ASSESSING THE ROLE OF HIGHER EDUCATION POLICY IN THE HUNGARIAN NATIONAL INNOVATION STRATEGY: STATUS QUO, SHORTCOMINGS AND WAYS OUT

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ABSTRACT

The funding of basic scientific research in universities is a public policy issue that lies at the crossroads of science, technology and innovation (STI) policy and higher education policy. Although there is a vivid discussion in Hungary about the need for continuing the reform of higher education finance and an equally vivid discussion about the role of basic research among other priorities of the STI strategy of the country, these two discourses are largely disconnected from each other. In the first analytical part of my thesis I investigate the causes of this disconnect and make a case for the need of dialogue between the two discourses. The call for dialogue is justified by presenting the challenge that the issue of funding basic scientific research in universities poses for both policy fields. The second analytical part of my thesis is an attempt to start the dialogue between the two discourses. I present arguments from both the STI policy and higher education policy discourses. Arguments are selected on the basis of their relevance to the issue of funding basic scientific research in universities and they are presented with the help of an analytical tool that I have designed specifically for this exercise. In a more refined version, the tool has the potential of facilitating dialogue between scholars and policy makers concerned with issues of Hungarian higher education policy and STI policy.

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LIST OF ABBREVIATIONS

KTIA	*Kutatási és Technológiai Innovációs Alap* (Fund for Research and Technological Innovation)
NKTH	*Nemzeti Kutatási és Technológiai Hivatal* (National Office for Research and Technology)
OKM	*Oktatási és Kulturális Minisztérium* (Ministry of Education and Culture)
OTKA	*Országos Tudományos Kutatási Alapprogramok* (Hungarian Scientific Research Fund)
R&D	Research and Development
STI	Science, Technology and Innovation

INTRODUCTION

The funding of basic scientific research in higher education institutions is a public policy issue that lies at the crossroads of science, technology and innovation (STI) policy and higher education policy. Although there is a vivid discussion in Hungary about the need for continuing the reform of higher education finance (Báger et al. 2004, Báger et al. 2005, Bokros 2008, Kováts 2006, Polónyi 2004, Szabó 2008) and an equally vivid discussion about the role of basic research among other priorities of the STI strategy of the country (Havas 2006, Havas and Nyiri 2007, Mosoniné Fried 2006, OECD 2008, Patkós et al. 2006, Veres and Krisztics 2007), these two discourses are largely disconnected from each other.

The aim of my research is to connect the Hungarian STI and higher education policy discourses by identifying and assessing those policy scenarios that would enable the performance-based funding of basic research in Hungarian higher education institutions.

The methodology used throughout the research is predominantly qualitative in nature, complemented with some quantitative analysis of publicly available data[1]. Review of the scholarly literature and analysis of the relevant policy documents provides the background for the discussion of STI and higher education policy goals. The comparative assessment of available policy scenarios is my own contribution.

The significance of my thesis to the Hungarian STI policy discourse is that it provides STI policy makers with a country-specific higher education policy perspective that is largely absent from current STI policy documents. This perspective, along with the proposed analytical tool, could be a useful starting point of further discussion for scholars and policy makers concerned with issues of Hungarian higher education policy and STI policy.

[1] An exception from this is the data received from the Hungarian Ministry of Education and Culture. Because this data was not easily accessible to the public at the time my research was conducted, the tables are reproduced in the appendix of this paper.

The thesis is divided into three chapters. In Chapter 1, I will briefly present the Hungarian STI and higher education policy discourses. Due to obvious length constraints, neither summary will be comprehensive. Rather, they will highlight those STI and higher education policy issues that have the most direct bearing on the thematic focus of my thesis, i.e., the issue of basic research funding in higher education institutions.

In Chapter 2, I will investigate the causes of disconnect between the STI and higher education policy discourses. I will argue that disconnect occurred because the public funding of basic research is currently (and somewhat misguidedly) marginalized in both discourses. In the first section the chapter I will discuss the marginal position of basic research funding in the current Hungarian STI strategy. In the second part, the research mission of Hungarian universities will be discussed. The third section concludes that the funding of basic research in universities poses an important challenge to Hungarian STI and higher education policy and that this challenge should be addressed in more theoretical and technical detail.

In Chapter 3, I will offer a potential starting point for such a debate that I called for in Chapter 2. The starting point of the debate is proposed to be the comparative assessment of the status quo and alternative policy scenarios relating to the issue of funding basic research in higher education institutions. I will analyze the status quo and two alternative scenarios with the help of an analytical tool that I designed specifically for this exercise. The thesis will conclude with conclusions drawn from the assessment of the policy scenarios and with the mapping of possible directions for future research.

1. HIGHER EDUCATION POLICY AND SCIENCE, TECHNOLOGY AND INNOVATION POLICY IN HUNGARY

The funding of basic scientific research in universities is a public policy issue that lies at the crossroads of science, technology and innovation (STI) policy and higher education policy. Although there is a vivid discussion in Hungary about the need for further reforms in the higher education sector, and an equally vivid discussion about the priorities of the STI strategy of the country, these two discourses are largely disconnected from each other. In the first chapter of my thesis, I will briefly present both discourses. Due to obvious length constraints, these summaries are not intended to be comprehensive. Rather, they highlight those policy issues that have the most direct bearing on the argument that will be presented in Chapter 2.

1.1 Higher education policy

The Hungarian higher education sector underwent a radical change since the change in the political system in 1990: an elite system of universities transformed into a mass higher education system, with the number of enrolled students tripling, the number of graduates doubling over the past two decades (Havas and Nyiri 2007, 24). This transformation went parallel with a number of significant legislative changes.

The first comprehensive law on higher education was passed in 1993, with major amendments in 1996 and 2001. The 1993 Act on Higher Education codified the autonomy of higher education institutions in all matters relating to education, as well as scientific and artistic activities (Báger et al. 2004, 42). The period between 1990 and 1993 was characterized by relatively low enrollment numbers (Szabó 2008, 141).

Throughout the 1990s, higher education institutions were financed partly through individualized negotiations between the institution and the state, and partly through the allocation of the so-called core grants[2], calculated on the basis of input factors such as the number of students enrolled (Szabó 2008, 141). Since the participation in higher education was nominally free, and the input-based core grant system of financing incentivized institutions to admit more and more students, enrollment numbers skyrocketed. However, the expansion in student numbers was not matched with expansion either in teaching staff numbers or in infrastructural investment. This tendency raised concerns about the decreasing quality of higher education (Bokros 2008, para. 10–11). To cool the drastically increasing demand for higher education, voluntary co-payment was introduced parallel with the codification of input-based financing in 1996. However, the number of students who could be admitted on a fee-paying basis was limited by law, which mitigated the expected effect of the policy (Bokros 2008, para. 16).

In 1998, Hungary received a structural adjustment loan from the World Bank on the condition that it will reform the governance of higher education institutions, rationalize the higher education system by institutional integration, and implement several other reforms in the higher education sector. The integration plan was implemented in 2000; it nearly halved the number of higher education institutions in Hungary. The governance reform was not implemented. (Báger et al. 2004, 53–54)

In 2000, Hungary signed the Lisbon Recognition Convention and committed itself to the project of creating an integrated European Higher Education Area, i.e., the Bologna process. Joining the Bologna process provided the impetus for proposing a global modernization plan for the higher education sector in Hungary. The four pillars of the

[2] The Hungarian term is *normatíva*. By translating it as „core grant" throughout the document, I follow the OECD practice. However, some liturature reviewed translated the same term as „normative (grant)". Since the English word *normative* has implications different from what the Hungarian word denotes, I avoided using this translation.

proposed reform were the modernization of teaching and research processes, finance reform, as well as reforms of institutional and sectoral governance. (Báger et al. 2004, 58–59)

In 2005, a new act on higher education was passed. This act, completed with a 2008 governmental decree, intended to introduce significant changes to the higher education sector. The original version of the law made a distinction between the academic and economic (internal) governance of higher education institutions. The university senate, which previously performed both functions, was to be deprived of its economic mandate; this function was to be delegated to a body called „economic council" (Szabó 2008, 183). The concept of economic councils was taken after the Anglo-Saxon board of trustees system and it was meant to increase institutional efficiency in resource allocation (Bokros 2008, para. 44). However, since the Hungarian Constitutional Court modified the original piece of higher education legislation in a manner that imbued only advisory powers onto these councils, the status quo regarding the internal governance of higher education institutions remained intact (Szabó 2008, 190).

The 2005 law and the related 2008 governmental decree were meant to induce changes in the field of higher education finance, too. Before 2008, a lump sum, calculated on the basis of education-related input indicators, was given to higher education institutions. This lump sum was meant to cover costs relating to education and research, as well as operational costs (Báger et al. 2004, 73–74). The new law introduced a modified version of the input-based system, in which education, research and general support for the operation of the institution are assigned separate indicators. Core grants are calculated based upon these field-specific indicators (e.g. the number of doctoral students for the scientific core grant). Tibor Szabó argued that the introduction of field-specific indicators served the interest of the largest universities who were more likely to perform better on the scientific indicators (2008, 142).

Last but not least, the 2005–2008 reforms introduced output-based elements to the financing of higher education institutions. Since 2008, higher education institutions are required to sign a contract with the Ministry of Education and Culture. The contract defines the amount of state support for the given institution and sets performance indicators. Contracts are reviewed after three years, and the renewal of the contract under the same (or better) conditions is dependent upon the institution meeting the performance requirements set in advance (Havas and Nyiri 2007, 25). Tibor Szabó argued that this change in the regulation was not successful in introducing meaningful and readily comparable performance-based elements in higher education finance, since the regulation allows for institutions to choose not only the output indicators upon which they will be assessed but also to define the methodology of measuring outputs and setting their own performance targets (2008, 142).

Throughout the 2000s, the issue of introducing mandatory co-payment instead of the already existing system which mixed nominally free higher education with a limited number of voluntary fee-paying places was debated several times. In the early 2000s, the idea of an *ex post* tuition fee (basically a graduate tax) was proposed but did garner much support (Riba 2006). Lajos Bokros made a case for co-payment in higher education as part of paradigmatic reform of higher education finance, where negotiation-based and input-based financing methods would be substituted by a mixture of performance-based institutional funding and reliance on tuition revenues (2008, para. 21). S key arguments for co-payment were that it would ease the fiscal pressure on the central budget by introducing elements of private finance into the higher education sector. Furthermore, co-payment makes student conscious about their educational choices which is forces higher education institutions to sustain the quality of education

In 2006, the freshly re-elected government decided to introduce a mandatory tuition fee (OKM 2006). The fee was proposed to be introduced in the 2007/2008 academic year but

the proposal met large-scale political resistance. The issue was put up to a referendum in March 2008 and since the majority of votes were against, the fee was never introduced (Heti Világ Gazdaság 2008). Becoming something of a political taboo, the issue of co-payment lost its priority on the higher education policy agenda.

The research mission of universities was also put on the higher education policy agenda in the 2000s. Chapter 5, Article 6 of the higher education act of 2005 empowered the government to design a framework for the targeted funding of universities based on their scientific performance. A proposal with a timeline for introducing a competitive grant system was prepared the next year (Patkós et al. 2006). The "research university" concept was modeled after the excellence initiative of Germany (Huber 2010), albeit with much more modest resources (Edupress 2010). The call for applications was introduced in January 2010 but no line in the central budget was separated for the purpose of funding the program (Riba 2010). When the Ministry of Education announced the winners of the competition in April 2010, it awarded the title „Research-intensive Elite University" (*kutató-elitegyetem*) to five Hungarian universities, stating that European Union structural funds will be used for supporting the research activity of universities until 2013 (OKM 2010). This solution was not met with unanimous support because the EU structural funds are allocated through a separate application procedure. Since not only universities who received the „Research-intensive Elite University" title are eligible for these grants, the money each institution is likely to receive is lower than was originally envisioned under the „Research-intensive Elite University" program (Riba 2010).

To conclude this section, there are several recurring issues in the Hungarian higher education policy discourse. One recurring issue is the need for further reform in the internal governance of higher education institutions. The dominant argument is to abolish the economic autonomy of higher education institutions, thereby increasing efficiency in resource

allocation. Another issue is the decreasing quality of higher education as a result of massification and how this tendency may be reversed. Two popular ideas are the introduction of performance-based financial incentives (e.g. output-based financing) and the introduction of quality assurance measures. Last but not least, the research mission of universities is gaining more and more public attention.

1.2 Science, technology and innovation policy

What is science, technology and innovation (STI) policy? The mid-term STI strategy document of Hungary, adopted in 2007, defines it as a set of policy instruments that aim at facilitating the transformation of the Hungarian economy so that economic growth will become a function of knowledge production and the ability of private and public sectors to innovate (Magyarország Kormánya 2007, 3). In this section I will outline the evolution of this policy approach in Hungary from the transition period of 1990s until the present day. The section also highlights key issues of the current policy debate on STI priorities. With the exception of the section on the transition period, the presentation of the subject matter relies heavily on the STI country review of Hungary, published by the Organisation for Economic Co-operation and Development in 2008.

In the 1990s, STI policy, similarly to the rest of the country, was in transition. In Hungary, just as in other countries of the Central and Eastern European (CEE) region, pluralization of the political system brought about the weakening of the previous central control over science and research policy (Schimank 1995, 649). This had several consequences. First of all, the cornerstone of the research system of state socialism, i.e., the Academy of Sciences, gained autonomy. However, the deepening economic crisis that

characterized all transition countries in the early 1990s left the autonomous Academy with drastically reduced funding (Balazs et al 1995, 613). At the same time, universities, who were mostly marginalized during the era of central planning as research institutes, were now emerging as competitors for the same (limited) public funds for research (Mayntz 1998, 5). In short, the 1990s were characterized by the end of central planning for science and research policy, a significant reduction in the size of the research and development sector, and increasing competition among research units for the shrinking pool of public funds.

The OECD report argues that a shift in thinking about the role of science, research and development occurred in the early 2000s, when fiscal stability was temporarily achieved in Hungary and the economy was in a boom. New resources for economic and social development became available and with it a need for thinking about using these resources in a strategic way also emerged. The need for development planning was also triggered by Hungary's upcoming accession to the European Union (OECD 2008, 157).

According to the OECD report, the first STI strategy document in Hungary, titled *Science and Technology Policy*, was written as part of the first national development strategy, the so-called *Széchenyi Plan* of 2000. In 2002, a *New National Development Plan* by the new government was adopted. This strategy document also set innovation as one of the key developmental priorities, positioning STI policy relatively high on the political agenda (2008, 157). The mid 2000s saw the creation of several R&D funding agencies as well as STI policy advisory bodies (for a detailed discussion cf. Havas and Nyiri 2007, 34-36). Two important pieces of legislation were passed, the Law on Research and Technological Innovation Fund (Act of XC of 2003) which mandated the creation of an extra-budgetary fund to be maintained from a profit tax paid by enterprises matched one-to-one from the central budget, as well as the Law on Research and Technological Innovation (Act of CXXXIV of 2004) which provided guidelines for governmental spending on research and innovation (Havas and

Nyiri 2007, 37–38). Policy dialogue among stakeholders from industry and academia were initiated and the outcomes of roundtable discussions were published.

The next chapter in the evolution of Hungarian STI policy, according to the OECD report, began after the EU accession. Hungary adopted yet another development plan, the *New Hungary Development Plan*, which served the purpose of planning the utilization of the EU Structural and Cohesion Funds that became available to the country. The Structural and Cohesion Funds prioritized R&D and innovation, therefore Hungarian policy makers drafted a mid-term STI strategy document and a related action plan, both of which were adopted by the government in 2007 (OECD 2008, 159). About the same time, an European Commission-sponsored study of the STI policy instruments used in Hungary was published (Veres and Krisztics, 2007), the results of which fed into a longer study about the Hungarian innovation system, prepared by the National Office for Research and Technology (Nemzeti Kutatási és Technológiai Hivatal, NKTH). The study prepared by the Havas and Nyiri, titled *National System of Innovation in Hungary* (2007) was used as a background study for the OECD innovation policy report, published a year later.

The OECD report, which as of yet is the most throughout review of the evolution and current setup of the Hungarian STI sector, has built on all major STI policy documents prepared in Hungary over the past decade, and the OECD team consulted all relevant stakeholders, including representatives from ministries, industry and academia. In addition to tracing the evolution of Hungarian STI policy, the report conducted a strengths, weaknesses, opportunities and threats (SWOT) analysis of the current STI policy setup (OECD 2008, 11-19). Furthermore, it made six general recommendations based upon the results of the country review process. These recommendations are a concise summary of the central issues of the Hungarian STI policy discourse.

The six recommendations of the OECD report are the following: 1. improve the governance of the innovation system; 2. foster innovation in the business sector; 3. strengthen the links in the innovation system; 4. foster critical mass, excellence and relevance of public research; 5. maximize benefits from the internationalization of R&D; and 6. strengthen the human resource base for STI and innovation (OECD 2008, 201).

Out of these six general recommendations, 4 and 6 have direct reference to the higher education sector. Recommendation 6 is a reference to the need for improving the quality of doctoral education, a task that is performed by the higher education institutions. Recommendation 4 is relevant because higher education institutions belong to the category of public research institutions. Here the OECD specifically recommends the introduction of performance-based financial incentives for public research institutions.

To conclude Chapter 1, it is worth noting that among the many issues currently on the respective STI policy and the higher education policy agendas, the call for increased quantity and quality of research in public research institutes (i.e. the excellence initiative), and the issue of introducing performance-based incentives for public research institutes appears on the agenda of both policy fields.

2. FUNDING OF BASIC SCIENTIFIC RESEARCH IN HIGHER EDUCATION INSTITUTIONS

In Chapter 1, I have outlined the evolution of the higher education policy and STI policy in Hungary over the past two decades and highlighted those policy issues in each field that are currently central to each policy discourse. Among the issues highlighted were the call for increased quantity and quality of research in public research institutes (i.e. the excellence initiative), and the related issue of introducing performance-based incentives for public research institutes.

The common interest of STI policy and higher education policy is obvious in the policy goals of excellence in research and performance-based research funding. In fact, scholars and policymakers have repeatedly called for a solution to these issues (Báger et al .2005, Török 2006, OECD 2008). However, the detailed, theoretical as well as technical discussion of these two issues is largely missing.

In Chapter 2, I will investigate the causes of disconnect between the STI and higher education policy discourses. I will argue that the disconnect exists because the public funding of basic research, that is, the issue where the policy goals of excellence in research and performance-based research funding meet, is currently (and somewhat misguidedly) marginalized in both discourses. In the first part of this chapter I will discuss the marginal position of basic research funding in the current Hungarian STI strategy. In the second part, the research mission of Hungarian universities will be discussed, the point in case being research funding as part of higher education finance. I will conclude that the funding of basic research in universities in fact poses an important challenge to Hungarian STI and higher

education policy and that this challenge should be addressed in more theoretical and technical detail.

2.1 Public funding of basic scientific research

2.1.1 The theoretical debate

In order to put the issue of public funding of basic scientific research in context, I will briefly review the key arguments for STI policy as a kind of public policy. Public expenditure on science, technology and innovation is justified by the following line of argument. According to some estimates, at least half of long-term economic growth in industrialized nations is accounted for by technological change (Tassey 1998, 4). Technological change, in turn, is dependent on the availability of a science base in a given system of national innovation. Science base is the aggregate of basic research activities, which can bolster technological change (Mosoniné Fried 2006, 259). Basic research creates knowledge, which is a non-rival and non-excludable good, i.e., a public good. Since public goods tend to be undersupplied by the market, the "process of providing basic science – basic research – is largely and legitimately financed by government" (Tassey 1998, 20). In short, the argument is that the government should finance basic research if it wants to ensure the existence of a science base which facilitates technological change and, subsequently, economic development.

This view, namely, that basic scientific research is at the bottom of technology-induced economic growth, is often referred to as the science push model (Mayntz 1998, 3). This approach is associated with the work of Vannevar Bush and Alvin M. Weinberg (Mosoniné Fried 2006, 259). The model has been criticized among others by Gregory Tassey who described it as "simplistic and inaccurate", arguing that it is not knowledge, i.e., the

output of scientific research that can be applied in economic activity but rather organized knowledge, i.e., technology. Since technology can and does become obsolete over time as more effective ways of organizing knowledge are invented, there is an investment risk involved (Tassey 1998, 67). Identifying private underinvestment in technological development due to risk-aversion as a market failure, Tassey called for public investment not only in basic scientific research but also in generic technology, a concept that he defines as "the first result of attempts to draw upon basic science for market application … from which specific commercial (and hence proprietary) applications are developed through subsequent applied R&D" (1998, 70).

Another criticism of the science push model came from Richard Nelson who argued that knowledge, defined here as scientific findings, can in fact be made excludable through the extensive use of patenting, which leads to the exploitation of scientific commons. This implies that public support for basic research should be designed with utmost care, as public expenditures allocated for such purposes can be easily captured by private agents, eroding the expected effect of positive externalities (Nelson 2004).

Although Tassey convincingly argued that public investment in R&D activities other than basic scientific research is justified, and Nelson made a compelling case for caution in public funding for basic research, neither of these arguments implied that public spending on basic research is not justified at all. Unfortunately, this insight is not always reflected in important policy documents that have a major impact on the Hungarian STI policy, too. One such document is the 2004 Kok report of the European Commission, which recommended that European Union member countries should expand their gross expenditure on research and development (GERD) primarily by the promotion of private investment in R&D (Török 2006, para 3.)

To conclude this section, there is an important argument from the field of economics for the public funding of basic scientific research. Some pitfalls relating to this issue are also pointed out in the scholarly debate. However, the acknowledgement of pitfalls seems to have had the negative consequence of legit concerns marginalizing the equally legit case for the public funding of basic scientific research.

2.1.2 Priorities of public research funding in Hungary

In the previous section I outlined the theoretical context of the public funding of basic research. In this section, I will briefly discuss how the public funding of basic research (or the lack of it) evolved in Hungary and how the current situation vis-à-vis basic research looks like.

During the socialist period in Hungary, central funding for basic research was heavily limited due to the political decision to direct most of the central funding for R&D to applied research and industrial development. During the transition period, it was not political will but the prolonged economic and fiscal crisis that set a limit for state spending on basic research. The late 1990s and early 2000s saw an area of fiscal stability and economic boom, making an increase in central funding for R&D possible (OECD 2008, 157). However, the increased state spending on various STI-related programs prioritized applied research and collaborative research. Central funding for basic research in fact decreased in this period (OTKA 2008, 1).

Hungary's 2004 accession to the EU did not alter the pool of resources available for funding basic research significantly. In the European Union, community level funding for research is allocated by means of the so-called Framework Programme. It purports to promote transnational research cooperation along thematic priorities set by the European Commission.

FP grants are allocated to projects proposed by transnational research consortia on a co-financing basis (NKTH website).

The Seventh Framework Programme (FP7, in effect 2007-2013) differs from its predecessor in that it introduced a program (*Ideas*) for supporting basic research (NKTH website). However, albeit the second largest in terms of budget in the whole FP7 portfolio, the *Ideas* program only takes up 15% of the total FP7 budget (European Commission 2007, 15). The majority of FP7 funds (approximately 65%) are still devoted to the promotion of applied research and development by means of facilitating university-academia collaboration. In fact, the OECD report on Hungarian STI policy talks about an increasingly disproportionate allocation of competitive grants for applied as opposed to basic research in the FP7 (OECD 2008, 210).

Public expenditures on basic research as opposed to other forms of R&D and innovation activities are biased toward applied R&D and innovation-related projects in Hungary, too. The full extent of this bias can be illustrated with a few figures. Based on the calculations of Jozsef Imre, the total amount of financial resources available to the Hungarian STI sector currently amount to an approx. 170 billion HUF annually (interview with Imre Jozsef, 8 April 2010). This figure includes the EU structural funds, the FP7 grants and other international grants available to the Hungarian R&D sector. Out of this 170 billion HUF, only about 9 billion HUF is devoted to basic research. 5 billion is the annual budget of the Basic Research funds (OTKA), 1 billion is allocated from the Research and Technological Innovation Fund (KTIA) and an additional 3 billion HUF can be expected from the FP7 grants[3].

Funds for R&D are also available through the EU structural funds, some of which are not specifically earmarked for applied R&D. However, since the main purpose of this pool of

[3] Jozsef Imre estimated the amount of FP7 grants received by Hungarian research teams to be approximately 20 billion HUF annually. Since 15% of the total FP7 budget is allocated to basic research projects, the 3 billion HUF for Hungarian basic research projects is a fair, albeit very crude, estimate.

R&D-related structural grants is to increase investment in R&D infrastructure and human resources (OKM 2010) and not for funding basic research projects, this amount should not be indicated on the resource map for basic research.

In conclusion, public research funding in Hungary is biased toward applied R&D and innovation. The resources allocated to basic research are significantly lower than public expenditures relating to applied R&D and innovation. This bias is reflected in the allocation of European Union structural funds and research grants, and is also present in the allocation of national resources channeled to the STI sector.

2.2 The research mission of Hungarian universities

In the previous section I argued that public funding for basic research was low on the STI policy agenda. In this section, I will argue that the funding of basic research in public research institutes is high on the higher education policy agenda but that neither the central government nor the higher education sector is fully committed to the review of the status quo.

As it was discussed in Chapter 1, the research mission of universities was put on the higher education policy agenda in the late 1990-s and remained there throughout the 2000s. Although both the 1993 and 2005 higher education laws defined research as part of the mission of publicly funded universities, originally no financial incentives were attached to this definition. The 2008 governmental decree changed this setup somewhat when it introduced input-based core grants specifically for scientific research. However, since the law maintained that higher education institutions could exercise their autonomy regarding the internal allocation of these grants, the core grants nominally allocated for scientific research were often spent on other, education- or maintenance-related costs (cf. OECD 2008, 118).

In addition to the introduction of input-based scientific core grants, another initiative appeared in the higher education policy arena that was deemed to be conducive to increasing the R&D performance of the higher education sector. This initiative was the "research university" concept, which was modeled after the excellence initiative of Germany (Huber 2010). As discussed in Chapter 1, fiscal resources allocated for funding the program were rather modest compared to Germany. Furthermore, the funds allocated were one-off items from the larger pool of EU structural grants, and not a line in the current budget. Although the impact of the 2009 economic crisis and the ensuing need for fiscal consolidation should be emphasized, it is equally important that the Hungarian government has yet to make a long-term fiscal commitment to the research university initiative (Riba 2010).

At the core of the research university initiative is to concentrate resources for R&D at a few universities that have good chances of achieving economies of scale and scope in basic research and the development of generic technologies (Duderstadt and Weber 2006, 294). And while increasing the pool of funds available for basic research is indeed important (the OECD makes a recommendation to this effect, cf. 2008, 210), in a country with a dire need for fiscal consolidation, the efficient allocation of already available resources is equally important.

Efficiency in allocating public funds to the R&D sector may be high on the governmental agenda, but not all stakeholders are equally interested. Higher education institutions, for one, try to maximize reputation rather than profit and thus have a virtually unlimited wish for expanding their budget (van Vught 2006, 68). According to the rules of the reputation race, higher education institutions will try to acquire more and more funds to invest in infrastructure (laboratories, dormitories) and human resources (doctoral students, star professors) in order to increase their reputation. Applying this logic to the Hungarian higher education sector, one can expect that while higher education institutions are likely to remain

vocal about the need for increased funding of R&D activities through the introduction of various new programs, they will not join an initiative which primarily aims at making the allocation of already existing funds more effective.

To conclude this section, I argued that despite ostensible consensus on the research mission of higher education institutions, the Hungarian government has yet to make a long-term fiscal commitment to funding research in these institutions. I have also argued that higher education institutions, while clearly having a stake at calling for significant and sustainable amounts of public funds to improve their R&D capacities, do not have a stake at a review of the current system of higher education finance vis-à-vis R&D activities.

2.3 Need for dialogue

In sections 2.1 and 2.2, I argued that basic research funding is marginalized in the Hungarian STI strategy, and that the issue of higher education finance vis-à-vis R&D activities is marginalized in the higher education policy debates. Despite these tendencies, there are good reasons for initiating a dialogue between the STI and higher education policy fields, as the status quo has several drawbacks and a joint STI policy -higher education policy approach could mitigate these effects. In the following, final section of Chapter 2, I will discuss the drawbacks of the status quo and make a case for intensifying the dialogue between the STI and higher education policy fields as a way to address these drawbacks.

There are several arguments why the issue of public funding of basic research in higher education institutions should be addressed in detail. The first argument concerns the low levels of financial support for basic research in Hungary. It is argued that disproportionate levels of public spending on applied R&D crowd out basic research, and this results in a lack of scope in basic research activities. However, economies of scope effects are at play in the R&D sector, therefore the existence of a diverse science base is a prerequisite

for the good performance of the national innovation system (Tassey 1988, 12). In case of the absence of a broad national science base, countries can free-ride on scientific results imported from abroad. However, this solution is not sustainable because the applied R&D sector quickly becomes dependent on the imported basic scientific findings, thereby restricting its own capacities for innovation. Free-riding on imported scientific results is also detrimental to the quality of higher education, especially to doctoral education, because the teaching staff loses touch with most recent developments of their field (Török 2006, para. 27).

A third argument is that low levels of financial support for basic research, if matched with disproportionately high expenditure on applied R&D, result in the artificial crowding-in of academic research institutes into the field of applied research (OECD 2008, 210). Arguably, the problem with crowding-in of academic research institutions into applied research is not simply that it diverts human, financial and infrastructural resources from basic research but also that it incentivizes academic research institutions to try to sell basic research projects as applied research. Anecdotal evidence seems to support the OECD's claim. The director of a Hungarian venture capital fund in a private discussion described academic research institutes as "grant-devouring voids" whose directly applicable research output existed mostly on paper, the research grants having been spent on basic research that the industrial partner had no way to benefit from.

Last but not least, there is a compelling efficiency reason for reviewing the status quo. This reason is that scientific core grants to higher education institutions constitute the single largest pool of national resources spent on research in public institutions in general and for basic research in particular, and therefore their efficient allocation is vital for improving the STI capacities of public research institutes.

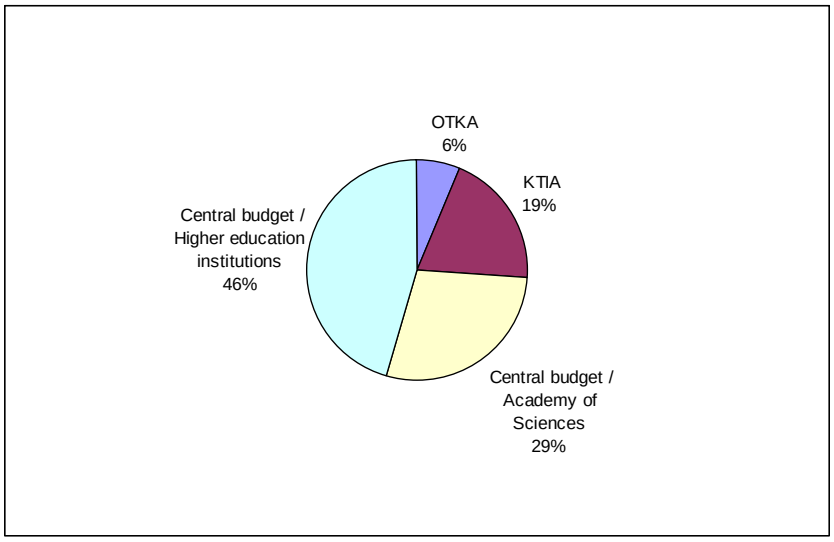

Figure I. The share of budget lines relative to total research-related expenditures on public research institutions

(Source of data: MTA, OKM, OTKA, NKTH)

The claim that scientific core grants constitute the largest pool of national resources spent on research in public institutions can be seen from the chart in Figure I. The chart shows the relative share of those four budget lines of the current budget of the Hungarian central government which are nominally devoted to the promotion of research activity in public research institutes. The OTKA grants, distributed on a project-funding basis by the Academy of Sciences, comprise the smallest slice of the pie, with its annual budget of 5 billion HUF (OTKA 2008). Grants given to public research institutes from the 55 billion HUF annual budget of the KTIA comes to 15 billion HUF a year (interview with Jozsef Imre, 8 April 2010). The budget line for operational and maintenance costs of the Hungarian Academy of Sciences (MTA) comes to an annual 22 billion HUF. This amount, out of the total MTA budget of 37 billion, is earmarked for financing research activities only. Last but not least, the scientific core grants given to higher education institutions make up the largest slice of the pie

with an annual 35 billion HUF which translates to 46% of total research-related expenditures on public research institutions[4].

It must be emphasized that the proportion of resources in Figure I. is somewhat misleading, though purposefully so. The figures are misleading because OTKA and KTIA grant recipients, and to a certain extent MTA, have an obligation (as manifest in their accounting obligations) to spend the public money they receive on research. This is not the case with the scientific core grants, since the internal allocation of these grants, similarly to the other core grants, is not monitored by the state (OECD 2008, 118). Ádám Török argued that the purpose of increasing the amount scientific core grants at the expense of the educational core grants was in fact an accounting gimmick: this way the government could claim that it raised gross expenditure on R&D (GERD) while it did not have to allocate additional fiscal resources to the sector. And by leaving the economic autonomy of academic institutions intact, it could also avoid large-scale resistance from the higher education sector (Török 2006, para. 40).

The introduction of scientific core grants to higher education institutions, and their increase at the expense of educational core grants might have originated as an accounting gimmick. However, there is a budget line which allocates 46% of the total research-related public outlays and the efficiency of these allocations is not guaranteed by any incentives, financial or other. If there is a budget line whose allocation would be worth reviewing with the view to increase the efficiency of public resources spent on STI, then scientific core grants to higher education institutions is this budget line.

In light of the arguments enumerated above, it is fair to say that the funding of basic research in higher education institutions poses an considerable challenge to Hungarian STI

[4] Data used for this chart is comparable as each budget line was taken for the fiscal year 2008. If only those grants of the KTIA are counted that are earmarked exclusively for basic research (2 billion HUF annually), the share of scientific core grants to higher education institutions relative to total *basic research-related* expenditures on public research institutions comes to 55%.

and higher education policy and that this challenge should be addressed in more theoretical and technical detail. The OECD report makes a very clear point regarding this case:

> Political commitment should be reflected not only in appropriate budgetary appropriations in support of STI activities, but also in the effective operation of a governance structure entrusted with the preparation of the S&T budget, and its co-ordination with relevant ministerial departments whose actions affect the performance of the STI system. (OECD 2008, 17)

In conclusion, a more intense dialogue between scholars of public policy, as well as better policy coordination between STI and higher education policy makers is needed to address the challenge that the funding of basic research in public research institutions poses. In the next, final chapter I will introduce an analytical tool that has the potential to facilitate the much needed scholarly discussion on the subject, which can be a first step towards improved policy coordination.

3. ARGUMENTS IN THE DEBATE ON POLICY OPTIONS

In Chapter 2, I identified the reasons why the issue of funding basic research in higher education institutions is currently marginal to both the STI policy and the higher education policy discourses in Hungary. At the end of the chapter I called for a debate on the issue with the view to improve policy coordination. In Chapter 3, I will offer the potential starting point of this debate in the form of an analytical tool that I have designed specifically for this exercise. The tool presents three policy scenarios (the status quo plus two alternative policy scenarios) relating to the issue of funding basic research in higher education institutions.

In the first section of this chapter, I will introduce three indicators to assess the performance of the three scenarios. Having established the assessment criteria, I will discuss the current setup of funding basic research in Hungarian higher education institutions and assess it on the basis of the indicators presented in the first section. After the analysis of the status quo, I will present and assess the two alternative policy options, too. Finally, I will draw preliminary conclusions and indicate possible directions for further research.

3.1 Indicators

In this section I will briefly define the indicators that I chose to use for the assessment of the status quo and the two alternative policy scenarios. The brief definitions provided here will be further elaborated on, where appropriate, in the sections assessing the policy scenarios.

The first indicator used is the quantity and quality of research, i.e., to what extent is the given policy scenario conducive to triggering increase in both fields. The introduction of this indicator is justified by the "excellence initiative" argument from Chapter 1 – that is, that

only research institutions with large research capacities and word-class quality research can meaningfully contribute to the national innovation strategy (cf. Duderstadt and Weber 2006).

The second indicator to be used is the diversity of science base. This indicator measures to what extent the given policy scenario is capable of sustaining a broad science base. The introduction of this indicator is justified by the "economies of scope" argument from Chapter 2 – technological change is dependent upon the availability of a broad science base, and the shrinking of this base has negative consequences both for the applied R&D sector and the quality of higher education, especially doctoral education (cf. Török 2006, para. 27.)

The third, last indicator is administrative ease, and measures the complexity of administrative tasks associated with a given scenario. This indicator is introduced on the grounds that one of the most common objections against performance-based funding systems is that is is very costly and difficult to administer them (cf. Szabó 2008, 137). Details about the difficulties and costs associated with various policies will be discussed at the given policy scenario.

Having identified the indicators that will be used for assessing the different policy scenarios, the next section introduces the status quo and the two alternative policy scenarios. The introduction of each scenario is immediately followed by the assessment; the comparative assessment of the three scenarios comes at the end of the chapter.

3.2 Identifying policy options

3.2.1 The status quo – Input-based financing

Scientific research in Hungarian higher education institutions is currently financed on the basis of input calculation. The Act of CXXXIX of 2005 on Higher Education introduced the allocation of scientific core grants. Article 5 of the 50/2008. (III. 14.) governmental decree introduced the formula for calculating the amount of these grants. The amount of grant each institution receives is based upon the number of professors the institution employs full time, the number of teaching staff holding a scientific degree, the number of full-time doctoral students with a state-financed status, the number of full time teaching staff, and the number of scientific degrees awarded in the given fiscal year.

In terms of the first indicator, i.e., the quantity and quality of research output, the input-based financing model of the status quo performs rather poorly. Kováts (2006) argued that there are three main disadvantages of the input-based financing of scientific research. First of all, inputs for scientific activity are more elusive than inputs for teaching. (For the teaching process, the key inputs are the students and teaching staff.) Secondly, incentives for making efficient use of scientific research funds are weak since the output of research is not taken into account when the amount of grant is calculated. Finally, since all institutions that possess the required inputs receive funding, the concentration of financial resources is not possible, yet the concentration of resources is a prerequisite for performing high quality research (2006, 930). In conclusion, the status quo is not conducive to increasing either the quantity or the quality of research.

As far as the second criteria, namely, diversity of the science base, is concerned, the status quo fares well. Since funding is not tied to performance in this model, researchers in

higher education institution are more likely to undertake more risky research projects and to diversify the portfolio of research projects (Geuna and Martin 2003, 299) Another advantage of this scenario is that even those universities who have no history in research may decide to develop this profile within this system (Kováts 2006, 931). In other words, input-based funding provides considerable freedom for universities in terms of developing diverse research profiles and undertaking high-risk research projects.

The third criterion is in a sense biased in favor of the status quo because when an administrative system is in use, it is normally less costly to stick with the system already in place than to pay the costs implied in the transition (Liviu Matei, personal communication). However, it is not simply institutional inertia that assigns a relatively higher score to the status quo for this criterion. Kováts (2006) pointed out that all forms of formula-based financing (and input-based financing belongs to this category) require the availability of reliable data. Since institutions have incentives to tamper with statistical data, ensuring that the data collected is as reliable as possible requires extra administrative efforts (2006, 928). In light of these considerations, the status quo performs only moderately well on the administrative ease criterion.

To summarize the assessment of the status quo, input-based financing of scientific research is not conducive to increasing the quantity and quality of research output; it fares well in terms of the diversity of science base; and it performs only moderately well in terms of administrative ease.

3.2.2 The first alternative – Output-based institutional financing

Given that the status quo performs poorly on the criterion that is most relevant from the point of view of STI policy, that is, the quantity and quality of research output, the OECD report recommended that Hungary offer more performance-based incentives for its publicly funded research institutions (2008, 210). Output-based institutional financing could offer such incentives. Kováts (2006) described this model as one where the size of institutional grants is calculated on the basis of certain output indicators. Such indicators for research activity typically are the number of publications, the number of citations or the number of publications in peer reviewed journals. Kováts argued that the most important feature of such a setup is that it incentivizes institutions to pay more attention to increasing the quantity of their outputs rather that of their inputs (2006, 931). From this argument it follows that if output-based financing for scientific research in higher education institutions was introduced, both the quantity of research outputs would increase.

What could be the cause of some concern regarding the impact of output-based financing on research quality is, according to Kováts (2006), the fact that while defining output indicators may be relatively easy, developing indicators that measure the quality of the output in the financing formula is a far more challenging task. There is a risk that if output indicators are not sophisticated enough, institutions will be incentivized to allocate more resources to increasing the quantity rather than the quality of the output. Another point Kováts made vis-à-vis this issue is that the value of outputs, i.e., what has been produced, and that of outcomes, i.e. whether the product has achieved the goal it was meant to serve, is not the same (2006, 931).

The difficulty in measuring the quality of outputs as well as the challenge to measure outcomes rather than outputs implies that output-based institutional financing may be conducive to increasing the quantity, but not the quality, of research output. While acknowledging this problem, Geuna and Martin emphasized that the output-based financing model encourages competition which is conducive to quality improvement. They also argued that this model allows for the concentration of resources which is a prerequisite for performing high quality research on the long run (2003, 296-297). Taking arguments both for and against the output-based model, it is fair to say that output-based financing of scientific research in higher education institutions is conducive to increases in both quantity and quality of research output as long as the formula for financing is matched with a sophisticated output and outcome indicator system.

When assessing the appropriateness of output-based financing models from the vantage point of a diverse science base, it must be noted that this system may incentivize researchers to participate in short-term, mainstream, low risk research projects only as these projects are more likely to produce the expected outcomes upon which the funding depends Kováts (2006, 932). This incentive decreases the freedom of higher education institutions to shape their research profiles. Furthermore, Kováts (2006) pointed out that output-based financing has a conservative impact on the higher education sector by limiting the number of institutions that can benefit from this kind of funding to those who traditionally had a dominant research profile (2006, 931).

While the conservative effect of the output-based model cannot be denied, the loss of freedom in shaping institutional research profiles due to the increased risk-aversion that this model causes can be mitigated. Bokros (2008) proposed that the Hungarian government should finance higher education institutions on the basis of five year contracts (2008, para. 25). It must be noted that Bokros (2008) recommended output-based financing not just for

research in higher education institutions but for the public financing of higher education in general and that his recommendations also included the matching of output-based finance with the introduction of co-payment in higher education. Regardless of the difference between his original proposal and the current issue, the idea of longer but limited term contracting is relevant and can be effective in preventing the unwanted homogenization of research portfolios.

The ease at which an output-based financing system may be administered depends mainly on the availability of a sophisticated system of output and outcome indicators as discussed above. If such a system is in place, the task of data collection is comparable to that of the input-based system or even easier if performance is assessed only at the end of each five-year contract period, thereby lowering the frequency with which data needs to be gathered. However, as Kováts (2006) pointed out, if such a system of indicators is not fully developed and there is a danger of decreasing quality of outputs, this financing model may need to be paired with quality assurance methods which mean additional (and quite significant) administrative work (2006, 931). In summary, administration of an output-based system for research finance may range from very burdensome to relatively easy.

The brief assessment of output-based research financing model is that it is conducive to high quantity and potentially to high quality of research output; it can have negative effects on the diversity of the science base but these effects may be mitigated; and the administrative burden associated with it depends on the availability of reliable indicators of high quality scientific performance.

3.2.3 The second alternative – Project-based financing

The output-based institutional financing model discussed in the previous section offers one way to create performance-based incentives. Another option for performance-based funding is the through the allocation of project-based research grants. In fact, the OECD report refers to this option when it recommends that "competitive funding for basic research ought to be stepped up considerably" (2008, 210). Similarly, Bokros (2008) proposed that the input-based financing of research in higher education institutions be ceased and research activities be financed partly through competitive grants from the central budget and international grants and partly through research collaboration with the enterprise sector (2008, para. 26). Research collaborations are not relevant to the discussion of this model since one of the reasons why there is a need for governmental spending on basic scientific research is exactly the fact that the enterprise sector does not invest, or under-invest, in basic research (Tassey 1998, 81).

What are the implications of this model for quantity and quality of research outputs? Similarly to the output-based model, competitive research grants allocated on a project-basis increase competition, which is conducive to improvements in quantity and quality alike. In fact, depending on the way assessment criteria for grant applications are defined, this model can fuel even more fierce competition than the output-based model. In the output-based model, output indicators are fixed and institutions with an already existing research infrastructure are the only ones to benefit. In a project-based grant system where grant applications are assessed on the basis of the strength of the research proposal rather than on the basis of achievement in previous research projects, newcomers have better chances of receiving grants. Depending on the way grant applications are evaluated, this policy option

can be just as conducive to the increase in quantity and quality of research as the output-based scenario. Another argument for the conduciveness of this policy option for the increase in quantity and quality of research output is the ability to concentrate resources, which, is a necessary, albeit not necessarily satisfactory, condition for high quality research (Duderstadt and Weber 2006, 294).

The diversity of science base is likely to be the lowest in this scenario. It does not matter whether it is a governmental agency or the broader scientific community who evaluates the grant applications, it will necessarily be a limited set of research projects for which funding is available and this limits the freedom of higher education institutions to shape their research profiles. Furthermore, similarly to the output-based model where the pressure to achieve the required number of outputs for continued funding could make researchers more risk-averse, not tampering with research topics that are doubtful to produce the right kind of outcome. Finally, the lack of sustained funding for research in the project-based finance scenario would result in a lack of strategic planning of research activities in higher education institutions, leading to researchers favoring mainstream, low risk research topics that can be handled easily within the framework of a short- or mid-term project. This would eventually lead to the shrinking of the science base of the country.

Last but not least, project-based financing resembles output-based financing in terms of (lack of) administrative ease, too, although the negative aspects are even more apparent. If the evaluation of individual grant applications for short- and mid-term research projects is administered by central funding agencies (such as NKTH or OTKA in Hungary), an application system with great administrative capacity is required. Unlike the output-based financing model where only higher education institutions with traditionally strong research profile may compete successfully, project-based financing involves an adverse selection problem of higher degree since newcomer institutions can and will compete, too. To mitigate

this problem of asymmetric information and ensure the quality of research, funding agencies need to use a diverse set of *ex ante* and *ex post* evaluation tools, always picking the ones most appropriate to the given project. This results in high administrative costs.

In conclusion, project-based financing resembles the output-based policy option in many ways. It can be conducive to increased quantity and quality of research; it threatens the diversity of the science base; and it has high administrative costs.

In the previous three sections I assessed the status quo and the two alternative policy options one by one. In the last section of the paper, I will compare the alternative options to the status quo and highlight the similarities and differences between the two alternative options.

3.3 Comparative assessment of the policy options

3.3.1 Introduction of the analytical tool used

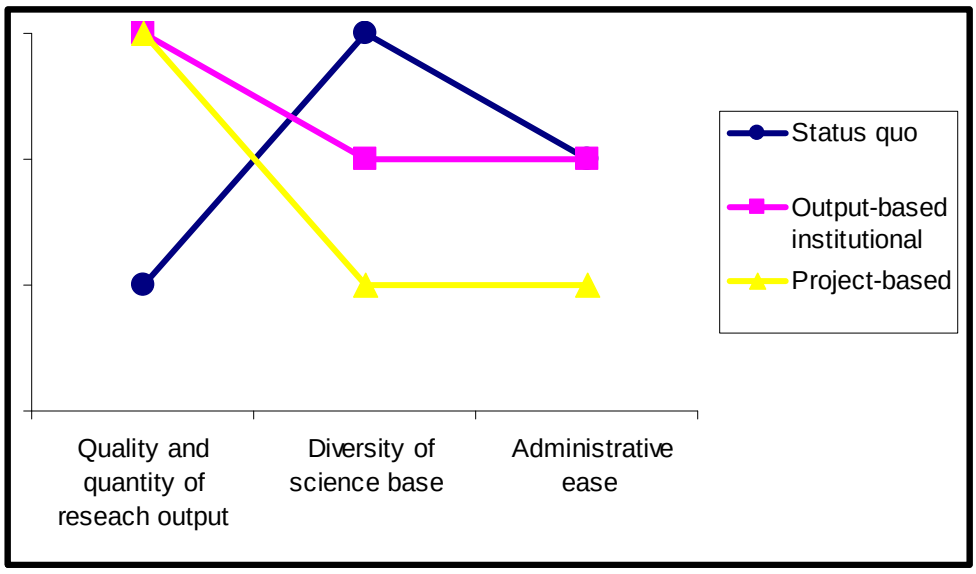

Figure II. Comparison of the status quo with output-based institutional and project-based research financing

The plot chart in Figure II. summarizes the findings of sections 3.2.1–3.2.3. The three indicators – quality and quantity of research output; diversity of science base; administrative ease – based on which the desirability of each scenario is assessed, are presented on the horizontal axis. Each scenario is assigned a total of three scores with the value of "low", "moderate" or "high" (as represented on the vertical axis); each score by a given scenario corresponds to one indicator on the horizontal axis. Indicators were defined in a way that scoring a "high" value for each indicator signals good performance of the given scenario regarding that indicator. In case of the third category – administrative ease –, the "high" value here translates to "highly easy", whereas scoring "moderate" signals that relatively more administrative capacity is required, and scoring "low" means that the given scenario has significant administrative costs.

A few methodological points need to be clarified before the interpretation of the plot-chart. First of all, the chart is meant to serve as a visual aid for comparing three policy scenarios in a qualitative and not in a quantitative manner. The three lines do not represent functions derived with the help of mathematical formulae; the symbols representing scores are connected simply to create a stronger image of the relative position of the three scenarios to one another. Indeed, the scores assigned to each scenario ought to be interpreted not in absolute terms but in relation to the other scenarios.

The chart in Figure II. is a crude analytical tool which serves the purpose of facilitating dialogue between two discourses, that of STI policy and higher education policy, which are largely disconnected in the current Hungarian scholarly discourse on public policies. The analytical tool purports to achieve this goal by summarizing those scholarly arguments from the two largely disconnected policy discourses that are the most relevant for the issue of funding basic scientific research in universities and by drawing attention to those arguments where more country-specific empirical research is needed to establish the exact

nature of trade-offs between different policy goals. With these provisos in mind, I will compare the three scenarios with the help of the chart in Figure II. in the next section.

3.3.2 Interpretation of the plot chart

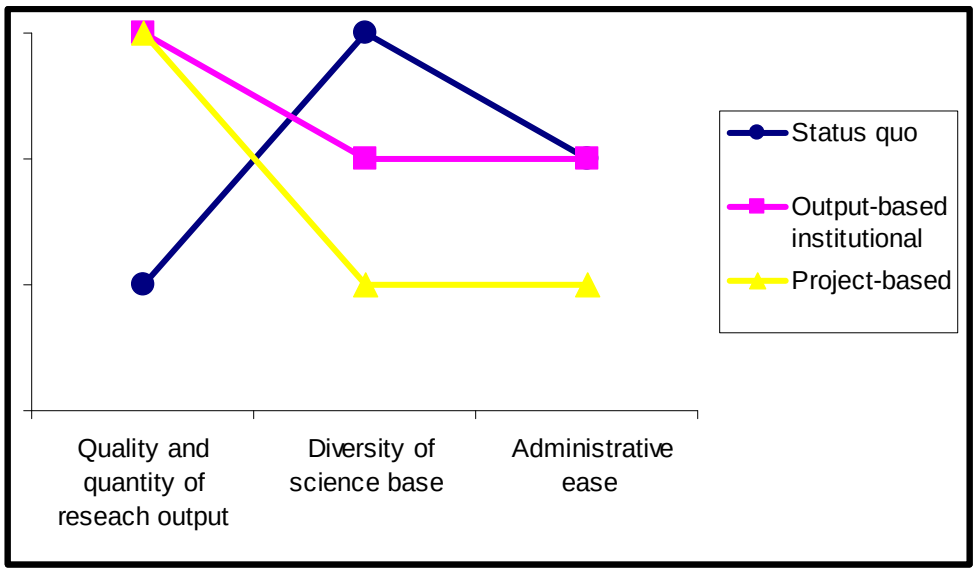

Figure II. Comparison of the status quo with output-based institutional and project-based research financing (repeated here for the reader's convenience)

The plot chart in Figure II. shows that the status quo, i.e., input-based institutional financing, scored low on the first indicator (quality and quantity of research output), whereas it was assigned a "high" score on diversity of science base and a "moderate" score on administrative ease. The first policy alternative, i.e., output-based institutional financing, scored "high" on the first, and "moderate" on both the second and the third indicators. The second policy alternative, i.e., project-based financing, scored "high" on the first, and "low" on both the second and the third indicator.

There is a clear, albeit not perfect, asymmetry between the status quo and the two alternative policy options. The status quo is characterized by low research performance as a result of weak incentives both for performing research and for increasing its quality. Both alternative policy options perform far better in this respect. However, it is fully justified to ask whether the two performance-based financing scenarios are indeed at the same high level of

performance or whether on of them could be describe as relatively higher and the other as more moderate. It is not easy to answer to this question because, as it was discussed in the previous sections, there are several factors influencing the conduciveness of these two scenarios to increases in the quality of research. Nevertheless, it was argued that both scenarios are clearly conducive to increases in the quantity of research output. Furthermore, based on the insights gained from the literature, any difference that may persist between the performances of the two alternative scenarios in terms of the research indicator appears to be far less marked than the difference between the status quo and these two scenarios, which justifies the assignment of "high" scores for both.

The statement that the difference between the two policy options in terms of impact on research is not likely to be large is of course subject to empirical testing. One possible way for refining this analytical tool would be to collect data on the impact of output-based financing and project-based financing on both the quantity and quality of research in countries similar to Hungary. A more systematic evaluation of the relationship between research quantity and research quality is also warranted. In addition to the ambiguous effect some financing policies may have on these variables (such as the increase in quantity but potential decrease in quality in the case of output-financing), it is also worth considering that the impact of these policies may not be linear (cf. Geuna and Martin 2003). This should also be taken into account when assessing the impact of different financing models. Subject to the findings of more empirical testing, the quantity and quality of research may be treated as two separate indicators in more refined analytical tools.

While the status quo scored worse than either of the alternative scenarios on the research indicator, it scored way better than the other two on the science base diversity indicator. Since input-based financing has absolutely no restrictions as to what the scientific

core grant can be spent on, institutional autonomy in shaping research profiles is technically unlimited.

Although similar mechanisms are at play in both the output-based and the project-based scenario, the different scores on the diversity indicator ("moderate" for the former, "low" for the latter) can be justified on the grounds that both trigger risk-averse behavior which may negatively affect the research profile of higher education institutions, yet the relative fiscal stability that the output-based scenario provides with its mid-term contracting setup mitigates this effect. That is why the output-based model scores higher in this respect than the project-based one. It must be noted again that the levels of autonomy ought to be understood in relation to one another and not in absolute terms. The plot-chart should not be interpreted in a way that, for example, input-based financing has a science base twice as diverse as the project-based scenario does.

As for the last indicator, i.e., administrative ease, the relative position of the output-based and the project-based scenario is the same as in the case of the autonomy indicator. The output-based scenario performs better than then project-based one for two main reasons. First of all, due to the mid-term contracting setup, data collection is needed less frequently, Secondly, once output and outcome indicators have been developed, the same formula may be used for longer periods of time for allocating research grants. In contrast, the project-based scenario implies continuous collection and assessment of data, and the set of indicators used for assessing grant applications needs to be custom-made at least to a certain extent for each project. The status quo scores "moderate" rather than "high" on this indicator because this scenario requires as an ongoing collection of data on the inputs, which is an administrative burden in itself but also because the higher education institutions have a stake at providing corrupted data in the hope of receiving higher levels of funding, which necessitates the implementation of data collection mechanisms other than self-evaluation.

3.4 Preliminary conclusions

As it was already disclaimed in section 3.3, the conclusions that can be drawn from the interpretation of the plot-chart in Figure I. should not be used for making a definite case for one scenario or the other because the qualitative analytical tool underlying it is, as presently formulated, too crude for detecting subtle yet potentially significant differences between the scenarios. Some conclusions can nevertheless be drawn, and these may be a good starting point for further research in the field.

One conclusion that can be drawn is that both alternative policy options have higher prospects of increasing both the quantity and the quality of basic scientific research, which is a key concern for the Hungarian STI strategy. Further research is needed to estimate not only the relative but also the absolute extent to which this potential can be realized.

Another conclusion is that project-based funding of research seems to perform somewhat worse than the output-based financing model. However, caution is needed here as empirical tests may well show that the differentials in terms of science base diversity and administrative ease are not significant and the two policy options are equally favorable, or non-favorable, to the status quo.

A last conclusion is that apart from the research indicator, the status quo fares relatively well compared to the alternative policy options. In fact, it clearly over-performs the project-based scenario and achieves a somewhat better position than the output-based scenario for the second and third indicators. This is not to suggest that the best policy is necessarily to maintain the status quo. Let us not forget that the low performance of input-based financing vis-à-vis research quantity and quality caused the search for alternative policies in the first place. A detailed analysis which takes into account not only current costs and benefits but also prepares long-term projections may show that the relative advantages of

the status quo are minor compared to the benefit of adopting either of the alternative policies, transition costs included.

CONCLUSION

In my thesis, I investigated the policy challenge of funding basic research in higher education institutions in Hungary. The reason why I chose to research this topic was because this policy issue clearly sits at the crossroads of STI policy and higher education policy, yet the Hungarian STI policy and higher education policy discourses are largely disconnected regarding this issue. And this disconnect is a problem because it is clear from the scholarly literature that the funding of basic research in higher education institutions is not only a very important but also a highly complex issue, and only a joint STI-higher education sector perspective can hope to offer solutions to meet this challenge.

In the first part of my thesis I presented the Hungarian STI and higher education policy discourses, highlighting those STI and higher education policy issues that have the most direct bearing on the thematic focus of my thesis, i.e., funding of basic scientific research in higher education institutions.

In the second chapter of my thesis I argued that the public funding of basic research is marginalized in both discourses; it is marginalized in the STI discourse because of disproportionate funding of applied R&D both on the European and the national level and it is marginalized in the higher education discourse because publicly funded higher education institutions have an interest in expanding their budget, not in allocating their resources more efficiently. I concluded my second chapter with a review of the potential drawbacks of a maintained status quo and made a case for facilitating dialogue between the STI and higher education discourse with a view to strengthening the coordination of the two fields.

In my final chapter, I presented three policy scenarios (the status quo and two alternative scenarios) that address the challenge of funding basic research in higher education institutions. I analyzed the status quo and two alternative scenarios with the help of an

analytical tool comprising of three indicators that I designed specifically for this exercise. The conclusions that can be drawn with the help of such a crude tool are preliminary at best. Further research is needed to determine not only the relative position of the three scenarios, but also the absolute extent to which the potential opportunities as well as potential threats encoded in each scenario may realize.

APPENDIX

The amount of input-based core grants allocated to higher education institutions in 2008 and 2009, by grant type, in million HUF.

Source: OKM.

Budget lines (core grants for higher education institutions)	State-owned institutions	Non state-owned	TOTAL (from OKM budget)
2008			
Student-based[5]	36 369	3 346	39 715
Educational	69 129	5 750	74 879
Scientific	31 797	2 744	34 541
Maintenance-related	31 737	2 185	33 922
TOTAL	169 032	14 025	183 057
2009			
Student-based	35 848	3 326	39 174
Educational	64 042	5 386	69 428
Scientific	33 251	2 795	36 046
Maintenance-related	31 737	2 185	33 922
TOTAL	164 878	13 692	178 570

[5] The Hungarian terms are: *hallgatói* (student-based), *képzési* (educational), *tudományos célú* (scientific) and *fenntartói* (maintenance-related) *normatíva.*

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