

ESTONIAN R&D POLICY – STILL TO BE DEFINED

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Abstract. Academic history of Estonia goes back to 1632 when Academia Gustaviana was founded in Tartu. In this paper the state-of-the-art of the Estonian science (R&D) system will be given, its functioning in the national socio-economic framework analyzed and the bottlenecks to be overcome identified. It will be concluded that Estonian science is well fit to adjust itself to these new demands if they emerge and able to contribute to national economy and the society at large.

Science, its more modern counterparts research and (technological) development (R&D) and innovation are inevitable ingredients of any modern society. Estonia is no exception. Our academic history goes back to 1632 when Academia Gustaviana was founded in Tartu. It flourished and prospered in the 19th century after the *Kaiserliche Universität Dorpat* was established in 1802, and gradually became a leading academic institution in Russia and Europe as a whole. The period between the two world wars saw the formation of Estonian science – an academic system with Estonian-born scientists and research largely oriented to Estonian problems. The Soviet period developed a fully-fledged Soviet type science system around the Academy of Sciences, specialized research institutions and only marginally involving universities, all aiming at strengthening the (military) might of the Soviet Union. The collapse of the Soviet Union left Estonia with an oversized and ill-structured system, which underwent a series of spontaneous and, later, legislative reforms that created a more or less stable research organization by 1997. The decade of science reforms has been thoroughly analyzed in *Science Reform in Estonia* (ET 2001:102). In the following, I will try to give an overview of the state-of-the-art of the Estonian science (R&D) system, analyze its functioning in the national socio-economic framework and identify the bottlenecks to be overcome. The description of the present system can also be found in *Estonian Encyclopedia* (Laasberg 2002:484–488).

The Estonian R&D system

The R&D strategy is defined by the Research and Development Council of Estonia (TAN), an advisory body to the government chaired by the prime minister. Two sub-councils, responsible for science policy, technological development and innovation policy, are respectively chaired by the minister of education and science and minister of economy and communications. R&D is mainly carried out by four universities (Tartu University, Tallinn Technical University, Estonian Agricultural University and Tallinn Pedagogical University) and their institutions, 14 state and 1 national research institutions and 28 private research institutions. Estonian Academy of Sciences is functioning as an honorary society, its former research institutions are affiliated with universities or function as state research institutions. The total number of researchers (including academic teaching staff) is 3912 (1999), down from 6245 in 1980. Slightly more than 50% of them work at the University of Tartu and the Tallinn Technical University. The national R&D spending (in 2000) was 617 MEEK or 0.7% of GDP, of which 380 MEEK comes from the government, 140 MEEK from the private sector and 97 MEEK from abroad (EU programs) or other sources.

Government spending for research is governed by the ministry of education (since 1 January 2003, ministry of education and science) through two independent channels. Firstly, advised by the Council of Scientific Competence, the minister allocates research funds for targeted research to individual research groups in research institutions (be it universities, state research institutions under different ministries, or other). In 2000, this funding reached 156 MEEK plus 54.6 MEEK to cover the costs of overheads and research infrastructure and a total of 219 projects were financed. Secondly, an independent body, the Estonian Science Foundation (ESF), delivers smaller research grants to individual researchers after peer review evaluation of their applications. ESF's total funding for 2000 was 71.1 MEEK distributed between 763 grants.

Government spending on technological development is supervised by the ministry of economy and communications and administered by the newly established Estonian Agency for Technology (ESTAG) under the Enterprise Estonia Foundation. Their allocations for technological development in businesses and research institutions amounted to 37.4 MEEK in 2000.

In addition to these sources, different ministries (education, agriculture, environment and social affairs first of all) have smaller programs for applied research with a total funding volume of about 30 MEEK.

In 2001 Riigikogu adopted the Estonian R&D Strategy for 2002–2006 “Knowledge-based Estonia”, which sets an ambitious target of increasing national R&D expenditure from the present 0.75 to 1.5% of GDP by the year 2006 (KbE 2001). In addition to the planned increase in R&D expenditure, the national strategy defines key areas for Estonian R&D – user-friendly information technologies, biomedicine and material science. National programs are envisaged to foster R&D activities in the key areas.

Insofar as the formal national R&D system is concerned, one may conclude that reforms have created a modern organization built on internationally understandable and acceptable principles. Although the national R&D spending is well below the EU average (1.9% of GDP) and Estonian business expenditure on R&D is even more modest (0.16% of GDP), the core structures are well in place and the national strategy raises hope for future.

A closer look at Estonian R&D policy, however, yields a more worrying picture. In the following, we will analyze the problems facing Estonian R&D from three aspects. Firstly, the strategic role of R&D in the socio-economic development of the country. Secondly, the long-term viability of the R&D system itself. And thirdly, the tactical weaknesses of the system.

Estonian national development and its R&D policy

The fundamental weakness of the present R&D system is clearly manifested in the strategic document “Knowledge-based Estonia”. Even a very superficial perusal reveals that the document has little if at all to do with any broader national strategy, be it of economical or social nature. This document might “suit” more or less any country because it is mainly based on general ideas about the role of science in a modern (developed) economy, and the priorities of the European framework programs. It also contains a number of bows to different interest groups in science for political compromise. It may well serve as a political manifesto of the science community but most probably fails as a national strategy of practical value, because there are too few stakeholders’ interests involved and even the research community is actually much more interested in the proposed doubling of research spending than in the rest of the document. This result is a natural consequence of science reforms in Estonia on the one hand, and the logic of the transition economies on the other.

The first, democratization stage of the reforms was aimed at liberating science from political and administrative interference, embodied by Moscow authorities and the administration of the Academy of Sciences acting as the ministry of science in Soviet Estonia. There was, and still is a widespread belief among a number of scientists that scientists themselves are the best governors and administrators of the system and the only input they need is money. Both the Estonian Science Foundation and the Council of Scientific Competence, which together allocate most of the national resources to research, are composed of scientists and they receive no external political guidance of any sort. The ministry of education who supervises their activity, has only three full-time civil servants to handle all research-related questions and they are clearly under-staffed, under-qualified and not even entitled (either formally or informally) to affect this decision-making in any reasonable way. The nominal advisory policy-making bodies (TAN and the two councils at the ministries) are unable to yield any real policy despite the fact that they involve major potential stakeholders in their ranks. The core problem is that the stakeholders do not have real stakes in R&D at least

for the time being, so they are ready to accept any comfortable compromise. Therefore the science community has taken the lead and power, since nobody else cares. It has been a good choice, however, because both funding bodies have adopted a reliable evaluation policy based (solely) on academic achievement and innovativeness. This approach, although neglecting the practical needs of the society, guarantees that surviving science is science indeed and able to deliver if real demand is (again) there.

The other part of the detachment of R&D from the economy is explained by the logic of the transition economy. Economic gains and profits are not, at least until most recently, been related to R&D. Much more powerful, profitable and shorter-term processes such as privatization, restructuring, (international) mergers and market expansion have governed the development. It is also true that for the time being, low labor costs are the competitive advantage of these economies rather than a highly qualified workforce or R&D infrastructure. The same, somewhat more surprisingly, is true in the public sector as well. The reforms carried out there have also been based much more on common sense, foreign models, political inclinations or even brave social experimenting than on academic or even applied research. As an example, the administrative-territorial reform effort of 1999–2001 may be considered. There was no real research commissioned to prepare for the reform and the background materials prepared independently were practically discarded as being “too academic”.

As a result of these circumstances there has been a silent compromise agreement between politics and science – both play on their own grounds. The only link is money and that has caused mutual discontent. Science claims they do not get enough for their needs and politics (and the wider public, as a matter of fact) claim they do not get value for money. True, they are unable to define what they want but this does not really matter. It is a growing conflict problem and needs a solution which, incidentally, can in the long run only be reached in an economic and social development process. Unless real understanding is reached in the society about the truly useful deliverables of science, little progress can be expected in enhancing the position of science (and technological development work). It is, to my mind, first of all the responsibility of science to prove its strength and usefulness, and I hope our science community is ready to accept this position as well.

The situation is not much different in the field of technological innovation in enterprises. A recent study clearly indicates the weaknesses of the Estonian innovation system – extremely low business sector R&D spending (0.16% of GDP and less than 1% of the turn-over) (Kurik et al. 2002). Business innovation is mainly directed to renewing the machinery and related training of the staff, almost no in-house R&D effort is directed to qualitatively new product development. Cooperation with external research institutions including universities is non-existent. One has to take into account also the facts that the most technology intensive enterprises belong to foreign capital and correspondingly, most of the technological development work is carried out in mother companies. There is little

hope for short-term improvement of the private sector R&D spending, especially out-of-house spending in research institutions including the universities.

I am concluding on the strategic role of R&D in Estonia – the national economy and the science (R&D) community live largely parallel lives in Estonia. This lacking interaction is weakening both sides but short-term improvement is not in sight. In order to foster mutually fruitful cooperation in the long run, three main objectives must be kept in mind. Firstly, the national R&D strategy must rely on an analysis of the long-term needs of the society and medium-term interests of the industry, and explicitly relate to the national socio-economic development plans. Secondly, special effort has to be undertaken to develop technology-transfer infrastructures around the universities in Tartu and Tallinn as well as supporting the development of R&D expertise in enterprises. Thirdly, other national policies must clearly support high-tech and high medium-tech industry developments in Estonia, including pro-active involvement in high-tech sector foreign investment.

It must be noted that there are several recent developments, which already support this trend. The government has launched a program, managed by ESTAG (the Estonian Technology Agency under the ministry of economy and communications), to finance the establishment of technological development centers as joint ventures between the industry and universities. One may just expect that the 5 MEEK annual budget of the program (lasting 5 years) will be increased by at least an order of magnitude in the next few years. At the same time universities have undertaken serious efforts to develop technology transfer infrastructures in order to support a different R&D culture in their institutions. And last but not least, several industries, first of all the world-scale producer of rare-earth metals AS Silmet, have shown their interest in PhD level university graduates.

The viability of the R&D system

The future of the national R&D system, as of any other system, crucially depends on investment into it. There are two major components of this investment – young researchers and new equipment and premises.

Firstly, one needs a constant flow of young PhDs into the system, which compensates for the retirement and allows for an expansion of the system to new research areas. Despite (some argue due to) the reform of the doctoral studies, which gave universities the right to award PhD degrees (in the Soviet system the research institutes of the Academy of Sciences and some other institutions were also granted this right), and an expansion of the system by introducing a number of new PhD programs in all faculties, the number of PhD graduates is low and shows no increase in recent years. At the end of the Soviet period some 120–130 candidate of sciences (the Soviet equivalent of the PhD) degrees were annually awarded in Estonia. In the early 1990s the number of awarded PhD degrees was around 30 and rose to about 80 (about 50 of them at Tartu University) towards the end of the 1990s and has remained at that level since then. Several efforts have been undertaken to increase this number, among them the establishment of

doctoral scholarships and special grants to finance the research work of doctoral students, but so far without much success. A thorough research for the causes of this process has to be carried out but most probably this trend results from two bottlenecks, which characterize the whole R&D system. Firstly, the reduction of the science base and the number of researchers and research groups, which limits the number of researchers who pursue their PhD studies part-time but can effectively combine their work and studies. Secondly, the motivation of young academics has drastically fallen – their study-time income rarely reaches the national average and is clearly less than what they get when they enter employment. More importantly, the PhD degree has actual value only in the academic sector and this means a lower income also after graduation. It has to be noted that Estonia has set rather high requirements for a PhD degree as well – three peer-reviewed publications in international journals are required for the thesis, which sometimes may seriously delay the dissertation or force to give up altogether.

The second strategic weakness of the R&D system is related to infrastructure. Over the last decade, or even the last two decades there has been only marginal renewal of the research equipment and premises. Since funding barely covers modest salaries and the running costs of research, no money is left over for more costly investments. The problem is aggravated by the smallness of individual research grants and the lack of a mechanism of concentrating the resources.

It is clear that these two bottlenecks must be addressed by the R&D policy in the nearest future in order to reverse the degradation of the whole system.

Small steps to increase the efficiency of the R&D system

As was mentioned above, there are two major channels of (public) R&D funding – the targeted funding of research programs lasting 5 years on average and short-term (2–3 years) research grants both granted to an individual researcher or a team. Although both these channels are supposed to support independent research work they are far too small to allow for it. The average size of the targeted research grant is 260,000 EEK a year (the institution receives an additional 30% of this sum to cover the indirect costs of research) and the smaller ESF grants are 120,000 EEK on average. A comparison of these sums to the average annual labor costs per researcher (200,000 EEK a year based on the monthly salary of 12,000 EEK) clearly reveals that without additional support no research can be carried out on this funding alone. Usually only a combination of different incomes – teaching grants, targeted funds, ESF grants and contract research – allows for a small research team to function effectively. In this light EU grants play a significant role. They are one of the few sources that have a critical mass and also allow for investment in equipment. It is a clear trend that research units that manage to combine different Estonian funds and match these with research funding from outside Estonia show dynamic development and produce competitive results. As a matter of fact, a large majority of research groups are clearly sub-critical in this respect and barely manage to survive. There is a clear need to concentrate the

resources for R&D by doubling funding per researcher but evidently this needs a bold political decision. Since no immediate political gain is in sight and a loud outcry of those left without funding is inevitable, this decision is hard to reach.

A good start has been the launching of the centers of excellence program with 10 research groups, 7 in Tartu and 3 in Tallinn, selected on an open bidding. Their funding was increased to about 1.5 MEEK per center giving an extra momentum to their development. It is highly advisable that this funding be further increased (to at least 5 MEEK per center in two years) which would create internationally visible and competitive research units at least in these fields.

Another policy shift might consider the abolishing of the small doctoral grants (about 10,000 EEK each), which actually contribute little to the efficiency of the PhD studies because no real accounting for their usage takes place. These funds could easily be attached to the funding of the centers of excellence thereby giving them also the function of a graduate school. It might be a good idea to combine these functions since there are probably no or little extra resources available for the much talked about graduate schools.

Let us conclude. During the years of regained independence Estonian R&D policy has gone through a series of modifications moving away from the Soviet command economy model. This process has been mainly “science driven”, i.e. following the ideas and ideals of the science community and ending up in a multiple source funding of public research based on peer review assessing of research quality. The research community has been reduced by a factor of two while the internationally visible output has been doubled. The reduced human resources are mainly concentrated at universities. Under given circumstances this development has been generally positive allowing for the survival of the research potential in the most competitive areas.

On the other hand, there is a long way to the R&D policy of a modern innovation driven economy since there are only occasional links between the industry and *academia* at present. This process has been recently started by formulating the national R&D strategy that tries to define the needs of the national economy and relate the R&D policy to the latter. It may, however, take another decade to reach a balanced situation since the national economy itself is only starting to regard innovation as its source of further development.

I am convinced that Estonian science is well fit to adjust itself to these new demands if they emerge and able to contribute to national economy and the society at large.

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