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17-Jul-2006
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ECONOMICS DEPARTMENT

POLICIES TO PROMOTE INNOVATION IN THE CZECH REPUBLIC

ECONOMICS DEPARTMENT WORKING PAPERS No. 498

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All Economics Department Working Papers are available through OECD's Internet Web site at www.oecd.org/eco/working_papers

JT03212062

ABSTRACT/RÉSUMÉ

Policies to promote innovation in the Czech Republic

The Czech government considers innovation policy a key component of the effort to improve the business environment. This paper underscores the importance for the Czech Republic of expanding R&D activities that have a potential for commercial innovation. It also points to the relevance of good general business conditions in encouraging research and ensuring that the economy benefits from the international diffusion of innovation. Concerning targeted policies, the need for structural reforms to improve the research and innovation environment is described. The paper looks at options to create a coherent governance framework for public R&D and to make the allocation of research funds efficient. Assessment of changes in R&D tax allowances and the strategy for giving direct support to innovative SMEs is also made. Finally, the paper considers what reforms are needed to help the creation of stronger science-industry links and the take-off of the venture capital and "business angels" market.

This Working Paper relates to the 2006 *OECD Economic Survey of the Czech Republic* (www.oecd.org/eco/surveys/Czech).

Keywords: Innovation processes and incentives; Management of innovation and R&D; Government policy and innovation; OECD; Czech Republic; Transition economies.
JEL Classification: O3

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Politiques visant à encourager l'innovation en République tchèque

Le gouvernement tchèque considère que la politique d'innovation est un élément clé des efforts menés pour améliorer les conditions de fonctionnement des entreprises. Ce document souligne l'importance que la République tchèque accorde au développement des activités de R-D pouvant déboucher sur une innovation commerciale. Il souligne aussi la pertinence de bonnes conditions générales pour encourager la recherche et tirer parti des avantages économiques de la diffusion internationale de l'innovation. S'agissant des politiques ciblées, la nécessité de réformes structurelles pour améliorer les conditions de la recherche et de l'innovation est soulignée. Le document examine les options en vue de la création d'un cadre de gouvernance cohérent pour la R-D publique et de l'allocation efficiente des fonds destinés à la recherche. Sont évaluées également les modifications des aides fiscales à la R-D et la stratégie visant à apporter une aide directe aux PME novatrices. Enfin, le document passe en revue les réformes qui sont nécessaires pour favoriser la création de liens plus forts entre la science et l'industrie et encourager le développement de l'activité du marché du capital-risque et des investisseurs providentiels.

Ce Document de travail se rapporte à *l'Étude économique de l'OCDE de la République tchèque* 2006 (www.oecd.org/eco/etudes/tcheque).

Mots clef : Processus d'innovation ; incitations à l'innovation ; gestion de l'innovation et de la R-D ; politique gouvernementale et innovation ; OCDE ; République tchèque ; économies en transition.
Classification JEL : O3

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1.   Czech R&D activity is below the OECD average, but compares favourably with other Eastern-European OECD countries, not only in terms of the overall level of activity but also in the mix between private and public research. Nevertheless, there is considerable room for improvement in policy. Reforming the research and innovation system is a key priority of several recent policy documents, including the *Economic and Growth Strategy* and the *National Innovation Policy of the Czech Republic for 2005-10*. The government's broad objective is to strengthen the organisation and the effectiveness of the public research framework with a new approach that emphasises research results and their commercial uses. This is going to require better organisation of the funding system, including making public support more accountable and results-driven.

2.   The paper first examines innovation activity and then looks into the importance of good framework conditions for supporting the effectiveness of innovation policy. This is followed by an assessment of what needs to be done to correct weaknesses in financial and administrative support to R&D. The paper expands on some policy issues brought up in recent OECD work on *Going for Growth* and the policy recommendations are summarised in Box 1.[2]

2.   See OECD (2006a).

Box 1. **Recommendations on innovation policy**

General business framework conditions and innovation

Framework conditions are a key precondition for a healthy level of innovation activity and this should be an important consideration in overall thinking in innovation policy:

- Macroeconomic conditions are a particularly important driving force for innovation activity.

- Generating healthy framework conditions underscores the need for a well educated workforce, as well as a high quality regulatory framework for business.

Policies to improve governance

The current system of public support for research is cumbersome. Work needs to be done to improve the public governance system, through simplification and re-definition of tasks and responsibilities:

- There is a need to reduce the number of R&D-related budgetary lines.

- The responsibilities of state administration in innovation need to be reformulated so as to orient innovation policy more clearly towards research that develops commercial applications or provides academic groundwork with potential for commercial application.

- With a view to tie pure and applied research more closely, there might be scope for enhancing the effectiveness of the Council even further by, for example, greater business-sector representation.

- Better co-ordination between Ministries involved in R&D spending and policy is also required.

Improving the allocation of research funds

The majority of public funding is allocated on an institutional rather than project-specific basis:

- As a step towards a more contestable funding model, the government should expand project-based funding.

- Ensuring that the available financial resources are directed towards the highest quality research projects also requires adjustments in the evaluation system. Public support allocation criteria should be modified to give more weight to the research record of the applicant team, rather than of the institution with which the team is affiliated.

- A system of periodic Research Assessment Exercises should also be considered.

Tax allowances

- Changes to the tax allowance system have been made only recently and policy should focus on evaluation before deciding on any further changes. Evaluation should in particular include assessing compatibility with fiscal policy objectives. In addition, sunset clauses should be considered for such programmes.

Support schemes for innovative SMEs

- Public support for SMEs comes through a range of financial and non-financial support schemes, many of which aim to focus support on businesses that are engaged in R&D or are innovative in a broader sense. To help increase the returns on public research spending, technology support schemes for innovative SMEs should be backed by an information system on current and upcoming development of projects in regions and municipalities.

Regulatory changes to help science industry links

As elsewhere in the OECD, the Czech Republic faces the challenge of strengthening links between researchers from public research organisations and industry:

- More regulatory changes should be considered to improve access and flexibility in doctoral programmes and post-doctoral positions. More performance-related pay in public-sector research positions could also be envisaged.

- More weight should be attached to joint work with business in evaluating research activities.

- There is also room for improving the information and administrative systems regarding intellectual property rights. There is notably a case for the intellectual property benefits system to give more incentives for researchers and institutions to commercialise inventions.

Creating the conditions for the take-off of venture capital services

The venture capital market is small – indeed indicators show that the Czech Republic has one of the lowest levels of venture capital investment in international comparison:

- The government plans to support both the venture capital market and activities of "business angels" through the creation of a "risk capital fund" (KAPITAL). This scheme is likely to need fine-tuning, and a good perspective on overall cost-effectiveness needs to be maintained, so impact assessment and monitoring is essential.

- Avenues for altering investment and tax rules, as well as stock market rules, need to be explored in order to encourage pension funds and "business angel" firms to enter the venture capital industry. As a step in this direction, Parliament is presently examining changes to the regulation on collective investment.

- There is also a need for science and engineering university programmes to include more practical business training courses.

The need to expand research that has a potential for commercial application

3.   Innovation affects economic growth, particularly by boosting multifactor productivity. In this regard, OECD work stresses the positive interaction between public and private research.[3] Public research can be particularly beneficial when it generates positive spill overs to a wide range of firms or industries thereby complementing the business-sectors own research efforts.

4.   For the Czech Republic, total R&D activity is equivalent to only about 1.3% of GDP. Quite a number of OECD countries have at least twice this level of activity.[4] Interestingly, the share of R&D conducted by business enterprises is not far behind the OECD average (Table 1) and this is broadly encouraging. However, public research workers in universities and the Academy of Sciences have little incentive to interact with the private sector. As a result, most public-sector research is not geared towards commercial application and the exchange of knowledge between industry and academic institutions is low. For example, evaluation of research results still focuses on citations, rather than granted patents, licences sold, commercially exploited patents and other indicators that underscore the intensity of the co-operation between firms and government institutions. Strict regulations on public research institutions are also thought to weaken the signals to turn knowledge into commercial gains (see below). This is particularly the case with the institutions that belong to the Academy of Sciences, even though recently introduced lighter

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3.   See OECD (2001a and 2003a).

4 .   See also OECD (2006b), Chapter 1.

regulations should help in this respect. The dichotomy between private and public research is confirmed in a wide range of other indicators:

- Patenting activity is low by international standards. The number of patent families per capita filed in the world's three main patent offices is relatively low, not just compared with the OECD average, but also neighbouring countries.

- However, based on publication rates in international journals, the quality of research is relatively high when evaluated against neighbouring countries.

- There is little by way of business-funded R&D in universities and other public research institutes. Corporate co-financing of research carried out by universities and other government agencies is significantly rarer than in Hungary, Poland and the Slovak Republic.

- Reflecting spending on R&D, the number of scientists and researchers overall is relatively low. In the regional comparison, the number of business researchers is high, but the Czech Republic scores very poorly in terms of researchers in the higher education sector.

Table 1. **Indicators of innovation activity**

|	Czech Republic	Highest level of indicator in neighbour countries[1]	Lowest level of indicator in neighbour countries[1]	OECD average
R&D activities				
Total R&D spending as a percentage of GDP	1.3	1.0	0.6	2.2
Of which:				
Business	51.4	45.1	30.3	61.6
Government	41.8	62.7	41.8	30.5
Higher education	2.2	2.4	0.4	4.9
Human resources in science and technology				
Total researchers per 1 000 total employment				
Business	1.3	1.1	0.5	4.2
Government	1.0	1.2	1.0	0.5
Higher education institutions	0.9	2.9	1.5	1.7
Public/private R&D linkages				
Share of publicly-financed business R&D	12.0	22.1	6.4	7.4
Share of government and university R&D funded by business	5.1	10.3	7.8	4.9
Scientific output				
Scientific publications per million population	256.5	243.3	148.7	467.7
Innovative output				
Triadic patents per million population	1.2	2.7	0.2	41.5
Number of EPO applications per million population	7.5	10.5	2.0	91.1
Technological entrepreneurship				
Investment in venture capital as a percentage of GDP				
Early stages	0.008	0.012	0.003	0.082
Expansion	0.048	0.042	0.012	0.175
High- and medium-high-technology exports as a percentage of total exports	59.4	12.0	42.3	66.6

1. Based on a comparison between Hungary, Poland and Slovak Republic.

Source: OECD (2005), *Science, Technology and Industry Scoreboard*.

Healthy general business conditions help boost innovation

5.   Framework conditions are a key precondition for a healthy level of innovation activity and this should be an important consideration in overall thinking in innovation policy. As the Czech economy is very open, processes that "import" innovation are particularly important. Indeed, recent OECD work underscores that international trade brings in innovations embodied in imported goods and services.[5] Similarly, inward foreign direct investment is also an important vehicle for knowledge diffusion. These are arguably important considerations for the Czech Republic, given its significant multinational enterprise sector (Figure 1, Panel A). Foreign companies make a large contribution to service and manufacturing exports – particularly in motor vehicles, computer manufacturing and computer-related services – and the share of manufacturing exports in medium-to-high technology intensive industries is relatively high (Figure 1, Panel B).[6] In addition, the Czech Republic has been gaining strength in outsourced services, some of which involve R&D (software outsourcing is a good example).[7]

Figure 1. **Foreign direct investment and trade flows**
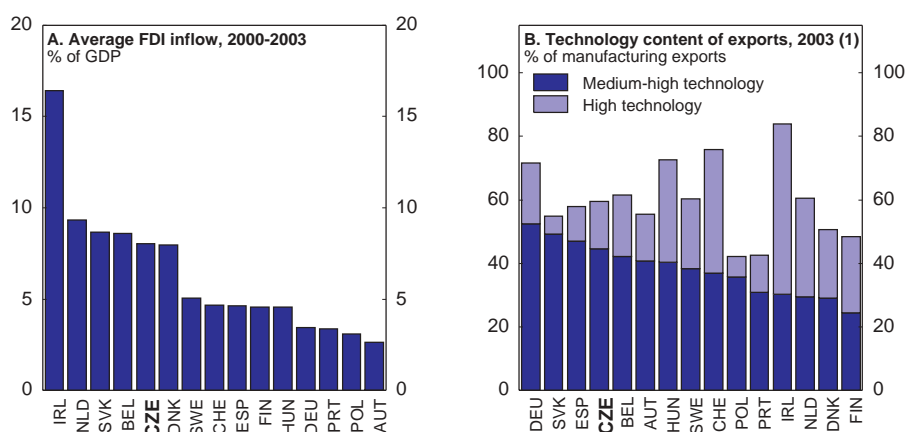
1.   Medium-high technology includes electrical machinery, motor vehicles, chemicals (excluding pharmaceuticals), rail and transport equipment and machinery and equipment. High-technology includes aircraft, pharmaceuticals, office and computing machinery, radio and communications equipment and medical and precision instruments.

Source: OECD (2005), *Science Technology and Industry Scoreboard*.

6.   Both original research and the absorption of innovation also require a well educated workforce, particularly as regards tertiary education. As mentioned above, the Czech Republic has a relatively low number of scientists in relation to its population (Figure 2). Indeed, tertiary education attainment in general is relatively low compared with many OECD countries. The enrolment rate is rising rapidly but both the secondary and tertiary education systems need further reform to cope with this.[8]

5.   See Jaumotte and Pain (2005).

6.   However, the export share in narrowly defined high tech products still lags behind the OECD average by a large margin.

7.   Marin (2006) discusses investment choices in Eastern Europe by, in particular, German and Austrian firms.

8 .   See OECD (2006b, Chapter 4) for a wider discussion of tertiary education policies in the Czech Republic.

Figure 2. **Human resources in R&D, 2003**
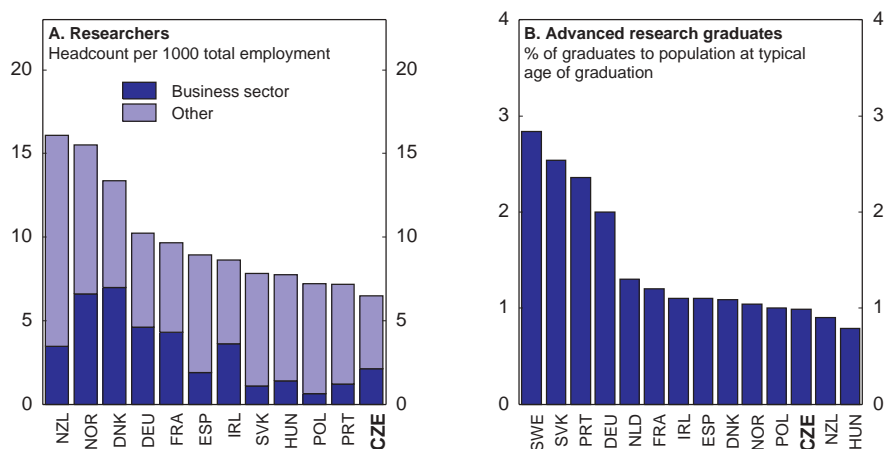
Source: OECD, *Education at a Glance; Main Science and Technology Indicators*.

7. In addition, OECD analysis shows that macroeconomic conditions are a particularly important driving force for innovation activity. Factors such as robust output growth, stable inflation and low real interest rates matter in explaining differences across member-countries in the expansion of R&D.[9] It is evident that a strong macroeconomic framework is essential to encourage existing enterprises to bring forward their research plans, including into new products and processes.

8. Good quality general regulatory frameworks for business and appropriate targeted support for new entrepreneurial activities are also important for innovation because they mean high-risk business ideas are more likely to be put into action. Therefore, the policy recommendations made in the 2006 *OECD Economic Survey of the Czech Republic*, aimed at improving the business regulatory framework, may have spin-offs in terms of increasing the country's potential for innovation and research.[10] For the Czech Republic, the importance of these policy areas is accentuated by the lagging dynamism of the small-and-medium enterprises (SMEs) sector. Indeed, based on indicators such as the contribution of SMEs to total manufacturing employment and value added, the Czech Republic is below the median for OECD countries.[11] Moreover, business interactions of these companies with the international firms located in the country are rare.

9. In terms of general purpose technologies the Czech Republic has some way to go before catching up with the levels of Information and Communication Technologies diffusion seen in leading OECD countries. Indeed, the cost of a business-based basket of fixed-line and mobile telephone calls is high relative to the OECD average, albeit somewhat below the levels observed for Hungary, Slovakia and Poland (Figure 3). Monthly charges for broadband internet access are also high. This underscores the need for continued vigilance to anti-competitive practices in markets for telecommunications.

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9. Again see Jaumotte and Pain (2005).

10 . See OECD (2006b) and particularly Chapter 1.

11. On both accounts the Czech Republic occupies the 14th position of the ranking, out of a total number of 23 countries surveyed by the *OECD SME and entrepreneurship outlook*. See OECD (2004a) and (2005b).

Figure 3. **Telephone charges for business, November 2005**[1]
USD PPP
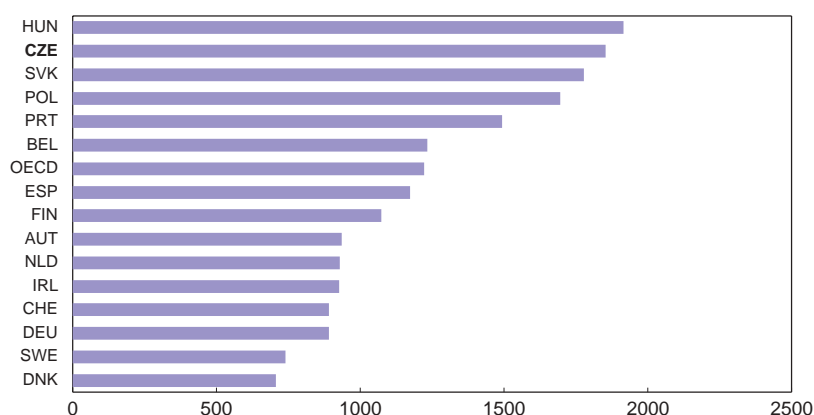
1. Including calls to mobile networks and international calls and excluding tax.

Source: OECD, *Communications Outlook*; Teligen.

Broad features of current policy on innovation

10.   Policy thinking on research and innovation has changed significantly over the past few years. This is reflected in a number of strategic documents: the government's *Growth Strategy*, the *National Lisbon Programme*, and the *National Innovation Policy of the Czech Republic*. All these documents see technical and technological developments as an important factor in maintaining competitiveness given global business developments.

11.   Czech innovation policy broadly aims to encourage both more private-sector research and a more market-driven approach to research by public-sector institutions and universities. As part of the Lisbon strategy for growth promoted by the European Union, the government has a target of boosting public R&D intensity to 1.0% by 2010, with private-sector R&D being set to increase to two thirds of total spending over the long term. Such quantitative goals provide useful focus but need to be underpinned by changes to the regulatory framework for innovation. The need to safeguard the formation of a strong SME sector is one important aspect of this. Moreover, if undertaken quickly, policy change would also encourage the large foreign-owned sector to follow up its earlier productive investment with a new wave of R&D-oriented inward investment.[12]

12.   The concrete measures of this strategy can be put under six headings: reform of the governance framework for public R&D, improved allocation of research funding, strengthening of tax breaks for R&D spending, additional support for innovative SMEs, strengthening of science-industry links and expanding the venture capital market.

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12.   Examples of foreign companies having already established (or being in the process of establishing) innovation centres in the Czech Republic are Bosch (electronic components for auto vehicles), Panasonic (digital television screens), Siemens (development of new railway cars, locomotives and trams), Mercedes Benz (design and test of innovative car concepts and the related machineries for production) and Bang & Olufsen (development of audio, video and telecommunication products). For example, between 150 and 200 employees are going to be hired by the new Bosch and Siemens centres, most of which are university graduates.

Policy options to improve the research and innovation environment

13.   The current system of public support for R&D is cumbersome because spending is divided between many ministries and institutions, including the Academy of Sciences and the special body in charge of grant allocations – the Grant Agency. Fragmentation problems are found in many OECD countries but are somewhat more severe in the Czech Republic.[13] In total there are 22 state authorities with distinct R&D budgets. Co-ordination problems are reflected in a lack of coherence between strategic and policy documents and overlaps in R&D programmes. Moreover, several regional and local governments are also active in undertaking autonomous initiatives. The priority areas for further improvement of the public governance framework are twofold: to introduce simplification and to re-define tasks and responsibilities of the key public players.

14.   It is important that plans reducing the large number of R&D-related budgetary lines are followed through. The governance issue needs to be tackled by tightening of responsibilities and tidying up of financial arrangements. The authorities recognise this problem but unfortunately, the prospects of introducing concrete measures in the near future look weak. In part, this is because there is a lack of agreement about which budgetary lines should be cut. Policy advisors close to the Ministry of Industry and Trade (MIT) consider that optimally there should be only between five and ten budgetary lines.

15.   In addition, to give policy-makers more scope for linking funding to achievements, reduction in budgetary lines should be accompanied by substitutability between lines as there is hardly any interdependence at present. As a result, the distribution of the public research budget between institutions has been fairly stable overtime. The experience of other OECD countries suggests that making budgetary lines more flexible has a positive impact on efficiency because this stimulates competition and widens the scope for interdisciplinary research between different public research institutions.

16.   Furthermore, the responsibilities of state administration in innovation need to be reformulated so as to orient innovation policy more clearly towards research that develops commercial applications or provides academic groundwork with potential for commercial application. At present there is a lack of jurisdictional responsibility for innovation and this accentuates the strong policy bias in favour of basic research. The *National Innovation Policy for 2005-2010* flags intention for stronger assignment of responsibility to the MIT because of its more explicit involvement in industrial, competitiveness and innovative SMEs policies, though no concrete schedule for doing this is outlined.

17.   The Research and Development Council plays a key role in innovation policies but, in order to ensure that pure and applied research activities become more closely tied, its role and responsibilities need some adjustments. Created in 2000, the Council is the umbrella organisation for R&D with representatives from various ministries, public research institutions, the private sector and regional authorities. The Council sets out short- and medium-term research priorities and objectives and in this way helps counter co-ordination problems. It also prepares the annual research budget proposal which is then submitted to the Ministry of Finance. Consistent with the current policy goal of shifting towards commercial innovation, the Council focuses on both basic and applied research. However, the effectiveness of the Council could be enhanced even further by, for example, greater business-sector representation.

18.   Better co-ordination between Ministries involved in R&D spending and policy is also required. Several ministries play a role in innovation policy. The Ministry of Education, Youth and Sports (MEYS) and the MIT understandably play significant roles. The former is responsible for research and development while the latter is responsible for supporting SMEs, as well as the development of the innovation infrastructure, such as science and technology parks and business incubators. However, other ministries are

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13.   For a wider discussion of R&D public governance issues see OECD (2003b) and OECD (2005b).

also involved in R&D policy including the Ministry of Agriculture and the Ministry for the Environment. Ministerial responsibilities are defined by the Competence Act of 1969 which, despite subsequent amendments, fails to provide strategic focus for innovation policy. There are also problems of overlap between the activities of the Research and Development Council and the MEYS.

Improvements should be made to the way research funds are allocated

19.   The Czech authorities readily acknowledge that there are problems in the way research funds are allocated. Indeed, the government's *Growth Strategy* describes the existing system of public support for R&D as "allow[ing] a number of beneficiaries to produce no more than research papers."[14] The majority of public funding is allocated on an institutional rather than project-specific basis in a split of roughly 60-40% (Figure 4). For the key public-sector research institutions, this imbalance is even more pronounced. Only 13% of total public funding to the Academy of Sciences is allocated to specific projects; for the university sector the share of project specific funding is 29%. As a step towards a more contestable funding model, the government should expand project-based funding. The authorities have plans to reverse the division between institutional and grant-based funding to 40-60% by 2010. If achieved, the new split would more closely reflect emerging best practices in other countries. Increasingly, OECD countries opt for more short-term project-based funding, while paring back long term and institution based funding.

Figure 4. **Distribution of public R&D expenditure**
Per cent of government R&D expenditure
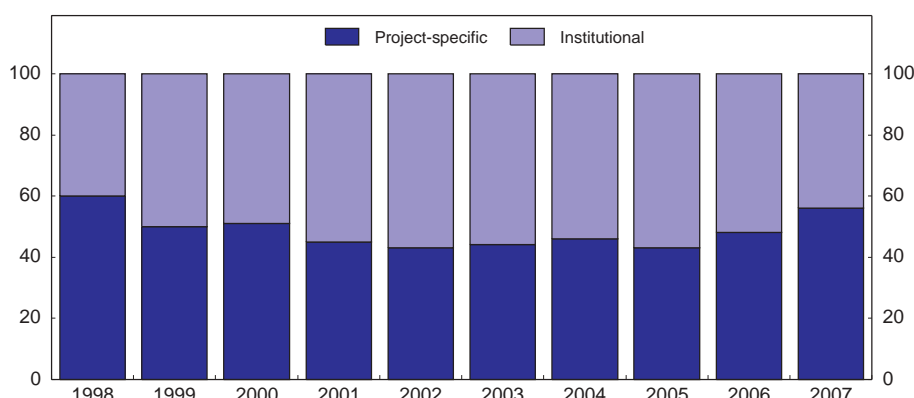
Source: Government of the Czech Republic (2005a), *Economic Growth Strategy of the Czech Republic* .

20.   Private as well as public research institutions can bid for funding from the Grant Agency, whose role is to help with financing of basic research projects. A number of OECD countries tie the amount of public funding universities and public research institutions can receive to a requirement that research ventures are co-financed with the private sector. There is a welcome proposal in a recent policy document to adjust the public universities funding system in a similar way.[15]

21.   Ensuring that the financial resources available are directed towards the highest quality research projects also requires adjustments in the evaluation system. Some quantitative performance-indicators for measuring R&D outcomes are already in use, such as the number of graduates, the completion of doctorate training, as well as publication and citation rates. However, the emphasis on traditional indicators of past

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14.   See Government of the Czech Republic (2005), p.118.

15.   See Ministry of Education, Youth and Sports (2005), p.18.

achievements means that qualification for public funds is almost entirely the domain of established R&D organisations, which discourages recently established research units from making research-grant applications. To rectify this, public support allocation criteria should be modified to give more weight to the research record of the applicant team, rather than of the institution with which the team is affiliated.

22.   A system of periodic Research Assessment Exercises should also be considered. Several OECD countries augment the information they get from measurable outcomes with a subjective quality assessment peer review (Australia, Finland, Denmark, and Iceland). Their experience suggests that this exercise becomes particularly valuable when the assessment panel includes foreign researchers.

23.   The *National Innovation Policy of the Czech Republic for 2005-10* recommends creating a research and innovation support fund following the Hungarian model. Hungary's Innovation Fund, which began operating in 2004, is a novel way of funding R&D projects and other innovation programmes. However, as discussed in the 2005 *Survey* for Hungary, the potential gains of the scheme need to be evaluated against the downsides of increased complication of the business tax environment and additional administrative costs (Box 2).[16] In addition, the *Survey* warns against the fact that the Hungarian scheme earmarks revenues from the Fund to R&D spending. This implies less flexibility in public financing and risks non-optimal allocation of funds to R&D. The option of sunset clauses should be considered when designing such programmes.

Box 2. **Financing R&D grants: the example of Hungary's Innovation Fund**

Hungary's Innovation Fund is the main source of financing targeted innovation policy. It is financed by a turnover-based tax on businesses (so called Innovation Contribution) and a matching transfer from central government. Only firms with more than 50 employees are required to pay the Contributions (0.3% of firm turnover as of 2006). A key feature of the Fund is that firms can deduct the value of R&D spending from their contribution – the aim being to add further incentives for R&D activity on top of tax allowances, as even firms with no profits are able to write off the Contribution. One downside of the fund is that earmarking revenues for R&D support in this way risks a non-optimal level of support for targeted R&D policy. The additional complication of another "tax" on business also raises questions about the usefulness of the scheme. Whether the scheme has been a positive move rests much on whether it will indeed widen R&D activity. On this front, effective checks are needed to ensure that any reported increase in R&D activity is through a genuine increase in research spending rather than creative accounting.

Recourse to tax breaks is growing

24.   In 2005 a 100% deduction of R&D expenditure from the profit base used to calculate corporate tax was introduced. The deduction can be made on a range of expenses including purchases of capital goods that will be used in research activities, patent and trademark registrations and evaluations of research outcomes by certified companies. Notably, this measure applies only to in-firm R&D, *i.e.* outsourcing of research activities and purchases of intangible research outcomes produced elsewhere (a license, for example) cannot be deducted. Understandably, the deductions do not apply to expenditure related to direct R&D subsidy. Gifts and transfers of real estate assets that will be used for research purposes are tax exempt. Furthermore, preferential lease of publicly owned properties is under consideration. This new measure is intended to boost the development of the innovation infrastructure – the creation of a new technology park, for example.

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16.   See for a wider discussion OECD (2005c).

25.   As the R&D allowance is recent, it is difficult to gauge its effects and therefore whether more, or less, scope for tax support should be considered. Recent OECD work suggests that the effectiveness of R&D tax breaks is mixed. Tax-breaks have the advantage that they provide non-discriminating support for R&D, thus avoiding the difficulties of "picking winners" that is an element of most other R&D support schemes. The experience of various OECD countries suggests that tax incentives are more conducive than direct grants in encouraging research that has commercial applications. On the other hand, they raise risks of duplications between projects, as well as the possibility of substantial deadweight costs. Given these considerations, the authorities should focus on evaluating the impact of the current level of support before deciding on any new changes. Evaluation should in particular include assessing compatibility with fiscal policy objectives.

Direct support schemes for innovative SMEs

26.   Public support for SMEs comes through a range of financial and non-financial schemes, many of which aim to focus support on businesses that are engaged in R&D or are innovative in a broader sense (such as service-sector innovation, for example). In particular, free-interest credits and soft loans are provided to SMEs within the frame of programmes run by the Czech-Moravian Guarantee and Development Bank, with two such programmes being START and KREDIT.[17] Risk managers from the Bank report that guidance from a better certification system would reduce difficulties in assessing the actual innovative content of an investment.

27.   Moreover, in countries such as the Czech Republic where there is a need for the SMEs sector to become better integrated into the supply chain of the multinational sector, direct support programmes for the development of the innovation infrastructure can help. Through its operational arm *CzechInvest*, the MIT runs several such programmes, providing support for technology parks, integrated "clusters" of local firms, business incubators and technology transfer centres.[18] Welcome attention is paid to preliminary project design – *e.g.* search for suitable partners and support to local authorities in the identification of needs and potentialities. For example, the amount of the subsidy provided under the programme KLASTRY (CLUSTER) covers around 75% of total preparatory costs and 50% of project implementation costs – the latter calculated over a period of three years.[19] Experience elsewhere suggests that, in order to help increase the returns on public research spending, technology support schemes for innovative SMEs should be backed by an information system on current and upcoming development projects in regions and municipalities.

28.   As of end-2005, however, the number of approved projects for technology parks *etc*. still waiting for financing far exceeds the number of projects underway, an indicator of delays and implementation

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17.   According to figures made available by *CzechInvest*, as of December 2005, 513 and 440 START and KREDIT projects, respectively, had been approved, of which 361 and 257 actually funded. Clients periodically submit information about the state of their business to the Czech-Moravian Guarantee and Development Bank.

18.   Examples of such programmes are PROSPERITA, KLASTRY, ROZVOJ and INOVACE. As of December 2005, 9 PROSPERITA programmes had been approved, along with 19 KLASTRY, 110 ROZVOY and 59 INOVACE.

19.   These figures refer to "eligible costs" only as specified in the programme prospectus. Examples of preparatory "eligible costs" are the costs of searching for suitable companies for clusters, as well as the costs of evaluating the viability of the cluster. Examples of implementation "eligible costs" are the costs of lease and equipment of offices, the costs of acquisition of tangible assets needed to ensure the functioning of the cluster, wage costs and the costs of benchmarking with foreign clusters. "Eligible costs" must be expended in compliance with the programme objectives in order to qualify for the subsidy. See http://www.czechinvest.cz/ for details about different programmes.

difficulties.[20] This is problematic, particularly given that the opportunities for such projects are set to increase through the larger allocations of the 2007-13 EU budget. As in other areas, success in tapping into the EU funds for R&D depends crucially on having good administrative support.

Regulatory changes to help science industry links

29. As elsewhere in the OECD, the authorities are trying to encourage more public-private partnerships in innovation.[21] New legislation approved in 2005 makes public research managers responsible for deficits and debts of their institutions and opens-up the possibility for a loss making institution to be dissolved.[22] These changes are welcome because they mean that control by public institutions' managers over the research and innovation investment decisions they make is set to increase. Arguably, they will also be more encouraged to establish research partnerships with the business sector.

30. While these are useful steps, further improvements are required. More regulatory changes should be considered to improve access and flexibility in doctoral programmes and post-doctoral positions. More performance related pay in public-sector research positions could also be envisaged. On top of strengthening the potential for establishing closer industry-science ties, these measures could also help attract back Czech researchers from abroad. Public-private links should also be improved by raising the importance of joint work with business in evaluating research activities.

31. There is also room for improving the information and administrative systems regarding intellectual property rights. It is thought that one reason underlying the presently low level of patenting is a lack of understanding on the importance of property rights by researchers; more information and training programmes would be one way of tackling this issue. Some observers report that more regulatory work to simplify the administrative system for patents and copyrights could also be helpful. There is a case for reforming the intellectual property benefits system to give more incentives for researchers and institutions to commercialise their inventions.

A small venture capital market

32. Access to finance is one of the key constraints for innovative SMEs. The venture capital market is very small – indeed indicators show that the Czech Republic has one of the lowest levels of venture capital investment in international comparison (when measured relative to GDP, Table 1). In part, this is because Czech high-risk investment proposals are typically too small for venture capital agents to consider because of high evaluation costs, including investors joining the management team of the companies. The government plans to support both the venture capital market and "business angels" activities through the creation of a "risk capital fund" (KAPITAL). The new scheme is scheduled to be launched at the end of 2006 in the form of a pilot project, after which the fund will be co-financed using European structural funds. This scheme is likely to need fine-tuning, and a good perspective on overall cost-effectiveness needs to be maintained, so impact assessment and monitoring is essential.

33. Several other factors explain the lack of enthusiasm for entrepreneurial financing by venture capitalists, specifically:

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20. Notably, out of the total number of approved projects belonging to the programme classes PROSPERITA, KLASTRY, ROZVOJ and INOVACE (see above endnote 20), only 26 ROZVOY projects were classified as "paid" by December 2005.

21. See OECD (2005d).

22. The act will be effective from 2007. Any public research institution will be organised around three bodies, director, the board and the supervisory board. The register of public research institutions will be maintained by the Ministry of Education, Youth and Sports.

- *Cultural factors.* Czech entrepreneurs generally feel more accustomed to use banking loans, with the currently low interest rates reinforcing this attitude even further.

- *Lack of business skills.* Czech innovators are reportedly generally good at conceiving ideas but are often very weak when it comes to selling them. They are notably unable to prepare well defined, and therefore marketable, business plans and this greatly hinders their ability to find financing.

- *Restrictive investment and taxation rules.* Pension and life insurance funds face a 5% ceiling on the proportion of funds they can invest in unlisted shares. While intended for prudential reasons, this level is quite low in the OECD comparison, even though at present funds do not fully exploit the conceded limit. At the same time, profits accruing to venture capital investors are subject to multiple taxation – respectively, at the level of the enterprise, the venture capital company itself and finally the financial investor level.

- *Lack of clear exit strategy.* Venture capital investors attach strong importance to exit strategies. Upcoming improvements to bankruptcy legislation should help improve exit strategies for when ventures run into financial problems. However, venture capitalists also sometimes wish to exit when businesses are successful, typically through initial public offerings (IPOs). These are rare in the Czech Republic, for example only one IPO was made in 2005. In part, this reflects an undeveloped stock market, which is very small in relation of GDP. However, it could also be attributable to minority shareholders enjoying a relatively low degree of investment protection in the Czech Republic.[23]

34.   Taken together, these factors exacerbate the low use of venture capital and suggest scope for additional policy action. In particular, avenues for altering investment and tax rules, as well as stock market rules, need to be explored in order to encourage pension funds and "business angel" firms to enter the venture capital industry. As a step in this direction, Parliament is presently examining changes to the regulation on collective investment. Once passed, the new legislation will authorise the creation of new Qualified Investment Funds which will be entitled to operate under less restrictive requirements than retail collective funds thus encouraging innovative investment. However, the discussion above also underscores the need for science and engineering university programmes to include more practical business training courses.

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23.   See OECD (2004, p. 68) according to which the Czech Republic is an example where the interest of minority shareholders could enter into direct conflict with that of large shareholders, notably in the context of a group of companies. This could happen when, for example, a controlling company shifts assets away from a dominated company by means of a capital increase to which the subsidiary must subscribe.

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Glossary

FDI	Foreign domestic investment
ICT	Information and communication technology
IDE	Investissement direct étranger
PIB	Produit intérieur brut
TIC	Technologies de l'information et des communications
R-D	Recherche et développement
PME	Petite et moyenne entreprise

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