc.

The research should also identify appropriate contact points (names and full addresses) for each of the innovation issues referred to in point 4.1.

4.3 Methodology

Taking the nature of the research into account, the bidder shall devise and propose a **detailed methodological approach** for this study, building on the terms of reference described above.

■ The methodology should cover:
- Preparatory work.
- Collection of information at national level.
- Systematic analysis of the information collected. Performance criteria to be reviewed.
- Comparisons of findings. Analysis of results in the light of theoretical and administrative factors.
- Review of data sources and methodology on innovation policy issues in six applicant countries.
- Setting up of a multinational **panel** of **5 experts** in this field to follow the progress of this study. Two workshops must be organised with this panel – one to test hypothesis about two months after contract start and another one about two months before contract end to validate findings and recommendations.

The bidder will make proposals for the composition of this multinational working group, the final members of the group, for the selected bid, will be designated in agreement with the Commission services.
The selected contractor will take care of all the organisational and budgetary aspects of this group of experts, covering fees, travel and other expenses needed. He will co-ordinate the work, assure participation of selected members prepare the meetings, take minutes and draft the proceedings.

- Presentation of findings highlighting issues of relevance to EC innovation policy.
- Conclusions and outlook.

■ A reporting schedule, with **deliverables** as indicated in point 5 below.

■ **A detailed budget** in accordance with the terms and conditions of this call.

The **preparatory work** should be carried out in close cooperation with Commission departments. Practical implementation of the study should begin after an **initial co-ordination meeting** in Luxembourg. Later, four or five presentation and discussion meetings will be held in Luxembourg to review progress. (The exact dates of the meetings will be decided on in the course of the project.)

5. Expected deliverables

The following reports and documents are to be submitted, in both paper and electronic versions (Word and ACCESS):

■ Interim reports. The interim reports (every four months) should include the following:

- Executive Summary
- A full interim report
- A stand-alone presentation report (four to six pages in length) on a topic covered by the interim report. The topic is to be chosen in consultation with the Commission departments for preliminary dissemination among the target audience. The purpose of the report is to set out the provisional findings in layman's terms, looking in particular at the relevance of the subject in the context of innovation policies.

■ Draft final report; presentation of results. The results and achievements of the study are to be presented for discussion at a final meeting in Luxembourg or Brussels.

■ HTML pages containing the executive summary. This material will be displayed in the CORDIS webpage (www.cordis.lu) and must comply with CORDIS formatting specifications.

■ Editing of the final report
■ A 30-page brochure, in four colours, setting out the main results of the study with the aid of tables, graphics, pictures, etc. It will set out the main findings of the study in everyday language. The brochure must be edited by an expert on communication (PR or media agent, journalist, etc.) and should be delivered in Luxembourg in 1 000 copies.

The contractor will deliver a final report containing a summary of key findings and policy conclusions of 5 to 10 pages maximum, the core body of the study of not more than 150 pages, including graphics and tables, and the main supporting documents, which are to be attached as annexes.

The final report is to be presented in English in a form and quality suitable for publication. It will be delivered on paper and computer diskettes, in an agreed format. The paper version will be professionally designed, including, where appropriate, photographs and charts, with a view to facilitating its dissemination among the target audience.

Apart from the above editing and printing of the brochure, with a view to facilitating dissemination of the results, the contractor shall also provide the Commission departments with **three typescript ready-to-print copies** of the manuscripts (final report and brochure), together with all pictures, charts and other materials necessary for its completion, ready for production.
The ready-to-print manuscripts will make a clear reference to the fact that the study has been funded by the Commission under the I**nnovation and SMEs** Programme.

The results of the study may be published under the authors' name in an issue of the Commission's Innovation series. They may also be used as part of an edited volume describing and/or summarising and integrating the various innovation studies, so that they are accessible to industrial, public and policy audiences.

6. Time scale

The project is planned to start in March 2000. The bidder will give a detailed time scale for implementing the various tasks associated with the project. Work should, however, be completed by the end of June 2001 at the latest, unless otherwise agreed with the Commission.

7. Copyright

Before printing the final report, the contractor shall specify any parts of the manuscripts, including pictures and graphs, on which copyright or any other right of ownership already exists, and shall prove that he has obtained permission to use such parts, either from the titular holder(s) of such rights or from their legal representatives. Any cost for which the contractor may become liable for such permission shall be borne by him.

Copyright and any other rights of ownership on the results of the study shall belong exclusively to the EC. The EC's copyright line should appear in an appropriate place, which would usually be on the reverse side of the title page, and should take the following form:

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The following legal notice should appear in the same place:

> *"Neither the European Commission, nor any person acting on behalf of the Commission, is responsible for any use which might be made of the information in this report.*
> *The views expressed in this report are those of the authors and do not necessarily reflect the policies of the European Commission".*

The contractor shall ensure that the printed final report is protected to the extent required in the interests of the Community and in accordance with any legal or contractual obligation which may apply.