INNO-Policy TrendChart –

Innovation Policy Progress Report

HUNGARY

2009

European Commission
Enterprise Directorate-General

PREFACE

Innovation is a priority of all Member States and of the European Commission. Throughout Europe, hundreds of policy measures and support schemes aimed at innovation have been implemented or are under preparation. The diversity of these measures and schemes reflects the diversity of the framework conditions, cultural preferences and political priorities in the Member States.

PRO INNO Europe® is an initiative of the Directorate General Enterprise and Industry (DG ENTR) which aims to become the focal point for innovation policy analysis, learning and development in Europe, with a view to learning from the best and contributing to the development of new and better innovation policies in Europe. Run by the Innovation Policy Directorate of DG ENTR, it pursues the collection, regular updating and analysis of information on innovation policies at national and European level.

INNO-Policy TrendChart serves the 'open method of coordination' approach laid down by the Lisbon Council in March 2000. It supports policymakers and innovation support measure managers in Europe by providing summarised and concise information and statistics on innovation policies, performances and trends. It is also a European forum for benchmarking and the exchange of good practices in the area of innovation policy.

INNO-Policy TrendChart products

INNO-Policy TrendChart, previously the TrendChart on Innovation, has been running since January 2000. It currently tracks innovation policy developments in all 27 EU Member States, plus Brazil, Canada, China, Croatia, Japan, Iceland, India, Israel, Norway, Switzerland, Turkey and the US. The INNO-Policy TrendChart website ([1]) provides access to the following services and publications, as they become available:

- a database of innovation policy measures in the 39 countries;
- a news service and related innovation policy information database;
- annual policy monitoring reports for all countries covered;
- the European Innovation Progress Report, an annual synthesis report bringing together key points in the INNO-Policy TrendChart.

This document has been prepared within the framework of an initiative of the European Commission's Enterprise and Industry Directorate-General, Innovation Policy Development Unit. Official responsible: Cesar Santos (Cesar.SANTOS@ec.europa.eu).

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The report covers the period from July 2008 to June 2009.

[1] See http://www.proinno-europe.eu/index.cfm?fuseaction=page.display&topicID=52&parentID=52 online.

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Hungary had been experiencing severe structural problems for several years before the 2008 global economic crisis. Myopic economic policies have led to ever increasing macroeconomic pressures since 2001. GDP/capita in Purchasing Power Standard (PPS) has been stagnating at 62-63% of the EU 27 average since 2002. Economic growth was below the EU 27 average in 2007 and 2008, and around 6-7% contraction is forecast for 2009. Unemployment is expected to exceed 10% by the end of 2009. Hungary is heavily dependent on exports, and thus weak demand in the global markets inhibits a quick recovery.

Framework conditions have not been favourable for innovation activities. The overall business climate, macroeconomic conditions, weak demand for new products and services, and perceived high costs of innovating have hampered innovation activities. Innovation has not become an integral part of firms' strategies in large parts of the Hungarian economy.

Innovation performance, measured by the Summary Innovation Index (SII) has improved since 2004: up from 0.266 to 0.316 in 2008, but it is still trailing the EU 27 average (0.475). Business expenditure on R&D (BERD) has been growing since 2004 both in absolute and relative terms. Yet innovation survey data show a low level of innovation activities in Hungary since 2001: around one fifth of companies are innovative. RTDI activities are concentrated to large, foreign-owned firms in a few sectors. The regional distribution is also heavily skewed towards the Central Hungary region. The intensity of innovation cooperation among key national innovation system (NIS) actors is low. A significant gap might be opening between the supply and demand for qualified S&E personnel in the near future, especially at the level of PhD degree holders.

2. Main developments in public support for innovation

In April 2009 a new, crisis management government was formed, and the position of minister without portfolio responsible for RTDI (created in May 2008 as part of the then major government reshuffle) was abolished. The Minister for National Development and Economy took over these responsibilities. Available funding opportunities – thanks in particular to the EU Structural Funds – have allowed launching a number of new schemes, which seem to address the pertinent challenges.

Three of the five broad policy objectives – introduced by the TrendChart and EraWatch projects to analyse the national STI policy measures – are well supported by various schemes in Hungary, namely Research and Technologies, Human Resources (education and skills), and Promoting and sustaining the creation and growth of innovative enterprises. Organisational innovation is supported by a smaller number of schemes than the EU 27 average, i.e. the Hungarian science, technology and innovation (STI) policy mix is focusing on technological innovation. Only a few Hungarian measures can be found in the category of Governance & horizontal research and innovation policies, while particularly limited efforts are devoted to 'strategic research policies (long-term research agendas)'. Creation of new markets – as part of the fifth broad category, namely Markets and innovation culture – is not supported in Hungary.

3. Appraisal of national innovation policy

There are a broad set of apparently appropriate STI policy measures in place in Hungary, yet innovation performance is poor by international comparison. High-level decision-makers, however, do not seem to take notice of this puzzle. In general, innovation has been a non-issue for them for many years. Their agenda has been preoccupied with short-term macroeconomic tensions for several years, and the global financial crisis has further aggravated the situation. Furthermore, political issues also called for intense attention. Thus, the potential – 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 economic policy goals and political conflicts. On top of that, the STI policy decision-making system has been reorganised quite frequently (almost every year more recently). Any of these factors alone would be sufficient to hinder major improvements. Their combined effects are even more detrimental: they hamper 1) establishing a legal and economic environment that is conducive to the creation and exploitation of knowledge, 2) systematic and gradual building of a comprehensive, well-coordinated policy mix; as well as 3) developing norms and other informal rules, which are required to develop an innovation-friendly culture among the political and policymaking circles.

The quantified targets set in the major policy documents are overly ambitious: it seemed unlikely even before the current global financial and economic crisis that those can be reached. In spite of the high number of potentially relevant policy measures there is no noteworthy improvement in research, technological development and innovation (RTDI) performance. The high number of schemes in itself indicates the *ad hoc* nature of policymaking: the current policy mix is rather a collection of otherwise standalone, isolated initiatives, than a result of conscious and coordinated strategic thinking. In other words, not only do the STI and other policies need to be aligned, but also the various STI policy measures among themselves.

The STI policy design processes suffer from a major methodological shortcoming: modern decision-preparatory tools are used in a sporadic, unsystematic way, at best. Technology foresight and technology assessment are largely unexploited tools, just as policy reviews and evaluations, and systematic international comparative policy analyses to assess the impact of STI policies.

The significant delay in implementing the STI policy Action Plan, approved in August 2007 signals inefficient policy delivery. The government, therefore, had to cut the number of actions considerably, and extend the deadlines in February 2009.

In sum, both policy design and delivery processes need to be improved considerably. As for the former, the crucial step would be the regular use of the modern decision-preparatory tools. In addition, it would be beneficial to support the orchestrated introduction of technological and organisational (market, marketing, managerial, financial) innovations. That might require some amendments in the legislation underpinning public interventions, currently focusing on technological innovations – but first perhaps changes in the mindsets of policymakers. Then this policy objective could be served by modifying the existing schemes (currently fostering technological innovations) or launching one or two thoroughly designed, well-targeted new measures.

Public procurement could be consciously used to stimulate demand for new products e.g. with superior economic and environmental performance. Systematic assessments of new legislative and regulatory proposals beyond the STI policy domain, analysing their impacts on RTDI activities and performance, would also be needed.

The room for manoeuvring is rather limited in Hungary. The current government is forced to focus on short-term crisis management (until the next general elections due in spring 2010), given the strong pressures stemming from severe macroeconomic imbalances, as well as its somewhat restricted political mandate (due to its minority position in the Parliament). Moreover, the opposition, with a fairly high chance of winning a comfortable majority, has rejected several initiatives to discuss strategic issues. Therefore, the prospects for preparing and implementing a well-designed set of policies required to deal with the current challenges and create new opportunities for innovative firms look rather gloomy – at least for a year. Yet, it would be crucial to strike a balance between tackling the short-term tensions and addressing long-term issues.

1. Main trends and challenges in the National Innovation System

1.1 Recent economic trends and market developments

Hungary had been experiencing severe structural problems for several years before the 2008 global economic crisis. Myopic economic policies (e.g. government overspending and real wage growth exceeding productivity growth), followed since 2001, have led to ever increasing macroeconomic pressures. The Hungarian GDP/capita (in PPS) has been stagnating at 62-63% of the EU 27 average since 2002. Economic growth was below the EU 27 average in 2007 and 2008. Hungary has been moving in the opposite direction compared to the EU 27 with regard to several important indicators (see Exhibit 1).

Exhibit 1: Comparable indicators of economic performance

Indicator	National performance		EU 27 average	
	2004	2008	2004	2008
GDP per capita in PPS (EU 27=100)	63.1	62.9	100	100
Real GDP growth rate (% change previous year)	4.7	0.6	2.5	0.9
Labour productivity per person employed (EU 27=100)	72.0	74.4	100	100
Total employment growth (quarterly % change)	-0.7	-1.4	0.7	0.9
Inflation rate (average annual)	6.8	6.0	2.0*	3.7
Real unit labour costs (growth rate)	1.1	-0.5^	-1.4	0.5
Public balance (net borrowing/lending) as a % of GDP	-6.4	-3.4	-2.9	-2.3
General government debt as a % of GDP	59.4	73.0	62.2	61.5
Unemployment rate (as % of labour force)	6.1	7.8	9.0	7.0
Foreign direct investment intensity (market integration)	2.8	4.5^^	0.9	3.4^
Business investment as a percentage of GDP	18.9	17.3	17.2	18.5

Source: Eurostat - Structural Indicators and Long-term Indicators (http://epp.eurostat.ec.europa.eu).
Key: (*) EU25 average, (^) latest available year (for example: 2007).
^^ Note: The 2008 FDI intensity figure for Hungary is not available yet, while the 2006 and 2007 figures are distorted by capital movements of the so-called special purpose entities (SPEs). To keep comparability with EU averages, 2005 figures are reported in Exhibit 1.

The most severe problems pertain to the decelerating GDP growth rate, persistently high budget deficits, rising debts, and low employment rate (hence low tax, social security, and health insurance revenues). Hungary has not met any of the Maastricht criteria. To tackle these challenges, the government introduced austerity measures after the 2006 election. The three-year Convergence Plan comprised a detailed roadmap of reducing the budget deficit, originally including significant structural reforms. In fact, the government has had to rely basically on tax increases instead of cutting expenditures and introducing measures to enhance competitiveness as the planned reforms had to be withdrawn ([2]).

Thus, the financial and the subsequent economic crisis found the Hungarian economy in an already weakened shape and struck especially hard. Due to plummeting investor confidence, the government was forced to negotiate a short-term loan of approximately EUR 20 billion with the International Monetary Fund, the World Bank and the European Investment Bank in November 2008. The conditions of the loan entail close monitoring of Hungarian fiscal policies.

[2] The healthcare reform plan, entailing the establishment of regional insurance funds involving private capital, was abandoned because one of its measures, namely a nominal doctor's visit and hospitalisation fee, was rejected at a referendum in March 2008. The introduction of a tuition fee at state-run higher education institutes as part of the higher education reform was also abolished by the same referendum. Initiatives to overhaul the public administration system to strengthen the regional level – at the cost of the traditionally strong counties – and rationalise the fragmented system of local governments, also failed given the lack of the required two-thirds' majority in the Parliament. Tax reforms have been abandoned given the severe budget deficit.

The minority government failed to deal with the mounting challenges, therefore a new PM took office in April 2009, heading a crisis management government involving party-independent professionals in key economic positions. The new government immediately started implementing severe austerity measures, including significant cuts in social benefits. The budget deficit is expected to stay below 4% in 2009, which reflects relatively good performance in the EU 27.

In the meantime, the national currency (like most others in the region) exhibited abrupt exchange rate fluctuations, and has depreciated by 40% against the euro between August 2008 and March 2009. Due to the heavy indebtedness of Hungarian private persons and enterprises in foreign currencies (especially CHF and EUR), this has had severe economic and social consequences. The exchange rate had stabilised by June 2009.

The contraction of the economy is expected to be around 6-7% in 2009, which is significantly worse than the EU 27 forecast (4% contraction). Unemployment rate has reached its highest level since the mid-1990s, and is expected to exceed 10% by the end of 2009 (up from around 6% in 2004). The already very low employment rate (56.7% vs. 65.9% EU 27 average in 2008) is declining even further: in June 2009 the number of active population decreased by 81 000 (compared to a year earlier), bringing down the employment rate to 55.1% (KSH, 2009b). Furthermore, Hungary is a strongly export-oriented economy. The drastically declining demand in the most important export markets, most notably Germany, therefore, clearly inhibits a quick recovery.

In sum, the competitiveness of the Hungarian economy has deteriorated in recent years ([3]). High administrative and tax burdens on businesses, as well as unpredictable changes in government policies have been some of the key obstacles noted by the OECD's Review of Hungarian Innovation Policy (OECD 2008). It also pointed to a number of government initiatives aimed at improving the business environment: reducing administrative burdens and the time required to set up businesses, and modernising competition policy. Nevertheless, the OECD calls for more efforts in this area.

Framework conditions have not been favourable for innovation activities. One of the most conceivable arguments for the poor RTDI performance of Hungarian firms, in spite of the high number and apparently appropriate STI policy schemes, is that the overall business climate, macroeconomic conditions, weak demand for new products and services, and perceived high costs of innovating have hampered innovation activities. Innovation has not become an integral part of firms' strategies in large parts of the Hungarian economy.

1.1.1 The credit crisis and its effect on innovation activity

As already stressed, the global economic crisis has had severe repercussions on the Hungarian economy. However, as of June 2009, there is no clear-cut evidence of any major impact on the innovation activities of companies (consistently at a low level since innovation surveys are conducted in the country). Some more detailed, but still preliminary considerations are worth mentioning, though.

The high export-intensity of the Hungarian economy makes the country extremely vulnerable to any major dive in demand from the main trading partners. The most severe lay-offs have been witnessed by export-oriented manufacturing industries (at least 35 000), including subsidiaries of large multinational firms in the automotive, electronics, and food industries ([4]), but also in the construction sector (25 000). Services followed suit with a few months delay (19 000), including the banking sector. (KSH, 2009b) Mainly workers with lower qualifications have been dismissed: the rate of physical workers' decrease in employment figures outnumbered white-collar jobs by 4 to 1. While the number of unskilled employees decreased by 10%, the demand for those with tertiary degrees even increased slightly (KSH, 2009b). This is in line with a basic characteristic of the Hungarian economic structure: many of the important export-oriented sectors mainly conduct activities with lower knowledge content.

[3] The European Competitiveness Report 2008 deemed the Hungarian performance 'worrying' (ECR 2008,, p. 19).
[4] Press reports mention Denso, Suzuki, Ibiden; Flextronics, GE, Philips, Elcoteq, Foxconn; and SAGA, Diageo, respectively, where the most severe lay-offs have occurred since November 2008.

There is no sign of an upsurge in entrepreneurial innovation as employees who had been laid off do not have either the necessary skills and experience, or funds to create their own businesses. Though the business climate has generally improved somewhat in recent years (Section 1.1), it is still rather costly and burdensome to set up a business. Due to the high interest rates, exchange rate volatility, and abrupt changes in accessing credit, it has become much more costly and difficult to raise capital. Furthermore, the sharp decline in demand is not attractive for new entrepreneurs.

More R&D-intensive sectors, such as pharmaceuticals and biotechnology have not been hit as hard, and have therefore not reduced RTDI activities to a significant extent. For example, both Egis and Richter (two of the major pharmaceutical companies listed on the stock exchange) reported increased R&D expenditures after September 2008 (compared to a year earlier). Richter significantly expanded its biotechnology R&D unit and production base in Debrecen in this period.

The crisis management programme of the new government (approved by the Parliament on 4 May 2009) does not put much emphasis on innovation. The government is almost exclusively concerned with 'fire-fighting' such as cutting expenditures, tax reform, short-term job-protection, dealing with the repercussions of the currency crisis, retaining foreign investors' confidence, etc. (Government, 2009) However, the programme regards research and development (R&D) and innovation activities in all sectors as 'indispensable' for inducing economic growth. It also states that the aim is to move towards the Lisbon target in terms of innovation expenditures. The significance of RTDI is stressed in relation to strategic sectors, such as the automotive industry, logistics, pharmaceuticals/biotechnology and information and communications technology (ICT). For example, the programme calls for better tailoring of higher education to the requirements of the automotive industry, as well as government efforts to preserve the internationally competitive R&D capacities and retain the highly qualified workforce in this sector (Government 2009, pages 27-28). The few specific new initiatives designed to boost RTDI activities to tackle the negative effects of the crisis include the intention to speed up disbursements from the Research and Technological Innovation Fund.

A scheme had already been launched by the previous government aimed at preserving researcher jobs (HU 186). Financial support is available for SMEs and publicly financed research organisations that employ researchers who had lost their jobs in the private sector given the global crisis. No other major STI policy action has been taken as a direct reaction to the crisis.

Public procurement, lead market policies and the like have not played a major role in promoting RTDI activities, and there are no signs that noteworthy changes will occur in the near future. Public support for RTDI (conducted by the private and public sector) is more or less sheltered, as its two main sources of funding – namely, the Research and Technological Innovation Fund and the Operational Programmes of the New Hungary Development Plan (co-funded by the EU Structural Funds) are relatively – are safeguarded against short-term influences. Therefore, the key bottleneck for boosting firms' RTDI activities will unlikely be the level of public funding ([5]).

1.2 Recent trends in the national innovation performance

Hungary's overall innovation performance (proxied by the Summary Innovation Index) is well below the EU average: 0.316 vs. 0.475 (EIS 2008). Its growth rate is somewhat higher, though. Therefore, together with most of its Central and Eastern European peers, Hungary is among the 'catching up countries' within the EU.

As for Enablers, the Hungarian performance is mixed. The share of firms with access to broadband internet has been increasing by 10% annually (reaching 70% in 2007 vs. 77% EU 27 average). Both the supply of new graduates and PhDs, and the level of life-long learning (37% of EU 27 average) are low by international comparison. Public R&D expenditures (as a percentage of the GDP) have been slightly declining in recent years: 0.47% in 2007 (72% of the EU 27 average).

[5] It should be added that all ministries and relevant agencies have had to cope with significantly decreased budgets as a result of the restrictive central budget.

Concerning Firms' activities, their R&D expenditures are still low by international comparison. Despite dynamic growth since 2004 in both absolute and relative terms, BERD/GDP was 0.49% in 2007, that is, 42% of the EU 27 average. The share of innovative companies is 20.1% (CIS 2006), i.e. basically the same share as in 2004 ([6]). The ratio of non-R&D innovation expenditures was 0.72% in 2006 (vs. 1.03% in the EU 27). The share of SMEs innovating in-house was 13.2% in 2006 (44% of the EU 27 average); basically the same as in 2004. The share of innovative SMEs cooperating with others remained at 6.5%. IT expenditures continued to be high (2.5% of GDP vs 2.7% EU average), reflecting high IT prices.

Both R&D and innovation activities are heavily skewed towards large, foreign-owned companies in a few sectors, such as pharmaceuticals. (OECD 2008, KSH 2008) The share of innovative enterprises is lower than the EU 27 average in basically all sectors, but some sectors perform significantly above the national average, e.g. chemical industry (including pharmaceuticals, 47.5%), computer consultancy services (51.5%), financial intermediation (39.5%), and automotive industry (37.5%).

Two-thirds of BERD is spent in the Central Hungarian region (comprised of Budapest and the surrounding Pest county), and the share of innovative enterprises is also higher in this region: around 23% (KSH, 2009a). Using the most aggregated indicator to gauge regional innovation performance in international comparison, the Regional Innovation Index of the EIS, Central Hungary ranks 34 among the 203 EU regions – only Prague and Bratislava have a better position in the new Member States – while all the other six Hungarian regions are close to the bottom of the list.

As in previous years, Hungary shows the weakest relative performance in intellectual property (IP) indicators (EPO and Triadic patents, community designs and trademarks): a mere 7-21% of the EU 27 average in 2006. However, at least two arguments should be recalled here as to why one should interpret these figures with a pinch of salt. First, when assessing the performance of the National Innovation System (NIS) in general, one should bear in mind that a wide array of other means can be – and indeed, are – utilised by firms to protect IP, many of which are not captured by measurable or readily available indicators. Moreover, the propensity to patenting is highly varied across sectors, and hence the sectoral distribution of a national economy might heavily influence the intensity of patenting activities. Thus, a low level of patenting activities does not necessarily indicate poor innovation performance ([7]). Second, concerning specifically a 'catching-up' economy and its NIS, at this stage of development it might not be a meaningful strategy to focus on producing patentable R&D results. It seems to be more relevant to concentrate on (1) fostering the dissemination of new technologies and other forms of innovation; and (2) enhancing the learning capabilities for more efficient absorption of new methods and technologies.

As for outputs, 16.8% of SMEs introduced product or process innovations in 2006 (a slight decline since 2004), that is, 50% of the EU 27 average. The occurrence of organisational and marketing innovations among SMEs remained at 66% of the EU average.

Hungarian performance looks fairly favourable in light of the 'high-tech' indicators: employment in medium- and high-tech manufacturing was 132% of the EU average (2007), while the share of high-tech products in total exports stood at 144% of the EU 27 average (2006). Yet, a number of factors should be considered when appraising these figures. First, although these sectors are regarded as 'engines of growth', a number of theoretical and empirical analyses refute this widely held, uncritically accepted view (Hirsch-Kreinsen et al. 2005; Smith 2002, 2003; Robertson et al. 2009; von Tunzelmann and Acha 2005). Second, one should keep in mind the dominant weight of foreign-owned companies in high-tech sectors in Hungary. Third, R&D-intensive industries (or services), as classified by the OECD, are not necessarily R&D-intensive ones in all countries. Indeed, in Hungary these firms mostly conduct assembly activities. Thus, from a policy point of view, it would be a gross mistake to regard these sectors as 'technology leaders' – with all the assumed positive impacts on growth and competitiveness – in Hungary, or in other countries with similar structural characteristics.

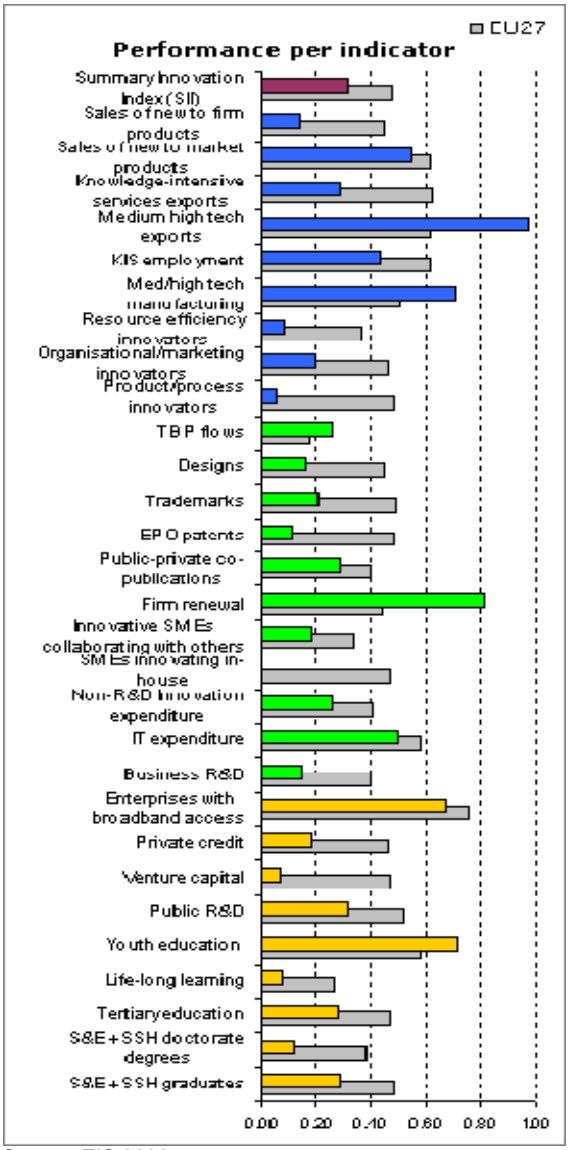
[6] Only Latvia exhibited worse performance (Eurostat).
[7] This is not to suggest that the Hungarian NIS performs satisfactorily, in spite of the picture shown in the mirror of patenting statistics.

The weight of knowledge-intensive services has also been increasing, although it is still well below the EU average. These sectors accounted for 25.6% of all services exports in 2006 (52.5% of the EU 27 average), up from 17.7% in 2004. In terms of employment in these sectors, the gap is smaller: 11.3% vs. 14.5% (2007), although the growth rate is negligible in Hungary. The share of turnover from new-to-market products has been growing since 2004 reaching 90% of the EU 27 average in 2006. On the other hand, new-to-firm sales have not increased since 2004, and are still 43% of the EU 27 average.

Exhibit 2: European Innovation Scoreboard: country pages

	2001	2002	2003	2004	2005	2006	2007	2008	Growth
SII				**0.266**	**0.273**	**0.287**	**0.305**	**0.316**	**2.9%**
ENABLERS									**1.5%**
Human resources									**0.8%**
1.1.1 S&E and SSH graduates	20.6	23.0	26.2	29.9	30.4	30.2	--		7.1%
1.2.2 S&E and SSH doctorate graduates	0.34	0.44	0.43	0.36	0.41	0.42	--		-1.1%
1.1.3 Tertiary education	13.9	14.0	15.2	16.6	17.1	17.7	18.0		4.4%
1.1.4 Life-long learning	--	--	4.5	4.0	3.9	3.8	3.6		-5.4%
1.1.5 Youth education	--	--	84.7	83.5	83.4	82.9	84.0		-0.2%
Finance and support									**2.3%**
1.2.1 Public R&D expenditures*	--	--	--	0.48	0.50	0.49	0.46		-1.1%
1.2.2 Venture capital (3-year average)	--	--	0.026	0.072	0.084	0.046	0.026		-8.3%
1.2.3 Private credit	0.33	0.35	0.42	0.46	0.51	0.55	0.62		9.9%
1.2.4 Broadband access by firms	--	--	--	--	48.0	61.0	70.0		9.9%
FIRM ACTIVITIES									**3.5%**
Firm investments									**1.9%**
2.1.1 Business R&D expenditures	0.37	0.35	0.34	0.36	0.41	0.48	0.49		9.6%
2.1.2 IT expenditures	--	--	--	2.4	2.4	2.5	--		1.0%
2.1.3 Non-R&D innovation expenditures	--	--	--	0.87	--	0.72	--		-4.5%
Linkages & entrepreneurship									**2.5%**
2.2.1 SMEs innovating in-house	--	--	--	13.2	--	13.2	--		0.1%
2.2.2 Innovative SMEs collaborating with others	--	--	--	6.6	--	6.5	--		-0.2%
2.2.3 Firm renewal (SMEs entries + exits)	7.8	7.2	7.4	8.7	--	--	--		2.7%
2.2.4 Public-private co-publications (2-year avg.)	--	9.3	10.3	10.9	14.3	16.9	--		7.7%
Throughputs									**5.9%**
2.3.1 EPO patents	9.5	11.8	12.4	15.1	7.8	--	--		-2.5%
2.3.2 Community trademarks	1.7	1.3	5.0	11.4	16.5	20.5	26.0		10.9%
2.3.3 Community designs	--	--	0.7	9.3	18.5	11.3	18.3		8.9%
2.3.4 Technology Balance of Payments flows	--	1.15	0.92	1.56	1.76	1.49	--		6.7%
OUTPUTS									**3.4%**
Innovators									**-1.1%**
3.1.1 Product/process innovators (SMEs)	--	--	--	17.6	--	16.8	--		-1.1%
3.1.2 Marketing/organisational innovators (SMEs)	--	--	--	25.3	--	26.4	--		--
3.1.3 Resource efficiency innovators									
3.1.3a Reduced labour costs	--	--	--	4.1	--	6.2	--		--
3.1.3b Reduced use of materials and energy	--	--	--	6.3	--	7.2	--		--
Economic effects									**5.3%**
3.2.1 Employment in medium-high/high-tech manuf.	8.73	8.47	8.27	8.31	8.19	8.46	8.82		1.6%
3.2.2 Employment in knowledge-intensive services	10.08	10.15	10.73	10.93	11.16	11.34	11.35		1.4%
3.2.3 Medium/high-tech manufacturing exports	--	65.9	68.9	71.0	68.5	69.3	--		1.2%
3.2.4 Knowledge-intensive services exports	--	--	--	17.7	22.7	25.6	--		9.6%
3.2.5 New-to-market sales	--	--	--	4.2	--	7.8	--		17.0%
3.2.6 New-to-firm sales	--	--	--	2.5	--	2.7	--		1.9%

* Public R&D expenditures are defined by EIS as the sum of R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD), that is, not the same as publicly financed GERD.



Source: EIS 2008.

1.3 Identified Challenges

The very low overall level of innovation activities of firms is the most severe challenge of the Hungarian NIS, especially those of domestic small and medium-sized enterprises (SMEs). Several European Innovation Scoreboard (EIS) indicators underpin this observation, namely the share of innovative firms, innovation expenditures, sales of new-to-firm products, share of product and process innovators (Exhibit 2). Despite the dynamic growth in BERD in recent years, the BERD/GDP ratio is still only 0.49% (42% of the EU average), which is not only way below the Barcelona target, but also the government's own target of 0.9% of GDP to be reached by 2013 (according to the mid-term STI policy strategy). A number of supposedly medium high-tech and high-tech sectors (e.g. automotive and electronics) are conducting activities with low knowledge content. RTD and Innovation (RTDI) activities are concentrated around large, foreign-owned firms in a few sectors. The pharmaceuticals industry accounted for 45.6% of R&D expenditures in the manufacturing sector in 2007. (KSH 2008) ([8]) Practically five to six large – mainly foreign-owned – companies account for around 30% of total Hungarian BERD. As already stressed, RTDI activities are concentrated in regional terms as well, with a high share of RTDI activities conducted in Central Hungary.

[8] The pharmaceutical industry's share in BERD was even higher in previous years.

A significant part of the economy, therefore, performs hardly any RTDI activities. It remains to be seen whether firms seriously affected by the global economic crisis will pursue more innovation-based strategies, or continue to regard innovation as too costly an activity and unfeasible when struggling for day-to-day survival.

Innovation processes draw on different types of knowledge and skills, often possessed by various types of actors. The cooperation of these players is, therefore, indispensable for successful exploitation of knowledge. At an aggregate level, the frequency of innovation cooperation reported by Hungarian firms is higher than the EU 27 average (39% vs. 25% in CIS 2006). Yet only 6.1% of innovative firms reported any form of cooperation with Hungarian 'government or public research institutes'. Figures in this category are low in most countries. Yet, two factors should be considered. First, the intensity of this type of cooperation has constantly declined since 2001, as revealed by the consecutive rounds of innovation surveys: 8.6% (1999-2001), 6.4% (2002-04), and 6.1% (2004-06). Second, the weight of the public research institutes is very high in Hungary: this sector accounted for 24.2% of BERD in 2007, while the EU 27 average was 13.2% (Eurostat). Thus, the low intensity of cooperation in this category is certainly a challenge. A promising sign is, however, that the number of public-private co-publications per million inhabitants has increased from 9.3 in 2002 to 16.9 in 2006.

A recent OECD review has put emphasis on this issue among its recommendations. 'A major challenge is to establish better links and networks involving enterprises and regional clusters using current policy initiatives (e.g. competence centres, regional knowledge centres, etc.), while at the same time ensuring the quality of basic research. To achieve this goal, the reform of public research institutions should be accelerated, and they should be offered more performance-based incentives. At present, such incentives are weak' (OECD 2008, page 210).

The challenge of strengthening links among the elements of the Hungarian NIS pertains to both indigenous SMEs ([9]) and large, mostly foreign-owned companies. As for the latter, the OECD review stresses the importance of embedding multinational enterprises (MNEs) into the regional innovation systems. A key obstacle here is that public research 'strongholds' often do not coincide with the location of FDI. Furthermore, while cluster-based policies 'have the potential to better embed MNEs into the various regional innovation systems, the integration of indigenous SMEs into these clusters is generally rather weak. Here, the volume and intensity of cooperation and the efficiency of cluster management need to be improved' (OECD 2008, page 209).

The human resources indicators for the Hungarian NIS are particularly unfavourable: a significant gap might be opening between the supply and demand for qualified science and engineering (S&E) personnel in the near future. The share of S&E and Social Science & Humanities (SSH) doctoral graduates in the 25-34-year age bracket stands at 38% of the EU 27 average (0.42% vs. 1.11% in 2006), whereas the share of S&E and SSH graduates in the 20-29 age group is 75% of the EU 27 average (EIS 2008). Even though the trend shows modest improvement, the number of PhD degree holders is forecast to be insufficient in the medium run for maintaining the quality of the Hungarian research system. (Tamás et al. 2005). Furthermore, brain drain seems to be an important challenge: it is primarily the highly qualified young workers, especially those with S&E degrees that are overrepresented within the group of Hungarians working abroad (Csanádi et al. 2008).

Finally, it is worth noting that the quality of human resources cannot be narrowed down to the number of S&E students and PhDs. Education and skills are vital more generally, and Hungary does not perform well in this area, either. For example, despite the fact that youth attainment level has consistently been above the EU average, and that the share of population with tertiary degrees is catching up persistently, participation in life-long learning has been decreasing even in absolute terms (from 4.5% in 2003 to 3.6% in 2007). It represents 37% of the EU 27 average in the 25-64-year age group.

[9] The share of innovative SMEs cooperating with others has dropped from 72% to 69% of the EU 27 average between 2004 and 2006 (EIS 2008).

The most recent National Lisbon Reform Programme (October 2008) addresses several of the above issues, reiterating the (numerical) targets of the mid-term STI policy strategy. (Section 2.1) A number of priorities, identified in the 2008 NRP, are relevant to the challenges discussed above:

- The reform of the STI system (including governance) and especially the Hungarian Academy of Sciences (e.g. asset management, introduction of a new performance evaluation system, development of research infrastructure, etc.),
- Promoting firms' RTDI activities (mainly by fostering market-oriented RTDI via the various schemes of the Economic Development Operational Programme, and the National Technology Programme'),
- Enhancing academia-industry cooperation (in the fields of RTDI and education),
- Creating and promoting so-called development poles, as defined in the mid-term STI policy strategy with the aim of reducing regional disparities. This objective has a strong focus on regional innovative clusters (NRP 2008).

The 2008 NRP does not discuss the challenge of human resources, and the objectives listed in the document do not seem to reflect any clear hierarchy or structure of priorities. In brief, a number of apparently relevant challenges are addressed in the 2008 NRP (as well as some other STI policy documents). The Lisbon Appraisal Report (2009) concludes, however, that Hungarian NRPs cannot be regarded as strategic planning documents, but are rather perceived and performed as bureaucratic exercises: reporting to the European Commission. This is not specific to Hungary, as pointed out by the most recent Lisbon Expert Group report (LEG 2009).

Exhibit 3: Main innovation policy challenges

Description of challenge	Relevant indicators and trends
1. Weak RTDI performance of firms; few innovative indigenous SMEs. The low intensity of innovation activities in the Hungarian economy has been identified as a key challenge in a number of analytical reports and policy documents. (Government 2007; Havas 2007; NRP 2008; OECD 2008)	• One-fifth of enterprises are innovative in Hungary, with no major change since 2002 • Only 16.8% of SMEs introduced product or process innovations in 2006, that is, 50% of the EU 27 average; a slight decline since 2004 • The occurrence of organisational and marketing innovations among SMEs remained at 66% of the EU average • New-to-firm sales are at 43% of the EU 27 average; no increase since 2004; while the share of turnover from new-to-market products has increased to 90% of the EU 27 average in 2006 • BERD/GDP is 42% of the EU 27 average, but increasing since 2004
2. Low occurrence of cooperation in innovation activities among key actors. Different types of knowledge and skills are required for successful innovation processes, and thus those players who possess these assets should cooperate. Yet, the intensity of innovation cooperation between innovative firms and public research institutes is low in Hungary. Furthermore, MNEs are not sufficiently embedded in the Hungarian NIS.	• The frequency of innovation cooperation among firms with more than 10 employees is higher than the EU average (39% vs. 25%), but the share of innovative companies co-operating with government research institutes has declined to 6.1% (6.4 in CIS4 and 8.6 in CIS3) • The share of large innovative companies cooperating with suppliers is one of the lowest among the EU countries (39%)
3. Potential gaps in the quantity and quality of human resources for R&D and innovation The future of R&D and innovation activities is predetermined by the quality and quantity of scientists and engineers, and the level of skills more generally. Yet, both the share of S&E graduates and the rate of participation in life-long learning are rather low in international comparison.	• The share of S&E and SSH doctoral graduates in the 25-34-year age bracket is 38% of the EU 27 average (0.42‰ vs. 1.11‰ in 2006) • The share of S&E and SSH graduates in the 20-29 age group is 75% of the EU 27 average (2006); modest improvement since 2004 • Youth attainment level is above the EU 27 average (84% vs. 78.1% in 2007), and the share of population with tertiary degrees is catching up (18% vs. 23% EU 27 average in 2007) • Participation in life-long learning had been low and further decreased (from 4.5% in 2003 to 3.6% in 2007), standing at 37% of the EU 27 average in the 25-64-year age group

As for prospects, the economic crisis might be seen as an opportunity by those firms that can switch to innovation-oriented survival strategies – entering new markets, introducing new products, processes and services – instead of continue the prevailing practices, that is, avoiding/minimising innovation and especially R&D activities as those are luxury items (NESTA 2009). Government policies, in principle, can assist in developing these new strategies in various ways: strengthening firms' R&D and innovation capabilities; supporting their efforts to align overall business and innovations strategies; improving framework conditions for innovation; and – to a limited extent and/ or indirectly – boosting demand for new products and services (e.g. by setting technical, safety and environmental standards/ regulations; via public procurement; and supporting awareness raising campaigns for innovative solutions). In other words, besides providing direct funding for RTDI activities, governments may have an important role to play in creating more favourable business climate, introducing better regulation, and improving access to capital for certain types of firms, e.g. for innovation-based start-ups.

These general considerations are valid for the Hungarian case – but the room for manoeuvring is rather limited. There are a relatively large number of apparently appropriate STI policy schemes, and yet, firms' innovation performance is poor in international comparison. That suggests that 1) there is no 'silver bullet': it is not possible to perform a miracle just by introducing one or two – currently missing – STI policy measures; and 2) the framework conditions for innovation are likely to hamper the expected impacts of the existing STI policy schemes. Furthermore, the current government is forced to focus on short-term crisis management (until the next general elections due in spring 2010), given the strong pressures stemming from severe macroeconomic imbalances, as well as its somewhat restricted political mandate (due to its minority position in the parliament). Moreover, the opposition, with a fairly high chance of winning a comfortable majority, has rejected several initiatives to discuss strategic issues. Therefore, the prospects for preparing and implementing a complex set of policies required to address the current challenges and open up new avenues for innovative firms look rather gloomy – at least for a year.

2. Public Support to Innovation

2.1 Main objectives for innovation policy

The most recent STI policy strategy of the government and its Action Plan were approved in March and August 2007, respectively. The main objective of the 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.' (Government 2007, page 10) The STI Policy Strategy defines mid-term (2007-13) targets, as well as a longer-term vision. Explicitly referring to the Barcelona target, this document sets the following mid-term goals: 'Total R&D expenditure in the function of available budgetary sources should possibly reach 1.4% of GDP in 2010, then 1.8% of GDP in 2013. In the interest of a more favourable R&D source structure it is a goal that every forint from the budget turned to R&D should attract at least one forint of corporate expenditure. Corporate R&D expenditure within total R&D expenditure should reach 45% in 2010, and 50% in 2013' (Government 2007, page 10). The STI policy strategy sets out visions or 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 that are considered competitive on the global markets.

The document determines several breakthrough opportunities for the Hungarian R&D sector. First, 'key technology areas' are identified, such as info-communication technologies; life sciences and biotechnology; materials science and nanotechnology; technologies of renewable energy resources; environmental technologies. Second, these S&T opportunities are supposed to be translated into economic success in 'knowledge-based industries': IT and electronics, engineering and vehicle manufacturing, pharmaceuticals, chemicals, food processing, and innovative services. Furthermore, besides Budapest (the dominant location of the domestic RTDI activities), six so-called 'development poles' have been defined with specific priority fields of science and sectors of industry.

The Strategy also defined a number of quantified targets, to be reached by 2010 and 2013, respectively. These included:

- Hungary's Summary Innovation Index should reach the EU average by 2013,
- Sales of new-to-market products (as a percentage of all turnover) should reach 5% by 2010 and 6.0% by 2013,
- EPO patents per million people should reach 24 by 2010 and 28 by 2013 (i.e. 20.5% of the EU average in 2005),
- GERD/GDP should reach 1.4% by 2010 and 1.8% in 2013, and BERD/GERD should reach 45% by 2010 and 50% by 2013 – i.e. BERD/GDP should reach 0.9% by 2013,
- The share of science and engineering graduates in the 20-29 age group should reach 5.5% by 2010 and 6.0% by 2013 (Government 2007, pages 9-10).

The STI policy strategy was complemented by an Action Plan in August 2007. It listed some 100 specific actions to be taken by various organisations or bodies. The deadlines and the responsible organisations were clearly stated in the document; and the source of funding is also given (where relevant) but without specifying the amount. A wide range of law amendments, organisational and other changes were initiated for a more efficient system of innovation governance and financing, for a more favourable economic environment, or for coordinating policy tools. The vast majority of these

actions were supposed to be taken 2008. The responsible bodies in most cases were the (then) Ministry of Economy and Transport, the Ministry of Education and Culture, the NKTH, and the Hungarian Academy of Sciences, depending on the task to be performed. The proposed actions were structured around the five prioritised areas of the mid-term STI Policy Strategy (see above), and the particular actions made explicit references to the Strategy.

However, due to a period of government crises, permanent reorganisation of the governance system and economic pressures (and the consequent lack of commitment), only a few of the intended steps had been taken by the stipulated deadlines. The government, therefore, revised the STI policy Action Plan in February 2009, listing all actions necessary to implement the mid-term STI policy strategy (2007-13). The revised Action Plan consists of much fewer actions, with slightly or significantly extended deadlines. This clearly indicates that the implementation of the plan had been behind the original schedule.

The most recent version of the National Lisbon Action Programme (NRP 2008) reiterates the targets set in the mid-term STI policy strategy, and directly responds to the recommendations by the European Commission. In its annual updates, the document lists the recommendations of the Commission by specific IGs, and mentions a number of measures addressing the given challenge. No new measures or strategic approaches are set out in the 2008 NRP. The Hungarian Association of Innovation (MISZ) argues that the document does not contain sufficiently operational and accountable targets. Hence, it is difficult to monitor its implementation (MISZ 2008).

The New Hungary Development Plan (NHDP 2007-13) is the framework document for allocating the financial resources provided by the EU Structural Funds and the national contributions. (Government 2006) In total, EUR 22.4 billion is available for Hungary to facilitate 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. To this end, it initiates measures in the following six areas: economy, transportation, social renewal, energy and environment, regional development and state reform. Within the first priority (Economic Development), a group of schemes aims at 'creating an innovative, knowledge-based economy' by 'supporting market-oriented R&D activities; promoting the innovation activities and cooperation 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 group of the planned actions is aimed at 'Developing human resources necessary for research and development and innovation'.

The Economic Development Operational Programme (EDOP 2007) defines how the financial resources provided by the EU Structural Funds will be allocated in order to improve 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' (page 2), and thus contribute to economic development. The RTDI priority of the EDOP aims at:

- promoting the demand for R&D results by solving the most crucial utilisation problem: promotion of marketing of research results that contributes to better pay-off of the corporate R&D expenditures,
- developing R&D supply by providing the necessary human resources and the infrastructural background of R&D,
- increasing the effectiveness of the research and innovation market by developing a network of bridging organisations, technology parks and incubators as well as technology transfer offices,
- achieving a more effective utilisation of research results through enhanced cooperation between different domestic and foreign actors,
- improving the access to financial resources.

The funds allocated for the 'R&D and innovation for competitiveness' priority amount to almost EUR 822 million (to be supplemented by 15% national contribution), roughly one third of the total EUR 2.44

billion budget of EDOP. Based on the above priorities, the biannual action plans of the various OPs detail the timetable and the financial allocations of the specific measures under the respective OP.

Exhibit 4: Main innovation policy documents

- Mid-term Science, Technology and Innovation Policy Strategy of the Government and its Action Plan (Government 2007; Action plan revised in 2009)
- New Hungary Development Plan (Government 2006)
- Economic Development Operational Programme (and its RTDI priority, EDOP 2007)
- National Reform Programme for Growth and Employment 2005-08 and its most recent updated version: National Action Programme for Growth and Employment 2008-10 (NRP 2008)

2.2 Innovation governance system

2.2.1 Governmental bodies

The Education and Science Committee, together with the Economic and Informatics Committee of the Parliament are the highest-level political bodies in the field of STI policy. Recognising the strategic importance and cross-sectoral nature of STI policies, a sub-committee of the Education and Science Committee of the Parliament, called the Science and Innovation Policy ad hoc Committee, was established in August 2007.

A new STI policymaking structure was launched in March 2009. A government decree abolished the Science and Technology Policy Council (STPC or TTPK, in practice defunct since January 2006) and created three new bodies: the Hungarian Innovation Forum, the Hungarian Innovation Council, and the Research and Development Supporting Scheme Coordination Inter-ministerial Workgroup, as advisory and coordinating bodies working for the Minister without portfolio for RTDI, involving a wide range of interest organisations and stakeholders. However, as of June 2009, the first two of these bodies only exist on paper ([10]). The government decree has not yet been put into practice, and members have not been appointed (or delegated), as the resolution went into effect only a few days prior to the PM's resignation. The new crisis management cabinet has not followed up these tasks, and thus these STI non-existing policymaking bodies cannot fulfil their intended tasks.

In April 2009 a new government was formed (headed by a new PM) and the position of minister without portfolio responsible for RTDI (created in May 2008 as part of the previous major government reshuffle) was abolished. The Minister for National Development and Economy took over these responsibilities, including the supervision of the National Office for Research and Technology (Section 2.2.2). One of the departments of the Ministry is responsible for the 'knowledge economy' ([11]). The Ministry of Education and Culture is responsible for the entire education system, including higher education and doctoral training.

The Research and Technological Innovation Council (KUTIT) oversees the use of the Research and Technological Innovation Fund (the main national source for funding technology and innovation policy schemes). The Council is a 15-strong body, with six members delegated by the relevant ministries (mostly state secretaries), six by various business associations and three other representatives of the RTDI community. The KUTIT approves both individual measures and medium-term programming strategies pertaining to the use of the Fund.

[10] The third one, i.e. the Research and Development Supporting Scheme Coordination Inter-ministerial Workgroup has been set up, and produced a 'Map of the available R&D supporting scheme 2009-10'. Government officials also claim that thanks to this new body public funds supporting RTDI activities are used in a more coordinated way.

[11] This department has devised action plans for two sectors, namely automotive industries and logistics by June 2009. These action plans were published on 8 October 2009, and did not launch any new innovation policy measure. Further action plans are also to be developed – e.g. for pharmaceuticals and biotechnology, as well as for information and communication technologies – later in 2009.

The Hungarian Academy of Sciences (MTA) is not a policymaking body per se, yet it is an important player in influencing STI policies. The MTA is a legal entity, a public body having self-governing rights. It has a high degree of autonomy in scientific and financial matters. Its main task is to develop, promote and represent science. The MTA gives its expert opinion to the parliament or the government upon request, supervises ethical norms in science, and publishes scientific journals. The Academy has the right to establish and operate research institutes, libraries, archives, information services, etc. The president of the MTA has to report on the Academy's activities and on the general conditions of science in Hungary to the government (every year) and to the parliament (every other year). The amended Law regulating the status of the MTA was approved by Parliament in early 2009.

Due to the centralised nature of the Hungarian polity, regional organisations do not play a major role in devising innovation policies. However, in line with EU requirements regarding planning units at the regional level, seven so-called Regional Development Councils have been set up, with some tasks in innovation policymaking at the regional level (mainly via the Regional Operational Programmes of the New Hungary Development Plan, 2007-13).

No new advisory/ monitoring bodies have been set up as a direct consequence of the global financial crisis, dealing with innovation policy.

Besides policymaking bodies, a number of interest organisations are also active in the innovation policy governance system. The most important one is the Hungarian Innovation Association (MISZ), established in 1990. It is an interest group of companies, universities, research institutes, foundations, and professional associations with more than 600 members. Its activities are focused on raising awareness for innovation and giving opinions on government strategies and policies. It also delegates a member to the Research and Technological Innovation Council, thus has a say in policymaking processes.

Other important players include the Hungarian Rectors' Conference, the Hungarian Association of IT Companies, Hungarian Association of Spin-off Companies, Hungarian Biotechnology Association, etc.

2.2.2 Main bodies managing implementation of policies

At the operational level, the National Office for Research and Technology (NKTH) is responsible for devising technology and innovation policy schemes, for managing international cooperation in these fields, and supervising the network of Hungarian science and technology attaches. The Office submits its strategic proposals to the Research and Technological Innovation Council (Section 2.2.1), and implements the Council's decisions. The status and autonomy, as well as the supervision of the NKTH have been changing frequently since 2004. Currently it is supervised by the Minister for National Development and Economy ([12]).

The National Development Agency (NDA, or NFÜ in Hungarian) is responsible for developing the Hungarian National Development Plans, including RTDI priorities. The NFÜ is assigned to carry out medium- and long-term development and planning activities, and to prepare and implement strategic plans and operational programmes in order to exploit the EU financial support. Until May 2008, the NFÜ was supervised by the Minister of Local Government and Regional Development, since then by the Minister of National Development and Economy.

The Hungarian Economic Development Centre (MAG Zrt.) is charged with the operational tasks of administering most of the NKTH's schemes as well as the measures launched under the aegis of the Economic Development Operational Programme (New Hungary Development Plan, 2007-13).

The Hungarian Patent Office is a government agency responsible for IPR issues. It operates a scheme, VIVACE, aimed at fostering SMEs' IPR activities. The Office is supervised on behalf of the Government by the Minister of Justice and Law Enforcement since 16 April 2009.

[12] The NKTH was originally supervised by the Minister of Education (2004-06). Following government reshuffles, responsible ministers were as follows: Minister of Economy and Transport (2006-08), Minister without portfolio for RTDI (2008-09), Minister for National Development and Economy (since April 2009).

As noted above, the Hungarian Academy of Sciences operates its own network of research institutes and administers several smaller schemes and scholarship programmes. Other organisations also administer funding schemes (e.g. research grants, researcher mobility), most notably the Office of the National Scientific Research Fund (OTKA). It operates independently, but its budget is included in the annual budget of the Hungarian Academy of Sciences.

There are a number of relevant bodies responsible for implementation at the regional level, too. The Regional Development Agencies are the operational bodies of the Regional Development Councils. The so-called Regional Innovation Agencies, established in all seven NUTS-2 regions – and funded by an NKTH scheme – operate relatively small regional innovation promotion schemes.

2.3 Public funding to innovation

2.3.1 Review of the current range of support measures for innovation

Policy measures are categorised under five headings according to their objectives in the ProInno TrendChart and Cordis EraWatch joint database of policy measures. Hungarian innovation policy measures are reviewed here, following these headings (data underpinning this review are presented in Figures 1-6 appearing in the Annex of this report).

Governance & horizontal research and innovation policies: These objectives are supported only by a small number of measures in Hungary; their frequency is below the EU 27 average. The difference is four-fold in the '1.2.1 Strategic research policies (long-term research agendas)' category (4% vs. 16%).

Research and Technologies: The highest number of Hungarian STI policy measures belongs to this group. Moreover, most measures have several objectives, and hence often fall under 2-3 of these categories. For instance, significant schemes falling under 'Research and Technologies' often aim at intensifying researcher mobility and PhD training as well, and thus could also be classified under the 'Human Resources (education and skills)' heading.

The most frequent type of public support to innovation in Hungary has been direct grants to business sector R&D, appearing almost twice more frequently than the EU 27 average (27% vs. 15%). Most of these measures do not differentiate between R&D and innovation, although in several cases the eligibility criteria stipulate that, for instance, at least 50% of eligible costs must be related to applied R&D or experimental development. Research infrastructures are supported by every fifth Hungarian measure (vs. 8% EU 27 average). Very often R&D cooperation is mandatory and is therefore an important secondary objective of measures. As a result, this objective is the second most frequently appearing one (27%). In the EU 27, this is the most common objective: 27% of all measures in the database.

Human Resources (education and skills): Mobility of researchers is supported by a high number of schemes: every fifth measure has it as declared objective. Thus, the occurrence of such measures is more than twice the EU 27 average. The recruitment of skilled personnel and researchers in enterprises, as well as the stimulation of PhDs are also supported by a relatively large number of measures, either as a primary or a secondary objective. In most cases, however, available funding is relatively small, and thus these measures are not among the important ones in terms of annual budgets.

Promoting and sustaining the creation and growth of innovative enterprises: Innovative start-ups have been supported by a relatively large number of measures by grants, loans, and equity guarantees. The number of measures promoting technology transfer between firms both domestically and internationally has increased since 2007, with the launch of the Economic Development Operational

Programme (2007-13). There has been no measure devoted to innovation in services. The support to organisational innovation and to risk capital is also less frequent than the EU 27 average.

Markets and innovation culture: These objectives are rarely supported in Hungary, but the frequency of this type of measures is not much higher in the EU 27, either.

As already mentioned, the major policy documents, notably the mid-term STI policy strategy, have identified several 'key technology areas': info-communication technologies; life sciences and biotechnology; materials science and nanotechnology; technologies of renewable energy resources; environmental technologies. These S&T opportunities are to be translated into economic success by 'knowledge-based industries': IT and electronics industry, engineering and vehicle manufacturing, pharmaceuticals, chemicals, food processing and innovative services. (Government 2007) Accordingly, the targeted areas are of various schemes are ICT, environment and energy technologies, nanosciences and biotechnology. There have been schemes dedicated to a single technology, e.g. the 'Mobile Communications R&D and Innovation Centre' measure (HU 92). It is more frequent, however, that a larger scheme supports several technologies or sectors via its sub-programmes. For example, the National Technology Programme (HU 155) defines the prioritised areas every year, when the new call is launched. In 2009, these included: Life sciences, Competitive Industry, Competitive Agriculture and food industry, Liveable and Sustainable Environment, Security and safety research.

Several schemes under the Economic Development Operational Programme (2007-13) indicate that special preference is given to – usually broadly defined – fields of strategic importance for the competitiveness of the Hungarian economy: medical sciences, pharmaceuticals, chemicals, biotechnology, agricultural sciences, energy research, transport, electronics, control systems, waste management, environmental protection, waste water treatment, environmental safety, IT hardware, database management, digital systems, IT programming, telecommunications, material technologies, nanotechnology, etc.

As noted above, most measures simultaneously support a wide range of RTDI activities from basic research to development/prototype creation. Therefore, all categories for 'aspects of innovation process targeted by measures' are more frequent in Hungary than in the EU, with the exception of awareness raising and the improvement of the regulatory environment.

As for funding sources, a slightly smaller share of schemes is co-funded by the Structural Funds in Hungary than in the EU 27 (25% vs. 28%). The EU's share, however, is much higher when we consider the volume of funds (instead of the number of schemes). In 2009, around EUR 350 million is available from the various Operational Programmes of the New Hungary Development Plan ([13]), i.e. roughly 54% of the total competitive public funding for RTDI ([14]). The other major source is the (national) Research and Technological Innovation Fund (roughly EUR 250 million in 2009).

As in the EU, the overwhelming majority of funding (over 70% in terms of the number of measures) is provided via competitive grants. Total competitive public funding has increased significantly in recent years (EUR 400 million in 2007), mainly as a result of increased support from the above two sources. Other domestic funding sources account for a minor proportion of public funding. Among these, various ministries finance mission-oriented research (partly through their own research institutes; around EUR 20 million in 2007). The National Scientific Research Fund (OTKA) provides competitive, 'bottom-up' grants for basic research (around EUR 20 million in 2008). These have stagnated in recent years, as has core funding to the higher education sector and the Hungarian Academy of Sciences.

[13] The Economic Development Operational Programme's (EDOP) Priority 1 (called 'R&D and innovation for competitiveness') provides some EUR 967 million over the seven-year programming period (2007-13). In 2009, approximately EUR 250 million will be available via the EDOP, the bulk of which is to foster private sector RTDI activities. The relevant schemes within Social Infrastructure and the Social Renewal OPs, in turn, are primarily targeted at large public research infrastructures and collaborative research, including basic research.

[14] The share of EU funding is slightly smaller, of course, namely 45.9% as 15% of the total public funds offered should be financed by national sources.

For a number of reasons, it would be misleading to rank the different policy goals on the basis of their budgetary weight:

- The breakdown of funds by policy priority is based on the 'principal priority' attributed to each measure. However, as noted above, most measures have several objectives, and the 'second' or 'third' objectives are as important as the 'principal' one. Available data on financial allocations does not capture this complexity.
- Tax incentives and other indirect forms of support (like guarantees) do not appear at all, as we do not have reliable figures on the magnitude of indirect support.
- The funds shown in the fact sheet do not include important elements, such as block grants for the public research sector (a large chunk of public RTDI funding), whereas some of the large measures included are funding general business development as well, besides RTDI activities.

Keeping these important caveats in mind, significant amounts of funds are allocated to '4.2.3 Support to technology transfer between firms' (22.4% of total public funding) and '4.3.1 Support to innovative start-ups including gazelles' (20.6%) in Hungary (Factsheet data). Technology transfer has indeed been an important objective addressed by the Economic Development Operational Programme. For example, measures aimed at fostering the technological upgrading of domestic SMEs (HU 114) and innovation activities, including technology transfer (HU 117) each provide roughly EUR 60-65 million per year, thus account for the bulk of the amount shown in the Factsheet. As for the second category, it is almost entirely accounted for by the New Hungary Enterprise Promotion Loan, which is difficult to compare with schemes providing grants. Furthermore, though the prioritised beneficiary group of this credit programme is innovative SMEs and start-ups, the range of eligible companies is much wider, and figures indicating the share of innovative companies receiving funding are not available.

The third largest amount (12.6%) goes to '2.1.4 Research Infrastructures'. The single largest scheme within this category (HU 177) provided EUR 160 million in 2008 for upgrading the research (and education) infrastructures of HEIs. Meanwhile, R&D cooperation (2.2.3) has long been a major issue addressed by many STI policy measures, as reflected in both the number of relevant schemes and the fact that roughly 9% of funding has the primary objective to foster cooperative RTDI activities. However, the importance of this issue is even higher, since cooperation is a secondary objective (and/or a mandatory requirement) of several other measures.

Cluster policies (8.3% of funds) and support to innovation management and advisory services (8.1%) have become more significant in recent years, especially with large schemes within the Economic Development Operational Programme providing significant sums for these purposes since 2007 (e.g. HU 185, HU 118).

As for the target groups of the support measures, almost half of the Hungarian policy schemes aim at the higher education sector specifically, or HEIs are among the eligible applicants – just as in the EU. The government research institutes come as a close second (45% vs. 33% EU 27 average). In fact, the publicly financed research institutes were the most important beneficiaries of the Research and Technological Innovation Fund during the first years of the Funds operation, despite the stipulation that this source of funding should primarily target the private sector RTDI ([15]). A gradual shift is occurring: companies have become the largest beneficiary group by 2007, as originally intended (NKTH 2006 and 2007, OECD 2008). Companies in general and SMEs in particular are slightly less frequent among the target groups of STI schemes than the EU 27 average, whereas individual scientists, technology centres and non-profit bridging organisations are more common beneficiaries.

Finally it must be stressed that the volume of funding allocated to a specific scheme does not necessarily reflect its importance, e.g. in terms of potential impact on RTDI performance. Certain measures, while providing little or no direct funding, potentially might have significant weight within the policy mix. Including this type of measures as well, the following innovation policy initiatives can be highlighted as the most important ones in Hungary:

[15] Contrary to the stipulations of the Law on the Research and Technological Innovation Fund, in 2004-07 69% of funds were disbursed to publicly financed or non-profit organisations, which was widely criticised, e.g. by the State Audit Office (ASZ 2008, p. 15).

- Research and Technological Innovation Fund (HU 86): As noted above, it is the main national source for funding RTDI activities. This mechanism is a novel instrument to foster private sector RTDI, used only in a few countries. It is financed by the so-called innovation levy (contributions paid in by medium-sized and large companies), and a matching fund from the central budget. This measure fosters private sector RTDI in two ways: 1) indirectly, as companies' R&D expenditures (spent on in-house R&D activities or on projects commissioned from public research institutes or universities) are deductible from the levy; and 2) directly, since the fund is the major source for funding national technology and innovation policy measures. There have not been (publicly available) studies analysing the impact of this funding mechanism, and thus it is not possible to establish whether it is the appropriate instrument to achieve the objectives.

- Law on Research and Technological Innovation (Act CXXXIV of 2004) (HU 95): This measure is a cornerstone of legislation, sets out the legal framework for a large number of STI policy measures. This Law has established the basic principles of state support for business R&D and technological innovation activities without distorting market competition. It has defined several important concepts for the first time (e.g. spin-offs, types of R&D etc.) in a legal document, identified the areas for government intervention, and outlined the main mechanisms and means (i.e. competitive grants via the Research and Technological Innovation Fund) to achieve the STI policy goals. It has also included important stipulations regarding the evaluation of support measures, and the need to devise a mid-term STI policy strategy.

- Academia-industry cooperation: Strengthening collaborative RTDI activities between firms, universities and public research institutes has been one of the most prominent objectives of Hungarian STI policy mix, served by several schemes, most notably the 'Cooperative Research Centres' (HU 152 and HU 171) and the 'Regional Knowledge Centres at Universities' (HU 159). A new scheme, called 'Developing and strengthening R&D centres' (HU 178) is a follow-up action on these measures, as it builds on their achievements and provides support to independent legal entities (business enterprises) founded by those HEIs and PROs, which had previously established Cooperative Research Centres or Regional Knowledge Centres. These shall provide RTDI services to firms, and are expected to play an active role in the development of new products, and to facilitate researcher mobility, etc.

- 200% of R&D expenditures deductible (HU 84): This is an indirect support measure, providing tax breaks for companies undertaking R&D activities. Firms can deduct 200% of their R&D expenditures from their taxable income. A 300% tax allowance is applicable from 2004 if a company lab is located at the site of a university or a public research institute. A large number of companies take advantage of this measure, but more detailed data or evaluation reports are not publicly available on its impacts.

- Innovative SMEs: Boosting RTDI activities of SMEs is also significant objective of the STI policy mix. Several schemes within the Economic Competitiveness Operational Programme of the first National Development Plan (2004-06) were aimed at improving absorptive and innovation capabilities of SMEs, fostering academia-industry cooperation with the participation of SMEs, setting up innovative, technology-based micro firms, as well as commercialising R&D results by establishing spin-off companies. In the Economic Development Operational Programme of the New Hungary Development Plan (2007-13) these efforts are continued via a modified scheme, Supporting the innovation activities of firms (HU 117). This measure provides roughly EUR 60 million per year to stimulate successful SMEs to increase and intensify their RTDI activities (especially experimental development), and thus improve their competitiveness.

- A closely related measure is INNOCSEKK (Innovation voucher) (HU 96). Despite the relatively small amount of public funding involved (altogether EUR 68 million in 2006-11), this scheme has been highly popular. The regional orientation of the scheme is also of importance, given the weak linkages within the regional innovation systems in Hungary. Available resources in the first call had been used well ahead of schedule, and the number of applicants, as well as

the amounts applied for far exceeded available funds (five-fold in 2006). Based on these facts, feedback from beneficiaries and other stakeholders, the OECD Review of Hungarian Innovation Policy recommended the continuation of this measure. A new, slightly modified version of the scheme was launched in 2008.

2.3.2 New or modified support measures

- National Technology Programme (HU 155). This measure supports application-oriented R&D projects that apply cross-disciplinary technological solutions in order to improve quality of life and promote long-term economic development and competitiveness. It is a continuation of a scheme running since 2000 under various names. Since then, several new priorities have been defined. The most recent call of this scheme, published in February 2009, invites project proposals in the following fields (sub-programmes): Life sciences; Competitive Industry; Competitive Agriculture and Food Industry; Liveable and Sustainable Environment; Security and Safety Research.

- Development and strengthening of research and development centres (HU 178). This scheme is a follow-up action of earlier schemes, which created the so-called Cooperative Research Centres (KKK) and Regional Knowledge Centres at Universities (RET). It aims to strengthen business enterprises established as a reorganisation of the R&D centres funded by the earlier schemes. It is expected that these enterprises will be able to provide high-quality RTDI services to the business sector. Furthermore, intensified cooperation with the business sector is also among the objectives, as well as the promotion of education activities (especially exchange of researchers, mobility and joint PhD training), and the development of economically exploitable innovative products, services and technologies.

- Support to market-oriented R&D activities (HU 180). The objective of this scheme is to support R&D projects that build on research results and are expected to develop prototypes or even marketable products, services or processes representing high added value. The measure aims to foster the feedback from business demand towards R&D and strengthen technology transfer by stimulating cooperation, especially between publicly financed R&D organisations and businesses.

- Support to accredited innovation clusters (HU 185). This scheme supports the joint projects of innovative companies cooperating within the so-called 'pole programme'. The main objective is to encourage joint innovation activities and generate projects (product and technology development) and the market introduction of the results. The basis of joint technological development shall be independent project-firms owned jointly by several members of the given cluster. The target group of this measure are the so-called accredited clusters, which have gone through a selection and accreditation process and have thus become entitled to apply for specifically dedicated schemes, such as this one.

- Developing and retaining R&D workforce (HU 186). The measure provides funding for projects which employ researchers and engineers whose jobs at medium-sized and large industrial enterprises had been lost as a direct consequence of the global financial and economic crisis. Projects to be funded must entail the full-time employment of these researchers and engineers in R&D positions at SMEs, publicly financed or non-profit R&D organisations.

- Strengthening R&D capacities of firms (HU 187). The main objective of this measure is to foster R&D activities leading to results that can be commercialised. This scheme, therefore, is aimed at strengthening the R&D capacities of firms by supporting the establishment and expansion of new research units, fostering R&D-intensive investments and the creation of R&D jobs.

- Mobility (HU 188). This scheme, co-financed by National Office for Research and Technology, the Hungarian Scientific Research Fund and EU Seventh Framework Programme (Marie Curie actions), promotes the scientific careers of experienced researchers with PhD degree or

at least four years of full-time employment as researchers by supporting their mobility and gaining international experience, as well as promoting the Hungarian exploitation of experience acquired in third countries by supporting researchers returning to Hungary. The call is published under three priorities – outgoing mobility, incoming mobility and reintegration – for researchers carrying out basic, industrial or applied research in the fields of technical-, natural-, life- and social sciences. As to which of the three priorities are open may change annually.

Exhibit 5: New Innovation Policy Support Measures (July 2008 – June 2009)

IPM No	Title	Innovation policy framework category	Organisation responsible*
HU 155	National Technology Programme	2.3.1 Direct support of business R&D 2.2.3 R&D cooperation 3.1.2 Relation between teaching and research	NKTH, MAG
HU 178	Development and strengthening of research and development centres	2.2.2 Knowledge Transfer 2.2.3 R&D cooperation 2.1.1 Policy measures concerning excellence, relevance and management of research in Universities 2.1.2 Public Research Organisations	NFÜ, MAG
HU 180	Support to market-oriented R&D activities	2.3.1 Direct support of business R&D 2.2.2 Knowledge Transfer 2.2.3 R&D cooperation	NFÜ, MAG
HU 185	Support to accredited innovation clusters	1.3.1 Cluster framework policies 2.2.3 R&D cooperation 2.3.1 Direct support of business R&D	NFÜ, MAG
HU 186	Developing and retaining R&D workforce	3.3.2 Recruitment of skilled personnel in enterprises	NKTH
HU 187	Strengthening R&D capacities of firms	2.3.1 Direct support of business R&D 2.1.4 Research Infrastructures 3.3.2 Recruitment of skilled personnel in enterprises	NFÜ, MAG
HU 188	Mobility	3.1.3 Stimulation of PhDs 3.2.3 Mobility of researchers	OTKA, NKTH

* Abbreviations: NKTH: National Office for Research and Technology; NFÜ: National Development Agency; MAG: Hungarian Economic Development Centre; OTKA: Hungarian Scientific Research Fund.

2.3.3 Strengths and weaknesses in the innovation policy support system

Following the categories introduced by the ProInno TrendChart and Cordis EraWatch projects to analyse the national STI policy measures captured in the joint database, one can conclude that three of these five broad policy objectives are well supported by various schemes in Hungary, namely Research and Technologies; Human Resources (education and skills); and Promoting and sustaining the creation and growth of innovative enterprises. As for the latter policy goals, using a more detailed categorisation, it should be highlighted that organisational innovation is supported by a smaller number of schemes than the EU 27 average (2% vs. 7%; TrendChart-ERAWATCH database of support measures). It indicates that the Hungarian STI policy mix is focusing on technological innovation. Both common sense and a vast body of literature on innovation processes suggest that technological and organisational innovations mutually support each other, and thus their simultaneous, well-orchestrated introduction is of a crucial economic importance. (Dosi et al. 1998, 2004; Tidd *et al*. 1997) The lack of this type of measures in Hungary, therefore, can be seen as a weakness, which might be addressed by modifying the existing schemes or launching a carefully designed, well-targeted new measure.

A more pronounced difference vis-à-vis the practice of the other EU member states is that only a few Hungarian measures can be found in the category of Governance & horizontal research and innovation policies, especially 'slim' efforts devoted to 'strategic research policies (long-term research agendas)'. This type of efforts would be highly beneficial to underpin the STI policy mix as a whole, as well as individual policy measures.

Finally, creation of new markets – as part of the fifth broad category, namely Markets and innovation culture – is not supported in Hungary. Given the size and the level of techno-economic development of the country it might be too ambitious a goal to introduce groundbreaking technological solutions and create markets for them by public funding. What would be more relevant and useful is, however, to use public procurement for boosting demand for new products e.g. with better economic and environmental performance, and also to introduce systematic assessments of new legislative and regulatory proposals beyond the STI policy domain, analysing their impacts on RTDI activities and performance.

3. Innovation policy and competitiveness: an appraisal

3.1 The ability of policy to address challenges

National innovation policies set priorities based on perceived challenges which are often are motivated by international agreements and commitments, such as the Lisbon agenda. Therefore national policies act and react in a complex set of overall policy priorities and commitments. Building on the analysis in previous chapters, this section investigates how well national innovation policies identify and respond to systemic challenges, which may or may not be common in other EU Member States or even other countries outside EU.

Section 1 of this report has identified three major challenges based on the analysis of long-term macroeconomic indicators, the set of EIS indicators, available information on the impacts of the recent international economic crisis, the relevant EU and Hungarian policy documents, as well as various reports and analyses. To recall these challenges:

- weak RTDI performance of Hungarian firms, and a particularly low share of innovative firms among indigenous SMEs,
- low occurrence of cooperation in innovation activities among key actors,
- potential gaps in the quantity and quality of human resources for R&D and innovation.

The main objectives of Hungarian innovation policies, as they are announced in key policy documents (Section 2.1), are clearly stated, and most of them correspond to the above challenges. For example, major policy goals include improving the national innovation system (driven by quality, performance, exploitation and efficiency); exploiting S&T results; establishing a legal and economic environment stimulating the creation and utilisation of knowledge; and improving the competitiveness of indigenous businesses. However, some of these objectives are rather difficult to operationalise, i.e. to translate them into actual measures. Moreover, high-level decision-makers have devoted little attention to STI policies since the early 1990s (if not longer), given the severe and permanent macroeconomic tensions. On top of that, the STI policy decision-making system has been reorganised quite frequently (almost every year more recently) ([16]). Either the lack of political attention or frequent organisational changes alone would be sufficient to hinder major improvements. Their combined effects are even more detrimental: they undermine 1) establishing a legal and economic environment that is conducive to the creation and exploitation of knowledge; 2) building of a complex policy mix systematically and gradually; as well as 3) developing norms and other informal rules required to develop an innovation-friendly culture among the political and policymaking circles.

The overall, long-term strategic objective mentioned in the 2008 National Reform Programme is that Hungary should 'catch up to EU member states ranked average by establishing a knowledge-based economy – with the help of products and services representing high added value and marketable on the global market – and for the Hungarian Summary Innovation Index (SII) used to measure implementation to reach the EU average by 2013' (page 39). A number of detailed quantitative targets are also set in the Government's mid-term STI policy strategy (presented in Section 2.1) and then reiterated in the 2008 NRP. All these goals seem to be overly optimistic: independent analysts had expressed serious doubts concerning the feasibility of these targets even before the global financial crisis (OECD 2008).

Monitoring data regarding the RTDI schemes of the New Hungary Development Plan suggest that, in general, these programmes are popular and there is a demand for these funds. Thus, these measures seem to respond to businesses' needs. An important exception is the scheme called 'Support to innovation activities of firms', where less than 50% of the earmarked funds had been committed, possibly due to the too high a minimum grant size.

[16] For details, see the current and previous TrendChart country reports.

A simple exercise – contrasting the declared objectives of the STI policy schemes with the challenges identified in Section 1.3 – also suggests that the Hungarian innovation support measures address the major innovation policy challenges to a large extent. The first challenge involves the largest number of Hungarian policy measures promoting innovation to strengthen firms' RTDI activities by direct grants to business the sector R&D – appearing almost twice more frequently than the EU 27 average (27% vs. 15%). It also invovles indirect tools. Furthermore, at least for the last five years there have been a number of measures specifically designed to assist SMEs in strengthening their absorptive and innovation capabilities, as well as to foster start-ups and spin-offs ([17]).

As for the second challenge, RTDI cooperation has been supported by several dedicated measures over the years, and a number of other schemes have also made it mandatory (as an eligibility criterion for funding). Hence, this objective is the second most frequently appearing one (27%) among the policy objectives ([18]).

An ex-ante evaluation of the Economic Development Operational Programme (2007-13, including its priority addressing RTDI) confirms the above assessment. It concludes that the OP and its specific schemes address relevant challenges. The schemes, however, are still somewhat biased towards R&D-based innovation and are less geared towards improving the innovative (adaptive) capacities of domestic SMEs. In other words, more emphasis on new-to-firm innovations would be needed, instead of promoting cutting edge technological R&D. This observation is also in line with the more general finding of the current report: the Hungarian STI policy mix allocates a lot of weight to technological innovation, while almost neglecting organisational innovation (Section 2.3) ([19]).

In some cases the evaluation report calls for more differentiation within the target group (e.g. tailoring policy tools to the needs of SMEs vs. large companies). Finally, it points out that there might be a danger of subsidising applicants who would implement the projects anyway, while not providing sufficient support and incentives to less innovative companies. In this case the overall innovation performance of the Hungarian business sector would not improve significantly.

The third challenge cannot be tackled by usual policy measures alone. A 'desirable' ratio of S&E students cannot be achieved in the short-run by simple policy actions, that is, by mechanistically – and forcefully – increasing the number of enrolled students at relevant faculties. First, as a basic precondition, S&E education can only be built on high quality primary and secondary education. Second, S&E careers must become attractive for young talents. Thus, both a much wider policy perspective and a longer time-horizon are needed to deal with this complex challenge.

Concerning human resources more generally, mobility of researchers is supported by one fifth of the Hungarian STI policy measures (as a primary or secondary objective). Furthermore, a relatively large number of measures are aimed at fostering the recruitment of skilled personnel and researchers by enterprises, taking up PhD courses or financing R&D projects for post-doctorates.

Moving one level up in the 'hierarchy' of policy objectives, an obvious weakness of the Hungarian STI policy mix is that only a few measures can be found in the category of Governance & horizontal research and innovation policies. In particular, not much attention is paid to 'strategic research policies (long-term research agendas)'. Without these types of analyses and strategic dialogues it is extremely difficult to arrive at an appropriate STI policy mix, as well as to underpin individual policy measures. Two important exceptions should be emphasised, however. A recent scheme supports National Technology Platforms to devise strategic R&D plans in their respective S&T fields (HU 176), while the National Office for Research and Technology launched a strategy-building process in 2008 to underpin policy proposals aimed at developing the R&D infrastructure ([20]).

[17] The history of measures supporting technology-based micro firms goes back even further, more than 10 years.
[18] The same level of occurrence can be observed for the EU 27: 27% of all measures in the joint TrendChart EraWatch database.
[19] It stems from the relevant legislation: both Act XC of 2003 on Research and Technological Innovation Fund and Act CXXXIV of 2004 on Research and Development and Technological Innovation emphasise the role of policies aimed at supporting technological innovation.
[20] Its Hungarian acronym is NEKIFUT (Take-off), derived from Nemzeti Kutatási Infrastruktúra Felmérés és Útiterv (National Research Infrastructure Survey and Roadmap).

Finally, creation of new markets – as part of the fifth broad category of policy objectives, namely Markets and innovation culture – is not supported in Hungary. No doubt, one should interpret this fact carefully, taking into account the size and the level of techno-economic development of the country. Hence, it would be a mistake to urge Hungarian policymakers to use public funding for fostering groundbreaking technological solutions and creating new markets for them from scratch. It would be worth considering, though, how to use public procurement for stimulating demand for new products e.g. with superior economic and environmental performance. Furthermore, systematic assessments of new legislative and regulatory proposals beyond the STI policy domain, analysing their impacts on RTDI activities and performance, might prove to be useful.

3.2 Effectiveness of policy design and delivery

The complex nature of the identified challenges would require a systemic approach: conscious and focussed efforts to co-ordinate the policies of various government departments – beyond the ones dealing with STI policies –, whose measures affect RTDI processes. Yet, an overarching socio-economic strategy is still absent, and thus STI policy tools simply cannot be devised taking into account these non-existing broader objectives. Public funds are, therefore, spent without this fundamental strategic guidance, which is likely to lead to efficiency losses. Furthermore, the constant reorganisations of the STI governance system do not facilitate a stable policy environment, and hence organisational learning, accumulation of policy design skills, and developing negotiation skills by gaining experience in policy dialogues are hampered. These observations are corroborated by a recent report by the State Audit Office, appraising the use of the Research and Technological Innovation Fund (ASZ 2008), as well as by the OECD review of Hungarian STI policies: 'excessive instability is a serious obstacle to institutional learning and to the adoption of an evidence-based approach to STI policy making in Hungary' (OECD 2008, page 15).

Interviews conducted with high-level public servants in the second half of 2008 confirm that policy coordination is a major issue, and suggest there are some misalignments and cultural differences between government bodies charged with STI policymaking. (Havas 2008) The perception of problems and views on the efficacy and efficiency of coordination processes reflect the positions of respondents. A high-ranking official claimed that STI policymakers had not been given a role in horizontal coordination of the Lisbon strategies in spite of their repeated efforts. They are only called in when something has to be explained to the EC (e.g. the poor Hungarian performance concerning the 3% target, slow progress compared to the previous NRP, etc.). In contrast, another government official argued that the National Reform Programmes (or generally the Lisbon goals) on one hand, and STI policies on the other, had been coordinated at a national level until a certain ministry had been in charge of both compiling the NRPs and overseeing a large chunk of STI policies (via the minister overseeing the government agency responsible for technology and innovation policies). When a new minister without portfolio was appointed in May 2008 to coordinate science and R&D policies, this ministry lost it former coordination power. No new coordination channels and mechanisms were devised and utilised between the two ministers at the time of the interview or several months later, when the position of the minister without portfolio was abolished in May 2009. Respondents also admitted tensions and inefficient communications between government bodies dealing with STI policies – a long-established, well-known feature of the Hungarian STI policy governance system.

Following a series of reorganisations of the governance system (performed rather frequently since the late 1990s), a new STI policymaking structure was launched in March 2009 in a government decree ([21]). Yet, while the previous coordinating bodies ceased to exist with immediate effect, none of the envisaged new ones had been established as a crisis management cabinet took office in May 2009, and had not followed up these tasks since then. Hence, these new, non-existing STI policymaking bodies cannot fulfil their intended coordination tasks. It is simply impossible, therefore, to judge at this stage whether there is a clear division of labour and responsibilities in the innovation governance system. Similarly, one cannot assess if this division of labour is functional and appropriate.

[21] For the details of these planned organisational changes, consult Section 2.2.

As a consequence of inefficient coordination and policy design, the number of STI policy schemes seems be too high, and thus some schemes tend to overlap. The policy mix has also been deemed insufficiently transparent and potentially inefficient by the State Audit Office. (ASZ 2008, pages 43-44) The high number of schemes in itself indicates the *ad hoc* nature of policymaking: the current policy mix is rather a collection of otherwise standalone, isolated measures than a result of conscious strategic thinking. In other words, not only the STI and other policy schemes need to be aligned, but also the various STI policy measures among themselves. The recent OECD Review has also called for action to reduce the apparent overlaps by streamlining the policy mix, making it more transparent and better coordinated, and recommended to avoid the proliferation of instruments in the future (OECD 2008).

Overlapping STI policy schemes entail high costs for companies when they search for relevant support schemes and devise their project proposals. Furthermore, the activities of implementation agencies also become unnecessarily complicated, and decision-making processes are too long, cumbersome, and insufficiently transparent (see also Section 3.2.2).

Previous TrendChart country reports have consistently emphasised a major methodological shortcoming of the STI policy design process in Hungary: the sporadic, unsystematic use of modern decision-preparatory tools, at best. Technology foresight and technology assessment are largely unexploited tools, as are policy reviews and evaluations ([22]) and systematic international comparative policy analyses to assess the impact of STI policies. These observations are corroborated by detailed analyses of these weaknesses in the recent OECD review, and concomitant strong recommendations to introduce participatory strategy-making and priority-setting processes, systematic policy evaluation and evidence-based policymaking practices. (OECD 2008).

Recalling several features of the Hungarian NIS, it can be argued that inefficient policy implementation is a major challenge. There are a large number of – apparently – relevant STI policy measures and yet, RTDI performance is rather poor by international comparison (as shown by several EIS indicators). The level of public funding does not seem to be a major factor explaining the unsatisfactory RTDI performance. First, the level of public funding for R&D in Hungary (0.43% in 2007) is not particularly low in international comparison (EU 27: 0.6% in 2006) ([23]). Second, funding (in absolute terms) has significantly increased since 2004, for two reasons: gaining access to the EU Structural Funds, and the introduction of the Research and Technological Innovation Fund. Framework conditions for innovations are undoubtedly unfavourable, but independent experts also point to various aspects of inefficiency in policy implementation: 'The difficulties encountered for optimal implementation of STI policy are partly related to the lack of commitment and stability. If the level of policy attention is low and organisations and institutions undergo frequent changes, implementation is likely to suffer. However, additional factors also limit the efficiency of the policy system:

- Scarce capacity at both the national and regional levels to implement a rather large number of programmes.
- Delayed decisions and tardy provision of promised public funding often make planning of projects by R&D performers, notably business enterprises, very difficult' (OECD 2008, page 15) ([24]).

Another strong signal of inefficient policy delivery is the significant delay in implementing the STI policy Action Plan, approved in August 2007. It listed some 100 specific actions to be taken by various organisations or bodies. The vast majority of these actions were supposed to be taken in 2008. Yet, only a few of the intended steps had been implemented by the stipulated deadlines. The government, therefore, revised the STI policy Action Plan in February 2009: It cut the number of actions considerably and extended the deadlines (in some cases only slightly, while in others significantly).

[22] Schemes co-financed by the EU Structural Fund must be evaluated externally. In most cases, however, only ex-ante and mid-term evaluation are available. As for national schemes (primarily financed by the Research and Technological Innovation Fund), external evaluations of individual schemes are rare, and the policy mix is still yet to be evaluated.
[23] Bear in mind that the Hungarian GDP per capita was around 63% of the EU 27 average since 2003.
[24] The previous TrendChart country report also present several examples of these types of weaknesses.

As for the distribution of responsibilities, national agencies continue playing a dominant role in delivering innovation policies, while the regional agencies have an auxiliary role. There has been no significant change in terms of the level of staffing, or the creation of think tank or analytical units to support policy implementation.

3.3 Impact of public support for innovation

Impacts of innovation policies on macroeconomic indicators take time to realise, often decades. However, it is important to address the issue of effectiveness of policies and analyse whether there are visible impacts due to national policies or other factors. Besides STI polices, many other factors also affect innovation processes and performance: a set of external economic forces epitomised by the global financial crisis, such as level of techno-economic development of a country, economic structure (sectoral composition, ownership and size/structure of firms), measures and instruments applied in other policy domains. Innovation policies, in brief, interact with favourable/adverse national or international socioeconomic environments that set often limits to how far STI policies can reach.

A comprehensive analysis, therefore, should aim at analysing 1) the links between the various polices affecting economic and innovation performance; 2) the impacts of these policies in both their respective domains and across; 3) interrelationships between innovation and economic performance (both at micro and macro levels). Clearly, this report cannot offer such a complex treatise of these issues. These links are always indirect, complex, and occur with considerable delays. We have neither a proven and operational general theory, nor readily available studies analysing the impacts of STI policies on economic performance ([25]). Furthermore, the lack of evaluation reports prevents analysts and policymakers from establishing whether public resources are spent effectively and efficiently to foster RTDI activities and improve innovation performance.

Given these limitations, this sub-section can only juxtapose the expected impacts of the Hungarian STI policy measures, on the hand, and available data on economic and innovation performance. As already detailed in Section 1 (as well as in previous TrendChart country reports), all the major economic indicators have worsened in recent years: real GDP growth rate slowed down already in 2007-08, and contraction is forecast for 2009; Hungary does not catch up with the EU 27 (GDP per capita in PPS slightly declined from 63.1% of the EU 27 average in 2004 to 62.9% in 2008); the budget deficit has been persistently high; general government debt has been rising; employment rate has remained low, and tax, social security, and health insurance revenues are not sufficient to cover public services. One can safely state that STI policies have not caused these macroeconomic tensions. A more relevant policy question points to the future: to what extent could a more appropriate STI policy mix and a more efficient implementation contribute to improve economic performance?

Turning to various aspects of STI performance, the largest number of Hungarian innovation policy measures aim at strengthening firms' RTDI activities through direct grants to the business sector R&D (with specific schemes targeting various types of SMEs), and through indirect tools as well. Yet, performance has stagnated or even worsened:

- one-fifth of enterprises are innovative in Hungary (CIS 2006) with no major change since 2001,
- only 16.8% of SMEs introduced product or process innovations in 2006, representing a slight decline since 2004,
- New-to-firm sales are at 43% of the EU 27 average, stagnating since 2004.

The only exception is an input indicator: BERD has been increasing both in absolute and relative terms since 2004 – but from such a low level that BERD/GDP is still only at 42% of the EU 27 average. Again, neither evaluations, nor other studies are available on which basis one could establish to what extent the large number of apparently relevant policy measures contributed to this

[25] Until recently researchers have not had access to data needed for basic econometric analyses on R&D and innovation activities of firms on the one hand, and their economic performance on the other. Thanks to a new legislation, this type of work is now possible, and an ongoing project, performed by the Institute of Economics, HAS, is aimed at that type of analysis.

development. It would especially important to have at least a good approximation concerning the weight of direct vs. indirect measures leading to this increase.

RTDI cooperation has also been supported by several measures, that is, the second most frequently appearing one among the policy objectives. Performance is slightly better in this respect, but still not re-assuring. The frequency of innovation cooperation among firms with more than 10 employees is higher than the EU average, but the share of innovative companies co-operating with government research institutes has constantly declined since 2001 ([26]). The share of large innovative companies cooperating with suppliers is one of the lowest among the EU countries (39%). Available assessments of individual measures – Pazmany (HU 87) and the Asboth (HU 133) Programmes – also suggest that the situation has not changed considerably. (Arnold et al. 2007) Number of public-private co-authored publications. The number of public-private co-publications ([27]) per million inhabitants has increased from 9.3 in 2002 to 16.9 in 2006. Several measures provide incentives for pursuing research careers, and more generally to enhance the competence level of the Hungarian workforce. EIS indicators show mixed performance:

- The share of S&E and SSH graduates in the 20-29 age group increased in 2001-04 and then practically stagnated,
- The share of S&E and SSH doctoral graduates in the 25-34-year age bracket increased by 2002, and has stagnated since then,
- Participation in life-long learning had been low and further decreased by 2007 (Exhibit 2).

Finally, it should be stressed that most indicators used as evidence in the EIS 2008 stem from the CIS 2006, and thus developments since 2006 cannot be traced. From a different angle, measures introduced since 2003-04 ([28]) cannot be assessed at all with this method.

3.4 Conclusions: possible future actions and opportunities for innovation policy

There are a broad set of apparently appropriate STI policy measures in place in Hungary, and yet, innovation performance is poor in international comparison. High-level decision-makers, however, do not seem to take notice of this puzzle. In general, innovation has been a non-issue for them for many years. Their agenda has long been preoccupied with short-term macroeconomic tensions, and the global financial crisis has further aggravated the situation. Furthermore, political issues also called for intense attention. Thus, the potential cotribution and obviously long-term contribution of innovation to socioeconomic development is not in the centre of political and policy discussions in Hungary: STI policies are eclipsed by the immediate economic policy goals and political conflicts.

This observation, however, should not be used as an excuse for overlooking the impacts of the current practices in STI policymaking: the efficacy and efficiency of this decision-making system has also been far from satisfactory. Both policy design and delivery processes need to be improved. The quantified STI policy targets are overly ambitious: it seemed unlikely even before the current global financial and economic crisis that those goals can be reached by 2010-13. Furthermore, reasons behind the apparent mismatch between the high number of potentially relevant policy measures and the lack of a noteworthy improvement in the RTDI performance need to be explored, and then the policy mix could be revised (OECD 2008). Systematic use of modern decision-preparatory tools – i.e. regular external evaluations, technology foresight and technology assessment, etc. – could also contribute to significantly more appropriate policy design processes.

The current legislation underpinning public interventions is focusing on technological innovations while more attention would be needed to support the orchestrated introduction of technological and

[26] See Section 1.3 for details.
[27] Public-private co-publications are defined as all research-related papers – i.e. research articles, research reviews, notes and letters – published in the Web of Science database (EIS 2008).
[28] Of course, this is an arbitrarily set date, assuming that at least 2-3 years are needed to have any impact. As already underlined, it might take 5-10 years too.

organisational (market, marketing, managerial, financial) innovations. This amended policy rationale could be served by modifying the existing schemes (predominantly fostering technological innovations) or launching a small number of thoroughly designed, well-targeted new measures.

Public procurement could be consciously used to stimulate demand for new products e.g. with superior economic and environmental performance. Furthermore, systematic assessments of new legislative and regulatory proposals beyond the STI policy domain, analysing their impacts on RTDI activities and performance, might prove to be useful.

The global financial crisis has fundamentally changed the economic environment for innovation. The concomitant structural changes might open new avenues for those firms that can devise and implement innovation-based business strategies. In general, government policies can assist firms in various ways: by supporting their efforts to align overall business and innovations strategies; strengthening their RTDI capabilities; improving framework conditions for innovation; and – to a limited extent and/or indirectly – boosting demand for new products and services. In other words, besides providing direct funding for RTDI activities, governments may play an important role by creating a more favourable business climate, introducing better regulation, and improving access to capital for certain types of firms, e.g. for innovation-based start-ups.

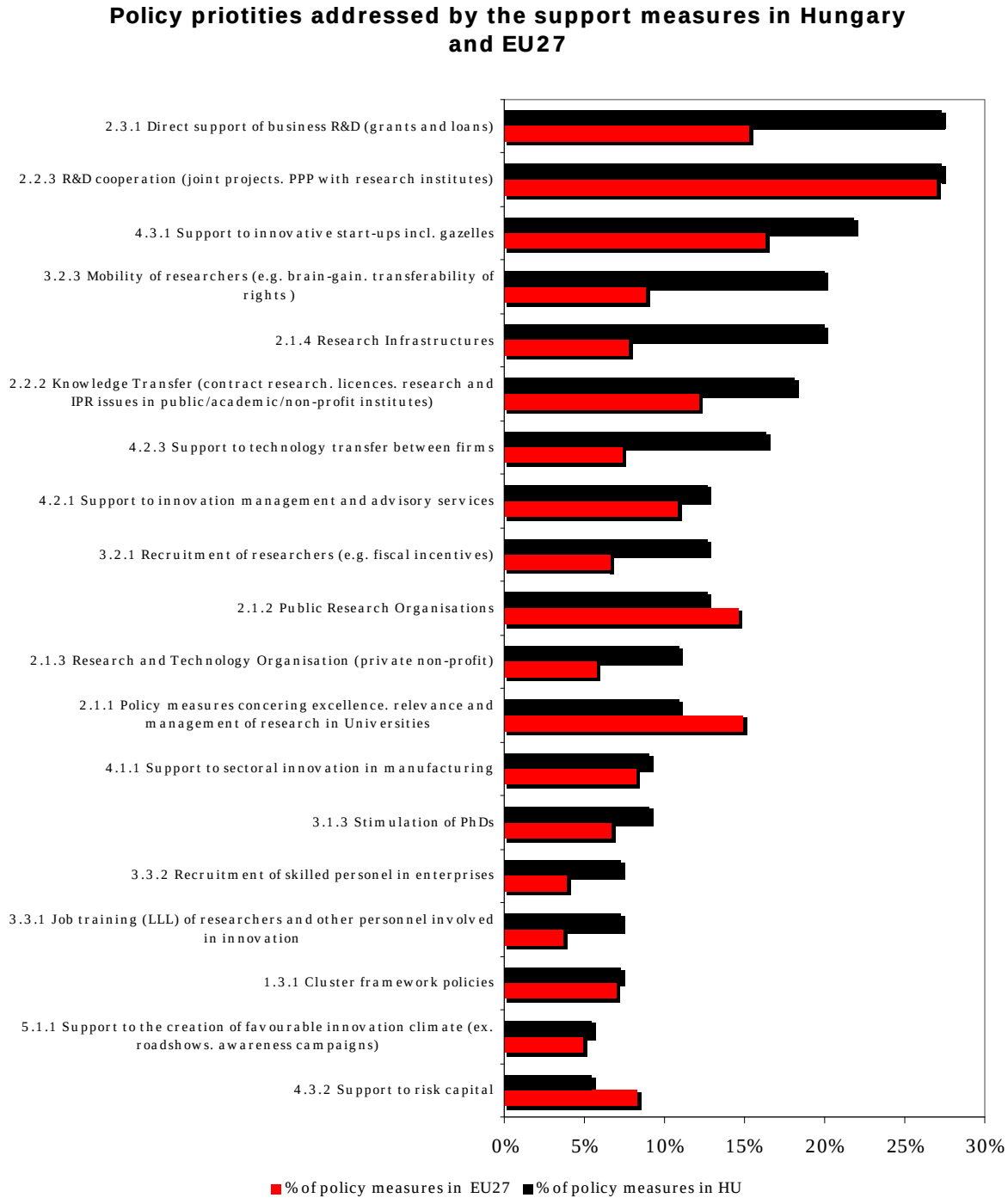
These general considerations are valid to the Hungarian case, too – but the room for manoeuvring is rather limited. The current government is forced to focus on short-term crisis management (until the next general elections due in spring 2010) by two stringent factors: 1) the strong pressures stemming from severe macroeconomic imbalances, and 2) its somewhat restricted political mandate (given its minority position in the Parliament). Moreover, the opposition, with a fairly high chance of winning a comfortable majority, has rejected several initiatives to discuss strategic issues. Therefore, the prospects for preparing and implementing an overarching set of policies required to deal with the current challenges and create new opportunities for innovative firms look rather gloomy – at least for a year. Nonetheless, it is crucial to strike a balance between tackling short-term tensions and addressing long-term issues.

Annexes

Annex 1: Innovation Policy Support Factsheet

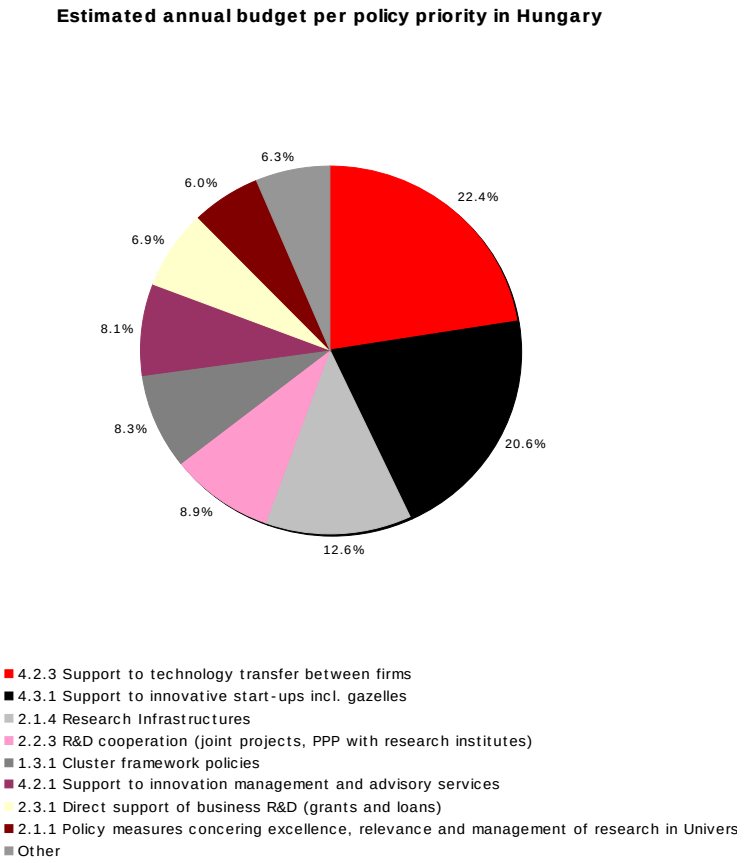
GENERAL OVERVIEW

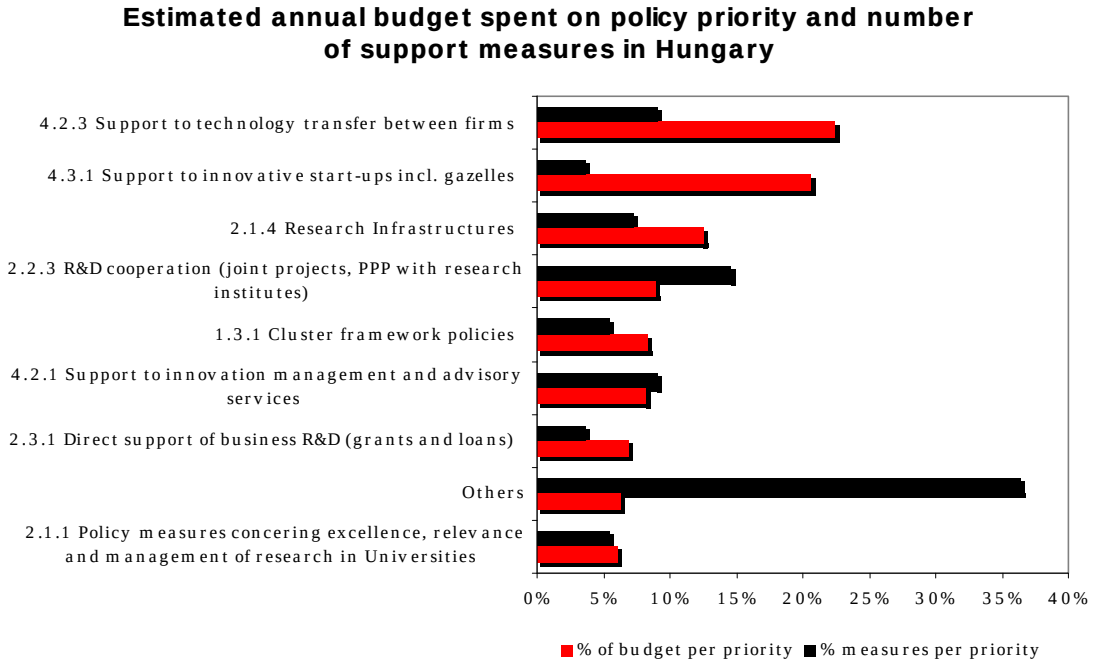
Figure 1: Main policy priorities addressed by the support measures



Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

Figures 2a and 2b: Main policy priorities and their estimated budget

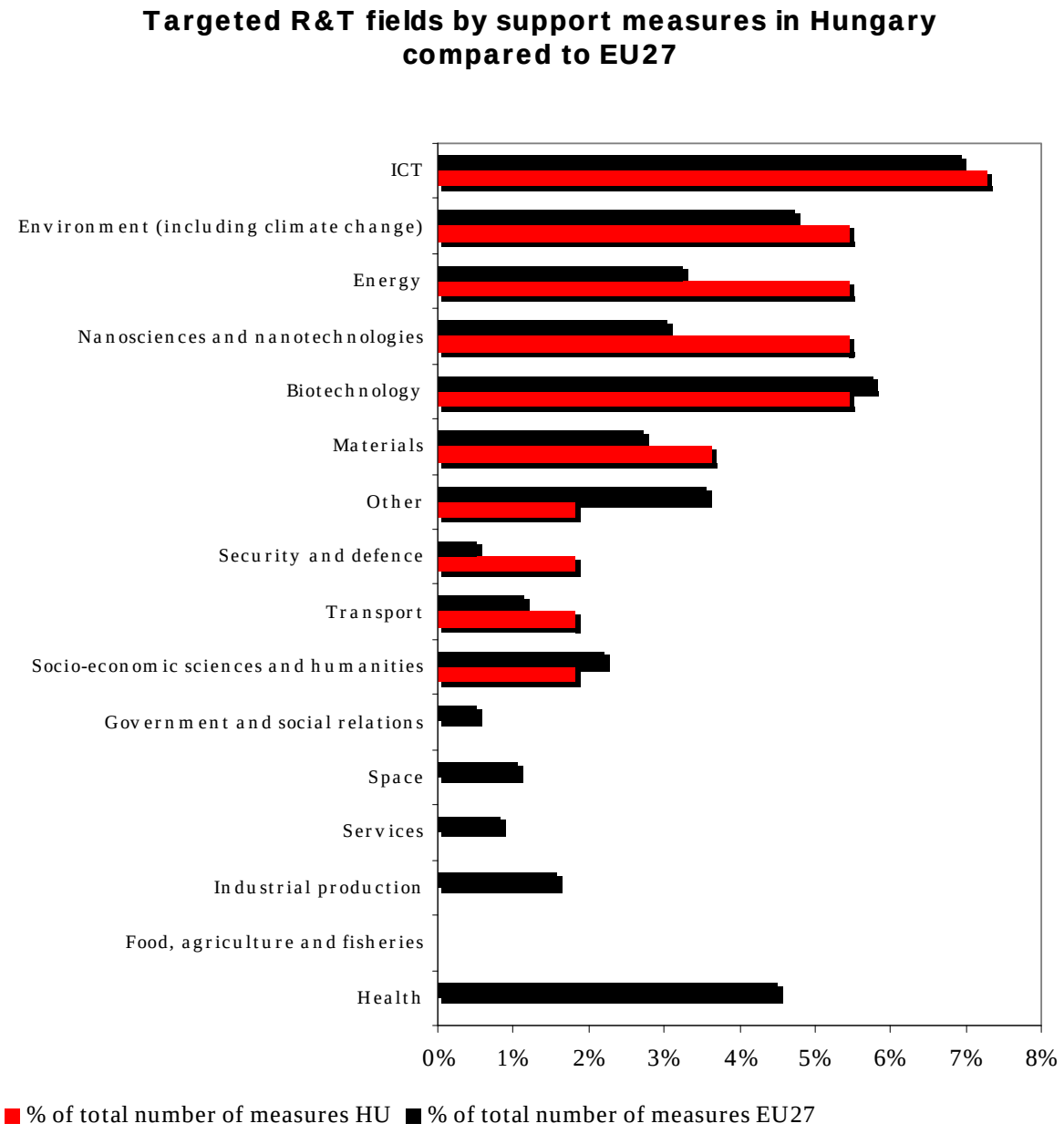




Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

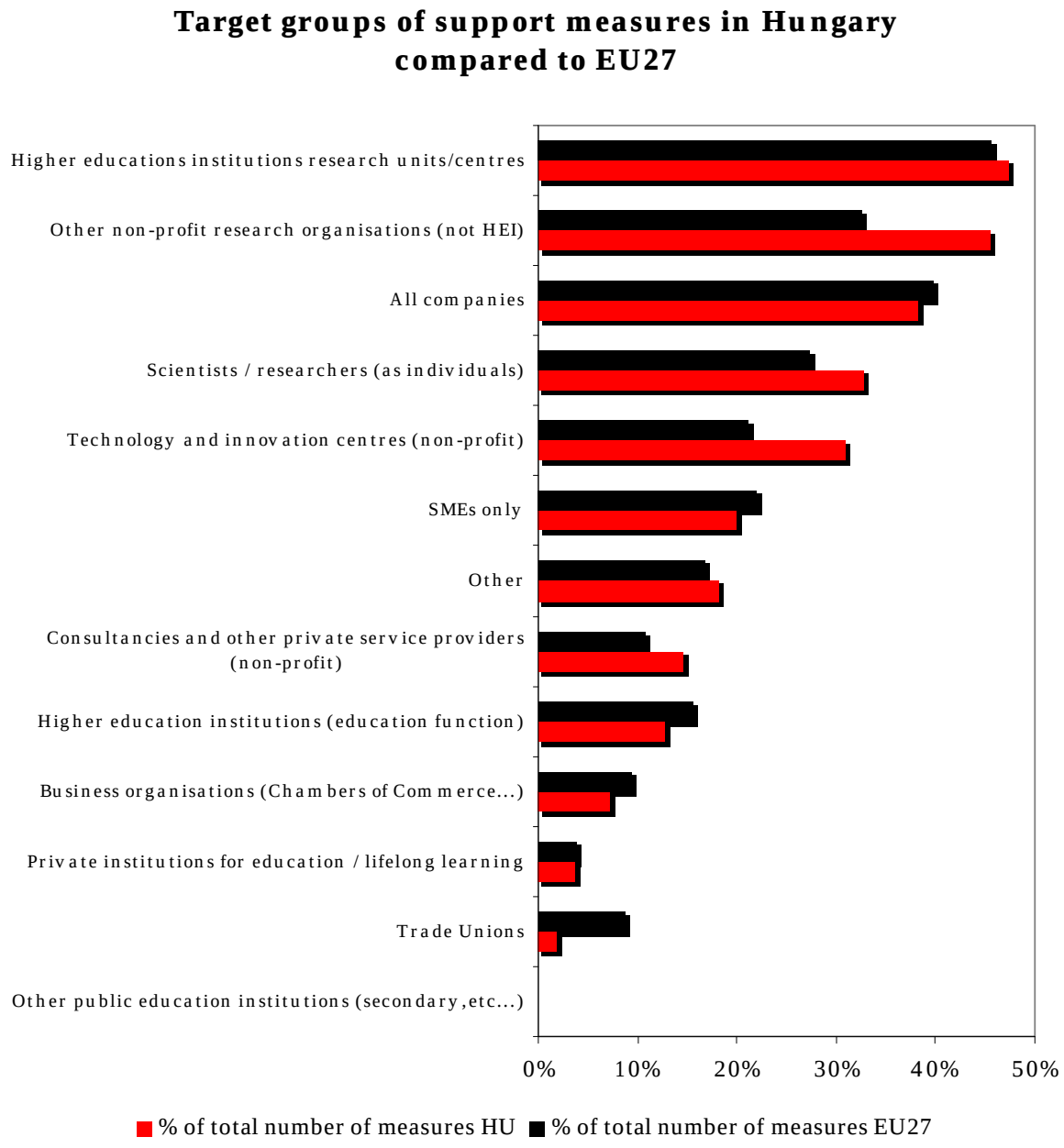
PROFILE OF PUBLIC INTERVENTION IN INNOVATION

Figure 3: Targeted research and technology fields



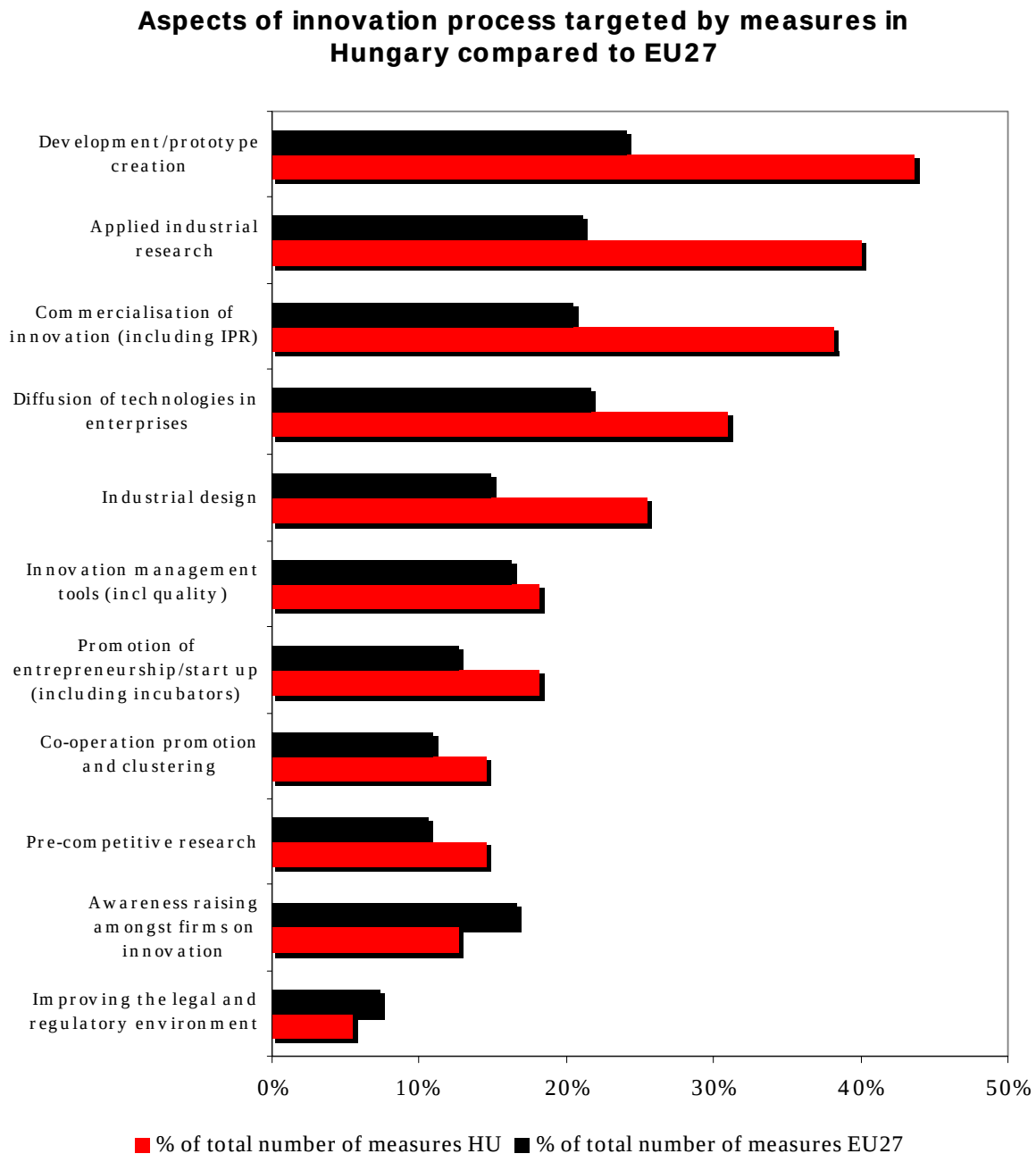
Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

Figure 4: Target groups of support measures



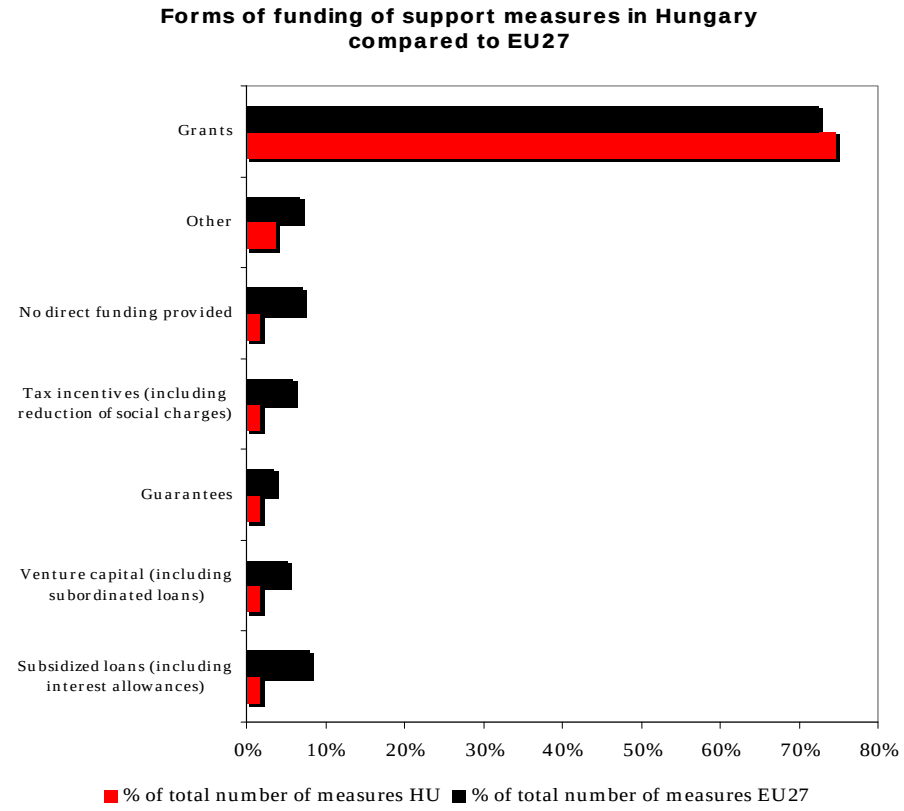
Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

Figure 5: Aspects of innovation process targeted by measures



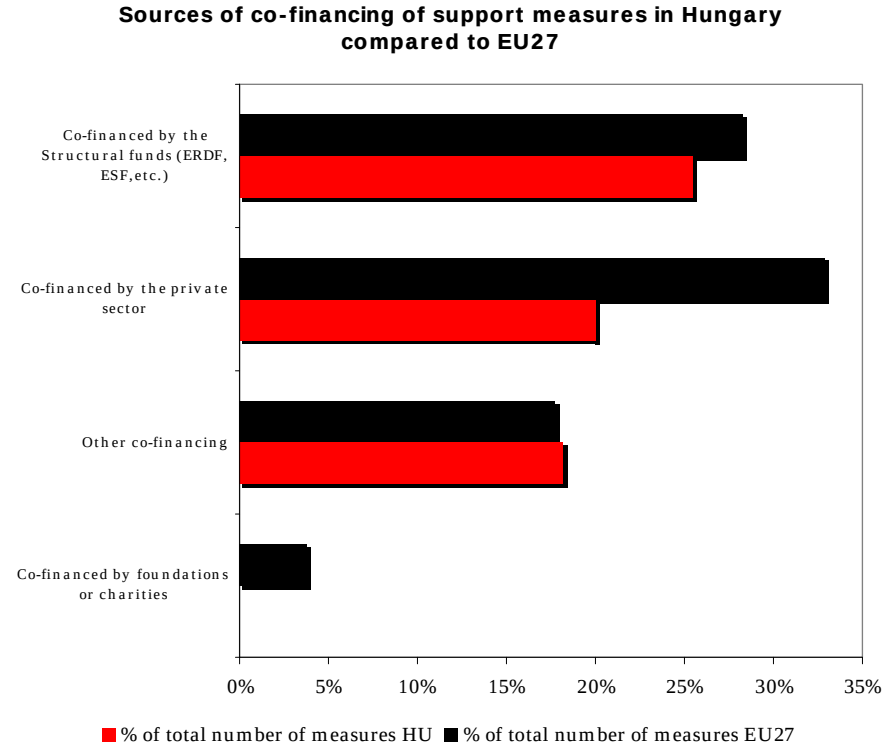
Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

Figure 6: Sources of co-financing of support measures



Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

Figure 7: Forms of funding of support measures



Source: TrendChart-ERAWATCH database of support measures (data downloaded on 5 June 2009); analysis by Technopolis Group

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Annex 3: List of Abbreviations

ASZ	State Audit Office
BERD	Business research and development expenditures
CEE	Central and Eastern Europe
CIS4	Communitiy Innovaton Survey (2002-2004)
EC	European Commission
ECR	European Competitiveness Report
EDOP	Economic Development Operational Programme
EIS	European Innovation Scoreboard
EPO	European Patent Office
EU	European Union
EUR	Euro
FTE	Full-time-equivalent
GBAORD	Government budget appropriations or outlays on R&D
GDP	Gross domestic product
GOVERD	Government research and development expenditures
HEI	Higher education institutes
HRST	Human resources for science and technology
ICT	Information and communication technologies
IP(R)	Intellectual property (rights)
KKK	Co-operative Research Centre
KSH	Hungarian Central Statistical Office
KUTIT	Research and Technological Innovation Council
MISz	Hungarian Association of Innovation
MNE	Multinational enterprise
MTA	Hungarian Academy of Sciences
NFÜ	National Development Agency
NHDP	New Hungary Development Plan
NIS	National innovation system
NKTH	National Office for Research and Technology
NRP	National reform programme
OECD	Organisation for Economic Cooperation and Development
OECD MSTI	OECD Main Science and Technology Indicators
OP	Operational programme
OTKA	National Scientific Research Fund
PM	prime minister
PPS	Purchasing power standard
PRO	Public research organisations
R&D	Research and development
RET	Regional Knowledge Centres at Universities
RTDI	Research, technological development and innovation
SF	Structural Funds
SII	Summary Innovation Index
SME	Small and medium-sized enterprise
SSH	Social sciences and humanities
STI	Science, technology and innovation
S&E	Science and engineering

S&T	Science and technology
TTPK	Science and Technology Policy Council