

Search of Talent Youth for Science: Experience of Ukraine and Other Post Soviet Countries

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Abstract. The authors analyze issues related with development and popularization of science, succession of generations in research teams, building up the national research potential in the conditions of ever increasing demands for qualified staff, search for contact points between the state and the scientific community are as important in our difficult time as never before, being a most important factor for building up the knowledge-based society.

Keywords. young scientists, succession of generations in science, national research potential, recruitment

Introduction

The modern society requires deep changes in all spheres of socio-economic life, especially in education. Education is becoming a most important resource for economic, politic, scientific and technological development. This society puts emphasis on human development. The development of an individual is assumed as a basic measure for the advancement of a nation, on the one hand, and a drive force for further social progress, on the other.

The issues relating with succession of generations, preservation of academic schools, transfer of traditions, knowledge and skills, going back to early 90s, has acquired vital significance for the post-soviet area in general and Ukraine in particular, as crisis tendencies in newly-born states, removal of science to the bottom of the priority list inflicted severe damage to the research potential. The Ukraine's transition to market-oriented methods of economy management has been accompanied by a severe economic crisis, which has had a grave impact on the Ukrainian society. Among the most important problems was the lack of adequate funding, which became the reason of destructive ruining of manpower potential of Ukraine. The human resources of the Ukrainian science system reduced more than twice by 2005 in comparison with 1990, of which the reduced share of young and medium age categories being very large. Migration of researchers into business and other branches increased due to its attractiveness in terms of salaries. Transformation process of science system changed seriously the number of youth in research institutes. The share of young researches of the age less 30 years decreased by more than 2 times and the share of researchers of the age over 50 years increased by 2 times.

1. Approaches to recruitment in science

The main source for recruitment of young scientists of the Ukrainian science system is the universities and institutes. According to statistical data, about 40% of the Ukrainian population was studying at Higher Education Establishments (HEE) in 2005. This is more than in countries with a high rate of per capita GDP. Over the latest three years, annual increase of the share of specialists with HEE diploma in Ukraine reached 1%, while the number of students studying at HEE per 1000 of employed population grew twice over the latest ten years.

In the Soviet Union was an effective system of education and training of qualified specialists. But economic and political crisis destroyed the contacts between universities and research institutes. Now only 15 leading universities of Ukraine have possibility to involve students in research projects. Among them is Kiev T.G.Shevchenko National University. This university has joint laboratories with leading research institutes of the National Academy of Sciences (NAS) of Ukraine. Talented students work together with famous scientists and they continue their research on the post graduate courses in the research institute on the NAS of Ukraine (NAS of Ukraine conducts the core fundamental research).

The NAS of Ukraine exerts active effort to expand collaboration of its institutes with HEE in education and training, through establishing research units with the so called “dual subordination”, joint research and training centers, departments, cathedras and laboratories. As of today, there are more than 60 units established by the NAS of Ukraine jointly with Ukrainian HEE. The number of students who have probation in research institutes of the NAS or prepare graduate thesis on the basis of research institutes of the NAS of Ukraine has also been up (Table 1).

Table 1. Incoming of youth to the NAS of Ukraine (persons)

Year	Students in probation in the NAS of Ukraine	Students preparing graduate thesis in the NAS of Ukraine	Who has prepared the thesis, recruited by the NAS institutes
2000	2192	675	78
2001	2448	742	152
2002	2936	897	161
2003	3018	1009	154
2004	3204	1101	244

The NAS of Ukraine collaborates with the Moscow Institute for Physics and Technology, to attract youth to science: each year, the Institute’s commission, jointly with the NAS of Ukraine, arranges selection of Ukrainian students in Kiev, who go to Moscow and come back to Kiev having received Bachelor degree in Moscow, to continue Master training on the basis of leading research institutes of the NAS of Ukraine: 726 Bachelors of the Moscow Institute for Physics and Technology have received Master diplomas in Kiev, of whom 211 have become Candidates of Sciences and 18 – Doctors of Sciences.

The Moscow Institute for Physics and Technology (MPTI) was organized specifically for training researchers and engineers on advanced areas of research and high technologies. In its earliest years a two-grade selection system existed to recruit students from across the USSR, and entrance exams of the first round were held in Moscow, Leningrad, Kiev, Tbilisi and Gorky, but the second round was only in Moscow. Applicants were advised “to mind that exams on math and physics will have an increased complexity, although not beyond the curriculum”. Entrance exams have always been held in advance. Those who have passed the exams were interviewed by special commissions of representatives from profile cathedras.

A specific role in recruiting is with the Federal Correspondent Physic & Technology School at the MPTI, organized in 1966. Its main areas are individual by correspondence training of pupils from secondary schools; training of pupils at optional groups under the supervision of teachers in math and physics, and methodological assistance to administrators of optional training courses. Pupils from 8, 9 and 10 grades of secondary school are trained in the school on standard supplementary education programs, and the training is built in a way so that a pupil of any grade can launch the course.

The school has affiliation in Kiev (the now Ukrainian Correspondent Physic & Technology school) operating at the Physic & Technology Training and Research Center at the NAS of Ukraine by methods elaborated in the Federal Correspondent Physic & Technology School and the MPTI (about 1500 trainees from all the Ukrainian regions; 244 graduates in 2005, of which 17 (7%) passed entrance exams to the MPTI in Kiev).

Also, of the budgetary arrangements to support youth in science, the following ones have been proven as the most efficient (Table 2).

Table 2. Budgetary Arrangements to Support Young Researchers in the NAS of Ukraine

Arrangement	Amount	Periodicity
Presidential bonuses for young researchers	25 bonuses (2,000 \$ each)	Annually
Bonuses of the Ukrainian Cabinet of Ministers (nomination “for research achievements”)	10 bonuses (420,0 \$ each)	Annually
Presidential grants for gifted youth	60 grants (15,000 \$ each)	Annually
Presidential grants to support R&D done by young researchers	For Candidates of Sciences – 50 grants (4,000 \$ each) For those doing dissertation for the degree of Doctors of Sciences – 20 grants (5,000 \$ each) For Doctors of Sciences – 7 grants (6,000 \$ each)	Annually
Presidential stipends for young researchers	200 stipends for 2 years term (40 \$ paid monthly)	Biannual

As of the beginning of 2004, of 188 recipients of Presidential stipends two were elected as corresponding members of the NAS of Ukraine, each of the five became Doctors of Sciences, 7 were awarded State Prize of Ukraine and Prize of the NAS of Ukraine, 14 held managerial positions.

In 2004, the Academy launched a new form of the work with young researchers, adapted from the Siberia Division of the Russian Academy of Sciences: young researchers' reports at the sessions of the Presidium of the NAS of Ukraine: 12 young researchers chosen by research institutes of the NAS of Ukraine have already passed reporting and discussion at the session. This can be seen as a kind of appraisal of our future generation, fostering young researchers' self-assertion and their career advance. Also, it's very important that results of the reporting are judged as heavy arguments to launch additional research themes supported from the budget, to allocate targeted funding for them, and to nominate young researchers as supervisors of these themes.

Many Academy's institutes have own forms of the support, including bonuses (stipends) named after distinguished scientists who formerly worked in the respective institute, extra payments for Candidate of Science degree, intra-institute grants for young researchers to purchase reagents etc.

The NAS of Ukraine collaborates with public administration bodies in supporting research youth in the NAS of the Ukraine in particular and in Ukraine as a whole. Proposals of the NAS of Ukraine to establish annual Presidential grants for young researchers and annual Presidential grants to support R&D done by young researchers (Candidates of Sciences and Doctors of Sciences) were implemented by Presidential Decrees in 2000 and 2002. Also, the NAS of Ukraine could secure a legal provision by which a young researcher is one younger than 35, and not younger than 28, as before. This allowed to enter legal amendments in 2003, beneficial for young researchers, such as privileged long-term bank loans for dwelling construction (reconstruction) or dwelling purchase, or privileges concerning participation of youth in competitions for certain kinds of grants or prizes from the central budget, and others.

Many forms of the support exist now, and nearly each of them was launched in the six latest years. We estimate that each of the five young researchers in the NAS of Ukraine (including post graduates and engineers) receives a bonus, a stipend or a grant from central or local budgetary sources. Our monitoring shows (Fig.1 and Fig.2) a positive trend in the number of young researchers over these years (from 1309 to 2174 persons, e.g. more than 1.6 fold increase; the number of young Candidates of Sciences increased from 737 to 1013, e.g. about 1.4 fold).

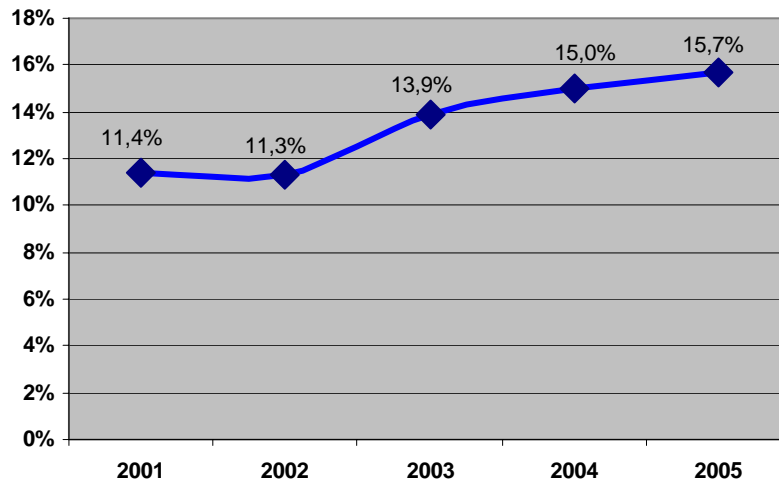


Figure 1. Share of young researchers (by 35 years) and the total number of researchers in NAS of Ukraine

However, the measures fail to change the ageing situation in the NAS of Ukraine radically: as of the beginning of 2005, average researcher in the NAS of Ukraine was 50.9 years old; average Candidate of Sciences was 51.3 years old; average Doctor of Sciences was 60.7 years old. It's true that the situation is a consequence of the imbalance between young researchers' outflow from and inflow in science in 90s

But if these measures had not been taken, the situation would have been even more serious, due to the following reasons. First, these are dwelling problems. Second, young researchers go to do R&D abroad or to business sector rather than stay in the NAS of Ukraine, due to impossibility to face research challenges today being equipped with out-dated facilities. (Note that 2004 was the first year over the last decade when the Academy received funds to modernization of the facilities and equipment, about 8,000.000 \$). Third, the problem cannot be faced without up-grading the social merit and status of a researcher, which requires an essential, e.g. manifold, growth in the researcher's salary, as well as other stimuli and prospects for the research community as a whole.

We believe that the key to the problem is with the state that must change its vision of the science, to move from mere statements to the effect of R&D priority to its mass-scale support on the whole and the young generation of researchers in particular.

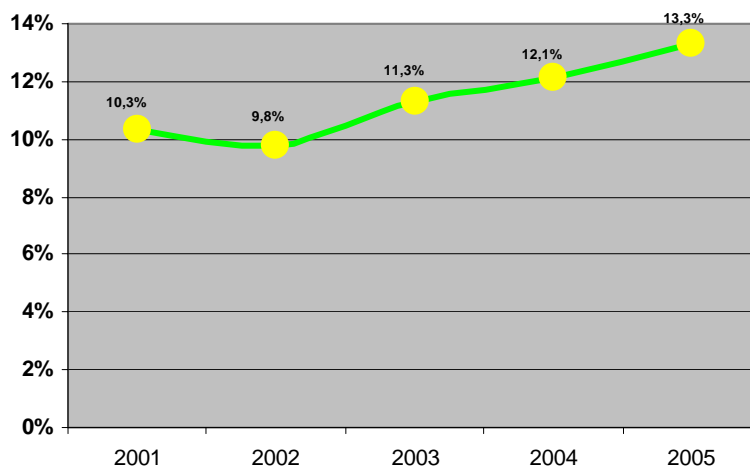


Figure 2. Share of candidates of sciences (by 35 years) in the total number of candidates of NAS of Ukraine

So, we cannot refer to discrimination of youth today, at least in excellent laboratories, when it comes to their coverage by additional material support. Yet, such elite labs still remain to be main suppliers of young researchers abroad. Why it so happens? What opportunities are available today with university students or post-graduated for career advancement? Answers to these questions were found in sociological research in Ukraine and Russia of university students, post-graduates and HEE researchers. Students' interview was meant to find out their attitude to R&D work, their involvement in R&D at university departments and cathedras, and to judge how strong students' intention is to engage in R&D in future.

Students were asked at what academic year they begin to take part in R&D; what should be changed in R&D to make R&D more attractive. According to students, it's necessary (in order of lowering priority): to pay for their job; to renovate laboratory facilities; to invite talented researchers as R&D organizers; to broaden students' initiative; to engage students in research rather than in auxiliary functions. 67% of students believe that participation in R&D is useful for them, while only 5.5% do not see any sense in it. 16.7% of them intend to start post-graduate course (33.3% in S.-Petersburg and 18.7% in Moscow; 25.6% in humanities, and only 15.3% in engineering disciplines). However, the overwhelming majority of those who want to work in R&D are intended to work abroad for a time, except for only 3%. And orientation to long-term work abroad prevails (more than 30% would like to work there unlimited time, and about 25% - from 1 to 3 years).

The prestige of science is higher in regions than in Moscow or S.-Petersburg, probably due to value orientations of the past and lack of job opportunities comparable with Moscow or S.-Petersburg. Students refer to innovation business as a factor in favor of their stay in R&D (Dezhina, 2006).

Interview of post-graduates included a number of similar questions, although with different focus. Because post-graduates have already made their choice, it was important to inquire what had they done before, why did they study, what did they want to do in future.

Most post-graduates said they came after the university (60 to 80%), while only 5-8% of them had worked by their dissertation profile. Of those who expected to engage in R&D in future, a significant share should like to work abroad, although a smaller one than with students. Unlike students, post-graduates are interested most of all in teaching (33%), while 30.4% didn't decide what they would do. About 20% were not going to work in either science or education.

The respondents who didn't want to engage in R&D, explained this by the following reasons (in order of decreasing frequency of references): low salary; poor facilities; excessive bureaucratization in science; poor social conditions; low prestige of R&D job.

In addition to the aforementioned, facing the problems requires: to focus mass media on up-grading the social merit of science; to conduct institutional revision of the national R&D; to target research capacities on relevant problems, so that to have research institutes integrated in international programs; to expand young researchers' participation in 7th FP, INTAS, ISTC, CRDF and other international programs; to establish legal background in R&D; to boost exports of the national R&D and technologies.