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Industrial Promotion and Technology Branch
TECHNOLOGY PAPER SERIES 2/05

Financing Innovation

UNITED NATIONS
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Financing Innovation

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Technology Paper Series

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August 2005

UNIDO's Contribution to Technological Development:

FINANCING INNOVATION

Ricardo Seidl da Fonseca

A. Veloso

Contributions

Contributions of articles are invited for the IPT Technology Paper Series (TPS). Articles should be of contemporary economic interest, with special reference to investment and its industrial dynamics in relation to economic development within the UNIDO field of competence. Each article should be between 8,000 and 15, 000 words in length. The presentation should be readable and scholarly. Tables, citations, footnotes, and quotations should be at the minimum essential for the analysis for or description intended. A brief abstract of maximum 500 words must accompany each article. It should be noted that contributions to the TPS are reviewed. Manuscripts should be submitted in typescript, 12-pitch, Garamond font, 1 inch margins all round, 1.5-spaced, along with electronic submission (Microsoft Word). References should be 1.5-spaced and placed in alphabetical order, and should follow the format indicated: Author name(s), initial, date, title, journal (or source of publication), Vol., No., p. (pp.). For example Buckley P. J., Hashai N., 2004, A Global System View of Firm Boundaries, Journal of International Business Studies, Vol. 35, No. 1, pp. 33-45.; and for a book: Author name(s), initial, date, title, publisher: place, page(s) (if quoting). For example Dunning J. H., 1993, Multinational Enterprise and The Global Economy, Wokingham: Addison Wesley. Manuscripts should be submitted to:

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Introduction to the UNIDO Industrial Promotion and Technology Branch

Technology Paper Series

The UNIDO Industrial Promotion and Technology Branch (IPT) Technology Paper Series (TPS) provides a means for: stimulating policy thinking; improving policy orientation among policy makers; assisting in the management of science and technology policy craft in industrialisation; and disseminating current thinking on technology, and its industrial dynamics, in broad relation to the economic development within UNIDO's field of competence. Attention is paid to developing countries (DCs) and transition economies (TEs). The predominant orientation of TPS is Science and Technology (S&T) policy, policy management, co-ordination dynamics of knowledge-based and public-private partnerships in relation to technology in industrialisation.

The effective, and efficient, management of the policy and structural dimensions of technology, broadly encapsulating trends in innovation, R & D and science is increasingly viewed as crucial to economic development. The systemic aspects of national technology management in terms of incentives, institutional generation of knowledge and flows of technology (and investment) present policy challenges to DCs and TEs.

Strategic decisions at government level concerning the articulation of policy instruments, and co-ordination of supporting institutions with respect to economy-wide technological enterprise are vital to creating competitiveness, sustaining total factor productivity growth, and cohering the national system of innovation. Furthermore, the social capital – public sector as well as private sector – dimensions of the S&T intellectual infrastructure of DCs and TEs present opportunities for science and technology to be harnessed more productivity for socio-economic advance.

The Reviewers of TPS welcome papers and work in progress on technological development in DCs and TEs within UNIDO's field of competence. The expectation is that submissions focus on technology policy – craft, analysis, formulation, implementation – in relation to economic development

Contents

I. INTRODUCTION

According to the OECD [10] the national innovation system approach has become increasingly more important in the technology field due to three factors:

1) The recognition of the economic importance of knowledge: the study of national innovation systems focuses on flows of knowledge and is directed at improving performance of knowledge-based economies.
2) The increasing use of systems approach as opposed to the linear model of innovation, thereby recognising innovation as a result of complex interactions between various actors and institutions.
3) The growing number of institutions involved in knowledge generation, and hence the growing importance of interactions amongst them, of knowledge diffusion, and of personnel mobility.

Hence an understanding of the national innovation system has become of utmost importance for policy makers, as it can help them identify leverage points for enhancing innovative performance and overall competitiveness. A number of framework policies relating to regulations, taxes, financing, competition and intellectual property can ease or block the various types of interactions and knowledge flows. This study focuses on possible tools governments can use to improve the financing of innovation.

After outlining a number of potential incentives, five case studies are considered, illustrating government efforts from Estonia, Romania, Hungary, Latvia, and Lithuania towards innovation financing issues.

II. FINANCING INNOVATION

1 Introduction

Governments can support innovative activity through financial incentives, fiscal incentives or a mix of both. Financial incentives may include grants, subsidies, low-interest loans, guarantee schemes, or the establishment of a venture capital fund; and allows a government to target funds to specific projects, companies, sectors and technologies for comparative advantage and high profitability issues. Fiscal, or tax incentives, reduce the total cost of businesses to carry out innovative activities, and allow the market, and not the government, to decide which activities to prioritise.

Non-Fiscal Incentives	Fiscal Incentives
• Grants, loans, subsidies • Venture Capital Fund • Guarantee Mechanisms	• Incentives inside Corporation Tax • Incentives outside Corporation Tax

Most countries choose to provide a mix of both incentives but the relative weight assigned to each depends on the characteristics of each nation. As will be shown, there are advantages and disadvantages with both types of incentives but a study by the European Commission [1] suggests that countries with a relative low innovative performance should give more importance to fiscal incentives.

The section begins by providing a brief comparison between both types of incentives in general. Each incentive is then considered in more detail.

2 Fiscal versus Non-Fiscal Incentives

According to a study by the European Commission [1], in countries where national innovation performance is low compared to the EU average, governments tend to prioritise incentives that seek to stimulate activity across the whole economy. Fiscal incentives thus have the advantage of allowing businesses (i.e. the market) to decide which sectors present the greatest opportunities for future business success.

On the other hand, in countries where the national innovation performance is high compared to the EU average, the preferred method of incentive appears to be through financial aids, which allow the

governments to choose those sectors or technologies which they wish to prioritise, for comparative advantage and high profitability purposes. As noted in that study, countries with high innovation expenditure (Germany / Sweden / Finland) already have an established innovation framework, with secure legal processes and strong links between companies and research / technological centres, for example.

Other issues, not linked with country-specific innovative performance, are associated with government control over their budget and administrative costs.

Non-fiscal incentives have the advantage of giving governments complete control over the expenditure in any area, as the value of each incentive is usually agreed in advance. While it is possible to establish maximum limits for and/or estimate total costs of fiscal incentives, a degree of uncertainty will always remain.

Nonetheless, fiscal incentives significantly reduce the administrative burden for both governments and businesses, when compared to non-fiscal incentives. Firstly, companies are in complete control of the process and may proceed with research and other innovation activities knowing that the incentive will be awarded. Secondly, there is little if any prior application procedure, reducing the bureaucratic process for both business and government alike. A government must of course have certain administrative procedures in place, in order to verify that the activity conducted by a company meets the qualification criteria set out within fiscal legislation.
The advantages of each incentive are summarised in the table below:

Type of Incentive	Advantages
Non-fiscal	• Fine-tuning within the economy. • Complete control over expenditure. • Useful for countries with high innovation performance.
Fiscal	• Allows the market to decide which sectors present the greatest opportunities for future business success. • May be accessed by all companies, regardless of size or sector of operation • Administrative burden shifted to companies. • Particularly useful for countries with low innovation performance.

3 Fiscal Incentives

Governments can identify specific innovation-related activities and introduce appropriate tax incentives to support them. A study by European Commission [1] found that the following activities have been selected by the a number of governments for targeted fiscal incentive support:

- Business R&D expenditure.
- R&D capital expenditure.
- Technology transfer.
- Industrial design and process engineering.
- Implementation of Quality certificates.
- E-commerce / new information and communication technologies
- Software.
- Patent applications.

Some tax incentives aimed at supporting the general business environment may also promote innovation indirectly, by reducing the obstacles to the innovation process. These incentives may foster relevant aspects related to innovation, including the training of staff, the contracting of researchers, the cooperation between firms and research institutes/universities, the creation/financing of innovative firms, and the encouraging of share ownership in new/innovative firms.

3.1 Incentives within Corporation Tax Regime

The majority of tax incentives for innovation activities are included in the corporation tax regimes of each country. Companies are usually allowed to write off all current expenditure on R&D against their taxable profits in the year the expenditure is made. Mechanisms that are typically used to further reduce the cost for businesses of performing innovation related activities include extra tax allowances, tax credits, or special depreciation of assets.

An **extra tax allowance** enables firms to deduct more than 100 % of their innovative activity expenditure from the tax base.

A **tax credit** enables firms to deduct a percentage of their innovative activity expenditure from their tax liabilities or tax bills. There are several ways to apply a tax credit. In a **volume-based (flat rates) scheme,** all expenditure incurred over a fiscal year or period is rewarded. In an **incremental scheme,** innovation expenditure is measured against a pre-determined baseline and any increase in expenditure over the pre-determined level is rewarded. In a **mixed scheme** expenditure is rewarded through a mixture of volume-based and incremental measures. The table below offers a summary of the advantages and disadvantages of each scheme. Examples are given in Appendix 1.

Scheme	Advantages	Disadvantages
Volume-based	• Easy to operate, and can be exploited irrespective of when the expenditure is incurred. • Easy calculate for both companies and tax authorities.	• Increased cost to Government, without the guarantee that companies will opt to reinvest the value of an incentive in increased levels of innovation activity.
Incremental	• Focuses the relief on companies that increase their innovative activity.	• Increased complexity of administration.

Special depreciation rules differ from standard depreciation, in that they allow larger sums to be written off the value of assets – used exclusively for innovation activities (typically R&D) – in their earlier years than in later years. This recognises that a company is unlikely to generate an immediate profit from purchase of an asset. Special depreciation measures include **accelerated or free depreciation.** Free depreciation allows companies to deduct up to 100% of the first year costs of capital investment immediately. Accelerated depreciation enables larger percentages of the purchase value of an asset to be written off in the earlier years than in their later years. The economic effect is similar to free depreciation but with less impact.

3.2 Incentives outside Corporation Tax Regime

Fiscal incentives outside of corporation tax are normally offered through one of the following mechanisms [1]:

- A reduction on the tax rate levied on capital gains.
- A deferral on capital gains deduction payment.
- A partial exemption of capital gains.
- A total exemption of capital gains.
- Favourable treatment within fiscal legislation for dividends accruing from specific venture capital investments.
- Favourable treatment of the salaries of researchers within personal income tax.
- There are also some entrepreneurs that do not pay taxes through corporation tax. For example there are countries where entrepreneurs may apply the same tax incentives within personal income tax.

3.3 Taxation Policy Issues

The following points summarise the main conclusions found by European Commission [1]:

- Given national differences that exist with regards to the general business environment and specific technical differences amongst corporation tax regimes, there is no special design for fiscal incentives to innovation. Taxation policy ultimately involves an element of political choice and a trade-off between varying policy goals and priorities.
- As R&D activities usually carry the highest level of risk, governments tend to focus fiscal coverage to these activities, usually through tax credits. However consideration should also be given to innovation activities that lie outside of R&D, or form part of the wider innovation environment such as technology transfer, training, contracting of researchers, etc.
- Fiscal legislation should contain clear, unambiguous definitions of the activities that fiscal incentives are designed to support. The need for a clear understanding of the activities that may or may not be classified as innovation is equally important.
- Tax incentives must also be easy to understand and implement. If decision makers within companies do not understand how best to take advantage of an incentive, they are unlikely to account for it within their budget planning, and will subsequently be unlikely to claim. In these circumstances, a tax incentive would lose a vital element of its effectiveness. Incentives must

therefore adhere to various characteristics, in particular clarity, certainty, simplicity and ease of access.

4 Non-Fiscal Incentives

4.1 Government Loans

Governments can provide low-interest, long term and/or non-refundable loans to venture capital firms or small firms. Low-interest loans provide a subsidy to the borrower equal to the difference between the rate that the market would offer and that offered by the government. Extended duration loans are tailored to the capital constraints of early stage companies. Finally, non-refundable loans are offered in case of a borrower failure. A disadvantage of loan programmes is that exposure to default can vary cyclically and unpredictably and may place a strain on national budgets. Factors which should be considered in designing government loan programmes include [9]:

- **Debt service capability**: Early-stage companies often have a negative (or at best, modestly positive) cash flow and so will be unable to pay interest or make principal repayments until a later stage. This must be considered in constructing a debt service schedule. A deferred repayment schedule is often appropriate.
- **Financing share**: Most programmes set a limit as to the percentage of a company's debt they will provide. This is done so that the enterprise itself retains a sufficient degree of the risk. Some countries maintain that the public sector should never provide more than 75 per cent of financing for a small firm.
- **Private sector expertise**: It is important to train bankers to properly evaluate the potential of technology-based companies. The capability of bankers to understand and appraise these companies varies greatly among countries. Government loan programmes can include training of bankers as one of its activities.
- **Interest rates**: If the rate on government loans is well below the market rate charged by banks for this class of lending, the programme may not truly create additional funding within the system, but may merely redirect small companies to borrow from the public rather than the private sector.

- **Private sector leverage**: Government loans may require that, concomitant with their debt investment, new private equity be invested.
- **Failure rate**: Government loan programmes might include risks that are not acceptable to commercial banks. If a programme has a negligible default rate, this suggests the government is providing little additionality. At the same time, very high failure rates can become unacceptably expensive and undermine the programme.

4.2 Venture Capital Funds

Venture capital can be used to finance the launch, early development, expansion or restructuring of a business. It can also finance new product lines, debt reductions, acquisitions and management buy-outs or buy-ins. Venture capital is an alternative source of funding which is more risky and less liquid than most other forms of finance. Government venture capital programmes may be designed to help companies at particular stages of development. Programmes may be targeted to start-up firms, growth firms or even mature firms. Studies show that start-up firms are most in need of support and thus early-stage financing may be most valuable. In almost all countries, private funding flowing to this type of company is inadequate.

Nonetheless, as with other initiatives, there is no single policy approach that will generate a significant increase in venture capital activity. The development of the venture capital industry requires the support of both the supply-side and the demand-side. On either side governments can act both directly, by establishing state-sponsored venture capital funds or public incubators; and indirectly, by attempting to improve the venture capital industry infrastructure. The table on the next page summarises measures that have been implemented at the European and national levels. A brief discussion of some of these initiatives follows.

	Demand-side measures	**Supply-side measures**
Direct intervention	• Public incubators	• Public-sponsored venture capital funds
Indirect Intervention	• Promotion of enterprise and entrepreneurship	• Down-side protection scheme • Upside leverage scheme

	Demand-side measures	Supply-side measures
	• Management and skilled workforce • Business incubators, Science and technology parks and clusters • Tax incentives	• Fund's operating costs scheme • Exit schemes • Tax incentives • Business angels network

Source: European Investment Bank [3]

Incubators, either public or business, offer infrastructure (office space), services (legal and accounting) and managerial support to start-ups in an attempt to promote entrepreneurship and decrease the failure rate of new companies. A young firm is expected to leave the incubator after its first few critical years. The main advantages of incubators are:

- Direct creation of jobs.
- Synergy by bringing complementary enterprises and assets into physical proximity.
- Financial support and connection to business angels who seek investment targets.

The development of incubators is related to the clustering of businesses and financiers, which helps to improve networking and the dissemination of ideas and technologies.

Science and technology parks are similar to incubators but are less oriented towards the commercialisation of outputs.

In an upside leverage scheme, the government provides a loan to a venture capital fund, so that every Euro of the fund is matched with one or more Euros from the government. Since the bulk of capital gains usually derive from a relatively small number of investments, this scheme benefits smaller funds in particular, as it allows them to leverage (gear up) both the scale and the returns of a fund. Moreover, this scheme aids the fund in providing portfolio companies successive rounds of finance.

Fund's operating cost schemes are subsidies provided by governments to support part of the administrative and operating costs of small funds. In effect they alleviate the impact of various fee-payments funds are required to pay, thereby increasing the viability of smaller funds.

Exit routes are crucial in that they ensure attractive returns to investors. They include: trade sales, Initial Public Offerings (IPOs), share buy backs, mergers, platform building [3].

4.2.1 Factors in Designing Government Venture Capital Programmes

The OECD [9] has identified several factors that should be taken notice of when designing government venture capital programmes:

- **Target equity gaps**: The two types of venture capital investment that most typically have problems raising equity are early-stage and technology-based firms or funds. These are the sectors to which government equity investment should be directed.
- **Fund size**: Much of a fund's cost is fixed and thus represents significant overhead for small funds. Since funds should aim to eventually achieve commercial returns, government funds should have sufficient size that they are not overly handicapped by costs.
- **Fund management**: Public officials should not be directly involved in the investment process. Rather, this responsibility should be delegated to top-quality venture capitalists from the private sector. While the government should monitor programmes, its involvement in investment decisions should be minimal and the decision-making mechanism should be transparent.
- **Management support**: Government venture capital funds, just as their privately owned counterparts, should supply investee companies with more than just money; portfolio companies should receive value-added advice regarding management, strategy and finance.
- **Additionality**: A programme goal should be to attract new private sector investment and create a commercially viable market. Programmes should seek to maximise private sector participation; to achieve this, government funds may be offered on a matching basis. Of course, this approach assumes there is a degree of liquidity in the market.
- **Effect on private sector**: An increased volume of funds may represent excess money and drive returns down to unacceptable levels. Care must be taken not to drive private investors from the

market. The quantity of attractive projects should be monitored and steps should be taken to increase the supply of viable proposals.

- **Duration**: Government equity investment should be used as a pump-priming exercise. As private sector involvement in a segment grows, the government should phase out its programmes.

4.3 Guarantee Mechanisms

A guarantee can be defined as:

"The assumption of responsibility for payment of a debt or performance of some obligation if the liable party fails to perform to expectations." (Campbell R. Harvey's Hypertextual Finance Glossary)

A range of guarantee instruments that can improve access to finance for enterprises include equity investment guarantees, export credit guarantees, political risk insurance and credit guarantees. Equity investment guarantees and credit guarantees in particular, may increase the provision of funds to SMEs and NTBFs, and are therefore discussed.

4.3.1 Equity Investment Guarantees

A downside protection scheme guarantees a venture capital fund a proportion of the costs of project failure. It can be implemented as an instituted publicly supported insurance scheme or as a measure for the State to share in the cost of investment. The guarantee may cover up to 75% of an investment, with a cap per portfolio [3].

As observed by Murray and Marriott (1998) in "Financing Innovative Firms through Venture Capital" this scheme is important to smaller funds, where the write-off of a significant portion of the portfolio may reduce the level of residual operating funds to below a viable limit. However, the scheme can also create adverse incentives for venture capitalists by reducing their willingness to ensure that they make good investments.

Some of the factors identified by the OECD [9] in designing such schemes include:

- **Risk sharing**: The percentage of loss that is covered must be high enough to encourage investments that would otherwise not be made. However, the private sector must bear a significant enough share of the risk as to ensure that they properly screen investments and that they do not give up prematurely on marginal investments.
- **Additionality**: It is difficult to ensure that SME funding covered by the guarantee is additive. Venture capitalists may include in the programme investments that would have received funding even without the guarantee. Measures of this additionality should see whether those investments that would have been made regardless of the programme are in fact higher due to the guarantee.
- **Programme allocations**: If specific annual allocations are made for payment against failures, investment managers may be tempted to shut down a marginal company and ensure a guarantee payment rather than make an additional effort for the company to succeed.
- **Value-added**: Venture capital firms which receive the guarantee should have experience and skill working with small firms. For example, the Danish programme requires that the venture capitalist take a board seat on a guaranteed company.
- **Pooled or individual investments**: Although guarantee programmes based on individual investment entail greater administrative effort and costs than portfolio guarantees, the former have often been viewed as not leaving the state sufficient control over its risk exposure.

4.3.2 Credit Guarantees

In countries where the venture capital industry is not developed, financial institutions, and particularly, commercial banks may be the only source of finance for SMEs and NTBFs. However, these businesses often do not have a credit history and/or are unable to provide sufficient and good-quality collateral to financiers. Credit guarantee schemes compensate banks in the event of a default on their loan, thereby relieving financiers of part of the risk that cannot be covered by the small enterprise itself. The government guarantee, by providing a floor on how much the lender can lose, serves as a substitute for collateral. To compensate for expected losses from loan guarantee programmes, the state is paid a premium. Because of the premium, loans covered by a guarantee charge the borrower a higher total interest rate than that paid under normal arrangements.

The main advantages for governments are that credit guarantees limit the need for direct budget allocations, as they are used to stimulate *financiers* to provide finance to SMEs or/and NTBFs; and that the borrower's assessment skills and knowledge of the existing financial sector is used, reducing or eliminating the need for involvement of government institutions in assessing potential borrowers.

The main problem associated with credit guarantees is the potential for both banks and borrowers to become less motivated in observing the conditions of their mutual loan agreement and call upon the guarantee too easily.

Some factors to be considered in the design of government loan guarantee programmes include [9]:

- **Risk sharing**: It must be determined what is the maximum percentage of a total loan the government will guarantee. In order for investments from the private sector to function properly, it is important that these investments have some risk attached. The most frequent percentages guaranteed by governments are 50 per cent or 75 per cent. If a government guarantees too great a percentage, lenders may provide loans at an inappropriately low rate as there will be minimal risk attached. Another effect could be that lenders may not do sufficient due diligence on borrowers.
- **Types of loans**: The types of loan to be guaranteed must be chosen – working capital, fixed asset, etc. Almost all countries have programmes that guarantee loans for fixed assets but these do not provide the greatest additionality to commercially available financing. Many countries exclude guarantees for refinancing loans. While some countries exclude guarantees for working capital loans, these provide a much greater degree of additionality.
- **Fees**: Generally, the borrower pays an annual premium on the guaranteed portion of the loan. Some programmes, such as SBA loans in the United States, charge an initial arrangement fee. Premiums should not be so high as to be unacceptable to potential borrowers. In most programmes, the borrower pays the fee to the guarantor. Some countries have instead experimented with the lender paying the fee to the guarantor. Although in this case the lender passes along to the borrower the cost of the fee, this mechanism may keep the lender more focused on the cost of the guarantee.
- **Personal guarantee/personal stake required**: Many countries require that the borrower put up a form of personal guarantee or minimum personal stake. This is done in order to increase

the borrower's commitment to keep the business solvent. Some programmes require loan applicants to have relevant professional or trade qualifications.

- **Project appraisal**: The appraisal of the project for the guarantee can, as is most often the case, be done by the lender, or it can be done by independent appraisers or by the guarantor. Separating the appraisal from the lender does, however, inject another layer of bureaucracy, and most probably cost. Most programmes believe it best that private sector lenders, working within the constraints of the programme, choose the companies to receive the guaranteed loan. Their credit granting and loan monitoring expertise usually exceeds that of government officials.
- **Default rate**: There is not yet sufficient data to compare the default rate among different countries' programmes. Since most of the guarantees are for long-term loans, the programme should have been in place at least 12 years in order to generate sufficient data for analysis. A cost-benefit analysis of the programme would compare financial losses associated with defaults vs. such benefits as additional jobs created or additional tax revenues from growth stimulated. Of course, a government can reduce its losses by excluding from the guarantee companies perceived as having higher risk. Restrictions on the programme based on the sector or size of a business may attempt to limit risk. It may also limit demand by raising the premium charged.

II CASE STUDIES

1 Estonia

1.1 National Innovation System

On the highest level of the Estonian National Innovation System are the Parliament and Government, which hold the legislative and executive functions respectively (see Figure 1.1)

The **Ministry of Education and Research** is responsible for the formulation and co-ordination of science and education policies. The **Estonian Academy of Sciences** and **Science Competence Council** are the bodies advising the Ministry on science and education issues. It is the responsibility of the **Estonian Science Foundation** – which comes under the authority of the Ministry of Education - to decide on financing research projects. The **Estonian Academy of Sciences** is a private advisory body.

The functions of the Ministry of Education and Research in R&D are supported by the **Archimedes foundation,** which carries out evaluation surveys of Estonian higher education and science programmes. Moreover, it acts as a national contact point for the EU Framework programmes.

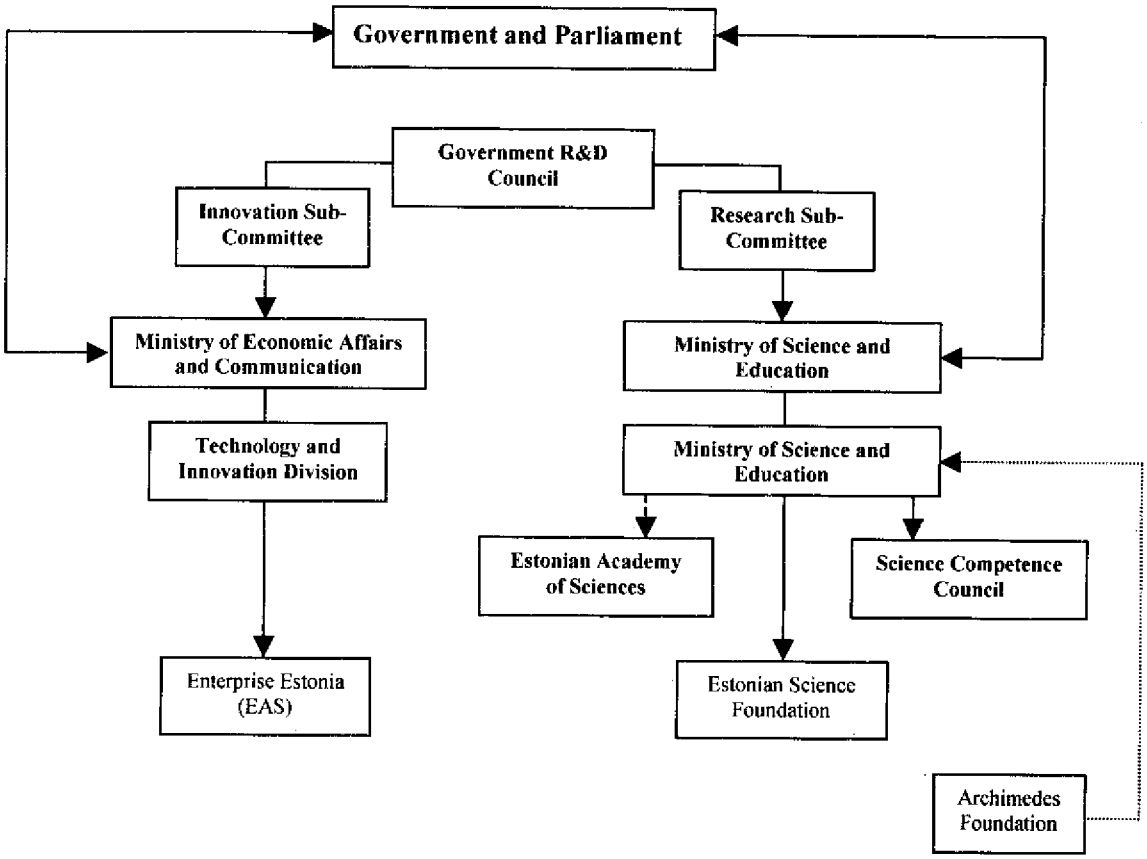
The **Ministry for Economic Affairs and Communication** has the central position in formulating state policies in promoting the development of technology and innovation. The main administrating unit within the Ministry is the Division of Innovation and Technology Development in the Industrial Department. The Ministry is responsible for the planning, co-ordinating, and supervision of the execution of the technology and innovation policy. The Ministry also has plans to launch foresight activities.

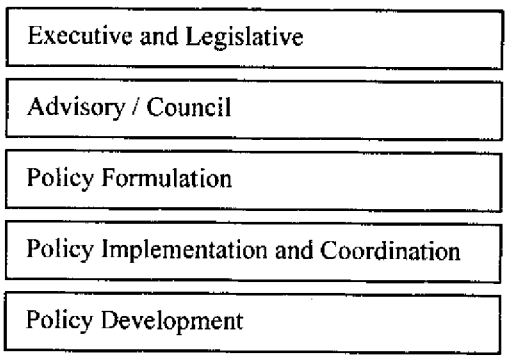
The **Research and Development Council** (RDC) is the main strategic advisory body to the Government, chaired by the Prime Minister. The Council is split into two sub-commissions specialising on R&D and innovation, and headed by the Minister of Education and Research and the Minister of Economic Affairs and Communication respectively. The RDC sub-commissions consist of the R&D

policy and innovation policy commissions. Various experts can be involved in the activities of the commissions when necessary. The possibility to widen the range of ministries involved in the council ((including the Ministry of Social Affairs, the Ministry of Environment and the Ministry of Finance) are being discussed.

The **Foundation Enterprise Estonia** (EAS) is responsible for the implementation of national innovation policy by providing financing for selected projects and technology programmes and by launching and co-ordinating targeted supportive activities for innovation. It finances projects and programmes essential for the technological development of the Estonian economy through special development support measures. The national structure for SME support rests on a network of county-based business advisory centres, administered by the EAS. These measures include loans, advisory services, training and consultancy for finance, management, marketing, strategy and legislation.

Figure 1.1 Estonian National Innovation System





1.2 Financing Innovation

The Estonian government has launched a number of programmes aimed at improving the national innovation system. The country's long-term goal is to encourage a more active participation of the private sector and increase total R&D investments from a present 0.6% of GDP to 1.7% by 2006.

With regards to the demand-side of the venture capital market, several initiatives have been launched in an attempt to improve the current environment. The Competence Centres Programme (Ministry of Economic Affairs and Communication), for example, seeks to increase the competitiveness of businesses through more intensive and strategic R&DI cooperation between the research and business sectors and is seen as a first step in fostering clustering. In addition, there is a new scheme being developed by the Ministry of Economic Affairs and Communication, which aims at supporting the establishment of incubators and industrial parks and the long-term investments in the necessary infrastructure. The Tartu Science Park has already been formed in close cooperation with businesses, offering infrastructure and consulting services at favourable terms. Finally, the SPINNO programme supports activities which contribute to the increase of entrepreneurship in universities and the development of a systemic higher education environment. Such activities include the development of a regulative framework, patent and license policy, promotion of the emergence of spin-off firms and their growth, including the creation of access to capital markets and cooperation networks with enterprises.

From the supply-side point of view, there is only a limited amount of private venture capital available in Estonia. However these funds usually do not support long-term technology-based companies, given the high risks associated with them and the relatively small size of Estonian projects. Thus, the government is studying the possibility of establishing a state-sponsored venture capital fund, aimed at improving access to capital at the initial stage of realising innovative ideas.

The state also provides grants (two-thirds of total support) and soft loans (1/3) for innovative product/service development, mainly to SMEs and science institutions. Export and loan guarantees are supported by the KredEx fund.

Finally, although there are no fiscal measures in place to encourage specific innovative activities, corporate income tax on all re-invested revenues was abolished in 1 January 2000.

2 Romania

2.1 National Innovation System

On the highest level of the Romanian National Innovation System is the Government, which holds the executive and legislative functions and is responsible for the National Plan for Research, Development and Innovation (see Figure 2.1).

The **Ministry of Education and Research** plays an important role in strategic planning, design and implementation of policies in research, technology and innovation. Moreover it coordinates and funds scientific research from the public budget. The Ministry is divided into two general departments: the Department of Education and the Department of Research. A Deputy Minister for Research leads the overall Research Department, and a subordinate Secretary of State for Research and for Relations with the Parliament are in charge of five departments as follows:

- General Department for Investments and for Patrimony;
- National Agency for Atomic Energy;
- General Department for Innovation and Technological Transfer;
- General Department for Policies;
- Research Strategies and National Programme;
- General Department for Institutional Development.

There are four consultative councils for research subordinated to MER:

1. Inter-ministerial Council for Science, Technology and Innovation - assures the correlation of policies, strategies and RDI programmes; it is chaired by the Deputy Minister for Research; there are representatives of over 25 ministries and specialised bodies of central administration.
2. Inter-ministerial Council for Atomic Energy – sets the structure and analyses the National Nuclear Programme, approves and submits it for approval to the Ministry of Education and Research which in turn, sends it for approval to the Government; it is chaired by the

delegated minister for the research activity; its members are the secretaries of state from involved ministries.

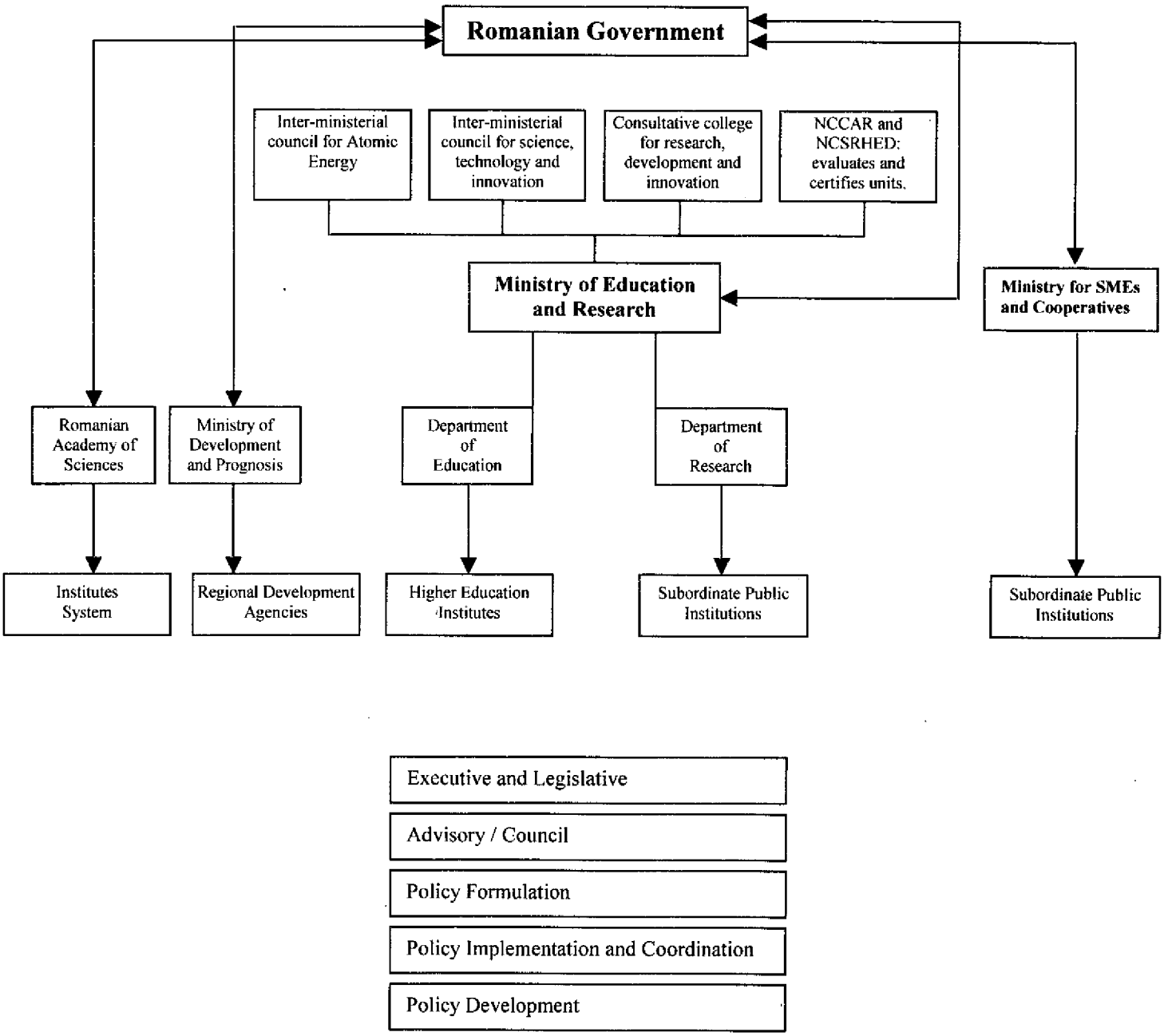
3. Consultative College for Research, Development and Innovation – has a consultative role in the elaboration, formulation and evaluation of the National Plan for RDI; formed by representatives of the scientific and technological communities, ministries and large economic agents.
4. National Council for Certification and Accreditation in Research and the National Council of Scientific Research in Higher Education Domain – evaluates and certifies the units for the capacity to undertake R&D activities.

The **Ministry of Development and Prognosis** coordinates the implementation of innovation policies through eight **National Agencies for Regional Development** (RDAs), which cover the whole territory of Romania. RDAs, together with the local administration, implement the regional development programmes and identify disadvantaged areas in which investment facilities could apply. This contributes to decentralising funds directed to regional development. The Ministry finances industrial park projects with the support of RDAs.

The **Ministry for SMEs and Cooperatives** elaborates and implements strategies aimed at stimulating SME development and ensures the coherence between these policies and Romania's broad economic and social policy. The Ministry has a total of 75 staff members, of which 20 are working on SME policies. (It is not clear whether such policies are put forward to the MER through the Inter-ministerial Council or directly to the government).

In the Institutes System of the **Romanian Academy**, the orientation of fundamental research is determined by a priority system. Proposed programmes of the Romanian Academy and programmes submitted by individual institutes are presented to a specialised authority within the Board of the Academy for approval and prioritisation. The Academy awards grants to the most valuable projects of fundamental research.

Figure 2.1 Romanian Innovation System



2.2 Financing Innovation

Although not designed with the specific objective in mind, the Romanian government has several initiatives in place that may encourage the demand for venture capital funds. Stimulating entrepreneurship in one of the topics included under innovation policy and there exists schemes to promote and support start-ups. For example, the promotion of incubators has taken place since 1991. Moreover, several companies have implemented programmes to stimulate research in universities. The government also provides financial support programmes offering subsidised interest-rates or non-reimbursable loans.

Regarding tax incentives, there are several activity-specific measures in place. For example, units with research, development and innovation activities that execute programmes and components of the National Plan for RDI are exempt of VAT. Moreover, micro-enterprises pay a quarterly tax of 1.5% on turnover, compared to 25% tax on profits applied to other companies. There are also tax incentives to investors in industrial manufacturing and related businesses, including the growing Romanian information technology industry. Finally, taxes on salaries for IT specialists of software companies were eliminated.

3 Hungary

3.1 National Innovation System

On the highest level of the Hungarian National Innovation System are the Parliament and Government, which hold the legislative and executive functions respectively (see Figure 3.1)

The **Ministry of Education** (MoE) is responsible for science, technology and innovation policy and has a major role in enforcing priorities. Its **R&D Division** is responsible for the co-ordination of policy, for the management of the competition-based national research and development programmes and for promoting the international science and technology co-operation of Hungary. The Division also runs technology foresight programmes. The **Fund Management Directorate** of the MoE is responsible for implementing science and technology policy by managing different programmes financed within the frameworks of the National Technology Development Fund and the National R&D Programmes. In the administrative field the MoE is also responsible for all universities.

The **Science and Technology Policy Council** (STPC) is the highest-level consulting and co-ordination body for the Government under the leadership of the Prime Minister. The main tasks of the council include directing science and technology policy, dealing with the overall development of scientific research and education, and issuing statements on the allocation of public science and technology funds to the various ministries and fields. These guidelines and issue statements are made public in ministerial orders. The **Science Advisory Board** (SAB), an advisory, evaluative and co-ordination body, was set up to support the work of the Council.

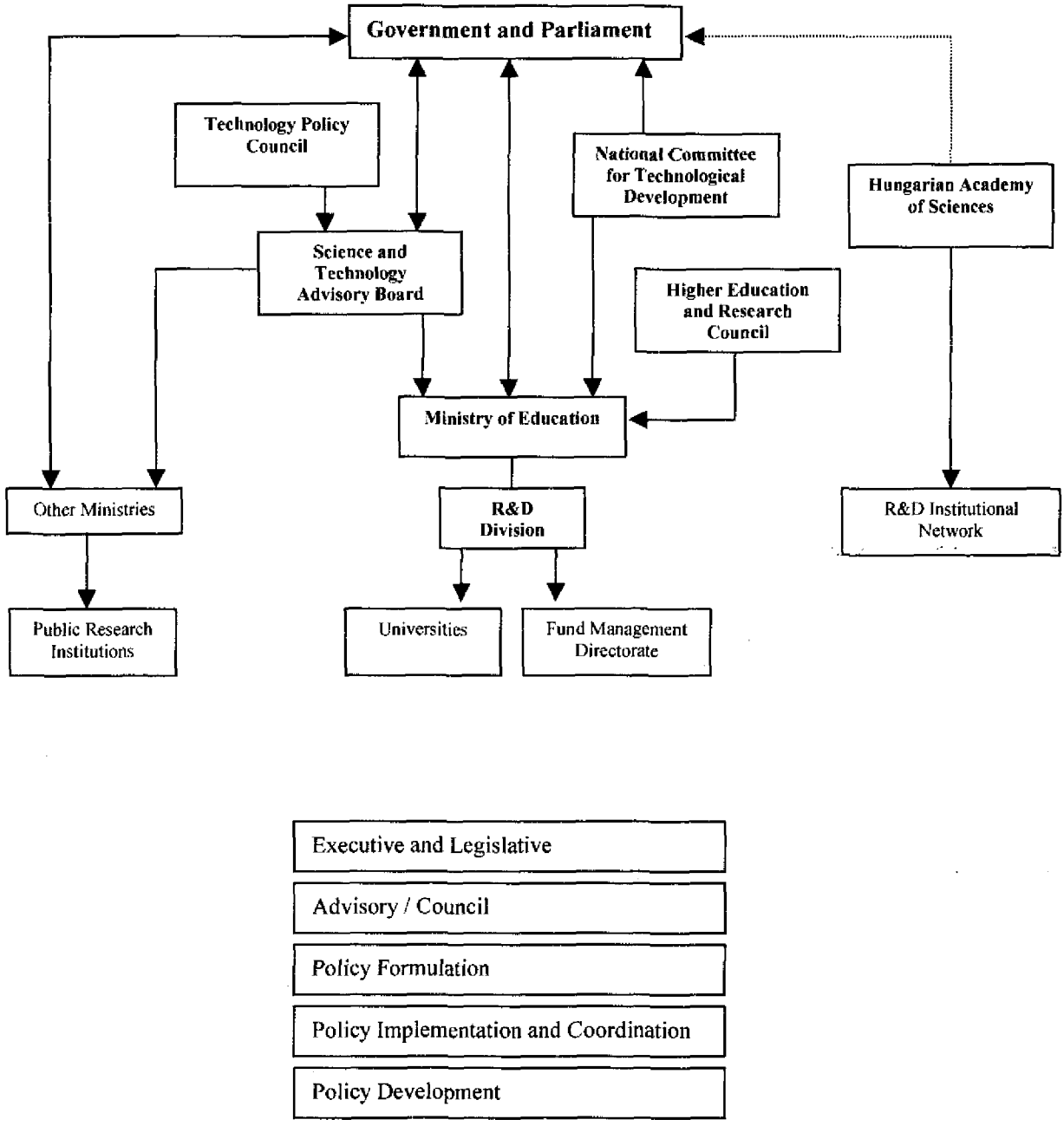
The **National Committee for Technological Development** (NCTD) is an advisory and evaluation body for the government, including the Minister of Education. It was established to work on strategies for research, innovation and technology policy. It advises on research programme priorities, and it also evaluates the annual report of activities undertaken within the framework of the National Technology Development Fund. The members of the Committee are drawn both from business, the scientific community and from government.

The **Higher Education and Research Council** gives advice to the Minister of Education concerning higher education and scientific research. It is an advisory, decision-preparatory body. MoE, The Hungarian Academy of Science, other research institutes, students, professional organisations, employers and local governments are represented in it. They are appointed by the Minister of Education.

The R&D institutional network of the **Hungarian Academy of Sciences** is the most important public research institution. It is a research performer, but also has a role as a funding agency. The HAS is an independent self-governed public body, its mission being to promote, support and represent Hungarian science. It has a high degree of independence in scientific, political and financial respects. The **HAS** has an important advisory, advocacy, and representative role in science policy.

Other ministries: There are some other public research institutions which are not under the portfolio of the MoE, but belong to the portfolios of other ministries and are financed out of the budget of these ministries. The Ministry of Agriculture and Rural Development, the Ministry of Environment and Water Management, and the Ministry of Economics and Transport have to be mentioned in this connection.

Figure 3.1 Hungarian National Innovation System



3.2 Financing Innovation

In Hungary, there exist mainly two types of governmental support for R&D and innovation, namely tax incentives and direct non-refundable state support through calls for proposals.

From January 2001, companies can account for their R&D expenditure at 200%. This option is now also available for extramural (subcontracted) R&D activity not carried out in the companies themselves. This policy is aimed at promoting domestic R&D from the demand side.

Also from January 2001, the depreciation of all R&D investments is flexible, and its rate depends on the company. From January 2003 further incentives have been introduced, such as the option for tax-free investment reserves up to HUF500 million (€1.95 million), accelerated depreciation of ICT investments, 70% tax release for R&D donations and faster tax reimbursement etc. making innovative activities and the overall entrepreneurial conditions more favourable.

In order to accelerate the exploitation of R&D results financed from public money and to strengthen the innovation policy related to information services a new bill was introduced in the Parliament during September 2003. According to the bill every Hungarian company should pay 0.2% of its annual net adjusted revenue as an R&D contribution. This new contribution is to be paid by all enterprises with over 10 employees. Moreover, enterprises can deduct their own R&D expenditures from their contribution. According to the Ministry of Education the amount of the tariff revenue will raise the Hungarian R&D budget by about 30%. The revenue of the fund will total about HUF20-25 billion (€80- 100 million) in 2004. According to the bill, the ratio of the contribution will increase from 0.2% in 2004 to 0.25% during 2005 and to over 0.3% from the year 2006 onwards.

With regards to direct support, the government promotes high-tech SMEs in their early phase and the establishment of new spin-off companies through the Tech-start programme. For this measure micro companies incorporated in Hungary, which are less than 5 years old, are eligible for R&D grants. Moreover, individuals with research background can qualify for spin-off grants. The overall aim of the programme is to provide incentives to direct seed capital for innovative start-up companies and venture capital for technology intensive investments.

Grants are also given to cluster initiatives and there is policy support for incubators and science and technology parks. On 15 May 1996, the Hungarian Government established a Technology and Innovation Park (Infopark). Its shareholders are the Budapest Technical University, the Eötvös Loránd University, the Ministry of Economic Affairs, the Committee for Technological Development, and the Hungarian Bank for Development.

4 Latvia

4.1 National Innovation System

On the highest level of the Latvian National Innovation System are the Parliament and Government, which hold the legislative and executive functions respectively (see Figure 4.1)

The **Ministry of Economy** holds the overall responsibility for elaboration of innovation policy and has a task force for development of the National Innovation Programme 2003-2006, the most important document to date communicating strategic vision research and development of innovation. The ministry is also responsible for the elaboration of State development strategy, for devising support policy for promotion of business and development of SMEs, State investments policy, and competition policy, and for the coordination of national programmes.

Another workgroup for innovation issues is also active within the **Ministry of Education and Science**, which also coordinates the Grants for Market Oriented Research Projects (adhering to a 50-50 co-financing principle). The **Department of Higher Education and Science** within the ministry is responsible for the implementation of the strategy and policy of the ministry with regards to higher education and science. It is concerned with the integration of science and industry through the implementation of research results, the development of SMEs, and the improvement of quality assurance systems.

The **Ministry of Environment and Regional Development** prepares and implements national policy for regional development.

It should be noted that representatives from almost all ministries are appointed in elaboration of particular policy documents related to innovation policy, but they are not deeply involved into these activities and usually do not have special departments dealing with these issues.

The **Latvian Academy of Sciences** facilitates research in basic and applied sciences and has an active participation in establishing Latvian science policy and consulting the Government on scientific issues. It is also responsible for allocating financing for basic and applied research projects.

The **Latvian Academy of Agricultural and Forestry Science** is an expert and advisory body to the Government, the Ministry of Agriculture and other institutions.

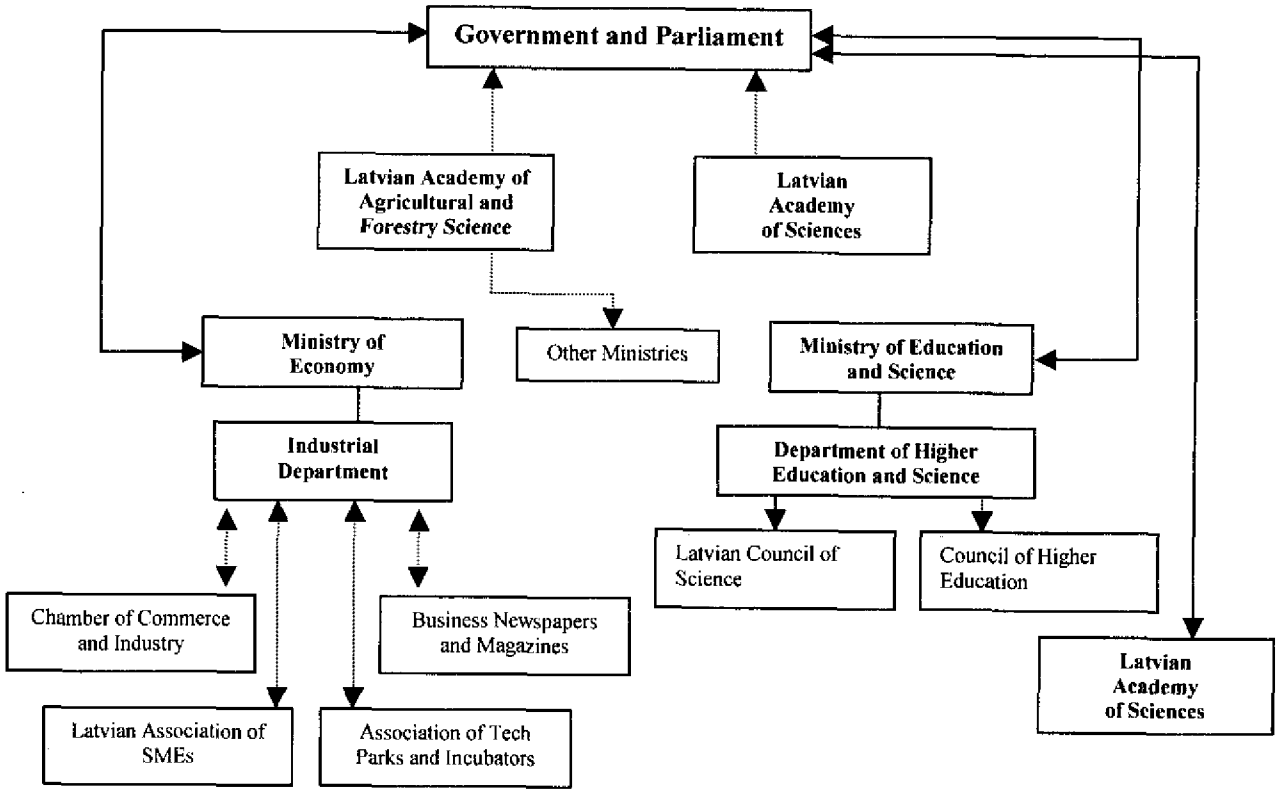
The **Latvian Council of Science** is concerned with the advancement, evaluation, financing and coordination of scientific research in Latvia.

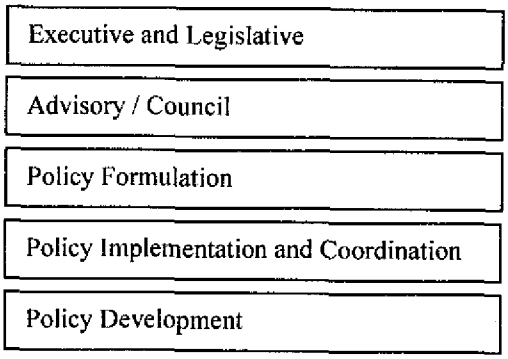
The **Council of Higher Education** is an independent institution created by the parliament and is responsible for the development and implementation of the national strategy in higher education, promotion of cooperation between higher schools, States institutions and society.

The **Latvian Chamber of Commerce and Industry** is a non-governmental voluntary organisation of Latvian companies and is concerned with the promotion of a favourable business environment, representation of economic interests of Latvian enterprises and provision of business promotion services.

There are a large number of intermediaries performing activities related to innovation. Latvia is a small country, thus many leaders of these units simultaneously take part in several task groups as well as other (broader) kind of associations etc. Accordingly rather strong informal contacts are established among them. Among formal and informal associations that play a certain role in the development of innovation policy in Latvia the following ones should be mentioned: Latvian Chamber of Commerce and Industry (with SMEs Development Commission), Latvian Association of Technology Parks/Centres and Business Incubators, Latvian Association of SMEs, and even the round-table meetings organised by the business newspapers "Dienas Bizness" and "Bizness & Baltija", and the business magazine "Kapitals". Key committees play certain role as well.

Figure 4.1 Latvian National Innovation System





4.2 Financing Innovation

Regarding fiscal incentives, the Latvian government intends to improve the business environment by continuing the begun tax reduction. Moreover the Law On Customs Tax foresees tax exemption for materials, technology and instruments for educational or scientific endeavours as well as related literature as well as for goods, imported for demonstrations in scientific etc. exhibitions and similar events.

Generally, innovation in Latvia is largely financed as separate projects, and runs parallel to the overall financing system of the Latvian Council of Science and Latvian Academy of Science, which allocates financing for basic and applied research projects. The financial support for these projects is provided in the shape of subsidies or interest free loans.

With the Programme of Crediting Latvian SME for the next three years the government foresees state guarantees in the amount of €34.3 million in an attempt to enable banks to borrow the necessary resources for crediting of SME in the financial market According to the plan the support will be targeted at the following groups: starting businesses, support to granting micro loans, support to business activity of women and youth (under 25), promotion of employment of unemployed persons, low skill workforce, support to crafts, SME restructuring, assistance to implement the EU requirements (environment, quality, etc.) in SME.

The establishment of technological parks and centres is also foreseen for the near future.

5 Lithuania

5.1 National Innovation System

On the highest level of the Lithuanian National Innovation System are the Parliament and Government, which hold the legislative and executive functions respectively (see Figure 5.1)

The **Ministry of Education and Science** used to be the principal actor responsible for technology and science policy. In 1998, the **Department of Science and Studies to the Ministry of Education and Science** was established for this purpose. Its main task was to develop and implement State Policy on Science and Studies. The main advisory body in the field is the **Science Council of Lithuania** an institution that represents interests of science community and state. In order to ensure financial support for the development of science and scientific education **Lithuanian science and study foundation** was set up by the Government.

The **Lithuanian Innovation Centre** (LIC), initiated by the United Nations Development Programme (UNDP) and supported by Ministry of Education and Science of the Republic of Lithuania together with Lithuanian Joint-Stock Innovation Bank, has the mission to support and promote commercialisation of scientific and technological achievements and assist in technology transfer to Lithuanian and international market. LIC is one of the main actors promoting horizontal innovation relationships between scientific and industry agents at the operational and policy level.

The **Ministry of Economy** plays a major role in development and implementation of innovation policy. The Ministry developed the Sunrise programme for developing favourable business conditions and under this programme established the Sunrise Commission and special working group on innovation problems in business, comprising representatives of other institutions and individual researchers.

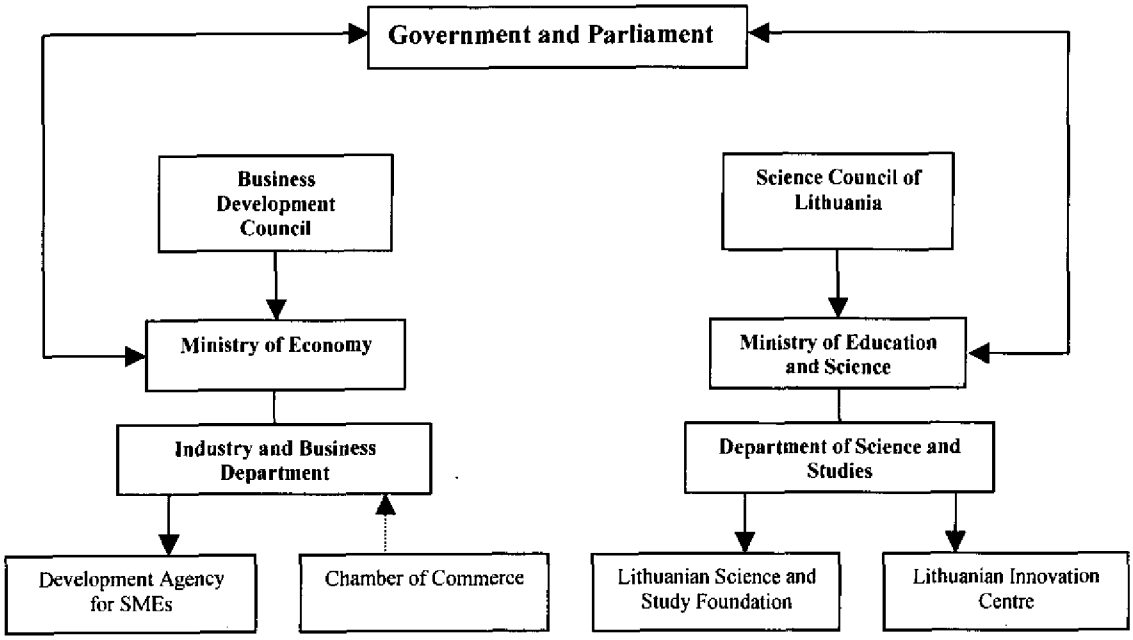
The **Business Development Council** is a collegial advisory body to the Government, and is chaired by the Minister of Economy. It includes representatives of the authorities entitled to make strategic decision, the leading specialists of different business sectors, representatives of the Chamber of Industry, Trade and Crafts, scientific and research institutes, banks and other institutions. The Council co-ordinates actions of all organisations involved in implementing the strategy. It monitors implementation of the strategies, sets criteria for funding and considers concrete projects, as well as making proposals to the Government regarding improvement of some legal acts. However, decisions taken by the Council are recommendations and the final decisions are made by Minister of Economy.

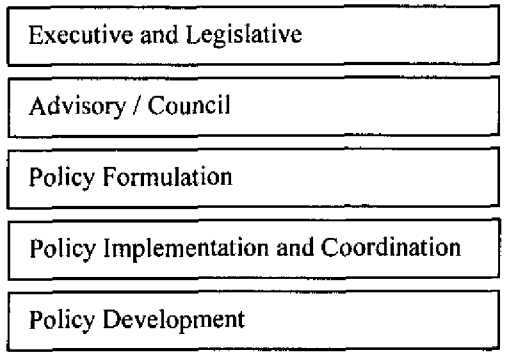
The **Lithuanian Development Agency for Small and Medium sized Enterprises'** (SMEDA), under the authority of the Ministry of Economy, principal objectives are to analyse and take part in forming development policy of small and medium sized business in Lithuania; to improve business

environment in which SMEs operate; to promote start-up and development of SMEs; and to implement European Union PHARE programme support to SMEs and regional development in Lithuania.

The main activities of **Chambers of Commerce** are the promotion of foreign trade, co-operation and investment policy, information and consulting services, providing information about fairs and exhibitions, inviting foreign consultant and experts, organising seminars on the market situation, publishing, and lobby.

Figure 5.1 Lithuanian National Innovation System





5.2 Financing Innovation

During the past 5 years the importance of giving financial support to innovation activities was recognised as one of the prime targets by the government. However taxation policy does not provide any specific tax incentive for innovation. Instead the government has recently reduced the tax burden: profit tax rate was reduced from 29% to 15% and the rate of tax on income from personal business activities from 20% to 15%. The latter decrease aims at improving conditions of business for small entrepreneurs. Finally, the tax rate for small and middle-sized enterprises is 13%, which is an incentive for start-ups.

Regarding non-fiscal incentives, the government supports businesses with direct financial support, direct technical support, and support in innovation and technology development. Financial support includes low interest loans and state guarantee systems (although not effectively functioning yet) and there are plans to establish a government venture capital programme in the near future. Technical support is mainly in form of free information, training and consulting services and organisation of exhibitions and other events of business community. There are business incubators that provide business framework under favourable conditions such as lower office rent rates, discounted administrative services, and free Internet connection.

III. CONCLUSION

The study was initially concerned in outlining potential measures available for governments to improve innovation financing, dividing them between fiscal and non-fiscal initiatives. Five case studies were then considered.

The group chosen represents countries in the transition process to knowledge-based economies, which therefore have recognised the importance of strong national innovation systems. Hence national policy is increasingly targeting leverage points for enhancing innovative performance. For example, all countries have established (or have plans to) business incubators and/or technology parks in an attempt to increase the number of spin-off companies and the rate of survival of start-ups. Estonia and Hungary have gone further and support spin-offs also with other specific incentives.

From a financing point of view, this importance given to entrepreneurship should increase the demand for venture capital. However, the venture capital industry in all countries examined is underdeveloped. As a result Estonia and Lithuania plan to establish government venture capital programmes, thereby tackling the supply shortage of venture capital. Credit guarantees were also used (planned to be used) in Estonia, Latvia and Lithuania.

Financing instruments that were used by all countries included non-reimbursable loans, grants and subsidies. In all cases co-finance from the business sector has grown in importance. Innovation is thus increasingly subject to pressures of financial optimisation, seen as an investment rather than subsidised domain.

With regards to fiscal policy, only Romania and Hungary utilise incentives targeted at specific innovation-related activities.

Clearly, governments choose a combination between fiscal and non-fiscal incentives to support the financing of innovation. Nonetheless fiscal measures are usually useful for countries with a relatively low innovation performance, such as the group examined. However, as just stated, only Romania and Hungary utilise such incentives for targeted innovative activities.

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V. APPENDIX

• EXAMPLES OF TAX CREDIT AND TAX ALLOWANCE WITHIN A VOLUME-BASE SCHEME

R&D Project		
Year	2000	
Total Expenditures	450	A
Volume Scheme		
Tax Credit Rate	20%	B
Tax allowance rate	50%	D
Tax Incentive		
Tax Credit	90	A*B-C
Tax Allowance	225	A*D-E

Example	Volume Scheme in a tax credit example	Volume Scheme in a tax allowance example	
Year	2000	2000	
Profits	5 000	5 000	
Tax Allowance	0	225	E
Tax Base	5 000	4 775	
Corporation Tax Rate	30%	30%	
Previous Tax Bill	1 500	1.433	
Tax Credit	90	0	C
Tax Bill	1 410	1.433	

• EXAMPLES OF TAX CREDIT AND TAX ALLOWANCE WITHIN AN INCREMENTAL SCHEME

R&D project				
Years	1998	1999	2000	
Total Expenditures	300	400	450	A
R&D expenditure average 98/99			350	B
Difference between the expenditure of the year and the average			100	A-B=C
Incremental Scheme				
Tax credit rate			50%	D
Tax credit			50	C*D=E

Example	Incremental Scheme	
Year	2000	
Profits	3 500	
Tax Allowance	0	
Tax Base	5 000	
Corporation Tax Rate	30%	
Previous Tax Bill	1 500	
Tax Credit	50	E
Tax bill	1 450	

• EXAMPLES OF TAX CREDIT AND TAX ALLOWANCE WITHIN A MIXED SCHEME

R&D project				
Years	1998	1999	2000	
Total Expenditures	300	400	450	A
R&D expenditure average 98/99			350	B
Difference between the expenditure of the year and the average			100	A-B=C
Mixed Scheme				
Tax credit rate up to the average			30%	D
Tax credit rate for the excess above the average			50%	F
Tax credit			155	E+G=H
Up to the average			105	B*D=E
Excess above the average			50	C*F=G

Example	Incremental Scheme	
Year	2000	
Profits	5000	
Tax Allowance	0	
Tax Base	5 000	
Corporation Tax Rate	30%	
Previous Tax Bill	1 500	
Tax Credit	155	H
Tax bill	1 345	

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