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A public policy analysis of the Hungarian "Regional Knowledge Centres at Universities (RET)" scheme:

Theoretical perspectives, policy learning and evaluation

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Introduction

The planned thesis investigates a highly relevant challenge not only for, but from the perspective of Hungary, and the government policies aimed at tackling it. It is by nature primarily *applied* political science, though the interdisciplinary approach provides firm theoretical foundations for the discussion of the narrow subject. Namely, it is based on the theoretical framework and relevant literature of public policy analysis, political economy and the economics of innovation (and the "Systems of Innovation" paradigm). Its main focus is on the analysis of the Hungarian government's policy to foster industry-academia co-operation via a specific "Regional Knowledge Centres at Universities" (RET) scheme devised and implemented by the government agency National Office for Research and Technology (NKTH) since 2005.

The added value of the proposed research is i) a thorough overview of the theoretical foundations of and the empirical justification for public policies aimed at strengthening industry-academia co-operation in general and in the case of the Hungarian "Regional Knowledge Centres at Universities" (RET) scheme in particular; and ii) an empirical analysis of the policy cycle and the impact of the Hungarian RET Programme, drawing on a wide range of quantitative and qualitative sources.

The following broad issues will be discussed:

- The theoretical foundations and the rationale of state intervention in innovation processes with the aim of enhancing research, technological development and innovation (RTDI) activities of the key players of the national innovation system (NIS), focusing on the role of public policy for promoting and strengthening co-operation between industry and academia (higher education institutes [HEIs] and publicly financed research units/organisations [PROs]).

- A review of the relevant theoretical and empirical literature on the topic of "competence/knowledge centres" as vehicles for fostering industry-science relations in general and collaborative research in particular: major findings of the growing body of research on the impacts of public policy aimed at establishing and operating such centres in other countries (most importantly the US, Sweden, Germany, Austria), the methodological concerns relating to the measurement of these policies' impact on regional and national economic development and on the RTDI performance of the NIS. This is a particularly important issue as fostering RTDI activities in the form of increased innovation of the enterprises is a key target of the EU's Lisbon Strategy, taking into consideration the so-called "European paradox", meaning that Europe generally possesses a large stock of cutting-edge scientific knowledge but fails to convert these into innovations (i.e. high knowledge-content marketable products and services) compared to its competitors (the US, Japan, Korea etc.)[1]. The majority of the literature I am aware of generally finds a positive impact of these schemes (e.g. Arnold ed. 2004, Arnold et al. 2004, Polt et al. 2001, Edler et al. 2004), although their overall (social) impact or efficacy is very difficult to quantify.

- Turning to the specific Hungarian case, the major elements and characteristics of the Hungarian NIS will be discussed with particular emphasis on insufficient industry-academia co-operation as a key weakness of the system, providing a major obstacle for converting scientific knowledge and the results of academic research into innovations (and indirectly to economic growth). The relevant literature is of the opinion that this weakness is one of the most important reasons for Hungary's poor RTDI performance benchmarked against almost all relevant EU and OECD indicators.

- Having gained a clear picture of the Hungarian situation and the need for state intervention, the development of the "Regional Knowledge Centres at Universities" shall be discussed in the framework of the policy cycle approach. The focus will not only be on the role of the relevant stakeholders and the policy community, but also the impact of international experience ("policy learning") which is clearly of primary importance in this particular case. The perhaps even more significant, but surely more sensitive issue, namely the background of the decision-making process, both with regard to the process of devising the scheme itself (its elements, priorities, eligibility etc.) and that of individual funding decisions, will be investigated, as far as the research methods facilitate this.

- Finally, I shall attempt to assess the impact of the programme, which can be considered as "mid-term" evaluation of a still on-going measure. It is all the more relevant, since Hungarian legislation (i.e. the Law on Research and Technological Innovation) stipulates that publicly financed RTDI schemes should be externally evaluated ex post. Despite this requirement, and although result indicators are defined ex ante for measuring the impact of these policies, the lack of an "evaluation culture" is clearly one of the major challenges hampering efficient, evidence-based policy making in Hungary. Therefore, in order to rationalise the currently somewhat ad hoc policy mix and to devise more efficient measures, it is indispensable that the running programmes are thoroughly evaluated and their impacts are understood. To this end, I shall attempt to assess the "Regional Knowledge Centres at Universities" scheme both as a part of the overall policy mix (the apparent overlaps and possible synergies with other measures, its place in the wider socio-economic development policies of the government[2]), and the impacts of the established centres.

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[1] Though the "European paradox" is basically the most important point of reference and driver for EU-level strategies and policies, more recently a number of important publications have qualified or even refuted both the validity and the (policy) implications of this generally accepted phenomenon, e.g. Dosi et al. (2006), Pavitt (2000).

[2] Most notably the so-called mid-term Science-, Technology and Innovation Strategy and the New Hungary Development Plan.

1. Theoretical background

1.1 The National System of Innovation approach

The important opening question of the planned dissertation is to provide an account of the major theoretical foundations underpinning state intervention in innovation processes, i.e. the rationale for an explicit science-, technology and innovation (STI) policy in a market economy, where, in principle, decisions to invest in RTDI clearly belong to businesses and not the state.

It is unavoidable to define at the outset what STI policies are comprised of. In this research, commonly accepted definitions put forward by authors such as Dodgson and Bessant (1996) or Lundvall and Borrás (1997; 2005) will be employed. According to the former authors, a distinction between the three components of STI policies can be conceived of in the following way. Science policy is 'concerned with the development of science and the training of scientists', while technology policy 'has as its aims the support, enhancement and development of technology, often with a military and environmental protection focus' (p. 4). Innovation policy, however, takes into account the complexities of the innovation process, and hence aims to facilitate interactions between firms of all sizes and public and private research institutes (pp. 4-5). This understanding of innovation policy is closely related to the (National) Systems of Innovation (SI or NIS) approach, pioneered by Freeman (1987), Nelson (1993) and Lundvall (1992), Edquist ed. (1997)[3] is discussed in more detail below. However, it is important to note already at this point that the object of this inquiry, namely the Hungarian public policies aimed at fostering industry-academia co-operation are clearly within the domain of "innovation policies", since these support measures are concerned with the linkages within the Hungarian NIS, and not (only) with scientific and technological development per se.

One of the foremost scholars of innovation policy, Charles Edquist argues over several contributions (the seminal volume, edited by him is Edquist [1992]) that "firms do not normally innovate in isolation, but in collaboration and interdependence with other organizations. These organizations may be other firms (suppliers, customers, competitors, etc.) or non-firm entities such as universities, schools, and government ministries. The behavio[u]r of organizations is also shaped by institutions—such as laws, rules, norms, and routines—that constitute incentives and obstacles for innovation. These organizations and institutions are components of systems for the creation and commercialization of knowledge." (Edquist 2005: 182) Therefore, it seems more realistic to study these questions from a systemic perspective, taking all its constituent elements into consideration, and directing our attention to the relationships between them. By (National) Systems of Innovation (NIS), we shall refer to "the determinants of innovation processes [that is,] all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovations." (ibid.)

1.2 The rationale for state intervention in the field of science-, technology and innovation (STI) policy

With regard to what we today call basic or fundamental research, which basically means research driven by scientific curiosity without (explicit) concern for economic exploitability, has been the object of state support for centuries. Though the public resources devoted to such activities cannot be compared to the levels of the early 21st century, various academic research projects received more or less regular state support already in the 1600s in Great Britain (cf. Freeman and Soete 1997: 374). It is by today more or less unchallenged that the state is responsible for funding basic research, although some authors doubt whether less developed countries can (or should) "afford" maintaining basic research activities (e.g. Kealey 1996). However, there is a relatively broad consensus in

[3] Overviews of the various uses of the concept (e.g. national, sectoral, regional SIs) as well as theoretical and policy implications are offered in, e.g., Edquist (2005) and Edquist and McKelvey (2000).

the literature that the state should continue to fund fundamental research, justified by the following main arguments (cf. Martin et al. 1996).

The first approach is based on the widely used concept of public goods and regards basic research as an important source of creating economically useful *information*, which can then be used by private actors to develop new products and services. Since this information is (by definition, by virtue of being a public good) non-rival and non-excludable, the firms operating in a market economy will not be able to appropriate the results of these research activities, and will thus have no incentives to invest (to a "socially optimal" level) in fundamental research. Therefore, the state should intervene and provide funding to overcome this challenge of under-investment.

The other approach concentrates on social or individual 'embeddedness' of scientific *knowledge.* According to this view, research does not (primarily) produce information which can be transferred or even traded in an unproblematic fashion, but is contingent upon learning capabilities and processes such as learning-by-doing, learning-by-using etc. (Freeman 1994), which are inherent features of the concept of "tacit knowledge" (cf. Polanyi 1966, David and Foray 1994, Cowan et al. 2000). A major implication of this approach, then, is that (scientific) knowledge created by (basic) research is person-embodied or the outcome of a set of social interactions, and is characterised by its cumulative nature. It follows that the benefits deriving from public funding of basic research are to be found in the training and development of these networks, which creates spillover effects.

In brief, the main economic benefits of basic research, which justify state support for its promotion are: (i) basic research as a source of *new useful information*; (ii) the creation by basic researchers of *new instrumentation and methodologies*; (iii) *skills* developed by those engaged in basic research (especially graduate students) which yield economic benefits when individuals move from basic research carrying codified and tacit knowledge; (iv) participation in basic research to gain *access to networks of experts and information*; (v) the fact that those trained in basic research may be particularly good at *solving complex technological problems*, an ability that often proves of great benefit in industry; and (vi) the creation of *'spin-off' companies*. (Martin et al. 1996: 60-61) As is apparent from the above brief discussion, the economic benefits stemming from fundamental research are manifold and take various forms depending on field of science, industrial sector and specific technology, and therefore no single type of benefit can be used as policy rationale for funding basic research (Salter and Martin 2001).

Applied research, and especially innovation are, on the other hand, clearly geared towards the market, as they aim, by definition, at exploiting knowledge. Therefore, in principle, the decisions of firms to innovate should be left to market forces. (Edquist 2001) However, even early neoclassical economic theories found a number of "market failures" which rendered the investments of firms in research activities insufficient compared to the socially optimal level. According to these early theories, mainly influenced by Kenneth Arrow in the late 1950s, these market failures stemmed from the lack of appropriability, uncertainty and indivisibility (Lundvall and Borrás 1997: 43). Furthermore, early neoclassical accounts of economic growth, based on the Solow model, while recognising "technological progress" as the main driver of economic growth, this "residual" factor was treated as an exogenous variable in the equation. It was only in the late 1980s, when mainstream economics incorporated technological progress into its formal models. (Verspagen 2005) A new wave of theoretical models, commonly labelled as "new growth" or "endogenous growth" theories, built into the models variables relating to investments in knowledge, either in the form of human resources (e.g. expenditures on higher education), or on research (e.g. R&D expenditures). In other words, these models treated investments in knowledge as rational decisions of the representative agents, and thus endogenised these variables. (see Romer 1990, Aghion and Howitt 1992)

These mainstream theories nevertheless still fail to take account of the systemic nature of the innovation process: namely, even the endogenous growth models tend to disregard the complex and systemic nature of innovation and concentrate on various supply side / input factors, such as investments in R&D or human resources (see, e.g., Verspagen 2005; Lundvall and Borrás 1997: 41-62; Freeman and Soete 1997: 323-333, Smith 2000). The assumptions of the new growth models have been challenged on various grounds. Firstly, several scholars argued that knowledge cannot be equated with information, which is the commonly used good in mainstream models. While information can, with various limitations, be traded on the market, knowledge often has a tacit nature which means that it cannot be passed on in a straightforward manner, but only through interactions between various producers and users of knowledge. Therefore, the results of research conducted at a particular research unit (even if codified in the form of scientific publications, manuals, databases etc.), are no guarantee that other users can benefit from these in the form of innovations. From a different angle, learning is seen as a cumulative process that is central in enhancing innovative capabilities, while knowledge has a wide range of sources and forms (such as know-how, know-what, know-who, know-why – see Lundvall and Johnson 1994), only a small part of which is codifyable and transferable scientific knowledge (or information).

Early conceptualisations of the role of science in technological progress and the innovation process, i.e. the so-called linear models of innovation, as well as new growth theories imply that investments in (basic) research will necessarily lead to innovations, which also provides justification for investments in basic research. On the other hand, more complex, non-linear approaches, such as the NIS model or the so-called "chain-link" and "interactive" models (Kline and Rosenberg 1986, see Rothwell 1994 for an overview) emphasise that there are frequent "feedback loops" in the system (e.g. between science and applied industrial research) meaning that innovation is not a one-way process leading from basic research through applied research to product development and introduction, but there are feedbacks at all stages of the process resulting in permanent learning and adjustment (e.g. to new scientific knowledge or market demands).

The other important contested assumption of mainstream economic models pertains to the inherent *risks* faced when investing in research. Namely, mainstream economic models assume that these risks are predictable, or at the very least their probability distributions can be appraised. In other words, it is only a matter of rational calculations by the representative agents to judge whether these risks are worth taking, and if the intended research activities should be undertaken. Evolutionary (neo-Schumpeterian) theories on the other hand use the concept of *uncertainties*, which in contrast cannot be calculated, thus the costs of knowledge production can be much greater, perhaps even prohibiting.

Based on these Schumpeterian traditions, authors in this line of thought, such as Smith (2000), and Dodgson and Bessant (1996) provide several useful typologies of barriers and failures, which on the one hand are much more attributable to the innovation process itself, and on the other take into account its systemic nature. For example, Smith (2000: 94-96) identifies the following four types: failures in infrastructure provision and investment; transition failures; lock-in failures and institutional failures. Carlsson and Jacobsson (1997) add 'network failures' to the taxonomy, which, again, is a key concept from the systematic perspective and once again stresses the importance of strengthening the ties between parts of the NIS, as a crucial objective of innovation policy.

In sum, non-linear models of innovation are not only and perhaps not primarily concerned with fostering basic or even applied research per se, but rather with strengthening the capacities to produce, disseminate and exploit knowledge in a complex and systematic way, perceiving innovation not so much as a product, but as an interactive learning process. From the point of view of the present research, the key challenge and an important rationale of innovation policy is thus the need to strengthen the linkages within the NIS, especially between industry and science.

1.3 The need to promote industry-academia co-operation

1.3.1 The changing role of universities

Universities are unquestionably key players in national innovations systems, even if their relative weight in performing research varies from country to country, basically depending on the balance of research and education activities of HEIs. Empirical evidence shows that despite the diversification of their roles, elaborated below, universities are still the central element of the knowledge production system (cf. Godin and Gingras 2000, Etzkowitz and Leydesdorff 1997). Though traditionally there have been several distinct traditions for national higher education systems in terms of universities' organisational structures, autonomy and roles they perform. The Hungarian universities traditionally followed the German/Prussian inspired Humboldt model, characterised by the strict separation of scientific disciplines, the relatively large autonomy of universities (and their faculties and research groups), and competition based on traditional scientific excellence. However, even in the case of Central European systems (including Germany), we can observe a gradual shift from traditional roles of universities associated with the linear model of innovation, where their main responsibilities were clearly connected to the "production" of qualified research personnel as well as carrying out basic research, towards "entrepreneurial" universities, where these organisations not only co-operate closely with other players of the NIS (most importantly firms) in order to create economically more relevant research results (as the so-called "Mode 2" model depicts), but even assume entrepreneurial roles, which is conceptualised in the so-called horizontal "triple helix model". (See Etzkowitz and Leydesdorff 1997, 2000, Mowery and Sampat 2005 for an overview) Furthermore, universities are seen to a growing extent to play a vital role in regional (economic) development and the regional innovation systems through various spillover mechanisms, in close relation to the so-called "third tasks" of universities concept. (cf. Gunasekara 2006).

Strongly related to these developments, a new model of knowledge and technology transfer taking place at universities is apparently becoming more widespread. Namely, as HEIs become more "entrepreneurial" (meaning, among other things, that universities to an increasing extent pursue funding from market activities such as contract research, licence- and royalty revenues etc.) [4] , funding and research related decisions are increasingly shifting from the individual professors and chairs to the top managements, who also centralise industrial relations in order to rationalise research conducted at the university and to render it more efficient. In this way, it is more feasible to create "critical mass" (i.e. by ensuring that resources are not fragmented), avoid overlaps and parallel activities as well as manage research into a more interdisciplinary direction. In organisation terms, these responsibilities are often entrusted in technology transfer offices (TTOs), for which there are several organisational solutions (see, e.g., OECD 2002: 64, Buzás 2007: 99-104, Debackere and Veugelers 2005). Also in Hungary, we can observe a very dynamic increase in these kinds of activities and organisational changes, which create both the need and a favourable environment for enhancing university-industry linkages and research co-operation.

[4] Though the majority of the related literature has a generally positive view on these developments and cites the well known positive examples of Stanford University and Silicon Valley in California or the MIT and the Route 128 beltway around Boston, some distinguished scholars are much more sceptical as to whether this conceptualisation of universities as "engines of growth" can be generalised, or even that universities can/should become "entrepreneurs" with significant resources allocated to activities such as IPR-management instead of remaining the producers of scientific knowledge and 'talents' – meaning more than just highly qualified researchers (cf. Florida 2000, Dosi et al. 2006). Needless to say, differences in these beliefs (based on empirical evidence) have fundamental policy implications, which are highly relevant from my thesis' point of view.

1.3.2 Policy focus on industry-academia co-operation

In line with the above, policies aimed at fostering industry-academia co-operation have become central in almost all OECD countries. This has not only been confirmed by the number of such support measures in various monitoring inventories (such as the EU's Inno-Policy TrendChart[5] and Cordis ERAWATCH projects as well as various OECD and PREST policy mix reports), but it is also reflected in the growing body of scholarly literature devoted to the topic of analysing the various types and economic benefits of such co-operations as well as the efficiency of state intervention in this area. For example, an important contribution by the OECD (2002) argues that industry-academia co-operations are complex relationships entailing much more than a simple knowledge or technology transfer from traditional knowledge producers (i.e. HEIs) to knowledge users (firms). "Rather, they represent an institutionalised form of learning that provides a specific contribution to the stock of economically useful knowledge". (Ibid. p.37).Therefore, these types of relationships must be analysed along three dimensions: nature and relative importance of the channels of interaction (e.g. contract research, IPR transactions, labour mobility, co-operation with firms in teaching/training etc., see also Scott et al. 2001: 15-23); their institutional arrangements (e.g. institutional set-up of intermediaries and publicly funded research organisations); and their incentive structures (which is clearly the most relevant aspect from the point of view of state intervention).[6]

An extensive body of empirical as well as theoretical literature explores the sources and magnitude of (economic) benefits of university-industry relationships. It is generally accepted that the private sector benefits from public sectors research through several mechanisms: e.g. firms may acquire knowledge which may ultimately result in innovative products, patents (e.g. Jaffe 1989) and growing profits or by upgrading the skills of their own researchers through knowledge transfer or employing qualified human resources. However, these benefits might not be direct and immediate, and there are basic prerequisites from both sides (the capacity of firms to absorb knowledge and the incentives for HEIs to carry out industrially relevant research), which might not be met without policies addressing them. Furthermore, empirical research has pointed out a number of factors (such as sector, regional proximity, the institutional characteristics of the given NIS – such as funding or IPR regime, the formal character of the collaboration etc.) have major bearings on the possible economic benefits of co-operation; in some cases, public R&D spending might even crowd out private investments in research. (For an overview of these empirical studies, see Jaumotte and Pain 2005: 10-13). Furthermore, the impact of university-industry co-operations on regional economic growth, especially in the form the popularly used "science park" policy response, has been subject to widespread criticism in a number of empirical works (cf. Mowery and Sampat 2005: 225-7).

Also in the case of Hungary, a growing policy-focus has been placed on promoting various types of research co-operation, although the success of these measures has been difficult to judge mainly as a result of few available (quantitative and qualitative) data. However, Hungary has been among the first new member states of the EU to develop a relatively complex set of innovation policy measures, with a major role of industry-academia research in it (cf. Radosevic and Reid 2006, Reid et al 2001, Inzelt 2004). Given the nature of the innovation process (with its inherent uncertainties as well as the considerable time-lags associated with the process from investment in research to economic benefits), as well as the crucial role of other policies and framework conditions with major repercussions on the innovation performance, it is all but natural that such

[5] As a very crude indication, the TrendChart database, for instance, contains around 100 support measures (EU27 and 8 "competitor" countries), the primary goal of which, based on the standard categorisation, is R&D co-operation.

[6] Further contributions discussing the various types of industry-university relations include: Polt et al. ed. (2001), Inzelt (2004), Wright et al. (2008) etc.

measures need time and a favourable constellation of other factors in order to exert a tangible positive influence. These crucial factors are dealt with in the following sections.

2. Stakeholders of the Hungarian NIS: policy networks, policy communities and issue networks

In order to be in a position to give a realistic analysis of the full policy cycle of the Pazmany (RET) Programme, it is necessary to provide a thorough overview of the stakeholders in the Hungarian NIS and the linkages among them. Here only a summary table is provided, where the ones most directly involved in the RET programme's policy cycle are typed in bold. However, in order to have a clear understanding of the mechanisms within the full policy cycle, the consideration of the other players in the Hungarian NIS will be indispensable. In this regard, an analysis based on the concepts of policy networks and communities will be provided within the Hungarian STI policy in general, subsequently turning our attention to the Pazmany (RET) programme.

Table 1: Major stakeholders of the national innovation system

Legislative and government bodies
Education and Science Standing Committee (Innovation and Science ad hoc Committee) Economic and Informatics Standing Committee
Science and Technology Policy Council (TTPK)
Ministry of Education and Culture (OKM)
Ministry for National Development and Economy (NFGM)
Minister without portfolio responsible for science policy and R&D
Research and Technological Innovation Council (KTIT)
National Office for Research and Technology (NKTH)
National Development Agency (NFÜ)
Other ministries running RTDI programmes/ institutes
Hungarian Patent Office (MSZH)
Private sector organisations and entrepreneurship promotion
Hungarian Chamber of Commerce and Industry (MKIK)
Confederation of Hungarian Employers and Industrialists (MGYOSZ)
National Association of Entrepreneurs and Employers (VOSZ)
Hungarian Venture Capital and Private Equity Association (MKME)
Hungarian Foundation for Enterprise Promotion (MVA)
International Trade Development Agency (ITDH)
Knowledge institutes (R&D and education bodies)
Universities; Hungarian Rectors' Conference (MRK)
Colleges; Conference of College Directors
Hungarian Academy of Sciences* (MTA)
Bay Zoltán Foundation for Applied Research
R&D units run by ministries, clinics, museums, archives
Industrial research centres and innovation intermediaries
Business R&D units
S&T parks, incubators
Technology transfer offices at HEIs
Financial system
commercial banks
Hungarian Development Bank (MFB)
12-15 venture capital funds (active in Hungary)
Professional associations, NGOs
Hungarian Association for Innovation (MISZ)
Federation of Technical and Scientific Societies (MTESZ)

Based on the observable structure of stakeholders, the following characteristics emerge. First of all, the most influential actors are partly at the macro-level and at the meso-levels of the polity. At the macro level, due to the lack of ideological conflicts and the low profile of the issue, the legislative organ and the political parties play a much less significant role than in the case of more central policy areas, such as social or tax policy. In brief, due to the low politicisation and relatively low salience of the issue, both the *initiation and the decision-making processes of the policy cycle take place at the level of the executive (mainly via its agencies), influenced by a range of interested stakeholders*.

As for the meso-level, organised interests are clearly present, and play a role in channelling social needs and thus initiating policy action. Again, due to the very technical nature and the low profile of the policy field, wider social groups are not mobilised by these issues, and that is why the active participation of organised interest groups is of primary importance for facilitating the democratic functioning of the political system in this particular area (cf. Ágh 2004: 149). Consisting of this network of interest groups, professionals, civil servants and politicians, we can observe a *relatively stable policy community*, *which is clearly the dominant factor in the whole policy cycle* (Heidenheimer et al. 1990: 403). Despite their internal conflicts, they have a common interest in preserving the "prerogatives", i.e. the financial resources and control over the decision-making process, and thus form an iron triangle (cf. Ágh 2004: 153). Furthermore, the pathologies of the Hungarian economy and more narrowly the national innovation system (discussed in the next section) are well known to the experts dealing with these issues, but these are rather wide-ranging, vague challenges, not "provoking" immediate calls for actions. This is partly because the interests behind them are, apart from some "issue communities", rather diffuse and such complex socio-economic problems are not normally articulated in an effective way. Therefore, it is the policy community, rather than a set of articulated public interests that becomes crucial for the agenda-setting, and later the formulation of STI policy. (Cf. Heidenheimer et al. 1990: 403)

However, due to the constant reorganisation of the governance system (every government has completely reorganised the entire STI governance system at least once while at the helm), and the changing framework conditions, the power relations and the dependencies hampered the solidification of this policy community, and created a *system of policy networks*. The governance structure is characterised by a segmented executive, where the core executive can be seen as a set of networks, policing the functional policy networks. (Rhodes 1997: 14) Detailed analysis would reveal that the power relations (and especially the changes that have taken place in this regard) between the various policy networks (e.g the formal and informal influence of government agencies, business associations, the scientific community etc.) have to a large extent determined the outcome of the STI policy cycle.

Furthermore, *occasional issue networks* are also at work from time to time. A clear example in this regard could be the case of the central topic of my thesis, namely the stakeholders of the Regional Knowledge Centres at Universities, where the main stakeholders of a given region (universities, firms, innovation agencies, municipalities, labour force), which may pursue other/narrower interests than the "natural" policy networks/communities, which are thus polarised, and result in the temporary alliance of normally distant social groups.

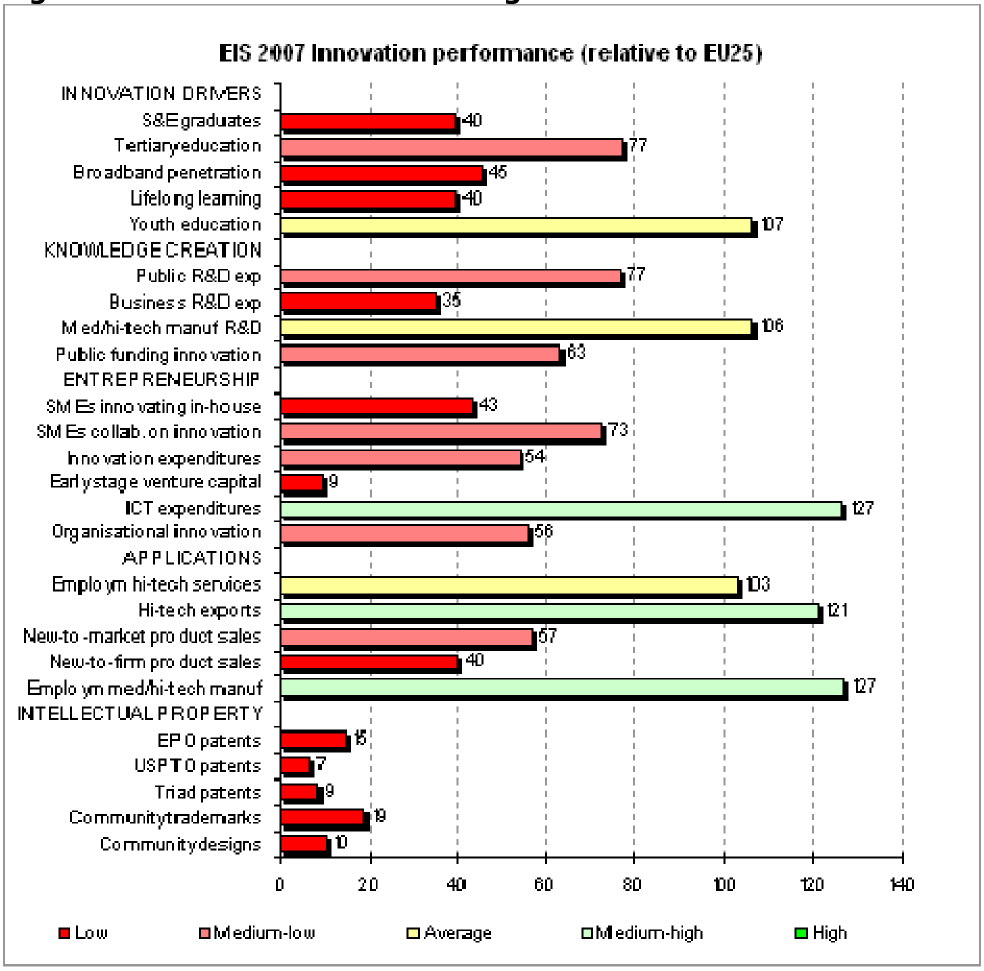
In brief, we can observe both a relatively stable (though partially changing) policy community, where i) the limited number of decision-making participants consciously exclude others; ii) frequent and high quality interaction between them regarding policy-related issues takes place; iii) there is an apparent consistency in values, membership and policy outcomes which persist; iv) there is consensus, with the ideology, values and broad policy preferences shared by these participants; and, finally, v) the members have (various types of) resources so the links between them are exchange relationships, and, on the other side, there are different issue networks, with more or less the opposite characteristics (Rhodes 1997: 43-44). Needless to say, as with all typologies, this Marsh-Rhodes typology gives only a stylised representation of the prevailing structures, which tend to, but never fully conform to the ideal types. However they provide us with a meaningful framework for analysis, which help us better understand the relations which clearly influence the policy cycle, to which we now turn.

3. Agenda setting and decision-making

3.1 The performance and challenges of the Hungarian NIS

According to the most recent European Innovation Scoreboard (EIS 2007, a set of indicators based mainly on data by the Eurostat and the Community Innovation Survey, developed by the MERIT Institute), Hungary, along with its Central and Eastern European "peers" is among the "catching up" countries. Innovation performance, as measured by the compact Summary Innovation Index (SII) has improved compared to 2006, albeit modestly (from 0.25 to 0.26), but is still way below the EU27 average, i.e. 0.45. This aggregate index – by its very nature – conceals the various aspects of the country's innovation performance, therefore it is necessary to carry out an analysis at a more disaggregated level.

Figure 1: Performance of the Hungarian NIS based on the EIS



Source: EIS 2008

Somewhat better performance can be observed with regard to input indicators ("Knowledge creation" and "Applications"), where Hungary is around the EU27 average. R&D performed by businesses (measured by business expenditures on R&D, BERD) has been growing quite dynamically since 2004 in both absolute and relative terms, but the assumed positive effects of this for enterprises' innovation activities – let alone economic growth – still remain to be seen. This particular indicator is especially susceptible to the strategies of large, foreign-owned firms, as these account for about two-thirds of total Hungarian BERD. More recent OECD data show that this trend has been continuing through 2006 (0.48). However, the public sector's contribution to overall R&D expenditures is still higher than private actors', i.e Hungary is still a long way from achieving the Barcelona target of 2:1 ratio in favour of private R&D. Furthermore, the internal structure of BERD is heavily skewed, with the bulk of BERD concentrated in a few sectors. The chemical industry (mainly related to pharmaceuticals) accounted for 60.4% of total R&D spending by manufacturing companies in 2006. (KSH 2007) That means that practically 5-6 large companies account for 35-40% of total Hungarian BERD. Several sectors perform way above the national average in terms of the share of innovative firms: chemicals, due to pharmaceuticals firms (51.9%), financial service providers (47%), automotive (37.2%), as well as electrical machinery and instruments (33.8%). A significantly higher share of large firms is innovative in these sectors, too, than that of small and medium-sized ones.

The share of medium high-tech and high-tech R&D as a percentage of total manufacturing R&D expenditures has been consistently above the EU27 average. However one must be cautious when drawing firm policy conclusions based on this particular indicator, especially as the last year for which the EIS indicates performance is 2002, and also due to the important caveats regarding all "high-tech" related indicators discussed below.

The same can be said about "entrepreneurship" indicators: as most of them are based on the Community Innovation Survey, most recently conducted in 2005 (CIS4), it is not feasible to observe the dynamics. Based on available evidence, it can only be stated that the innovation capabilities and absorption capacity of Hungarian enterprises (especially SMEs), proxied by, e.g. innovation expenditures and co-operation is very low compared to the EU average. The Hungarian CIS4 survey, covering the period of 2002-2004, showed 20.9% of firms with at least 10 employees as innovative, leaving Hungary among the worst performers of the EU27. Concerning the weight of new products/ services in total sales, Hungary ranked eleventh in the EU25. Almost 60% of firms identified lack of demand for new products and services as the major reason for not being engaged in innovation activities. A recent Background Report prepared for the OECD (Havas and Nyiri eds. 2007), devoting a separate chapter to the topic of innovation capabilities of firms and the absorption capacity of SMEs, comes to the same conclusion using a range of (mostly) quantitative indicators. The increasing, yet still very low level of available (early and pre-seed phase) venture capital is a very important bottleneck hindering the activities of high-risk innovative start-ups, which would otherwise have a huge growth potential. (Karsai 2007, Iliev 2006).

ICT expenditures, on the other hand have been large, even by EU standards, although it must be kept in mind that ICT prices are high in Hungary in an international comparison. Furthermore, as noted above, investments in ICT per se cannot be expected to be a driver of technological growth, unless absorptive capacities and skills of firms as well as workers are enhanced correspondingly.

Skills and investments in knowledge and innovation infrastructure are therefore key factors in enhancing national competitiveness. These can be gauged by using a combination of "intellectual property" and "innovation drivers" indicators. The attainment level of the Hungarian workforce shows a varied picture. While the consecutive governments have clearly made efforts to raise the number of those participating in higher education (thus transforming the elite-type HE towards a mass-education system, leading to a significantly higher share of the population with tertiary qualifications), the fields of study most conducive to R&D and technological innovation, namely science, technology and engineering has suffered a huge setback in the 1990s (in line with the declining demand for engineers by the demolished industrial R&D sector). This has led to the current situation, where the share of new S&E graduates is permanently around a mere 40% of the EU average.

This can be deemed a serious threat, as the low supply of qualified researchers with science and technical background can be a major obstacle to investments in high value-added activities. This has been acknowledged by policy makers (and the government's mid-term STI policy strategy) in recent years, and new quotas and other incentives have been introduced in the HE system in order to boost the number of S&T students and hence graduates. Figures for the 2008/9 academic year, however, suggest that enrolment in natural sciences and engineering (especially the former) has not risen and that a researcher career is still not a popular option among secondary school graduates.

Moreover, non-technical skills pose another important challenge across economic sectors: a survey undertaken by the Ministry of Economy and Transport (GKM 2007) among Hungarian firms and entrepreneurs has indicated sketchy entrepreneurial, managerial and language skills. Language, ICT and managerial skills should thus be among the top candidates for subjects of life-long-learning, potentially financed by the employing firm. However, both the EIS indicator (40% of EU27 average) and the cited study indicate that the large majority of the workforce is not participating in such training activities. Despite successful efforts of the (previous) government coalition to raise the level of ICT skills and accessibility (e.g. dynamic increase of broadband penetration), these indicators are still way below the EU average.

Clearly, Hungary shows the weakest relative performance in terms of intellectual property indicators, which are in the area of a mere 7-19 percent of the EU average. However, several theoretical arguments can be put forward, why these are not adequate benchmarks for assessing the performance of a less developed but catching up economy and its NIS. First of all, at their stage of development, it might not be considered as a meaningful (or feasible) target at all of the national economy and its firms to produce as many patentable products as possible; rather it would be more desirable to concentrate on technology transfer and enhancing the learning capabilities for more efficient absorption of new methods and technologies (Radosevic 2006). Furthermore, a wide array of other means are utilised by firms to protect intellectual property, many of which are not captured by measurable or readily available indicators.

With regard to 'applications', an apparently very good Hungarian performance is suggested by two indicators: employment in medium and high-tech manufacturing was 123% of the EU25 average, and the share of high-tech products in total exports stood at 118% of the EU25 average in 2004. Yet, a number of factors should be considered when appraising these figures from a policy point of view. First, one should keep in mind the very high share of FDI in Hungarian manufacturing, coupled with the weight of foreign-owned firms active in sectors that are classified as high-tech ones by the OECD, given their R&D intensity. Second, although these sectors are commonly regarded as 'engines of growth', a number of recent theoretical and empirical analyses refute this widely held, uncritically accepted view (Smith 2002; Tunzelmann and Acha 2005; Havas 2006). Third, R&D-intensive industries (or services), as classified by the OECD, are not necessarily R&D-intensive ones in all countries. Namely, empirical evidence suggests that the high-tech manufacturing that is present in the CEE economies mainly represents low-skill and low added-value segments of a global production chain, with R&D-intensities below the 1% (mid-tech) margin (Radosevic 2006: 40; Srholec 2006). 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 these countries. Rather, governments should concentrate on diffusing knowledge and technologies across all sectors of the economy, not just the ones which are defined as high-tech.

As a horizontal issue, it must be noted that RTDI activities are also concentrated in regional terms, too. This results in huge regional disparities. Central Hungary (comprising Budapest and the county surrounding it) has an excessively high share in terms of GDP, GERD and human resources for science and technology (HSRT). GDP/capita and GERD/GDP are about 1.5 times higher than the national average, and around two thirds of GERD and more than 70% of BERD is spent in this region. The share of GERD per total highly skilled labour force is about 1.6 times of the Hungarian average. Though some of the regions have very favourable conditions in terms of human resources endowment (due to prestigious universities with high-quality S&T education), they suffer from inadequate physical infrastructure and other unfavourable framework conditions for RTDI. This means that the Hungarian regions, with the exception of Central Hungary, show an even weaker performance on almost all input and output indicators. Using the most aggregated indicator to gauge innovation performance, the Regional Innovation Index of the EIS, Central Hungary ranks 34 among the 203 EU regions – only Prague and Bratislava have better position among new member states, while all the other regions are close to the bottom of the list.

3.1.1 A key challenge of the Hungarian NIS: weak exploitation of R&D results

As RTDI indicators (EIS, OECD 2007, see above) as well as the available authoritative analytical sources (OECD 2008, Havas and Nyiri eds. 2007, Havas 2007) clearly illustrate, one of the main complex challenges of the Hungarian NIS is that the relatively strong knowledge/science base (at PROs and HEIs, evidenced by standard measures of scientific excellence such as publications, citations and impact factors) and existing R&D results stemming from it are not efficiently being transformed into innovations (i.e. marketable products and services).[7] A wide range of interconnected factors accounts for this particular weakness.

Firstly, and most importantly from the perspective of the present research proposal, there is weak co-operation between publicly financed research units (including HEIs) and the industry (which, despite some improvement still only performs some 40 percent of total R&D in Hungary). (cf. Inzelt 2004) Data from the OECD's Science, Technology and Industry Scoreboard (OECD 2007) clearly shows that the occurrence of innovation co-operation between Hungarian firms (especially SMEs) and publicly financed research units is much less frequent than in most other OECD countries, and the picture is especially gloomy with regard to utilising the internationally competitive research base of the institutes of the MTA. The findings of a recent monitoring report by international experts (Arnold et al. 2007), including a pilot assessment of two major schemes, one of them being the Pazmany (RET) Programme, confirm the pertinence of this challenge. To a large extent, similar diagnoses are observed for both measures, e.g. that industrial exploitation of university capabilities are weak; universities lack experience to address industrial needs; there are few incentives for universities to perform industrially relevant research work; university regulations and management are not compatible with the needs of businesses and vice versa; commercialisation activities at universities are at an inadequate level, etc. Similarly, the mid-term SME Strategy devised by the Ministry of Economy and Transport (GKM 2008: 43-44) points out that there is weak or no consideration for industrial needs in publicly financed research units due to diverse incentive structures, i.e. economic aspects are not considered in the management of such institutes, whereas knowledge transfer is impeded by an alarmingly low level of researcher mobility between sectors and fields of research. It is therefore a key challenge, not sufficiently addressed by on-going endeavours to establish lasting and organic co-operations among the players of the NIS (i.e. the producers and users of knowledge) in order to facilitate the systematic exploitation of research results.

Some progress has been made by targeted changes in the regulatory environment: every publicly financed research institute is obliged to devise an IPR management strategy, IPR regulation has become more favourable for the exploitation of R&D results by giving property rights to the publicly financed research units and by allowing the establishment of business entities (spin-off) for the commercialisation of HE intellectual assets. Since the approval of the Law on Research and Technological Innovation in 2004, the number of spin-offs has risen significantly. Though no precise figure is available, the Hungarian

[7] For example, the recent „OECD Review of Innovation Policy – Hungary" (2008) makes a number of policy recommendations in 9 broad fields with the aim of improving Hungarian innovation performance. Below the heading „Fostering critical mass, relevance and excellence in public research", the following recommendation is made: „*Take measures to increase the contribution of public research organisations*, including universities and the Academy of Sciences, to the overall performance of the Hungarian innovation system. The reform of these organisations should be accelerated, and they should have more performance-based incentives, in order to make fuller use of their strong capabilities in achieving priority socio-economic objectives." (OECD 2008: 27)

Association of spin-offs estimates that the number of officially recognised spin-offs (i.e. as defined by the law on innovation) is around 40, while that of quasi spin-off (university affiliated) firms is 100-120. Their yearly turnover is estimated to be around EUR 40m. These figures suggest that there is still room and potential for significant improvement in the utilisation of research results.

3.2 Identifying and channelling social demand into the policy-making process: structures and mechanisms of agenda-setting and policy making

As noted above, stakeholders such as policy-makers and research performers are generally aware of the major weaknesses and challenges of the NIS, as indicated by the growing number of dedicated analyses and even strategic government documents/declarations. What is not clear, however, is how (and how effectively) the existing policy-making structures are used when devising and implementing new measures aimed at addressing some aspects of these challenges. *What my dissertation aims to achieve is a thorough analysis of the formal and actual mechanisms that finally resulted in the implementation of the RET scheme.*

The questions will include, but not be confined to, the following:

- What formal structures and mechanisms are in place to identify and channel social demands into public policy responses?
- Do these structures formally involve a wide range of stakeholders, thereby facilitating more consensual and deliberate policy-making process and style?
- As opposed to their formal role, (how) do these mechanisms work in practice? Do they efficiently fulfil their intended roles?
- Can the actual 'centre of power' be identified? Who gets to influence and who makes the final decisions?
- Are the expected outcomes (i.e. indicators measuring efficiency and efficacy) clearly identified ex ante? If so, by whom and what are these?
- Are these outcomes and instruments aligned with other major goals of public policy? What mechanisms exist to facilitate policy co-ordination and policy integration?
- What is the role of international experience, policy intelligence and policy learning? Do policy-makers consider these, or even attempt to adopt a (successful) international instrument in a more or less unchanged form in the Hungarian context?
- As a consequence, is the final outcome of the process in line with the objectives? To put it simply: does the policy measure address the existing challenge originally identified?

It is my firm belief that finding answers to the above very broad questions will basically allow me to draw conclusions as to the efficiency and efficacy of the outcome of the policy-making process. As indicated among my hypotheses and research methods, I intend to investigate these questions primarily by making interviews with the relevant policy-makers. To what extent these methods will be suitable to shed light on such sensitive issues, remains to be seen. What is apparent already at this early stage of my research is that policy learning did play a crucial role in this case, as the success of the "competence centres" instrument, applied in several developed countries, undoubtedly exerted an influence on the Hungarian policy response. This aspect is summarised briefly in the next section.

3.3 Policy learning - review of international experience with knowledge/competence centres

Several countries have been facing similar challenges in recent decades, and various policy responses have been devised with the objective of fostering various forms of industry-academia co-operation (see Polt et al. 2001, OECD 2002). As the systemic nature of the innovation process has become more frequently acknowledged (as opposed to earlier approached taking as a point of departure the linear model with its "technology push" or "demand pull" mechanisms), governments have increasingly focused on strengthening the linkages between the elements of the system. A widely employed policy response is the so-called competence centres or co-operative centres approach, first devised by the National Science Foundation in the US in the mid-1980s. Several European countries followed suit in the 1990s, and some of them have proved to be extremely successful at facilitating science-industry co-operations with significant economic benefits for the participants but, through various spillover effects, for a much wider target group, indirectly boosting the innovation capacities and the competitiveness of the given region and/or country. The most successful ones have been the Swedish Competence Centres Programme (managed by NUTEK/VINNOVA [see Arnold et al. 2004]), the Austrian Kind and Kplus (by TIG, BMVIT and BMWA [see Arnold ed. 2004, Edler et al. 2004]), as well as the Finnish Technology Programmes (by TEKES – Polt 2001). These programmes have been evaluated by panels of international experts, which have basically confirmed the overall benefits of these initiatives (see, e.g. OECD 2004; Arnold et al. 2004, Arnold ed. 2004, Edler et al. 2004), and the observations to be found in these reports will be discussed thoroughly in the dissertation.

It is a central argument of the NIS approach that institutions and policies cannot be transferred from one national system to another in a straightforward manner, without taking into consideration the institutional and cultural characteristics, as well as the specific challenges of the given system. However, good practices can be identified and based on these, instruments can be adjusted to another national context, as the popularity of the competence centres approach clearly illustrates (Cf. Polt et al. 2001). Over the years, several basic characteristics have emerged distinguishing the competence centre programmes from other initiatives with similar goals and/or ingredients. Following Arnold et al. (2004: 5-6), these features are the following:

- They are normally funded by three partners: industry, university and a state agency;
- They are intended to have an effect on university resource allocation and strategy, in addition to reinforcing university-industry links. To this end, they involve an unusually high degree of subsidy;
- They involve long term contractual arrangements, requiring a much bigger commitment than traditional project by project funding of collaborative R&D;
- They create new on-campus structures, and therefore make new organisational and structural demands on the universities;
- They are interdisciplinary and generally problem-focused in the research they do, demanding 'horizontal' networking across traditional university structures;
- Their long-term presence on campus and their engagement with postgraduate education draws them into closer contact and co-operation with universities' 'core business' of education and research than is often the case with linkage actions, which tend to focus more purely on research;
- By drawing industry personnel onto campus to join in research, they also extend academics' networks into the industrial research community.

Though gathering strategic policy intelligence has not been one of the main system characteristics of Hungarian policy making practices, in the case of these types of measures, the influence of internationally successful practices is rather clear. The research (employing the methods outlined below) will shed light on the direct and indirect forms of policy learning (based on formal organisational as well as informal personal networks) that has taken place in the policy design phase.

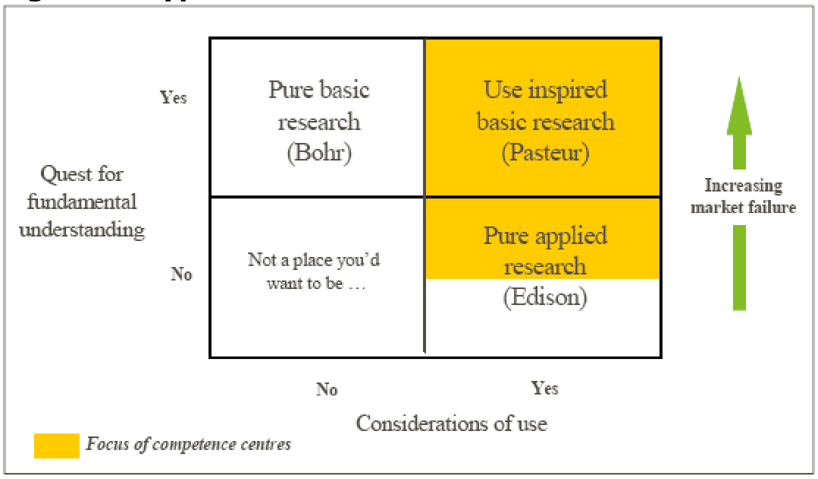
4. Implementing the Regional Knowledge Centres at Universities scheme

The main objective of the scheme, launched for the first time in 2004 is to foster R&D co-operation between academia and the industry, and the creation of research and technological innovation centres at universities on a par with the best ones globally. These Regional Knowledge Centres are supposed to co-operate with businesses, speed up the region's technological and economic development, and enhance its competitiveness both at the regional and the national level. Further objectives include:

- create critical mass of knowledge and professionals in the field of advanced technologies;
- involve students in R&D in large numbers, create new jobs, employ young researchers;
- speed up knowledge and technology transfer among universities and businesses;
- foster exploitation and commercialisation of R&D results;
- support innovation activities of SMEs in the region, especially knowledge- and technology-intensive start-up and spin-off firms by subsidising R&D projects;
- create university innovation centres and cores of regional innovation clusters;
- attract high-tech companies and R&D institutes to locate their activities at university campuses, including foreign investors.

As outlined above, the main challenge to be addressed by the scheme is weak academia-industry co-operation. Furthermore, it aims at strengthening regional innovation systems. In brief, the expected results are intensive R&D co-operation between academic institutes and the industry in all regions of Hungary, focused R&D projects, improved R&D and innovation capabilities, significant investment projects, and efficient, quick commercialisation of R&D results. A strong industrial presence nearby these Regional Knowledge Centres is an essential pre-requisite for improving the R&D performance of the regions.

Figure 2: Types of research



Source: Arnold et al. (2004: 46)

It follows from this brief summary of the programme's objectives that the types of research promoted are primarily within the so-called use-inspired (or sometimes called "oriented") basic research conducted at higher education institutes (HEIs), who possess a significant research infrastructure and knowledge base that can be utilised in the form of marketable products and services in close co-operation with firms located in the given region. The closer the research result produced at the universities' research labs is to market introduction, the more we move into the quadrant of "pure applied research" (see Figure 2).

The criteria for project selection also confirm the complex approach to enhancing regional innovation capacities. Namely, apart from traditional aspects of professional and scientific excellence, 40% of the total scores could be awarded based on economic and regional aspects, such as industrial background and relations, economic importance and co-operation with enterprises, regional effects of the RET, cost-efficiency. Furthermore, the pre-defined ex ante indicators, against which the achievements of the established centres can be monitored and evaluated (see next section), also strongly focus on aspects of socio-economic relevance and exploitation.

There were three calls announced under this scheme (2004-6), and the amounts distributed among the altogether 18 winning RETs in the form of competitive grants was 20 billion HUF (see Annex). The RETs are consortia led by Hungarian universities, involving partnership structures, including firms in the region where the university is located. At least one RET has been established in all seven Hungarian regions. The first projects are due to be completed in 2009.

However, the most delicate and sensitive question pertains to the *actual loci of influence* in the implementation of the programme, most notably the process whereby the priorities and the elements of the programme were defined (as discussed in the preceding section), as well as the selection of applicants to be funded. Despite the fact pointed out previously that STI policy is not a high-profile party-political issue, shedding light on the background of such decisions would be an important added value of the research, with major implications for the analysis of the policy cycle and the dominant policy style. At this point it is difficult to speculate whether any of the scientific research methods will be suitable to reveal any useful information in this regard (see next section).

5. Hypotheses and evaluation methodology

Based on the above situation analysis and theoretical framework, the aim of the research is to test the following four hypotheses:

1. **The RET Programme addresses a central challenge of the Hungarian NIS (in itself) and it is an appropriate instrument or policy tool (interviews, background reports);**
2. **The RET Programme produces benefits not only for participants directly involved but, through indirect effects and spillovers, also for a wider target group, mainly in the region of the RET;**
3. **The RET scheme facilitates co-operative research projects that would not have been realised otherwise, i.e. we can observe a degree of additionality;**
4. **The RET Programme was conducive to universities becoming more aware of industrial needs, and the incentives provided by the scheme resulted in socially/economically more relevant research carried out at these HEIs. (In case this hypothesis should be refuted, it would mean that, as some scattered and anecdotal evidence suggests, the projects financed by the scheme are in principle university-driven ones, or even "basic research in disguise").**
5. **The RET Programme cannot fully exert its potential impact in "isolation" – the characteristics and the challenges of the NIS as well as the so-called framework conditions (most importantly the regulatory framework – IPR, funding etc – and organisational structures which provide mismatch in incentives) are major barriers that can only be overcome by a coherent and long-term strategy involving a concertation both within the innovation policy mix and its alignment with other major policy areas (macroeconomic, social, education, taxation etc.). Therefore, the concept of "policy integration" as well as policy co-ordination will be given due consideration.**

As discussed in the section dealing with the implementation of the programme, I am hoping that interviews with stakeholders (most probably meaning anonymous quotations) might reveal structures and tendencies regarding the *actual* background of the selection process. At this point I feel that it is not possible to formulate a genuine hypothesis, but merely a topic or question which will be investigated as an outcome of the on-going research.

Given the nature of these hypotheses, the methods employed will necessarily be mostly *qualitative*, involving:[8]

- A thorough content analysis of the findings of country reports produced by external experts (such as the monitoring exercises of the EU: Inno-Policy Trendchart and ERAWATCH Research Inventory, or overviews of the Hungarian NIS by the OECD [OECD 2008]), as well as relevant official documents and strategies by the Hungarian government (most notably the mid-term STI policy strategy [Government 2007], the National Reform Programme, the New Hungary Development Plan [Government 2006] and the "Mid-term Institutional Strategy of the NKTH" [NKTH 2007]).
- Regarding the first three stages of the policy cycle, I intend to conduct structured interviews with responsible policy makers (mainly in the Ministry of Education and Culture and the National Office for Research and Technology) and persons involved in the management of the Programme (mainly the NKTH and the former KPI) in order to map the process and mechanisms of policy design, project selection and management. These processes, as noted above, are of crucial importance with regard to the dominant policy style and the eventual efficacy of the measure: these are clearly questions of prevailing policy-making practices and power relations.
- Analysis of the documentation of the RET Programme, including its stated goals and rationales, target groups, activities eligible for support, selection process, management structures, ex ante and monitoring indicators etc.
- As for the discernable impacts and challenges, I will first devise a survey to be completed by stakeholders of the 18 winning RETs (programme managers, researchers at the universities, participating firms, phd-students), collecting both basic information pertaining to i) research topics and significance ii) financial data iii) organisational set-up, and more fundamental issues such as i) perceived tangible and intangible benefits, ii) identified challenges and bottlenecks. In order to shed light on the additionality effects of the programme, I plan to collect data in the form of questionnaires from a number of rejected applicants, concentrating on the question of whether their originally planned project eventually materialised, perhaps in a modified or reduced form.
- It is indeed not feasible for an individual researcher to conduct a full-scale impact assessment (beyond easily accessible indicators) for the 19 existing centres, therefore I intend to dedicate more attention to a small number of (not yet defined) centres, possibly one or two in the most developed region (Central Hungary) and one in the laggard North Great Plain Region (most likely Debrecen, having a significant potential in terms of its scientific base, which, however, is not reflected in the region's so-called innovation capabilities and economic development). Here, I wish to conduct deep interviews with major stakeholders of the scheme in order to have a clear understanding of the expectations and the outcomes of the programme.
- Finally, as it is a common practice in international programme evaluation, I intend to organise a workshop, where preliminary findings of the research will be discussed. The main goal of this exercise is to establish a common perception of the so-called problem- and goal-trees underlying the RET Programme, as well as to identify as specifically as possible its wider impacts and the bottlenecks, possible unintended effects brought about during the implementation process.

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[8] With regard to methodological issues I intend to draw on, e.g. Arnold (2004), Arnold et al. (2004), Edler et al. (2004), Shapira (1996), Georghiou and Roessner (2000).

In addition, some *quantitative* data are also available for analysis.

- Data from the selection process are in principle accessible, which enables an analysis of different types of applications (e.g. in terms of scientific field, type of applicants, size of projects etc.) with regard to their chance of being selected for funding.
- A number of output indicators have been defined ex ante by the implementing agency, in order to be able to monitor the progress of the projects carried out within the framework of the scheme. These are: the number of prototypes and production processes close to the market; the number of patent applications and registered patents; the number of new companies in the region; the number of new jobs and revenues generated by the supported Centre; the number of students involved in R&D activities; the umber of researchers involved in R&D activities, leading to scientific degrees; the number of young researchers and degree holders trained by the Centre and employed by companies; the umber of publications. In principle, these can be obtained for research purposes, and can provide meaningful insights into the immediate outputs of the projects, as well as provide a firm basis for further (qualitative) inquiry into the wider impacts.

Finally, besides the synthesis of the findings obtained from the above methods and sources, a number of policy recommendations will be formulated in order to enhance the efficiency of public funding. In line with my fourth hypothesis above, it is apparent that it is not solely the structure and implementation of this given programme that probably needs to be improved, but also its “environment”, both with regard to the policy mix and the wider framework conditions.

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ANNEX: REGIONAL KNOWLEDGE CENTRES AT UNIVERSITIES FUNDED BY THE PAZMANY PROGRAMME (2004-6)

2004

University	Region	Project Title	Grant (thousand HUF)
Debreceni Egyetem	Észak-Alföld	Csúcstechnológiák a Debreceni Egyetem vonzáskörzetében: genomikai, nano- és biotechnológiai alkalmazások	1 700 000
Szegedi Tudományegyetem	Dél-Alföld	Dél-Alföldi Neurobiológiai Tudásközpont (DNT): Terápiás célú idegrendszeri kutatások a molekulától az integrált idegrendszeri működésig	1 700 000
Semmelweis Egyetem	Közép-Magyarország	Molekuláris és info-bionikai kutatások a medicinában	1 600 000
Budapesti Műszaki és Gazdaságtudományi Egyetem	Közép-Magyarország	Elektronikus Jármű és Járműirányítási Tudás Központ	1 500 000
Miskolci Egyetem	Észak-Magyarország	Tudásintenzív mechatronikai és logisztikai rendszerek	1 400 000
Nyugat-Magyarországi Egyetem	Nyugat-Dunántúl	Erdő és Fahasznosítási Regionális Egyetemi Tudásközpont létrehozása és működtetése	1 100 000

2005

University	Region	Project Title	Grant (thousand HUF)
Budapesti Műszaki és Gazdaságtudományi Egyetem	Közép-Magyarország	Információtechnológiai Innovációs és Tudásközpont (IT2)	1 200 000
Szegedi Tudományegyetem	Dél-Alföld	Környezet- és Nanotechnológiai RET: a dél-alföldi régió életminőségét javító integrált rendszerek fejlesztése	1 200 000

Pécsi Tudományegyetem	Dél-Dunántúl	Dél-Dunántúli Innovációs Egyetemi Tudásközpont az Életminőséget Javító Gyógyszerek és Gyógyító Eljárások Fejlesztésére	1 200 000
Széchenyi István Egyetem	Nyugat-Dunántúl	Járműipari Regionális Egyetemi Tudásközpont	1 100 000
Eötvös Loránd Tudományegyetem	Közép-Magyarország	e-Science Regionális Egyetemi Tudásközpont	800 000
Szent István Egyetem	Közép-Magyarország	Természeti erőforrásokra alapozott környezetipari tudásközpont a Szent István Egyetemen	500 000

2006

University	**Region**	**Project Title**	**Grant (thousand HUF)**
Pannon Egyetem	Közép-Dunántúl	Informatikai Biztonsági Kutató-Fejlesztő Központ (IBKFK) és Pannon Egyetem Környezetvédelmi és Hulladékhasznosítási Innovációs Tudásközpont	800 000
Budapesti Corvinus Egyetem	Közép-Magyarország	Kutatás-fejlesztés az Élelmiszerláncban – Regionális Egyetemi Tudásközpont	500 000
Nyíregyházi Főiskola	Észak-Alföld	FOOD-ENERG Tudáscentrum	300 000
Eötvös Loránd Tudományegyetem	Közép-Magyarország	Budapesti Tudásközpont: a sejtkommunikáció zavaraira visszavezethető betegségek kutatásán alapuló új technológiák fejlesztése	300 000
Dunaújvárosi Főiskola	Közép-Dunántúl	Dunaújvárosi Anyagtudományi és Logisztikai Tudásközpont	300 000
Budapesti Műszaki Főiskola	Közép-Magyarország	Közlekedésinformatikai és Telematikai Tudásközpont	300 000

Abbreviations used in the text:

For English terms used regularly throughout the relevant scholarly literature I have retained the original English abbreviations, whereas for the names of Hungarian organisations/schemes I have used the common Hungarian ones.

BERD	Business R&D expenditures
CEE	Central and Eastern Europe
CIS	Community Innovation Survey
EIS	European Innovation Scoreboard
EU	European Union
GDP	Gross domestic product
GERD	Gross R&D expenditures
GKM	Ministry of Economy and Transport (Gazdasági és Közlekedési Minisztérium)
HE(I)	Higher Education (Institute)
HRST	Human resources for science and technology
ICT	Information and communication technologies
NFGM	Ministry for National Development and Economy (Nemzeti Fejlesztési és Gazdasági Min.)
NIS	National Innovation System
NKTH	National Office for Research and Technology (Nemzeti Kutatási és Technológiai Hivatal)
OECD	Organisation for Economic Co-operation and Development
OKM	Ministry of Education and Culture (Oktatási és Kulturális Minisztérium)
PRO	Public Research Organisation
R&D	Research and development
RET	Regional Knowledge Centres at Universities (Regionális Egyetemi Tudásközpontok)
RTD(I)	Research and Technological Development (and Innovation)
S&E	Science and engineering
SII	Summary Innovation Index
SME	Small- and medium-size enterprises
S&T	Science and technology
STI	Science, technology and innovation (policy)
TTO	Technology transfer office
VC	Venture capital