Escaping from the Nutcracker? Innovation policy in Hungary

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Chapter 8.

Escaping from the nutcracker? Innovation policy in Hungary

Attila Havas

8.1. Introduction

The principal challenge for Hungary is to achieve cohesion with the advanced member states of the EU, and hence to be in the position to improve quality of life.[1] To this end, international competitiveness should be enhanced significantly and then maintained for long-term. It is not a trivial task as Hungary is squeezed in a 'nutcracker' formed by advanced countries, on the one hand, and dynamic industrialising countries, on the other. The former ones are capable of controlling international production networks and markets via new technologies, financial muscles and superior business models, while the latter ones are characterised by extremely low wages and highly disciplined work forces. It is crucial for Hungary to escape from this trap. That requires the introduction of new products, production processes and services, as well as organisational innovations to raise productivity and find new markets.

Macro-economic pressures, notably budget, trade, and balance of payment deficits, also call for a successful, competitive economy. Brain drain, which is harmful both from an economic and a social point of view, can only be reversed, or at least slowed down, by offering attractive conditions for researchers and engineers; i.e. challenging projects, appropriate funds, much better equipment and higher income. Further, there is already a very high share of foreign-owned companies in Hungary, but they should be better embedded in the domestic economy by improving the performance of the local supplier base, creating attractive conditions for more intense academia-industry relationships, and thus

[1] This chapter draws on various projects financed by the EU, aimed at analysing the Hungarian innovation policies, their implementation, and impacts; notably the Trend Chart on Innovation in Europe and ERAWATCH.

convincing foreign firms to invest in knowledge-intensive activities in Hungary and offer well-paid jobs by doing so.

In sum, a number of elements of the national innovation system (NIS) should be strengthened, and even more importantly, the relationships between them should be intensified to tackle the challenges outlined above. Effective science, technology and innovation (STI) policies are, therefore, needed to promote innovation activities. Indeed, there are over 40 STI policy measures in place in Hungary.[2] Their aims are sufficiently wide-ranging:

- support the development of new products, services and processes;
- provide incentives to increase business R&D and innovation expenditures;
- foster academia-industry co-operation;
- improve physical infrastructure at public, private non-profit and business R&D establishments;
- strengthen innovation capabilities of SMEs;
- slow down brain drain;
- provide human resources for RTDI;
- develop the national and regional innovation and innovation governance systems; and
- promote international co-operation in R&D and innovation.

Innovation, however, is definitely not a panacea: a coherent cohesion strategy is required, composed of appropriate human resource development, health, macroeconomic, investment promotion, regional development and environmental policies – just to mention the cornerstones – aligned with each other, as well as with the overall, broad aim of rapid, but socially, economically, and environmentally sustainable development. Obviously, STI policies should be orchestrated with these other major policies.

In spite of the impressive number and range of STI policy measures, for a large number of innovation performance indicators Hungary is lagging considerably behind most other EU countries. Further, as already alluded, there are severe macroeconomic imbalances, too. A comprehensive analysis, therefore, should aim at analysing

a) the links between the various polices affecting economic and innovation performance;
b) the impacts of these policies in both their respective domains and across;
c) as well as the interrelationships between innovation and economic performance (both at micro and macro levels).

[2] These measures are described in the detail in the TrendChart and ERAWATCH databases (http://www.proinno-europe.eu and http://cordis.europa.eu/erawatch, respectively).

Clearly, this chapter cannot offer such a complex treatise of these issues. We neither have a proven and operational general theory, nor access to the necessary Hungarian data to establish the impacts of STI policies on economic performance. These links are always indirect, complex, and occur with considerable delays. Moreover, it is hardly possible to disentangle the effects of various economic and other macro-level policies and STI policies *per se*.

Given these limitations, the modest aims of this chapter are to characterise briefly the recent economic and innovation performance of Hungary, and highlight several puzzles concerning micro- and macroeconomic performance, economic and innovation performance, as well as the large number of STI policy schemes and poor innovation performance. Then an attempt is made to explain these apparent contradictions by describing the policy-making structures and the practices of policy design and policy implementation in detail.

8.2. Economic and innovation performance: overview and challenges ahead

Available data suggest a relatively rapid catching-up with the EU 25, which can be attributed to export-driven growth, fast and fundamental micro-level restructuring. These latter factors, in turn, can be explained by the high share foreign-owned firms operating in Hungary, also leading to a substantial weight of "high-tech" exports. All these features could be interpreted as signs of a successful transition process. In the meantime, however, there are severe macroeconomic pressures, and strong symptoms of an emerging dual economy. These factors suggest a fragile competitiveness, especially in the 'worst case' scenario, in which macro imbalances cannot be rectified, the dual economy would prevail, and a large chunk of foreign firms leave Hungary. In short, several paradoxes could be identified in Hungary – or even worse, by picking certain indicators (and eclipsing others) either a misleadingly 'rosy' or a deceptively 'gloomy' picture can be painted. This section is aimed at providing a balanced overview of economic and innovation performance.

8.2.1 Macroeconomic performance

Hungary has achieved substantial real convergence with the EU25: GDP per capita measured in Purchasing Power Parities, compared to the EU25 average, increased from 50.9% in 1998 to 63.5% in 2006. (Eurostat forecast) It is due to sustained economic growth since 1997: the Hungarian economy recorded annual growth rates of 4.3-5.2%.[3] More recently, the GDP grew by 4.1% and 4% in

[3] Major sources for this sub-section include Central Statistical Office (CSO), National Bank of Hungary and Eurostat data and analyses, as well as press reports.

2005 and 2006, respectively. That is, around two percentage points above the EU average for a number of years, but only one percentage point in 2006. However, it lags behind the figures of all the new EU member states (except for Poland). Due to the severe austerity measures implemented in July 2006 (see below), the growth rate is expected to fall back in 2007: about 2.7-3.0%, but only temporarily, since the expected positive effects of the fiscal measures are assumed to push the economy back onto a stable path with a higher growth rate.

Labour productivity has also improved significantly, from 62% of the EU25 average in 2000 to 73% in 2006.

Both export and import volumes have almost tripled since 1989. Hungary's exports and imports figures with the EU-15 have quadrupled since 1989 by the early 2000s. The dynamic increase in exports can be attributed mainly to multinational companies establishing manufacturing plants in Hungary. These plants import much of their input from abroad, also causing a dynamic increase in imports. Foreign-owned companies play a dominant role in the Hungarian economy: their share in total manufacturing revenues was 71.6% in 2002, surpassed only by Ireland (79.5% in 2001) among the OECD countries. (OECD, 2005) The stock of foreign direct investment (FDI) per capita in Hungary is still among the highest in Central and Eastern Europe. Hungary was second only to Poland concerning cumulated FDI inflow: $61.2 bn vs. $93.3 bn by 2005. (UNCTAD) Thus, FDI stock per capita was $6122 in Hungary in 2005, ranked between Estonia: $9441.5; and the Czech Republic: $5829. (own calculations based on UNCTAD data).

During the first half of the nineties Hungary showed inflation trends similar to those in most transition and emerging economies. Starting from 28% in 1995, inflation gradually decreased due to a successful anti-inflationary policy: it was 3.6% 2005, then reaching 3.9% in 2006 (National Bank of Hungary).

Since 2001, fiscal discipline has deteriorated, and budget deficits have occurred persistently, most notably in election years, when government overspending peaked at around 10% of GDP. The incumbent coalition, having won the 2006 elections, was forced to implement the most serious austerity measures since 1995 in order to avoid the most pessimistic projections, that is, a 10% budget deficit. The Convergence Programme, approved by the EC, contains a detailed roadmap of stabilising the Hungarian economy in 4 years, e.g. bringing down the budget deficit below the Maastricht criterion by 2010, namely to 2.7%. In line with the high budget deficits, the government gross debt has steadily increased in recent years, and is expected to peak at around 71% in 2008. This is another major obstacle to Hungary's ambition of joining the EMU.

Unemployment stood at 7.2% in 2005, and then rose to 7.5% in 2006, which is still below the currently improving EU25 average. Despite some modest improvement, the activity rate is still 6 percentage points below the EU25 average

(57% vs. 63%), and far away from the original Lisbon target (70% by 2010). This low activity rate poses a heavy burden on the central budget, both in terms of a 'slim' revenues base and in terms of social security expenditures.

Table 8.1. Comparable indicators of economic performance

Indicator	Hungary		EU 25 average	
	2000	2006	2000	2006
GDP per capita in PPS (EU25=100)	53.9	63.5[f]	100.0	100.0
Real GDP growth rate (% change previous year)	5.2	3.9	3.9	2.9
Labour productivity per person employed (EU25=100)	62.0	73.0f	100.0	100.0
Total employment growth (annual % change)	1.3	0.0*	1.7	0.9*
Inflation rate (average annual)	10.0	4.0	1.9	2.2
Unit labour costs (growth rate)	-0.8	0.1*	0.2	-0.6*
Public balance (net borrowing/lending) as a % of GDP	-2.9	-6.5*	0.4	-2.3*
General government debt as a % of GDP	55.4	57.7*	62.9	63.2*
Employment rate (as % of age 15-64 population)	56.3	56.9*	62.4	63.8*
Unemployment rate (as % of active population)	6.4	7.5	8.6	7.9
Foreign direct investment intensity	2.3	3.9*	2.4**	1.2*
Business investment as a percentage of GDP	19.7	18.7*	18.3	17.4*

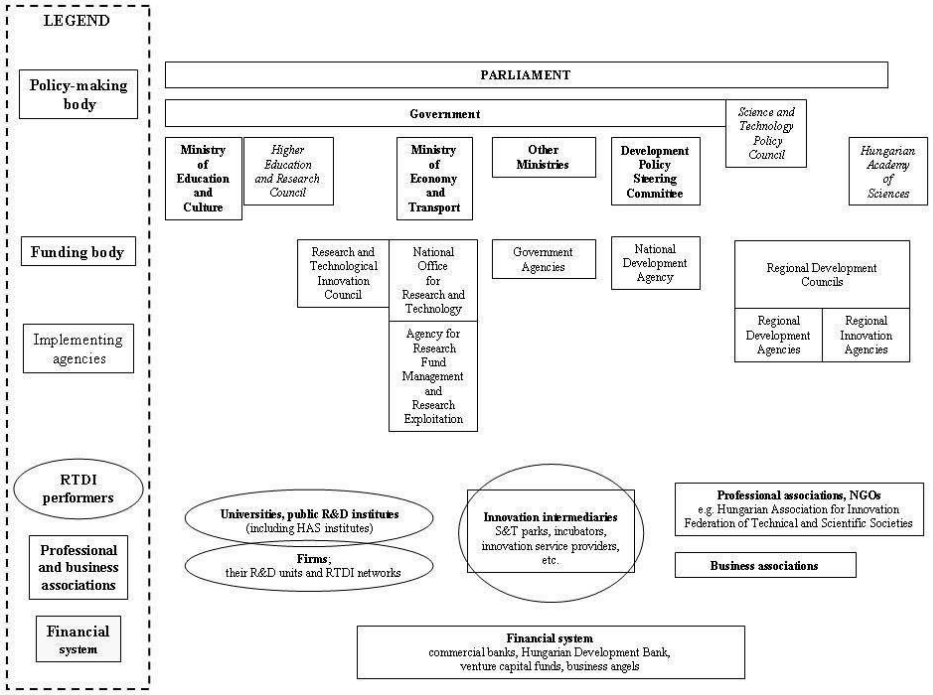
Note: * latest available year: 2005; ** 2001; (f) forecast.
Source: Eurostat, Structural Indicators and Long-term Indicators.

8.2.2 Innovation performance

Hungary has all the major elements of a potentially successful national innovation system (NIS):

- a fully fledged education system;
- internationally recognised research units both at universities and the institutes of the Academy of Sciences;
- an increasing number of business R&D units, several of them operated by multinational firms and thus integrated into international networks;
- a number of government bodies engaged in STI policy-making and a considerable number of policy schemes in place;
- various types of professional associations and chambers;
- a functioning capital market, complete with venture capital funds;
- a legal infrastructure up to international standards;
- norms and values compatible with the requirements of a market economy based on private property;
- creative people; etc.

Figure 8.1. Major players of the Hungarian national innovation system



For a large number of innovation performance indicators used in the European Innovation Scoreboard (EIS), Hungary is lagging considerably behind the EU-25 average. On the input side, the most worrisome feature is the very low level of business R&D expenditures: 0.41% of GDP (in 2005), which is less than one third of the EU25 average. Innovation expenditures are also way below this benchmark. Public spending on R&D – measured as a percentage of GDP – was 74% of the EU25 average in 2004. The ratio between public and private R&D efforts is 2:1, i.e. the opposite as it is set out by the Lisbon process. Gross R&D expenditures (GERD) were a mere 0.95% of the GDP in 2005 (fluctuating in the range of 0.82-1.01% since 2000). Given the macroeconomic pressures to comply with the Maastricht criteria, a pre-requisite to join the euro zone, it is questionable whether the country could make any significant progress in this respect in the coming years. Yet, rather ambitious goals are set in the STI policy strategy, approved by the government in March 2007: GERD should reach 1.4% of the GDP by 2010 and 1.8% by 2013 – although these targets are contingent upon the availablity public funds for R&D.

There is a significant gap in terms of human resources for R&D and innovation, too: the ratio of science and engineering graduates among people aged 20-29 years was 5.1‰ in 2004, which is a mere 40% of the EU25 average. Yet, the low share of S&E graduates might be regarded as a rational reaction if it is seen in its wider historical perspective. R&D personnel had been cut drastically up until 1995, by 56.5% compared to 1988. Since then, a slight increase can be observed. Yet, the 2005 total was still 48.4% lower than the 1988 one, while for scientists and engineers the gap was 25.9% (see table 8.2) Moreover, the number of university personnel is still being reduced, in spite of the 'exploding' number of students. Job prospects were not promising for engineers, either, for most of the 1990s, although improved in the recent years. Further, the severe lack of financial and marketing managers, as well as the booming opportunities for lawyers made these specialisations more attractive. Against this background, it is quite understandable that young talents opt for other career paths.

Table 8.2. R&D employment, 1988-2005 (FTE)

	1988	**1992**	**1995**	**1998**	**2001**	**2004**	**2005**
Total R&D personnel	45,069	24,192	19,585	20,135	22,942	22,826	23,239
of which RSE staff	21,427	12,311	10,499	11,310	14,666	15,180	15,878

Source: CSO.

The share of working age population with tertiary education is also below the EU25 average: 17.1% (HU) vs. 22.8% (EU25) in 2005. A further warning is signalled by the low participation in life-long learning: 4.2% (HU) of the population aged 24-65 years, as opposed to 11.0% (EU25) in 2005.[4]

An apparently very good Hungarian performance is suggested by two indicators: employment in medium and high-tech manufacturing was 123% of the EU-25 average, and the share of high-tech products in total exports stood at 118% of the EU-25 average in 2004. Yet, a number of factors should be considered when appraising these figures from a policy point of view.

1. First, one should keep in mind the very high share of FDI in Hungarian manufacturing, coupled with the weight of foreign-owned firms active in sectors that are classified as high-tech ones by the OECD, given their R&D intensity.
2. Second, although these sectors are regarded as "engines of growth", a number of recent theoretical and empirical analyses refute this widely held, uncritically accepted view (Hirsch-Kreinsen *et al.,* 2005; Smith, 2002, 2003; von Tunzelmann and Acha, 2005).

[4] It should be added, however, that there is no unequivocally accepted indicator that could provide us with meaningful and comparable measurement of this phenomenon.

3. Third, R&D-intensive industries (or services), as classified by the OECD, are not necessarily R&D-intensive ones in all countries.

In fact, R&D intensities of the so-called ICT high-tech industries were way below the OECD high-tech threshold in 1995-2000 in a large number of OECD member states: all the four Central European member states, as well as Denmark, Italy, Korea, Mexico, Portugal and Spain. What is even more striking, the R&D intensity of the high-tech ICT sectors was below the average R&D intensity of manufacturing industry in the four Central European countries (Srholec, 2006). Thus, it would be a gross mistake to regard these sectors as 'technology leaders' – with all the assumed positive impacts on growth and competitiveness – in these countries.

The fourth Community Innovation Survey (CIS4), covering the period of 2002-2004, showed 20.8% of firms with at least 10 employees as innovation active, putting Hungary to the last but one among the EU25 countries. Concerning the weight of new products/ services in total sales (combining new to market and new to firm products/ services), Hungary ranked eleventh in the EU25. There are significant differences, though, by size and sectors.[5] The share of innovative firms among the large ones was 52.1%, while this ratio was 16.9% for small ones (with 10-49 employees). Several sectors perform way above the national average, in terms of the share of innovative firms: chemicals, due to pharmaceuticals firms (51.9%), financial service providers (47%), automotive (37.2%), electrical machinery and instruments (33.8%). A significantly higher share of large firms is innovative in these sectors, too, than that of small and medium-sized ones. Almost 60% of firms identified lack of demand for new products and services as the major reason for not being engaged in innovation activities. These figures suggest that Hungary continues to suffer from a dual economy syndrome: it is composed of highly productive and technologically intensive foreign-owned – mainly large – firms, and fragile, financially and technologically weak indigenous SMEs. Further, poor patenting records also call for an immense improvement.

A wide variety of knowledge and skills are required for innovation processes to be successful, and these different types of inputs are distributed among various actors. Thus, their co-operation is vital. Again, CIS data reveal a low intensity of innovation co-operation in Hungary, as compared to the EU-15 average (table 8.3).

[5] The distribution of innovative (and non-innovative) firms by ownership is not available for 2002-2004 (CIS4), but CIS3 data clearly show that the share of innovative firms among the foreign-owned ones was significantly higher than among the indigenous ones. There is no reason to assume that it has changed since 2001.

Table 8.3. Incidence of innovation co-operation in Hungary and in the EU15 countries, by partner and by location: proportion of enterprises with innovation activity indicating co-operation with specified partners in specified locations, % (Hungary: 1999-2001, EU15: 1998-2000)

		National	EU-15 or EFTA	CEE*	US	Japan	Other	Total
Other enterprises within the enterprise group	Hungary	1.6	3.3	0.6	0.6	0.3	0.2	5.1
	EU avg.	*23*	*13*	*2*	*6*	*1*	*2*	..
Suppliers	Hungary	17.3	14.6	0.8	2.6	1.1	1.5	26.8
	EU avg.	*36*	*16*	*2*	*5*	*1*	*3*	..
Clients or customers	Hungary	21.1	8.7	3.4	1.7	1.6	0.4	24.8
	EU avg.	*35*	*15*	*3*	*6*	*2*	*4*	..
Competitors within the same industry	Hungary	10.0	4.2	2.2	0.8	0.02	0.1	10.9
	EU avg.	*25*	*8*	*1*	*2*	*1*	*2*	..
Consultants	Hungary	12.5	2.8	0	0.2	0	0.02	14.6
	EU avg.	*24*	*4*	*0*	*1*	*0*	*1*	..
Commercial laboratories, R&D enterprises	Hungary	11.8	3.3	0.4	0.1	0	0.02	13.7
	EU avg.	*16*	*5*	*1*	*1*	*0*	*1*	..
Universities or higher education institutes	Hungary	21.5	2.8	0.8	0	0	0	21.6
	EU avg.	*35*	*7*	*1*	*2*	*0*	*1*	..
Government or non-profit research institutes	Hungary	7.9	2.2	0.8	0.02	0	0	8.6
	EU avg.	*21*	*4*	*0*	*1*	*0*	*1*	..

Notes: contribution by Zsuzsannna Szunyogh, KSH is gratefully acknowledged.
* Central and Eastern Europe in the Hungarian survey, candidate countries in the Eurostat report
Source: compiled by Balázs Borsi for Havas (2004), based on the unpublished results of KSH (2003) and Eurostat (2004c).

CIS-4 results suggest no major improvements in this respect: Hungary is still way below of the EU-15 average observed in 1998-2000, that is, the period covered by CIS-3. Moreover, co-operation with higher education organisations and public labs has become even less intense (table 8.4).

To sum up, two major reasons can be identified as the root cause of the poor innovation performance. First, although the necessary 'nodes' in the NIS are set up, a number of them do not work satisfactorily, or still fledgling. Second, as innovation studies stress, the crucial factor determining the overall innovation performance – and thus the quality of life and international competitiveness – is not the performance of the individual organisations, but the intensity and quality of linkages and co-operation among them (Fagerberg *et al.*, 2005; Lundvall *et al.,* 2002; Niosi, 2002).

Table 8.4. Share of innovative enterprises indicating co-operation with specified partners (percentage of all innovative enterprises)

	1999-2001	2002-2004
Other enterprises within the enterprise group	5.1	9.6
Suppliers of equipment, materials, components, or software	26.8	26.6
Clients or customers	24.8	20
Competitors or other enterprises in sector	10.9	14.2
Consultants*	14.6	13.9
Private R&D organisations	13.7	
Higher education organisations	21.6	14.6
Government or public research institutes	8.6	6.4

Note: * Co-operation with consultancy firms and private R&D organisations has been merged in CIS-4.
Source: CSO

From the point of view of future economic development, the above analysis implies three key challenges:

1. low share of innovative firms in general, and innovative SMEs in particular;
2. low occurrence of co-operation in innovation activities;
3. potential shortage of human resources for R&D and innovation.

The next section is aimed at analysing how Hungarian STI policies tackle these major challenges, and thus it describes the recent developments in innovation policies.

8.3. Innovation policies

8.3.1. The organisational structure of policy-making bodies

The highest-level co-ordination body in this policy field is the Science and Technology Policy Council (STPC), headed by the Prime Minister. The Research and Technological Innovation Council (RTIC), consisting of several high-ranking government officials as well as representatives of the business and research communities, oversees the operation of the Research and Technological Innovation Fund, the most important domestic source to promote RTDI activities. These bodies are apparently appropriate fora for efficient policy co-ordination between various ministries, key stakeholders (e.g. businesses, academia), sectoral and other interests (see also the next sub-section).

Several ministries and government agencies are involved in devising and implementing STI policies. The Ministry of Economy and Transport runs several

technology and innovation policy schemes, and responsible for major policies that are influencing innovation activities (especially industrial and investment promotion policies).[6] Its minister supervises, on behalf of the Government, the activities of the National Office for Research and Technology (NORT), which is responsible for the government's RTDI policies.

The Ministry of Education and Culture plays a key role in the formation and implementation of science and education policies, and also supervises the whole state education system from elementary schools to universities, except the defence and police education institutes, thus it has full responsibility in training human resources for the economy. The Higher Education and Research Council is an advisory body, assisting the Minister of Education and Culture in tasks and decisions related to higher education and academic research.

Other ministries – in particular, the Ministry of Agriculture and Rural Development, Ministry of Environment Protection and Water Management, and Ministry of Health – also have some role in STI in their remit: they supervise their own R&D institutes and/or finance other ones, and run STI policy schemes, education, and training projects.

The Hungarian Academy of Sciences (HAS) is also shaping science policy schemes, although it has a much broader mandate. It is a legal entity, a public body having self-governing rights. Its main tasks are to develop, promote and represent science. The HAS gives its expert opinion to the Parliament or the Government upon request and supervises the ethical norms in science and publishes scientific journals. The Academy has the right to establish and operate research institutes,[7] libraries, archives, information services etc. The president of the HAS, elected for five years, has to report on the activities of HAS and on the general conditions of science in Hungary to the Government (every year) and to the Parliament (every other year). Further, its President is a Vice-Chair of the STPC.

The National Development Agency is responsible for developing the Hungarian National Developments Plans (Community Support Frameworks), including STI policy priorities, in co-operation with the NORT, for the latter priorities.

8.3.2. Major trends in innovation policies

Prior to the recent mid-term STI strategy for 2007-2013, no explicit, stand-alone innovation policy document had existed. The most important policy documents included the "Science and Technology Policy – 2000", the reports of the first

[6] The Ministry also supervises the government offices responsible for quality management, intellectual property, standardisation, metrology, energy, and consumer protection.

[7] As of 2006 – having merged several smaller institutes in the late 1990s – MTA had 39 research institutes and 171 research units associated with universities.

Hungarian Technology Foresight Programme (TEP), published in 2001, the government programmes of the respective cabinets (2002, 2004, 2006), the "National Lisbon Reform Programme for Growth and Employment 2005-2008", and the Economic Competitiveness Operational Programme (ECOP) of the first Hungarian Development Plan (2004-2006).

Without going into the details of these documents and without describing the actual policy measures, a number of major features can be highlighted that have characterised the policy mix supporting RTDI processes in recent years. **First**, while previously favourable loans used to be the dominant tools, grants have become the 'rule' since 2003-2004 for all sorts of goals, including to support the development of new products, processes and services, to promote various types of co-operation (e.g. academia-industry links, clusters, international RTDI collaboration), to modernise RTDI infrastructure and for human resource development.[8] The other two principal instruments have remained in place: core funding for universities and public R&D institutes, and tax incentives for businesses. Besides, further fiscal measures have been introduced to promote the employment of PhD, MSc or MBA students, while recent legislation provides an overall legal and financial framework for RTDI activities.

Second, joining the EU has had major repercussions on the Hungarian STI policy schemes. EU rules on public subsidies have to be followed. One of them is that schemes cannot be "doubled": a given objective / activity can only be supported by one scheme, either by a purely national one, or by a jointly financed one. Therefore, the ones eligible for co-funding from the EU Structural Funds have to be clearly separated from the ones supported by purely national sources. A large number of previously introduced schemes had direct impacts on competitiveness and have thus became part of the Community Support Framework, under the heading of Economic Competitiveness Operational Programme (ECOP), Priority 3, Research, Development and Innovation in May 2004. It also means, however, that significant additional funds became available. The budget of this priority was HUF35 billion (approx. €140 million) for the period of 2004-2006, of which HUF25 billion (approx. €100 million) was financed by the ERDF.

Third, funding has increased for two reasons:

1. As already mentioned, co-funding from the European Regional Development Fund (ERDF) has become available since 1 May 2004 (~ €140 million).
2. A new source of supporting RTDI activities, the Research and Technological Innovation Fund became effective from January 2004. The innovation levy paid by companies amounted to HUF16 bn (~€64 m) in 2004 and HUF20.5bn (~€82 m) in 2005.

[8] This shift from using favourable loans as a chief policy instrument to providing grants has not been evaluated.

Evaluation reports are not available to assess the absorptive capacity of the key players. Monitoring data on the STI policy schemes co-financed by the EU Structural Funds show that all the funds made available for 2004-2006 have been committed.[9]

Fourth, several dedicated measures have been launched since December 2004 to support specific technologies (e.g. mobile telecommunications, nanotechnology, and biotechnology). Until then, so-called horizontal policy measures had been the main tools, supporting e.g. academia-industry co-operation, modernisation of the physical infrastructure of R&D units, applied R&D, start-up firms, international RTDI co-operation, etc. In short, these, previously predominant measures have not had any technology-specific goals.

Fifth, a much stronger emphasis has been put on regional RTDI issues since the second half of 2004.

Since September 2006, four major policy documents have been approved, namely the New Hungary Development Plan (NHDP), its Economic Development Operational Programme (EDOP), the Revised National Lisbon Action Programme for Growth and Employment, and the mid-term "Science, Technology and Innovation (STI) Policy Strategy" (henceforth: STI strategy) of the Government. This list follows the timeline of these recent documents, i.e. the final version of the EDOP had been devised prior to the STI strategy (October 2006 vs. March 2007). It can be seen as a rather unfortunate timing as naturally, a strategic document should define the broad framework and objectives of an implementation programme, such as the EDOP.[10]

The impacts of these new policy documents obviously cannot be assessed, but their objectives and tools are summarised below to illustrate the most recent trends in policy thinking.

The New Hungary Development Plan (2007-2013) is the framework document for allocating the financial resources provided by the EU Structural Funds and the national contributions. In all, EUR 22.4 billion is available for Hungary with the aim to facilitate socio-economic convergence with the more developed countries of the EU. The two central priorities of the NHDP are increasing employment, and establishing the conditions necessary for sustained economic growth. Within the first priority (Economic Development), a group of measures aims at "creating an innovative, knowledge-based economy" by "supporting market oriented R&D activities; promoting the innovation activities and co-operations of businesses; motivating the establishment of technology intensive (spin-off) small businesses; promoting technology transfer; strengthening bridge

[9] The actual spending takes longer, of course, as subsidies can only be paid once a project is completed.

[10] The EDOP, nonetheless, refers explicitly to the mid-term STI strategy, stating that its main objectives, priorities and instruments have been concerted with that of the latter.

building and incubation activities; development of the background infrastructure of R&D." Furthermore, under Priority 3 („Social renewal"), one of the groups of priorities deals with „Developing human resources necessary for research and development and innovation".

The Economic Development Operational Programme (EDOP), approved by the European Commission on 7 May 2007, defines how the financial resources provided by the EU Structural Funds will be allocated with the aim to enhance the competitiveness of the Hungarian economy. The overall objectives of the EDOP "are to achieve long term growth of the Hungarian economy by improving the quality of physical and human capital, as well as of total factor productivity".

Four specific objectives are selected in the EDOP in order to strengthen those factors that would foster growth, that is: (a) increasing R&D and innovation capacity, activity, as well as co-operation; (b) complex development of corporate capacities; (c) development of the business environment; and (d) facilitating the access of SMEs to financing resources.

The funds allocated for the "R&D and innovation for competitiveness" priority amount to approx. EUR 822 m (to be supplemented by 15% national contribution), which is roughly one third of the total EUR 2.44 bn budget of EDOP.

The Revised Lisbon National Action Plan outlines the steps to be taken in line with the Guidelines of the Revised Lisbon Strategy. This document can be deemed as a telling illustration of the consequences of the lack of long-term strategic thinking: most of the statements included in the report are the repetition of EU requirements/ guidelines – without a clear vision of a national (broad socio-economic and STI) strategy – plus a list of already existing STI policy schemes. As mentioned, this document had been produced prior to the STI policy strategy and therefore even the most basic indicators are not harmonised.[11]

The Law on R&D and Technological Innovation stipulated that a mid-term science, technology, and innovation (STI) policy strategy should be devised by the government by May 2005. Following a number of unsuccessful attempts to compile a strategy document based on the various drafts produced by the NORT and the HAS, practically a brand new document was approved by the government on 28 March 2007, that is, with an almost 2-year delay. This final version was drafted jointly by the experts of the Ministry of Economy and Transport, the Ministry of Education and Culture and the HAS.[12] Some stakeholders, e.g. the

[11] For example, the Action Plan's target for the GERD/GDP ratio is 2.1% by 2013, while the STI strategy sets more modest – but still rather ambitious – objective of 1.8%.

[12] A sociological or a political science analysis could ask fascinating questions, e.g. why the composition of the drafting team had changed (experts of two organisations joined the team), while one organisation lost its former leading role), and what the implications of this change are in terms of the content of the document, its approval, and the chances of its implementation.

Hungarian Association for Innovation, the Hungarian Chamber of Commerce and Industry, and the Competitiveness Council had commented on the various versions of the STI policy strategy. Despite this fact, it would be overly optimistic to talk about a wide-ranging, proper dialogue or a broad consensus. Notably, no white or green paper had been published to initiate a thorough professional discussion. Moreover, neither the Science and Technology Policy Council, nor its Advisory Board had discussed this document prior to its approval by the government.

The main aim of the STI strategy is to put the Hungarian economy and society on a new development path by 2013, whereby the engine of growth is knowledge and innovation, and businesses can enter global markets with their own competitive, knowledge- and technology-intensive products and services. The strategy summarises the strengths and weaknesses of the Hungarian national innovation system, and sets out several target indicators to be reached by 2010 and 2013, respectively. The highest-level aggregated target stipulates that GERD must reach 1.8% of GDP (2005: 0.95%) and BERD 0.9% (2005: 0.37%) by 2013. It sets out visions and specific goals in the following five areas:

1. the culture of embracing and exploiting S&T results;
2. quality-, performance- and exploitation-driven, efficient national innovation system;
3. respected, creative and innovative workforce suited for the needs of the "knowledge-based" economy and society;
4. legal and economic environment stimulating the creation and utilisation of knowledge;
5. indigenous businesses that are competitive on the global markets.

An action plan, elaborating on the tasks to be performed, is due to be approved by the end of June 2007. This will also include the financial resources that are allocated to achieve the above goals.

8.3.3. Policy responses to challenges

Relying on the European Innovation Scoreboard, three key challenges were identified in chapter 8.2.2. Drawing on further sources, too (Havas, 2004, 2006), this list can be extended, and the challenges can be reformulated as policy goals as follows:

- strengthening competitiveness by introducing new products, processes and organisational innovations;
- promoting academia-industry relationships;
- increasing business expenditures on R&D and innovation by offering appropriate incentives;
- modernise physical infrastructure for R&D;

- » reversing – or at least slowing down – brain drain;
- » providing adequate human resources for RTDI processes.

As a general observation, the current set of STI policy tools seems to address the above challenges – but only in their remit. In other words, the complex nature of these challenges would require conscious and focussed efforts to co-ordinate the policies of various government departments.

In more detail, several policy schemes are explicitly aimed at supporting the development and introduction of new products, services or production processes. Further schemes are designed to contribute to enhancing competitiveness via specifically targeting academia-industry relationships, usually by supporting joint development of new products, services and processes. Overcoming the lack of finance as a major barrier to innovation has been the subject of a number of policy measures: tax incentives have been introduced to stimulate firms spending more on R&D, while the 'Research and Technology Innovation Fund' was set up with the aim of creating a stable and reliable financial ground for research, technological development and innovation activities.

Other measures aim at upgrading the infrastructure of publicly financed and non-profit research institutes and the R&D units of companies, and thus to improve the chances of developing new products, services and processes, as well as to provide the necessary background conditions for more intense academia-industry co-operation.

Originally, one of the goals of the Hungarian Scientific Research Fund (OTKA) was to tackle brain drain. More recently, however, grants available from this Fund have become so small that no major impact can be expected. Finally, there are measures to increase the number of science and engineering students, as well as to offer favourable employment conditions for MA and PhD at research organisations.

These facts present an intriguing puzzle: there are a large number of apparently relevant policy schemes to foster RTDI activities, and yet, the innovation performance is far from being satisfactory. A number of hypotheses can be formulated as to the cause of this puzzle:

a) the schemes are relevant, but more time is needed to have their impacts materialised, and thus the current practice should be continued patiently, without any major changes;
b) the schemes are relevant, but even the recently increased funding is insufficient, and hence more resources are needed for the same types of policy measures;
c) the major policy aims and the tools to achieve them are the right ones, but policy implementation is poor (e.g. selection and monitoring of projects funded by these schemes);
d) fundamental changes are required in the overall STI policies: priorities and funds earmarked to the particular objectives should be redressed;

e) given the predominantly unfavourable framework conditions – e.g. the macroeconomic situation, the structure of the economy, the nature of competition, standards and regulation, the overall entrepreneurship culture, human resources, the quality and directions of publicly financed R&D activities – the incentives provided by STI policy schemes cannot have any significant impacts on their own.

Given the current policy design practices, notably the lack of through analyses and evaluation, it remains a huge task to establish if these large number of schemes are effective and efficient. In other words, a new element needs to be added to the opening list of challenges: the operation of the national innovation governance system. The next section, thus, is analysing the policy design and implementation practices.

8.4. Policy design and implementation practices

As outlined in chapter 8.3, most of the current STI policy objectives were set during the negotiations between the Hungarian government and the European Commission on the Community Support Framework (for the periods of 2004-2006, and 2007-2013, respectively), relying on SWOT type analyses, as well as benchmarking with the EU. By the very nature of these negotiations, stakeholders have not been involved. Policy measures, in turn, are designed by government officials, with the occasional assistance of external experts. The business sector has been consulted during the design stage in a few cases of domestically financed policy schemes.

The Act on R&D and Technological Innovation was aimed at creating a stable financial source to promote RTDI activities, namely the Research and Technological Innovation Fund, co-financed by the innovation levy, paid by firms, and a matching fund from the central budget. Yet, the government initiated an amendment to this Law in December 2005 to reduce the contribution from the central budget in 2006.[13] This can easily lead to a detrimental socio-psychological effect: trust might be undermined between firms and the government. It can be particularly harmful, as private and public resources need to be pulled together to make innovation process successful, given the inherent uncertainties in this field.

Partnership structures involving key stakeholders do exist, and thus could, in principle, be used in the policy formation process. However, this is not a deeply

[13] In contrast to the Act, which stipulates that the payments made by enterprises in the first year, that is, 2004, shall be supplemented with an equal amount from the central budget starting from 2006, the Law on the 2006 budget has allocated a smaller amount to the Fund. The Law on Research and Technological Innovation was amended: the supplement would only be introduced as of 2007.

rooted practice. **First**, the highest-level consulting and co-ordination government body, the Science and Technology Policy Council has been reorganised constantly since the 1990s. It has rarely met since 1998, and this practice has not changed since its most recent reorganisation (2003), either: on average, it meets once a year. These sessions tend to be short, and do not discuss if the major policies and STI policies are aligned. Moreover, there have been such fundamental conflicts among the members of the STPC that it became impossible to reconcile the different interests even by the prime minister (Palugyai, 2006).

Second, somewhat similar conclusions can be drawn when considering the fate and operation of another major decision-making body, that is, the Research and Technological Innovation Council (as it is called since 2004). The frequent changes in the status, decision-making competences, and operation of this body (and its predecessor, called OMFB Council) obviously prevent organisational learning, the institutionalisation of involving key stakeholders as partners, and thus the establishment of good practices in policy co-ordination. Some practices have not favourable from the point of view of developing partnership among key stakeholders. Interview evidence and press reports suggest that several important decisions have been 'rushed through' this body: Council members have not received sound, detailed studies informing their decisions and have thus not been able to conduct thorough discussions in a number of cases.[14]

Third, further policies having major bearings on innovation processes and performance – such as education, investment promotion, competition, fiscal, monetary, regional development, health, environmental protection and employment policies, as well as public procurement rules and practices in a number of fields, etc. – are devised without giving due consideration to innovation issues. It can be attributed to the weak position of STI policy-makers in the decision-making system: short-term concerns dominate the agenda of the decision-makers responsible for economic and overall government policies.

In sum, although an apparently appropriate, and sophisticated, policy co-ordination mechanism has been put in place in the form of the above two high-level bodies, policy co-ordination is fragmented in practice.

Against this backdrop, it is not surprising that the policy design and implementation practices of the NORT have been criticised by a number of players for various reasons. First, its unsatisfactory co-operation with the Hungarian Academy of Sciences (HAS) had led to the belated preparation and eventually the rejected draft of the STI strategy document, as already mentioned above.

Second, the Research and Technological Innovation Council (RTIC) should approve an overarching strategy of those policy schemes that are financed by the Research and Technological Innovation Fund, and operated by the National Of-

[14] For a detailed discussion of these issues, as well as evidence, see TrendChart, 2004 and 2005.

fice for Research and Technology (NORT). Yet, the NORT only devised such a strategy for the first time in 2007, and thus for the preceding 3 years the RTIC had not been in a position to approve it – although this task is stipulated by the Law on the R&D and Technological Innovation Fund.

Third, several actions stipulated in the Law on R&D and Technological Innovation, effective from January 2005, have been only very slowly, or not at all, put into practice by NORT. Most notably, only a single scheme – called "Supporting co-operative research and technology-transfer between companies and higher education" – has been evaluated so far, despite the fact that this Law made the evaluation of STI policy schemes compulsory.[15]

Fourth, several concerns have also been raised as to the operation of the Research and Technological Innovation Fund (RTIF). It is particularly worrisome, given the amount of financial resources (40 billion HUF; ~€160 million in 2005) involved in the RTIF, managed by NORT. Several times unrealistically short application deadlines were set,[16] often coupled with unacceptably long appraisal periods. The reports by appraising committees were not made available for the applicants who applied for grants. On top of that, as the Hungarian Association for Innovation has pointed out at several occasions, even after a decision has been taken, it takes unduly long time before the contracts are signed (not to mention disbursements), not least because new project documents are demanded even at this stage of the procedure (HVG Online, 3 February 2006).

Finally, the Research and Technological Innovation Fund (RTIF) was introduced to promote primarily firms' RTDI activities (as it is largely financed by a levy paid by enterprises). Funds, however, hardly reach the intended recipients: firms received only 20% of the total disbursed funds in 2004 (73% went to universities and publicly financed R&D institutes, and the remaining 7% to non-profit R&D units (NORT, 2005, p. 18). The goal for 2005 was to increase the share of firms to 40%, but they only received 26.7% (universities and publicly financed R&D institutes were paid 61.9%, while non-profit R&D units were granted 11.4%) (NORT, 2006, p. 2).

Monitoring had not been a widely used practice in Hungary, as no indicators had been set in advance, against which projects and programmes could have been monitored. A visible impact of the EU practice can be detected, however,

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[15] Compliance with the EU rules seems to be much stronger than with the Hungarian law: ex-ante and mid-term evaluations of the new policy measures launched in January 2004 as part of the Community Support Framework had to be carried out, as requested by the EU.

[16] The call for the "Asbóth Oszkár Innovation Programme for Cutting-edge Industries" was an extreme example. The call, offering 2bn HUF (~€8 m) for R&D activities in connection with the pandemic caused by the Influenza "A" virus, was published on 19 December 2005, with the deadline for submission being 21 December. The expected number of grants was one, and the period of support one year. The deadline was extended – yet, only one proposal was submitted, and subsequently granted.

in the documents of the new policy schemes operated since September 2004: in most cases, indicators are specified *ex ante* for the measurement of their results/ impacts. Further, foreign experts were commissioned in 2006 to design a monitoring system, based on the following underlying principles: policy-relevant programmes and projects – e.g. those schemes and projects where a considerable amount of money is spent, or those pursuing essential policy goals – would be thoroughly monitored, while those with less significant funding – e.g. small grants for international project preparation – would be checked only by financial and administrative criteria.

As for background analyses, and use of indicators, R&D data have been collected in Hungary for decades, initially following the UNESCO methodology, and since 1994 that of the OECD. The first fully-fledged innovation survey, using the Community Innovation Survey (CIS3) questionnaire was only conducted in 2002. (KSH, 2003) It covers the period of 1999-2001. A number of major, policy-relevant indicators have not been published, although they were included in the questionnaire: e.g. innovation expenditures as percentage of sales; share of new products in sales or export revenues; effects of innovations. The Hungarian CIS4 covered the 2002-2004 period. Again, not all the results were published; but this time the distribution of sales revenues by novelty of product was. (KSH, 2006) It still means, however, that the other indicators mentioned here have not been made available. Lack of these types of data clearly prevents analysis aimed at assessing existing policies and underpinning new or revised ones.

The way in which data protection is understood and implemented is also posing a challenge from the point of view of policy analysis and policy-making. For instance, the list of R&D performing companies is not available, and thus it is not possible to conduct even the most elementary calculations, e.g. to establish how many of the top exporters conduct R&D activities in Hungary. It would be a fairly simple and cheap exercise, and given the weight of exporting firms in the small, open Hungarian economy, a rather pertinent one. It is not possible to analyse the impacts of R&D on micro-economic performance, either, although both sets of data are collected – but using different surveys and thus stored in different data sets, which cannot be linked for legal restrictions. In other words, public money is spent on collecting data which cannot be used for analyses aimed at supporting public policies. This problem can be resolved in several ways, following the practice in other countries. The most convenient way is to set up so-called data rooms, where researchers can access the relevant data sets at the level of firms, but without revealing the identity of the firms. Regressions and other methods can be run as many times as needed, and the processed data – not the ones at firm level – then can be used for analytical purposes. Another existing, proven solution Researchers can submit their requests for data processing via the intranet of the Statistical Office, and receive the results quickly. They thus can

check and revise their hypotheses without significant delays, and submit new requests.

In sum, policy can be based on evidence only to a rather limited extent because of the lack of access to existing data for further analyses, which prevents policy-makers from having adequate information and policy conclusions on which to base choices. In other words, the lack of reliable analyses on innovation performance prevents any sound appraisal of the effectiveness of the process of designing and delivering policies. For the same reasons, it cannot be established, either, whether the policy-making processes and mechanisms lead to a coherent and balanced policy mix. Further, an evaluation culture is almost totally absent, and the lack of thorough and evidence-based evaluation practices creates the impression of schemes introduced without having a clear, sound strategy. The lack of thorough analyses poses a significant threat: policies might be influenced largely by pressure groups and short-term political considerations without a sound understanding of the impacts of foregoing decisions and current (as well as foreseeable future) socio-economic needs.

8.5. Conclusions

Innovation has not become a major policy issue in Hungary for a number of reasons. Macroeconomic pressures, the social costs of the transition process, as well as other 'burning' political issues have pre-occupied the agenda of high-ranking decision-makers. Further, RTDI is still mainly perceived as burden on the budget, rather than part of the solution, i.e. contributing to socio-economic development. In sum, RTDI issues have not been given sufficient intellectual and financial resources in the government circles.

On the surface, the large number of STI policy measures contradicts the above general observation. Actually, this presents a puzzle: there is a broad set of apparently relevant policy schemes to foster RTDI activities, and yet

a) innovation performance is rather poor in Hungary, and
b) there is no obvious link between economic and innovation performance.

A number of hypotheses can be put forward concerning the root cause of this major challenge. The most plausible of those seems to be the one that stresses the chief role of the so-called framework conditions. The macroeconomic situation, the structure of the economy, the level and type of competition, standards and regulation, the overall entrepreneurship culture, human resources, the quality and directions of projects conducted by the publicly financed R&D units have so unfavourable impacts on innovation activities of firms that the incentives provided by STI policy schemes cannot counterbalance those effects.

Thus, there seems to be no 'panacea' or a 'simple, quick fix' to improve innovation performance by introducing 2-3 new STI policy measures. On the contrary, substantial efforts are needed, based on a comprehensive approach. At a strategic level, conscious co-ordination of major economic and STI policies should be introduced, guided by an overarching socio-economic development strategy, aligning the EU goals and funding opportunities with the national ones. To this end, the implementation of the recently approved STI policy strategy should be carefully monitored, and the strategy refined, if it is needed. Foresight processes would be useful to underpin these strategies, as well as orchestrate the main objectives at these different levels; in other words, to establish how RTDI processes – advanced by appropriate STI policies – can contribute to overall socio-economic development, and thus a faster cohesion with the more advanced EU members. This process can also be facilitated by the effective use of the existing, but currently unexploited channels and organisations for harmonising policies, coupled with regular, meaningful dialogues with the major stakeholders. Fundamental changes are required at the level of policy design and implementation, too: up-to-date decision-preparatory methods – most notably thorough analyses of innovation performance, combining census, R&D and innovation data; evaluation of individual policy measures, as well as that of the policy mix as a whole; and technology assessment – should be relied upon when devising and implementing STI policy measures, also assisted by recurring consultations with the major actors of the national innovation system.

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