A Hungarian paradox?

Poor innovation performance in spite of a broad set of STI policy measures

Attila Havas
Institute of Economics, Hungarian Academy of Sciences
Budapest, Hungary
havasatt@econ.core.hu

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Attila Havas, PhD is a Senior Research Fellow at the Institute of Economics, Hungarian Academy of Sciences, and regional editor of *International Journal of Foresight and Innovation Policy*. His academic interests are in evolutionary economics of innovation, systems of innovation, innovation policy, and technology foresight. He holds a PhD in economics (The Diffusion of New Technologies), from the Hungarian Academy of Sciences, 1997. He has participated in a number of EU-funded research projects on STI policies, innovation and transition, as well as on foresight and prospective analyses, advised several national technology foresight programmes, and has been invited speaker at a number of conferences and workshops on technology foresight.
In 1997-2000 he was Programme Director of TEP, the Hungarian Technology Foresight Programme. Previously he worked for IKU, Innovation Research Centre, Budapest University of Economics (1990-97) and for other institutes in the field of industrial economics and industrial policy (1983-89).

1. INTRODUCTION*

1.1 The main research question

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 science, technology and innovation (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. Yet, performance is far from satisfactory. In brief, two major reasons can be thought of when discussing this apparent contradiction. First, although these 'nodes' of the NIS are set up, a number of them do not work satisfactorily, or still fledgling. Second, as innovation studies stress, the major factor determining the overall innovation performance is not the performance of the individual organisations, but the intensity and quality of linkages and co-operation among them. (Fagerberg *et al.* (eds) [2005]; Lundvall *et al.* [2002]; Niosi [2002])

This paper cannot analyse in detail the major characteristics and operation of the principal players of the Hungarian NIS, and thus cannot tackle the first hypothetical explanation.[1] Rather, it is focussing on just one element of this broad picture, which is a difficult enough question in itself: How to explain the paradox between a broad set of STI policy measures in place and the poor innovation performance? When tackling this "Hungarian paradox", the second reason mentioned above should be included in the analysis, no doubt.

1.2 State of the art

Comprehensive analyses on the innovation performance of the so-called transition countries are apparently scarce in the international literature (Dyker (ed.) [2006], [2010]; Dyker, Radosevic (eds) [1999]; Nauwelaers, Reid [2002]; Piech, Radosevic (eds) [2006]; Radosevic [1994], [1998], [1999], [2004], Radosevic, Lepori [2009]; Reid *et al.* [2001]), and the same applies to Hungary. Exceptions include thorough, but non-academic reports. (EC Erawatch and TrendChart country reports since the mid-2000s, OECD [2008]) Hungarian authors, however, have analysed various aspects of the Hungarian NIS (e.g. Balogh [2004], [2006]; Borsi [2005a], [2006]; Borsi, Udvardi [2009], Havas [1999], [2002], [2006], [2007]; Havas, Nyiri (eds.) [2007]; Halpern, Muraközy [2009], [2010]; Hámori, Szabó [2010]; Inzelt [1995], [1996]; Karsai [2006], [2007], [2009]; Mosoni-Fried [1995], Mosoni-Fried, Tolnai (eds) [2008]; Mosoni-Fried, Szunyogh [2008]; Török [2006]),[2] and more recently a few evaluation reports have also been commissioned by the relevant government agencies (Arnold et al. [2007]; Ernst & Young and GKI [2010a], [2010b]). All these reports point to the need of strengthening various features of the Hungarian NIS.

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* This paper draws on various projects, aimed at analysing the Hungarian innovation performance and policies; notably "Sectoral Systems of Innovation and Production in an Open Transition Economy (OTKA, contract No. T 046880 KGJ), Micro-Dyn (EU RTD FP6, contract No. 028868 CIT4), and AEGIS (EU RTD FP7, grant agreement No. 225134). Financial support provided by these projects is gratefully acknowledged.

[1] For a detailed discussion on the major players of the Hungarian NIS, see, e.g. Havas and Nyiri (eds) [2007].

[2] Some of these papers are available in English, but the bulk is published in Hungarian.

1.3 Methodology

The paper draws on the conceptual framework offered by evolutionary economics of innovation, and especially its systems perspective. This school, together with the triple helix concept, stresses that innovation systems need several elements to operate successfully. Further, the major factor determining the overall innovation performance is not the performance of the individual organisations, but the type, intensity and quality of linkages and co-operation among them. It is also emphasised that STI policies should be devised carefully, in co-ordination with other relevant, but non-STI policy tools, relying on modern decision-preparatory tools, and implemented systematically. (Carlsson *et al*. [2002]; Dodgson, Bessant [1996]; Ergas [1986], [1987]; Etzkowitz, Leydesdorff [2000]; Edquist (ed.) [1997]; Fagerberg *et al.* (eds) [2005]; Foray (ed.) [2009]; Freeman [1987], [1991], [1994], [1995], [2002]; Lundvall (ed.) [1992], Lundvall *et al.* [2002]; Metcalfe, Georghiou [1998]; Nelson [1993], [1995]; Niosi [2002]; Smith [200], [2002])

Relying on desk research, close reading of relevant policy documents and evaluation reports, interviews with policy-makers and other key stakeholders, as well as on statistical analyses, six factors are considered in an attempt to explain the 'Hungarian paradox': a) STI policy measures are not co-ordinated with the broad objectives of an overall socio-economic development strategy; b) STI policy goals are not tailored to the needs to be addressed; c) STI funds are inadequate; d) the available funds are spent in an inefficient way; e) STI policy measures are not evaluated regularly, and hence lessons cannot be learnt and the measures cannot be improved; and finally, f) the so-called framework conditions are unfavourable for innovation.

The paper is organised as follows. *Findings and their interpretation* are reported in Sections 2-4. A brief overview of the STI policy measures effective until 2010 is offered in Section 2,[3] and the major performance indicators are presented in international comparison in Section 3. Then the above six possible explanations are explored in Section 4. Based on these discussions, *conclusions, policy implications and directions for further research* are summarised in Section 5, suggesting that several of the above factors should be included in a thorough assessment. The framework conditions, however, play a decisive role: 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. This policy implication is likely to be valid in several other countries, too: devising appropriate STI policies and implementing them in an efficient and effective way might not be sufficient on their own to improve innovation performance. To establish the validity of this proposed generalisation, comprehensive international comparative studies on the efficacy and effectiveness of STI policies are needed a) across Central and Eastern Europe (CEE) with similar political and economic history legacies, as well as b) between more advanced Western economies, with a markedly different legacy and institutional systems, and CEE countries.

[3] The paper cannot address the policy changes introduced since January 2011.

2. THE STI POLICY MIX

2.1 Policy rationale

No Hungarian government has devised an overarching, comprehensive socio-economic development (or catching-up/ cohesion) strategy since 1990, that is, the beginning of transition to market economy. The available strategic documents are only comprised of what is requested by the EU.[4]

These documents clearly indicate the lack of strategic thinking: e.g. the Revised Lisbon National Action Plan simply (a) repeats the EU requirements/ guidelines, without a clear vision for a broad socio-economic development and a national STI strategy to support it; and (b) reproduces a list of already existing STI policy schemes. In that respect it is a coherent document: no strategic goals are set, and thus there is no need to devise new measures to achieve new objectives.

This special way of 'planning' – just submitting the requested documents to Brussels to meet the formal requirements without strategic thinking – has three major repercussions. First, the (non-existing) overarching development strategy cannot be aligned with the STI strategy (which, in turn, was missing until 28 March 2007). Policy analysts have repeatedly pointed out that pubic funds cannot possibly be spent efficiently in this way, and this assessment has been given more weight by a report of the State Audit Office. (ÁSz [2008a]) Second, given the lack of an overall national socio-economic development strategy, it is not possible to co-ordinate the goals across the various policy domains, either. Finally, it is also impossible to align the utilisation of the national and the EU resources.

The STI policy mix – effective in 2010 – itself is set out in four major policy documents, approved in 2006-2007, namely the New Hungary Development Plan (NHDP), its Economic Development Operational Programme (EDOP), [5] 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 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.[6] Furthermore, the national policy schemes, funded by the Research and Technological Innovation Fund, operated by the National Office for Research and Technology, are set in the annual and mid-term strategies of the Office.

The impacts of these policy documents cannot be assessed yet, but their objectives and tools are summarised below to illustrate recent 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

[4] The most important documents include: (a) the National Development Plans, or Community Support Framework (devised in the framework of the EU Structural Funds) – for the 2007-2013 period the "New Hungary Development Programme" and its 7 Operational Programmes; (b) the Lisbon National Action Programme for Growth and Employment and its regular revisions; and (c) the Convergence Programme (presented to the EU as a pre-requisite to join the euro zone).

[5] Not only the EDOP, but other Operational Programmes, such as the Social Infrastructure OP and the respective Regional Development OPs contain a number of measures with direct or indirect relevance for RTDI (such as research infrastructures, promotion of life-long learning, etc.). The total volume of RTDI-related financial resources within the New Hungary Development Plan is thus roughly EUR 2b, which is approximately 6.5% of the total budget for 2007-2013.

[6] 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.

contributions. In total, 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 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 Law on R&D and Technological Innovation stipulated that a mid-term STI policy strategy should be devised by the government by May 2005. Following a number of unsuccessful attempts to compile a strategy document on the basis of the various drafts produced by the National Office for Research Technology (NKTH) and the Hungarian Academy of Sciences (MTA), 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 (GKM), the Ministry of Education and Culture (OKM) and the MTA.[7]

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 (from 0.95% in 2005), while BERD 0.9% (from 0.37% in 2005) by 2013. It sets out visions and specific goals in the following five areas:

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

[7] 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 [NKTH] 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.

An STI Policy Action Plan, elaborating on the tasks to be performed in 2007-2010, was approved by the government on 29 August 2007 – but without allocating financial resources to achieve the above goals. In February 2009, the government approved a revised version of this action plan, listing almost the same tasks, with slightly or significantly extended deadlines, indicating that the implementation of the original plan had been behind schedule.

2.2 STI policy measures

There are over 40 STI policy measures in place in Hungary.[8] Their aims are covering a broad set of objectives, and thus it would be rather difficult to find any relevant goal, which is not targeted by at least one measure. The goals include: to 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 research, technological development and innovation (RTDI); develop the national and regional innovation and innovation governance systems; and promote international co-operation in R&D and innovation.

A number of major features can be highlighted that have characterised the STI policy mix. First, while previously favourable loans used to be the dominant tools, grants have become the 'rule' since 2003-2004. The other two principal instruments have remained in place: core funding for universities and public R&D institutes, and tax incentives for businesses.

Second, funding has increased considerably for two reasons. As already mentioned, co-funding from the European Regional Development Fund (ERDF) has become available since 1 May 2004.[9] Besides, a new source of supporting RTDI activities, the Research and Technological Innovation Fund (KTIA) became effective from January 2004. KTIA is financed by the innovation levy paid by companies, as well as by contributions from the central budget.

Third, several dedicated measures have been launched since December 2004 to support specific technologies (e.g. mobile telecommunications, nano-technology, 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.

In sum, a large number of STI policy schemes are operated in Hungary, targeting a broad set of apparently relevant objectives, disbursing non-negligible funds in the Hungarian context. Thus, one could expect a good – or at least improving – innovation performance in recent years. The next section, thus, looks at the impacts of STI policy measures, as reflected in various economic and RTDI indicators.

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[8] These measures are described in the detail in the joint TrendChart and ERAWATCH database: http://cordis.europa.eu/erawatch.

[9] In the 2004-2006 planning cycle the RTDI budget of Community Support Framework (or National Development Plan) was HUF35 billion (approx. €140 million), of which HUF25 billion (approx. €100 million) was financed by the ERDF. In the 2007-2013 planning cycle funds allocated for the "R&D and innovation for competitiveness" priority of the New Hungary Development Plan 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.

3. AN OVERVIEW OF ECONOMIC AND INNOVATION PERFORMANCE

Available data suggest a relatively rapid catching-up with the EU average, 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. 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.

3.1 Economic performance

Hungary's economic performance, measured in GDP per capita (PPS) had fluctuated between 62-65% of the EU27 average in 2002-2009, that is, no significant real convergence has been achieved. The Hungarian economy is losing momentum, especially in comparison to its Central and Eastern European (CEE) peers.[10] Hungary is among the EU members with the lowest rate of activity (56-57% until 2008 vs. 62-66% EU27 average). This low employment rate poses a heavy burden on the central budget: a 'slim' revenues base vis-à-vis excessive social security expenditures. Inflation is significantly above the EU27 average (between 4.0-7.9% vs. around 2% for most of the 2000s). (Table 1)

Economic and innovation performance are not linked in mainstream political and policy discussions. Parliamentary debates do not focus on the underlying factors of the poor economic performance and the possible remedies. The unfavourable macro-economic situation, the heavy burden on firms, coupled with the lack of stability – even in the short-run – in the regulatory framework has undermined business confidence and hence prompted many Hungarian firms to focus on short-term issues, i.e. on day-to-day survival, rather than pursuing long-term strategic goals, including enhanced innovation efforts.

3.2 Innovation performance

Several main features of the Hungarian national innovation system is compared to an advanced EU country, that is, Austria, two other Central European countries, namely Poland and Slovenia, as well as to the EU27 average. (Table 2)

In brief, significantly lower financial resources devoted to R&D in Hungary than in the other countries, except Poland. There are marked differences in terms of the weight of the three major research performing sectors, too. Firms perform 65-70% of GERD in the two more advanced countries, compared to 57% in Hungary, and business expenditures on R&D are also much higher in these two countries. The higher education sector is the most important research performer in Poland, while the other countries are at the level of the EU27 average, or significantly below, namely Slovenia. The weight of the government sector is also fairly high in Poland, and this share is well above the EU27 average both in Hungary and Slovenia.

[10] For example, the Czech Republic has shown a much faster convergence, moreover, at a higher level: from 70% of the EU27 average in 2002 to 82% in 2009. Other CEE countries from a lower level of economic development have also developed considerably faster, and some even overtaken Hungary: Estonia from 50% of the EU27 average to 64%; Latvia (41 vs 52); Lithuania (44 vs. 55); Poland (48 vs. 61); Romania (29 vs. 46); Slovakia (54 vs. 73).

Table 1: Economic performance, Hungary, 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
GDP per capita in PPS (EU27=100)	62	63	63	63	63	62	65	65
Real GDP growth rate (% change on previous year)	4.1	4.0	4.5	3.2	3.6	0.8	0.8	-6.7
Employment rate (%)	56.2	57.0	56.8	56.9	57.3	57.3	56.7	55.4
Labour productivity per person employed (EU27=100; GDP in PPS)	64.9	66.0	67.5	67.5	67.8	68.0	71.5	72.4
Labour productivity per hour worked (EU15=100; GDP in PPS)	47.1	48.6	49.7	49.6	49.9	50.3	53.0	53.5
Inflation rate (average annual, %)	5.2	4.7	6.8	3.5	4.0	7.9	6.0	4.0
Public balance (net borrowing/lending; % of GDP)	-8.9	-7.2	-6.4	-7.9	-9.3	-5.0	-3.7	-4.5
General government debt (% of GDP)	55.6	58.3	59.1	61.8	65.7	66.1	72.3	78.4

Source: Eurostat

Table 2: Main comparable RTDI indicators, 2009

	Austria	Hungary	Poland	Slovenia	EU27 average[a]
			Total		
GERD as a percentage of GDP (%)	2.75	1.15	0.59	1.86	2.01
GERD per capita (€)	903.2	106.4	47.9	323.2	473.4
Total FTE researchers per thousand total employment	8.4	5.3	3.9	7.6	7.3
			Business enterprise sector		
BERD as a percentage of GDP	1.94	0.66	0.18	1.20	1.25
Percentage of GERD financed by industry	44.8	46.4	29.6	58.0	54.8
Percentage of GERD performed by businesses	70.6	57.2	30.9	64.6	62.1
Percentage of BERD financed by industry	66.3[c]	71.0	83.1	83.8	82.4
FTE researchers in business (percentage of national total)	63.2	44.7	16.7	44.0	44.3
			Higher Education		
HERD as a percentage of GDP	0.66	0.24	0.21	0.27	0.48
Percentage of GERD performed by HEIs	23.8	20.9	34.9	14.6	23.7
Percentage of HERD financed by industry	5.7[c]	15.5	4.0	9.2	6.8
FTE researchers at HEIs (percentage of national total)	31.9	30.7	62.3	26.6	42.1
			Government		
GOVERD as a percentage of GDP	0.15	0.23	0.20	0.39	0.27
Percentage of GERD financed by the government	39.1	42.0	63.7	35.7	33.9
Percentage of GERD performed by the government sector	5.3	20.1	34.1	20.8	13.2
Percentage of GOVERD financed by industry	9.3[c]	12.6	7.3	11.7	8.2
Government FTE researchers (percentage of national total)	4.4	24.6	21.6	29.2	12.4

Source: Eurostat, and author's calculation

Notes: [a] 2009 or the latest available figure

The Summary Innovation Index (SII) takes into account 3 main types of indicators (Enablers; Firm activities; Outputs) and 8 innovation dimensions, capturing in total 25 different indicators. (Hollander, Tarantola [2011], 2-3) Hungary is among the "moderate innovators", together with most of its Central and Eastern European "peers". (IUS 2010) Hungary and Poland are way below the EU27 average (0.516), Slovenia is fairly close to that, while Austria is well above. (Table 3)

Table 3: Summary Innovation Index, 2010

Austria	Hungary	Poland	Slovenia	EU27
0.591	0.327	0.278	0.487	0.516

Source: Innovation Union Scoreboard (IUS) 2010

More firms tend to be innovative in the two advanced countries (AT, SI), and the share of the so-called novel and technological innovators is also higher there. Further, a significantly higher share of small and medium-sized enterprises (SMEs) is innovative in these countries. The share of innovative firms among the large ones, however, is markedly higher in all the four countries considered. (Tables 4-5)

Table 4: The share of innovative enterprises, 2006-2008 (%)

	Austria	Hungary	Poland	Slovenia
Small enterprises (10-49 employees)	50.9	24.5	22.4	44.5
Medium-sized enterprises (50-249)	70.2	39.6	40.0	63.4
Large enterprises (250-)	86.4	67.1	66.7	89.2
Total	**56.2**	**28.9**	**27.9**	**50.3**

Source: CIS data (Eurostat)
Note: Innovation activity includes product, process, ongoing or abandoned, organisational and marketing innovations

Table 5: The share of novel innovators (product and process innovators), 2006-2008 (%)

	Austria	Hungary	Poland	Slovenia
Small enterprises (10-49 employees)	17.0	5.9	6.6	14.2
Medium-sized enterprises (50-249)	33.0	10.7	15.6	28.9
Large enterprises (250-)	56.9	30.2	35.6	58.2
Total	**21.9**	**7.8**	**9.7**	**19.2**

Source: CIS data (Eurostat)

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.

The 25 IUS indicators paint a more detailed picture for comprehensive comparisons among the four countries considered here. (Table 6)

Table 6: Innovation Union Scoreboard (IUS) indicators

	AT	HU	PL	SI	EU27
ENABLERS					
Human resources					
1.1.1 New doctorate graduates	2.0	0.7	0.9	1.3	1.4
1.1.2 Population completed tertiary education	23.5	23.9	32.8	31.6	32.3
1.1.3 Youth with upper secondary level education	86.0	84.0	91.3	89.4	78.6
Open, excellent and attractive research systems					
1.2.1 International scientific co-publications	936	328	186	750	266
1.2.2 Scientific publications among top 10% most cited	0.12	0.05	0.04	0.07	0.11
1.2.3 Non-EU doctorate students	8.47	2.95	2.27	4.64	19.45
Finance and support					
1.3.1 Public R&D expenditure	0.81	0.47	0.41	0.66	0.75
1.3.2 Venture capital	0.029	0.019	0.043	N/A	0.110
FIRM ACTIVITIES					
Firm investments					
2.1.1 Business R&D expenditure	1.94	0.66	0.18	1.20	1.25
2.1.2 Non-R&D innovation expenditure	0.47	0.74	1.25	0.79	0.71
Linkages & entrepreneurship					
2.2.1 SMEs innovating in-house	34.37	12.60	13.76	N/A	30.31
2.2.2 Innovative SMEs collaborating with others	14.71	7.15	6.40	14.24	11.16
2.2.3 Public-private co-publications	56.3	19.6	2.5	51.0	36.2
Intellectual Assets					
2.3.1 PCT patent applications	5.05	1.54	0.31	2.56	4.00
2.3.2 PCT patent applications in societal challenges	0.71	0.39	0.06	0.65	0.64
2.3.3 Community trademarks	9.56	2.03	2.82	3.80	5.41
2.3.4 Community designs	9.19	0.85	4.71	2.45	4.75
OUTPUTS					
Innovators					
3.1.1 SMEs introducing product or process innovations	39.55	16.82	17.55	31.02	34.18
3.1.2 SMEs introducing marketing/organisational innov.	42.78	20.52	18.65	39.37	39.09
Economic effects					
3.2.1 Employment in knowledge-intensive activities	14.04	12.13	8.87	12.88	13.03
3.2.2 Medium and high-tech product exports	52.30	66.43	51.06	58.45	47.36
3.2.3 Knowledge-intensive services exports	30.90	28.08	30.60	27.23	49.43
3.2.4 Sales of new to market and new to firm innovations	11.24	16.44	9.84	16.31	13.26
3.2.5 Licence and patent revenues from abroad	0.19	0.62	0.02	0.08	0.21

Source: IUS 2010
Note: For the definition of the individual indicators, and the years considered, see also IUS 2010

4. POSSIBLE EXPLANATIONS FOR THE PUZZLE

Several factors can be thought of as explaining the gap between a broad set of STI policy measures and a poor economic and innovation performance in Hungary. These are discussed below in more detail.

4.1 Co-ordination of STI policies

To be effective, STI policies need to be aligned with broader socio-economic policies, and various types of STI policies should orchestrated, too. As for the former, Section 2.1 already pointed out that there is no broad socio-economic strategy in Hungary, and thus STI policies cannot possibly be devised by taking into account these overarching issues, and cannot be established either weather STI policies contribute to achieving these broad development goals.

As for the latter, various policy tools (e.g. direct vs. indirect ones; or those pursuing science, technology or innovation objectives; or the ones aimed at more specific challenges any of these domains) might reinforce each other, or on the contrary, one might prevent the other from having the desired impact. A trivial – hypothetical – example could be that science policy tools strengthen the traditional way of academic behaviour (e.g. by favouring publications aimed at advancing science for the sake of science), while innovation policy tools try hard promoting academia-industry co-operation. When the behaviour of academic researchers are strongly influenced by funding decisions and promotions based on 'pure' science considerations, it is unlikely that intense, mutually beneficial co-operation would flourish between researchers working for publicly financed R&D units and their industrial partners. Simply, there would be a wide gap between their incentive systems, and thus goals, and ultimately their values and way of thinking.

There had been an apparently relevant governance system in place Hungary to co-ordinate STI policies. In principle, the highest-level consulting and co-ordination government body, the *Science and Technology Policy Council* (TTPK) could in principle co-ordinate various policy efforts until 2009. The Council's mandate was: to discuss preparatory documents on policy decisions submitted to the Government on STI policy issues; to co-ordinate STI policy measures; to discuss current STI policy issues and facilitate their solution. TTPK was headed by the prime minister,[11] and its members were the most influential ministers, together with the representatives of the RTDI community. However, it had been reorganised constantly since the 1990s: for several years it was headed by the prime minister, and at the end of the 1990s by a representative of the prime minister; its secretariat had also been moved around the Prime Minister's Office and other ministries. These organisational changes had clearly reflected its diminishing political clout. Moreover, it had rarely met since 1998, and this practice had not changed since its last reorganisation (2003), either: on average it met once a year. Tellingly, the last meeting was held was held in January 2006. In addition, there had been such severe conflicts among the members of the TTPK that it became impossible to reconcile the different interests even by the prime minister. (interview with the President of the Advisory Board to STPC, Népszabadság, 30 June 2006) TTPK was dissolved in March 2009. Half a year later a new high-level STI policy co-ordination body was created by a government decree (September 2009), called *Research and Science Policy Council*, in practice to replace the dissolved TTPK, with somewhat revised responsibilities. It held its first and only meeting on 17 February 2010, chaired by the prime minister. It was disbanded on 15 December 2010 by a government decree stipulating the creation of the *National Research, Innovation, and Science Policy Council*. It is chaired by the deputy prime minister, co-chaired by the president of the Hungarian Academy of Sciences, and composed of three ministers, i.e. the RTDI community is not represented any more by stakeholders.

The *Science and Technology Policy Advisory Board* was established in 2003 as an expert committee of TTPK, consisting of researchers active in the various fields of sciences and engineering. It was renamed as Science and Technology Policy and Competitiveness Advisory Board in 2005. Its mandate expired in July 2006, and has not been renewed since then.

The *Research and Technological Innovation Council* (KuTIT) could have been another important forum for policy co-ordination at a lower level. Its main responsibility was to make strategic decisions concerning the use of Research and Technological Innovation Fund: what sorts of technology policy schemes to be launched, and how much funding to be allocated to the specific schemes. It was a 15-strong body, with six members (mostly state secretaries)

[11] Except the 2000-2002 period, when TTPK was headed by a minister without portfolio.

delegated by the relevant ministries, six ones by various business associations, and three members by Hungarian Academy of Sciences, the Hungarian Rectors' Conference, and the Hungarian Association for Innovation.

The operation of KuTIT, especially until the end of 2006, had been criticised by its members, as well as major stakeholders. Interview evidence and press reports suggest that several important decisions had been 'rushed through' this body: Council members had not received sound, detailed studies informing their decisions and thus not been able to conduct thorough discussions in a number of cases.[12] One possible explanation is that both the government agency responsible for technology and innovation policies, that is, the National Office for Research and Technology (NKTH) and the Council were (re-)established in 2004, and thus NKTH was 'racing against time': had they prepared in-depth documents to inform the decision-making process – which is undoubtedly a time-consuming activity –, and had the Council rejected some of the proposals in their first versions, it would have not been possible to launch calls for project proposals in time to spend the available funds in 2004. Another factor might be a 'cultural difference', noted by a senior NKTH staff member: Council members and the NKTH seemed to have a different understanding of the role of the Council in the decision-making process, and therefore of the amount of information needed by the members to fulfil their role, too.

Without having appropriate pieces of information and relevant analyses in time, however, those members of the Council, who represent various ministries, could not possibly perform their co-ordination task between NKTH and their own organisations. Thus, policies of these government bodies affecting RTDI processes and those of the NKTH cannot possibly be concerted.

Further, no strategy on the use of the Research and Technological Fund had been approved until 2006, although this is foreseen in the legislation on the responsibilities of the Council. Such strategy was eventually devised in 2007. KuTIT was dismantled in December 2010, without setting up a new body with similar responsibilities at this important level of policy-making.

The preparation of the mid-term STI policy strategy, by its very nature, would have required a broad consensus on the main goals and instruments in order to be effective. Although some stakeholders, e.g. the 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, 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 TTPK, the highest

[12] This observation has been confirmed by the Chair of the Council, as well as by other well-informed sources who wish to remain anonymous. Several members of the Council, a former senior RTDI policy-maker and other leading figures in this field, interviewed by HVG, a top economic weekly, also highlighted a number of problems, among others the poor co-operation between the President of the National Office for Research and Technology and the Chair of the Council, as well as the lack of proper decision-making methods. As an extreme case, the proposal by NORT to launch a policy measure with a considerable budget was distributed just 10 minutes before the 2004 October Council meeting, while in principle all documents should be circulated 14 days in advance. For further examples of questionable decision-making practices and lacking preparatory information, see Gyenis [2004] and "Politikai kutatóharc", Népszabadság, 24 December 2004 (www.nol.hu). The President of the NORT denied any misconduct in Gyenis [2004], and emphasised his efforts to put the NORT in order. Yet another doubtful case was mentioned by a former senior policy-maker at a workshop on STI policies, held in January 2005: NORT staff had 1-2 months to prepare a brand new scheme on Regional Knowledge Centres at Universities; obviously, it could have not been designed and discussed in an appropriate way at such a short notice. (the minutes of the workshop are available at www.fejlesztespolitika.gov.hu)

level decision-making body in the field of STI policies, nor its Advisory Board had discussed this document prior to its approval by the government.

In sum, although most of these high-level bodies were apparently appropriate fora for efficient policy co-ordination, as well as strategic dialogues among key stakeholders, their actual operation have prevented them from fulfilling these roles. Moreover, when one of them was reorganised in December 2010, stakeholders of the RTDI community were not appointed as member, while the other one was disbanded altogether.

4.2 Policy goals: responses to identified challenges

Recent analyses of the Hungarian NIS (Havas [2006], [2007]; Havas and Nyiri [2007], OECD [2008]; Erawatch and TrendChart country reports) have identified several challenges, which can be reformulated as policy goals as follows:

- strengthen competitiveness by introducing new products, processes and organisational innovations;
- promote academia-industry relationships;
- increase business expenditures on R&D and innovation by offering appropriate incentives;
- modernise physical infrastructure for R&D;
- reverse – or at least slow down – brain drain;
- provide adequate human resources for RTDI processes.

Several STI policy schemes are explicitly aimed at supporting the development and introduction of new products (goods or services) or production processes. Further schemes facilitate academia-industry co-operation, by supporting joint development of new products and processes. 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 RTDI activities. Other measures aim at upgrading the infrastructure of publicly financed and non-profit research institutes and the R&D units of companies, as well as to provide the necessary background conditions for more intense academia-industry co-operation. Several measures are in place to tackle the challenge of human resources for RTDI activities.

The above brief overview on the objectives of the current set of STI policy tools[13] suggests that these schemes seem to address the identified challenges. Thus, no major mismatch can be found in this respect, and therefore this factor cannot be relied on as a major reason when analysing the "Hungarian paradox".

The number of STI policy schemes, however, is rather high, and thus some schemes tend to overlap. (OECD [2008], pp. 23-24) The policy mix has, therefore, been deemed insufficiently transparent and potentially inefficient by the State Audit Office. (ÁSz [2008b], pp. 43-44) The high number of schemes in itself indicates the *ad hoc* nature of policy-making: the current policy mix is rather a collection of otherwise stand-alone, isolated initiatives and actions, than a result of conscious and co-ordinated (re-)targeting of policy strategies.

4.3 Funding

Another potential explanation could be that the level of funding of the STI policy measures is inadequate. Public R&D expenditures in Hungary accounted for 0.43-0.58% of the GDP in

[13] As already mentioned, these measures are described in the detail in the joint TrendChart and ERAWATCH database: http://cordis.europa.eu/erawatch.

2001-2007,[14] and were significantly higher in several countries, indeed: Sweden (0.85-0.92), Finland (0.84-0.91), France (0.79-0.85), Austria (0.72-0.82), Germany (0.7-0.79), The Netherlands (0.64.-0.75), Denmark (0.67-0.7), and Norway (0.63-0.74). Yet, in countries with a superior innovation performance compared to Hungary,[15] this ratio is just slightly above the Hungarian level, or even below: UK (0.52-0.57), Italy (0.52-0.55), Czech Republic (0.5-0.63), Slovenia (0.42-0.0.56), Portugal (0.43-0.52), Spain (0.36-0.55), Ireland (0.28-0.41), and Greece (0.26-0.28). (Eurostat)

Moreover, as already mentioned, funding has significantly increased since 2004, for two reasons: access to the EU Structural Funds, and the introduction of the innovation levy. This increase has not been translated into better innovation performance yet, relative to EU countries.

Most likely, therefore, the level of public funding does not have a major explanatory power, either.

4.4 Allocation of available funds

One should also consider the efficiency of funding decisions (at least at the level of programmes and in an 'ideal' world, at project level, too). Evaluation of STI policy tools is not widely used practice in Hungary (see below), and thus only other types of information can be used to assess the funding mechanisms. Available data on funding decisions, officially expressed opinions of stakeholders and professional associations, as well as press reports suggest a strong need for improvement.

Applicants for KTIA grants have claimed that the appraisal reports on their project proposals are usually not made available for them.[16] It is a particularly severe concern, given the financial resources allocated via this fund (KTIA).[17] Several times unrealistically short application deadlines have been set,[18] often coupled with unacceptably long appraisal periods. On top of that, as the Hungarian Association for Innovation has pointed out at several occasions that even once a decision is made, it takes unduly long time before the contracts are signed (let alone disbursements), not least because new project documents are demanded even at this stage of the procedure.[19] The first President of NKTH had several times made his funding decisions by neglecting the recommendations of independent experts, indicated in their appraisal reports. Finally, the Research and Technological Innovation Fund (KTIA) is meant to promote primarily firms' RTDI activities (as it is largely financed by a levy paid by enterprises). Firms, however, received only 31% of the funds disbursed in 2004-2007 (that is,

[14] More recent data are also available, but as the latest innovation performance data concern the 2006-2009 period (CIS data: 2006-2008; while IUS indicators are based on 2007, 2008, or 2009 data), public spending is considered up to 2007.

[15] Only four countries are ranked consistently lower on the European Innovation Scoreboard (Innovation Union Scoreboard since 2010) than Hungary in 2003-2010: Bulgaria, Latvia, Poland, and Romania, while Lithuania and Slovakia has "alternated" their ranking relative Hungary. Portugal had been behind Hungary in-2003-2005, but has been ahead since 2006.

[16] Several press reports provide details on various cases, see, e.g. "Biosteksz", *Figyelő*, 2006, No. 18 (4 May).

[17] NKTH officials, and the annual report for 2005 claim, however, that the full appraisal report (anonymously) was made available to applicants on request. (NKTH [2006], p. 17)

[18] 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. Further examples are listed in various TrendChart reports.

[19] HVG Online, 3 February 2006; The 2006 NKTH Report briefly mentions that new, more time-efficient procedures have been implemented in order to reduce the time required to complete this process. (p. 4)

69% went to universities, publicly financed R&D institutes, and non-profit R&D units). (ÁSz [2008b], p. 15)

These facts indicate that at least a significant share of public funds has not been used effectively to achieve the STI policy goals. Besides financial losses, a further likely major implication is that these questionable funding decisions have undermined trust among the stakeholders vis-à-vis the funding mechanisms, and indirectly regarding STI policies as whole, too. Clearly, a broader set of evidence would be needed for firm conclusions – eventually leading to relevant steps to improve the allocation mechanisms.

4.5 Monitoring and evaluation practices

Monitoring and evaluation are vital policy-preparatory tools at three levels: projects, programmes and the overall policy mix. In Hungary, these tools are not used systematically in any policy domains – STI policy is not being an exception, either.

The National Office for Research and Technology (NKTH) has decided to introduce a new monitoring system, and commissioned foreign experts to devise it. A report has been produced on programme monitoring, including a pilot monitoring exercise of two programmes. (Arnold *et al*. [2007]) The new monitoring system was to be implemented following two 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. The proposed system, as well as the lessons from the pilot exercise was discussed in 2007. Yet, the new monitoring system has not been implemented according to the original plans. (ÁSz [2008b], p. 41)

Evaluation of policy measures or governance structures is still not a widely used practice in Hungary, either, especially in the case of nationally financed schemes. (ÁSz [2008b], p. 48) However, a few potentially important steps have been taken more recently.

The National Office for Research and Technology has commissioned the OECD to review the Hungarian NIS. (OECD [2008])

As for nationally funded support schemes, one of the basic principles of the Law on Research and Technological Innovation was that publicly financed STI policy measures shall regularly be evaluated by independent experts. The Government Decree no. 198/2005 specifies the precise range of measures to be evaluated ex-post. As a general rule, one-off schemes above 1bn HUF (~4m EUR) are to be evaluated within 3 years following the closure of the scheme, whereas continuous programmes (with a cumulated funding over 1bn HUF) within 2 years of the closure of the given programme cycle. For continuous programmes, irrespective of the volume, ex-post evaluation is compulsory within 4 years of the launch of its first call. Despite these stipulations, only four nationally funded STI policy schemes have been evaluated since 2006.[20]

[20] The evaluation report on the operation of the KTIA in 2004-2009 also noted these weaknesses: "Until the end of the reviewed period, NKTH performed rather poor monitoring. As a result, the Fund's programmes and projects could not provide the feedback important for programme planning or evaluating the proposals. The Fund does not use indicators to monitor the progress of its mid-term strategy, programmes or projects or to monitor direct and indirect impacts.

In the reviewed period, NKTH commissioned independent experts only occasionally with the task of evaluating the Fund's operation, and no such evaluation was directed towards the Fund's operations or the programmes as a whole. Thus, NKTH could not experience the benefits of constructive feedback. The majority of these evaluation reports were not disclosed to public.

Schemes co-funded by the EU Structural Funds, however, must be evaluated, following the EU rules (ex-ante, mid-term and ex-post evaluations).

Given this evaluation practice, the State Audit Office has stressed that several billion euros for economic and regional development purposes had been allocated without clearly defined goals, rationales for state intervention, efficient co-ordination of sectoral strategies. The impact of state intervention cannot be established due to the lack of clearly defined targets (and indicators), as well as systematic evaluation. (ÁSz [2008a])

4.6 Framework conditions for innovation

There are several 'working definitions' of framework conditions for innovation, the main difference being the breadth of this concept. The broadest understanding includes the following elements: macroeconomic situation and dynamics (especially growth prospects and access to capital); the overall entrepreneurial culture; conditions for doing business; standards and regulation; the publicly financed R&D organisations; physical infrastructure for R&D; human resources. These factors are considered below, except the last two ones.[21]

Macroeconomic performance

Elementary economics suggest that activities with long-term returns require a stable, or at least, predictable environment. Innovation and R&D are such activities: they expand in times of political, macroeconomic stability, stable finances, and reliable, sustained external assistance. Indeed, robust output growth, stable inflation, and low real interest rates are all found to be important drivers of innovation in a wide-ranging comparative analysis. (OECD [2005])

In contrast, Hungary has traditionally opted for a boom and bust policy since the 1970s, where the budget deficit soared in good times, leading to a close-to-crisis level, followed a string of austerity measures. This general tendency for instability has affected the 2000-20010 period, too: a rising budget deficit led to a harsh austerity programmes, altering taxation rules several times, and cutting government spending.

In brief, the macroeconomic environment in recent years has been unfavourable for innovation activities of firms: growth has slowed down years before the global financial and economic crisis, the domestic market is weak, government investment has fallen, and inflation has remained high. (Table 1)

Entrepreneurial culture

Survey results suggest that the share of genuine entrepreneurial businesses is rather small in Hungary. The most important motivation to set up a business is "no possibility for being employed",[22] (MVKA [2004]) while among the motives for opting for a self-employed status „a business opportunity" is ranked only fourth. (EC [2004])

A further sign indicating weakening entrepreneurial drive is the decreasing enterprise birth rate since 2001. The birth/death ratio decreased from 1.26 (2001) to 0.98 (2004). In he same period, the birth/death/ increased from 0.85 to 0.94 in the group of medium-sized firms. (KSH [2007])

The current management of NKTH (in office since September 2008) also perceived the above weaknesses and efforts have been made to improve the most important areas." (Ernst & Young and GKI, 2010a, p. 5)

[21] All these factors are dealt with in Havas and Nyiri (eds) [2007], on which this sub-section draws on.

[22] It is usually referred to as "forced entrepreneurship".

The size distribution of firms was heavily biased towards large businesses in the centrally planned economy era, but then it was changed rapidly and fundamentally by the transition process towards market economy. Now it resembles the European Economic Area (EEA) average. The share of SMEs in the Hungarian economy is fairly similar to that in the EEA (52.6% vs. 51%, respectively), while the share of medium-sized enterprises is higher (18.3% vs. 15.7%). In manufacturing, electricity, gas & water supply, transport, postal services & communication large firms dominate the market, while micro-firms (usually a single person "enterprise") are particularly active in education and health & social services.

The weight of small firms might suggest a high degree of entrepreneurship. CIS data are sobering in this respect: as already pointed out, the share of innovative Hungarian SMEs – especially that of small firms – is rather low in international comparison, and way below the share of innovative large Hungarian businesses. (Tables 4-5)

Conditions for doing business

A key factor hampering businesses to enter the market is the high level of administrative costs businesses incur at various stages of their operation. It takes just a little bit longer in Hungary to register a new company than the OECD average (16 vs. 14.9 days), but costs are around 3.5 times higher (17.7 vs. 5.1% of GNI per capita), and the capital requirement is two times higher (65.1 vs. 32.5% of GNI per capita). Closing down an operation takes double amount of resources, and 8.4 months longer compared to the OECD average. The tax system is also putting a significantly higher administrative burden on companies, and the total tax rate is notably higher than the OECD average (55.1% vs. 46.0% of profit).[23]

As for competition, OECD reviews have concluded that "Hungary has caught up with typical OECD practice in terms of competition legislation and oversight. Progress has been spurred on by entry to the European Union and policy is backed by EU legislation and institutions." (OECD [2007], p. 31) The Competition Office applies harsh penalties when cartel practices are noticed and can be proved, e.g. in the case of road construction. The government has not sheltered industry through standard protectionist measures.

The Hungarian IPR legislation is in accordance with the EU legislation and international treaties. The respective industrial property acts[24] are suitable to comply with the requirements of a market economy and offer an adequate protection for the innovators.

It seems, however, that regulation is a necessary but not sufficient condition for an intense market competition, inducing innovation. Most firms do not feel the pressure to innovate. When asked about the factors hampering innovation, financial reasons are mentioned with the highest frequency: 28.8% of innovative (and 25.5% of non-innovative) firms point to the lack of own financial resources, and 27.3% of innovative (and 28.2% of non-innovative) firms to high costs of innovation. Market conditions also play a role: "markets dominated by established enterprises" is referred to by 15.4% of innovative (and 17.6% of non-innovative) firms, while uncertain demand for innovative goods or services is mentioned by 14.0% of innovative firms, and 20.4% of non-innovative ones. (CIS 2004-2006)

Publicly financed research organisations

The number of R&D organisations has doubled since 1995, due to a significant expansion in the higher education (HE) sector, especially up to 2004, but more recently given the boost in

[23] For further data, as well as details of the methods, see http://www.doingbusiness.org/economyrankings.

[24] Act No. XXXIII of 1995 on the Protection of Inventions by Patents, Act XXXVIII of 1991 on the Protection of Utility Models, Act XI of 1997 on the Protection of Trademarks and Geographical Indications, Act No. XLVIII of 2001 on the Legal Protection of Designs

the business sector: from 226 business R&D units in 1995 to 1,307 units in 2009. The largest number of research units is still operated in the HE sector: 1,394 of the total 2,898.

The business sector became the largest employer of researchers (FTE) in 2006, and has maintained that position since then, followed by the HE and the government sector. (Table 2)

Linkages among NIS actors are of crucial relevance as 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. CIS data, however, reveal a lower intensity of innovation co-operation in Hungary than in more advanced Central European countries. (Table 7)

Table 7: Share of innovative enterprises* indicating co-operation, 2006-2008 (percentage of all innovative enterprises)

	Austria	Hungary	Poland	Slovenia
All types of co-operation	38.8	41.3	39.3	48.0
By specific co-operation partners				
Other enterprises within the enterprise group	17.0	11.8	9.4	20.2
Suppliers of equipment, materials, components, or software	21.9	27.5	31.3	41.0
Clients or customers	16.2	18.6	20.4	35.9
Competitors or other enterprises in the same sector	9.2	13.1	11.7	24.4
Consultants, commercial labs, or private R&D institutes	14.6	16.6	10.8	24.2
Higher education organisations	19.6	18.7	10.7	23.1
Government or public research institutes	7.3	6.5	9.1	16.9

Source: CIS data (Eurostat)
Notes: * Enterprises with technological innovation (product, process, ongoing or abandoned)

Qualitative evidence supports the claim that business-academia linkages [25] are weak primarily due to the mismatch in the incentive structures of these different types of players, as well as the insufficient understanding of the industry's needs in academic circles. (Arnold *et al.* [2007]) Similarly, a report by the Ministry of Economy and Transport points out that despite the relatively good performance of public research institutes (in terms of scientific output, in international comparison), there is a weak or no consideration for industrial needs in these units. Scientific excellence is still considered the first and foremost criterion for advancement in the HE and government research sector; economic relevance of research is given far less attention. Economic aspects are not considered in the management of such institutes, whereas knowledge transfer is impeded by an alarmingly low level of researcher mobility between research performing sectors. (GKM [2008], p. 43-44)

5. CONCLUDING REMARKS

The main objective of this paper has been to explore several potential factors, which can explain an intriguing puzzle observed in Hungary: there are a large number of apparently relevant policy schemes to foster RTDI activities, and yet, innovation performance is rather poor. To indicate the dimensions of this "Hungarian paradox", first the breadth of policy measures has been presented, followed by an overview of the economic and innovation performance in international comparison. Then six factors have been considered, leading to a

[25] For detailed analyses of industry-academia collaboration see, e.g. Borsi [2005b], Havas, Nyiri (eds.) [2007], Inzelt [2004], [2010]; and Inzelt *et al*. [2009].

conclusion that several of them should be combined for a plausible explanation. The most important one of these factors, however, point outside the narrowly defined STI policy domain: the framework conditions for innovations seem to play a decisive role. These conditions influence firms' innovation activities with such a power that STI policy schemes cannot offer strong enough incentives to overrule their unfavourable effects.

Innovation has not become a major policy issue in Hungary for a number of reasons. Politicians' agenda has been preoccupied with short-term macroeconomic tensions, the complex challenges of the transition process, and then joining the European Union, as well as 'burning' domestic political issues. Further, RTDI is still mainly perceived as burden on the budget, rather than part of the solution, i.e. a major input to socio-economic development. Thus, the potential – and obviously long-term – contribution of innovation to socio-economic development is not in the centre of political and policy discussions in Hungary: STI policies are eclipsed by the immediate political and economic policy goals.

The above observations, however, should not be used as an excuse for overlooking the impacts of the current practices in STI policy-making: the efficacy and efficiency of this decision-making system has also been far from satisfactory.

Combing these two major explanatory factors, there seems to be no 'panacea' or a 'simple, quick fix' to improve RTDI 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. Foresight processes would be useful to underpin these strategies, as well as orchestrate the main objectives at these different levels. These dialogues can also highlight how RTDI processes – advanced by appropriate STI policies – can contribute to overall socio-economic development. Policies affecting RTDI processes and performance need also to be orchestrated. Fundamental changes are required at the level of STI 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.

One of the above policy implications is likely to be valid in several other countries, too: devising appropriate STI policies and implementing them in an efficient and effective way might not be sufficient to improve innovation performance. Favourable framework conditions – notably a stable macroeconomic environment; endurable administrative and tax burdens on firms; market conditions conducive to innovation; a sufficient supply of skilled people for RTDI projects; appropriate regulations and standards; effective IPR policies; etc – are also needed. Thus, policies affecting these conditions should be aligned with STI policy efforts to make a difference.

To establish the validity of this proposed generalisation, comprehensive international comparative studies on the efficacy and effectiveness of STI policies are needed a) across Central and Eastern Europe (CEE) with similar political and economic history legacies, as well as b) between more advanced Western economies, with a markedly different legacy and institutional systems, and CEE countries. That systematic analysis could lead to a taxonomy of NIS and especially their policy governance sub-systems, which still missing, in spite of the increasing body of literature on NIS.

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