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ADVANCEMENT OF THE RESEARCH AND DEVELOPMENT ACTIVITY IN BULGARIA OVER THE PERIOD 2000-2010

Slaveva K. Advancement of the research and development activity in bulgaria over the period 2000-2010. The development of information and communication technologies, the transition from industrial to information society and the increased requirements for work force quality are among the reasons for raising the funds earmarked for science and scientific research. The main goal of this inquiry is the empirical exploration of regularities in the status and development of scientific research and development activity in Bulgaria in the light of the European policy of intelligent growth within the framework of strategy "Europe 2020". Based on official statistical data we study the tendencies in the alteration of expenditures for scientific research and development activity in Bulgaria by sectors, economic activities and scientific fields over the period 2000-2010.

Славева К. Розвиток науково-дослідних, дослідно-конструкторських і технологічних робіт у Болгарії за період 2000-2010 рр. Розвиток інформаційних та комунікаційних технологій, перехід від індустріального до інформаційного суспільства і зрослі вимоги до якості робочої сили одні з причин збільшення коштів, що виділяються на науку і наукові дослідження. Основною метою дослідження є емпіричне дослідження закономірностей стану і розвитку НДДКР в Болгарії в контексті європейської політики інтелігентного зростання в рамках стратегії "Європа 2020". На основі офіційних статистичних даних досліджені тенденції зміни витрат на НДДКР в Болгарії за секторами, видами економічної діяльності та галузей науки за період 2000-2010 рр.

Славева К. Развитие научно-исследовательских, опытно-конструкторских и технологических работ в Болгарии за период 2000-2010 гг. Развитие информационных и коммуникационных технологий, переход от индустриального к информационному обществу и возросшие требования к качеству рабочей силы одни из причин увеличения средств, выделяемых на науку и научные исследования. Основной целью исследования является эмпирическое исследование закономерностей состояния и развития НИОКР в Болгарии в контексте европейской политики интеллигентного роста в рамках стратегии „Европа 2020". На основе официальных статистических данных исследованы тенденции изменения расходов на НИОКР в Болгарии по секторам, видам экономической деятельности и областям науки за период 2000-2010 гг.

At the end of the 20th century and the beginning of the 21st science and scientific research turned into a key factor for socio-economic development. The advancement of information and communication technologies, the transition from industrial to information society and the heightened requirements for labor force quality are among the reasons for raising the funds earmarked for science and scientific research. Bulgaria is a small country with limited natural resources and in order for her to achieve a sustainable economic growth it is necessary to finance with priority her scientific research and develop programs for stimulating the implementation of new technologies and productions. To this end it is necessary that national scientific priorities be identified in compliance with the European strategy for scientific research development, but conformed to the financial capacity of the country and her scientific potential.

To Bulgaria antecedent is the scientific research of a practical and applied nature, whose results can impact the all-out development of economy via the achievement of high productivity and effectiveness, enhancement of competitiveness and assuring a sustainable economic growth. Such a goal requires considerable long-term financing to be utilized for investments in specialized infrastructure, increasing the explorers` qualification, providing access to information data bases and to the accomplishments of modern science. On a world scale the funds set aside for scientific research are incrementally rising, this trend being highlighted in the USA, Japan, Finland, Sweden, Germany, et al.

Bulgaria's membership in the EU has posed a number of challenges in the realm of innovations and scientific research, but at the same time it has provided opportunities for their funding. As per the Lisbon strategy in order that the EU should transform into the most competitive and dynamic economy in the world, the member countries must reach certain benchmarks in the following directions: research and innovation costs must reach up to 3% of GDP; conditions must be created for attracting public investments for scientific research; auspicious conditions must be created for the advancement of high technology productions and state-of-the-art infrastructure must be created for scientific research.

The main purpose of this study is the empirical exploration of the regularities in the status and development of research and development practices in Bulgaria in the light of the European policy towards an intelligent growth within strategy "Europe 2020". The subject of research is the cost of research and development by sectors, economic activities and by scientific fields over the period 2000-2010.

The National Statistical Institute has conducted observations on the costs of research and development in Bulgaria, whose data have been analyzed. The methodology of the conducted statistical explorations is in line with the requirements of the normative documents of the EU for the production of statistical information in the field of science and technology According to the adopted methodology research and development activity entails fundamental and applied research, and experimental treatments. The indicator "Research and Development Activity Costs" embraces al expenditures on employed research and development activity within the framework of the statistical unit, notwithstanding the source of funding. In the costs on research and development activity are included current expenditures and expenditures on the acquisition of fixed tangible assets /FTA/ intended for research activity.

Table 1

Expenditure on research and development in Bulgaria for the period 2000-2010

years	Types of costs (million Euros)			Rate of increase of the types of costs (%)		
	Total	Current costs	Costs on acquisition of FTA	Total	Current costs	Costs on acquisition of FTA
2000	71.4	67.2	4.2	-	-	-
2001	71.0	66.5	4.5	-0.5	-1.1	8.0
2002	81.2	77.9	3.3	14.3	17.1	-27.2
2003	88.7	84.6	4.1	9.3	8.7	23.9
2004	99.5	92.2	10.3	12.1	9.0	152.1
2005	106.7	94.8	11.9	7.3	2.8	16.1
2006	121.6	108.1	13.5	13.9	14.0	12.6
2007	140.0	125.6	14.5	15.2	16.1	7.5
2008	167.1	145.7	21.4	19.3	16.0	47.9
2009	185.2	164.4	20.8	10.8	12.8	-3.0
2010	215.4	199.4	16.0	16.4	21.3	-22.8

Source: Costs for research and development activity by types NSI, http://www.nsi.bg/otrasal and computations of the author.

Over the revised period the total expenditure for research and development activity grow threefold, from 71,4 million Euros in 2000 to 215,4 million Euros in 2010 /table 1/. Over the

period 2000-2010 the average rate of alteration of the total expenditures for research and development activity is 113,1% and shows a growth of 13,1% on the average. The growth rate of total expenditures for research and development activity is biggest in 2010 compared to 2009 when a growth of 16,4% is recorded. Over the period 2000-2010 there is a sustained trend towards increase of the total expenditures for research and development activity, which is a positive testimonial on the carried-out policy, but at the same time we should not ignore the fact that the base levels are very low and over the next years the growth rates must be accelerated.

Current costs include personnel costs, materials, external services and other current costs/excluding depreciation/ which are linked to carrying out research and development activity. Over the explored period the current costs for research and development activity rise threefold, from 67,2 million Euros in 2000 to 199,4 million Euros in 2010 compared to 2009, when an increase of 21,3% is recorded. Over the period 2000-2010 there is a sustained tendency towards increasing the current expenditures on research and development activity and having in mind their content it is obvious that 90% of scientific research funds were used for covering current costs and a very small portion was used for establishing a new infrastructure and renovating of the existing one.

Over the period 2000-2010 the costs for acquiring fixed tangible assets intended for research and development activity increase almost fivefold, from 4,2 million Euros in 2000 to 21,4 million Euros in 2008, but over the next years they begin to decline and in 2010 they are 16 million Euros The average alteration rate of costs for acquiring fixed tangible assets intended for research and development activity, with a chain base is 116,1% There is a forestalling increase of the current costs for research and development activity at the expense of the costs for acquiring fixed tangible assets. This tendency is adverse in view of the future development of scientific research, and the building and maintaining of an adequate materiel In order that we foster the development of scientific research and the implementation of new technologies it is necessary that we increase the costs for covering current needs as well as invest in modern scientific infrastructure – laboratories, experimental centers, new machinery and equipment, etc… The lack of such infrastructure creates a number of difficulties before scientists and specialists employed in scientific research, owing to which over the last few years the state is promoting its renovation and development along the lines of institutional financing. In order to achieve advancement in research activity it is necessary for us that we have the provision of a constant access to electronic data bases with scientific information.

Data analysis on the distribution of costs for research and development activity as per THE Classification of Economic Activities indicates that the biggest expenditures for scientific research are uncured by the companies in Sector E: Processing Industry and from Sector J: Creation and Dissemination of Information and Creative Products;; long-distance communications. The low percentage of costs for research and development activity with the other economic activities explicitly indicates that what has been achieved so far is not sufficient and in the years to come the efforts must be focused on enhancing scientific research in all fields. Over the period 2000-2010 significant changes took place in the structure of expenditures for research and development activity, the technical, agricultural and natural sciences being in the lead in the year 2000, and in 2001 the medical, natural and technical sciences take the leading position. /Figure 1/.

The intensity of structural changes of the costs for research and development activity by scientific fields has been established through the integral coefficient of structural changes (K_s). The analysis results show that great changes occur in the structure of the costs by scientific fields, since the structural change coefficient is $K_s = 0{,}2591$ in 2005 ., and in 2010 it is. $K_s = 0{,}542$ with a base 2000 .

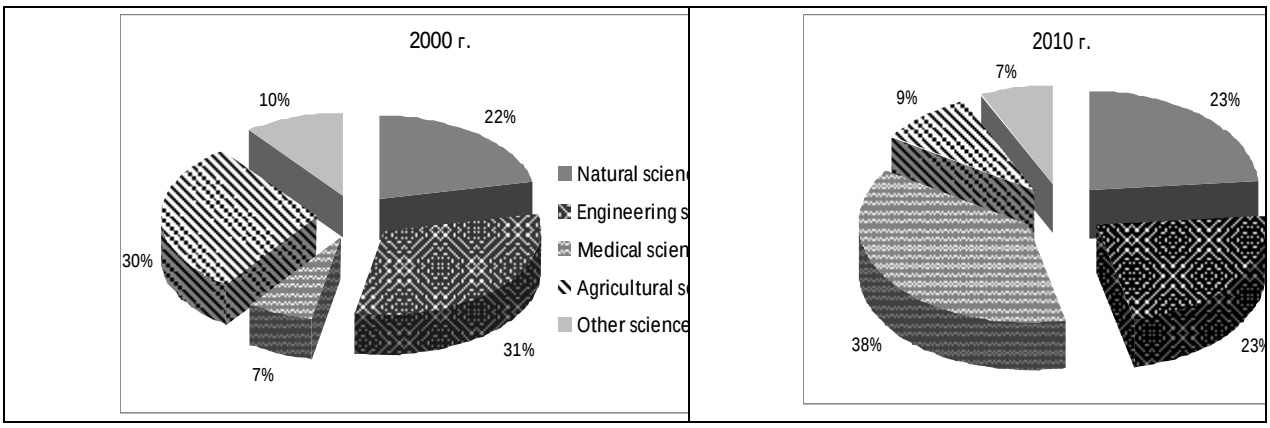

Fig.1. - The structure of the expenditures for research and development activity in 2000 and 2010 by fields

The quantity and quality of scientific research depend on the funds invested in this process as well as on the number and qualification of the staff employed in research and development activity. The following through of the dynamic of the indicator "Staff employed in research and development activity" shows the change in the number of employed persons in charge of creating, implementing and disseminating new knowledge. The total number of personnel employed in research and development activity increased from 16853 individuals in 2000 The personnel employed in research and development activity embraces researchers, technical and auxiliary personnel. The relative portion of researchers in the total number of personnel was 62,4% in 2000 and rose to 67,9% in 2010. The graph readings /fig.2/ show that over the studied period there is a tendency towards increasing the number of researchers and this is a crucial condition for fostering the quality of scientific research, the patents listed and the deliberations implemented.

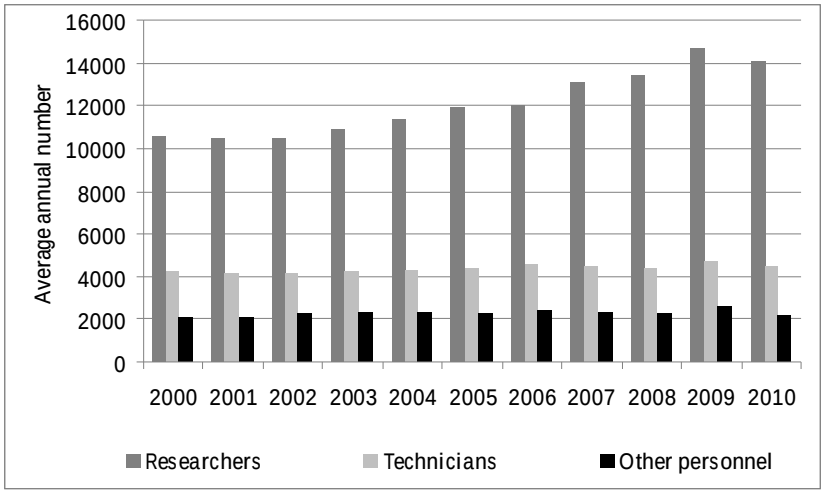

Fig.2. - Categories of personnel employes in research and development activity in Bulgaria over the period 2000-2010.

The data shows that the number of technical and auxiliary personnel is relatively constant, the technical personnel having a preponderance which is also typical of the other countries developing scientific research. The analysis results show that in the structure of the personnel categories employed in research and development activity insignificant changes occur since the coefficient of structural changes is $K_s = 0{,}02$ in 2005 and $K_s = 0{,}067$ in 2010 г. with base 2000 , which means that there is a stable structure.

Over the studied period the number of researchers in the age group under 25 is very small – about 50 individuals. The data shows a lack of interest of young people in research activity

owing to low pay, long process of scientific career making and endeavors of young specialists to find realization abroad. The same tendency is being observed as to age group from 25 to 34 years of age /fig.3/.. As a result of the impoverishment of these age groups we have the number of researchers up to t5he age of 34 and this renders the opportunity of additional study of the reasons, and for working out strategies for attracting young people to research work. The researchers at the age of up to 34 years dropped by 15% in the year 2010 against the year 2006.

Over the period 2006-2010 the number of researchers in the age group of 35 to 44 years of age climbs by 12,8% in 2010 compared to 2006. The number of researchers in the age groups of 45 to 54 years of age, from 55 to 65 and beyond that decreases, and this might be a serious problem in a number of fields where there are not enough specialists and the necessary continuity is not secured.

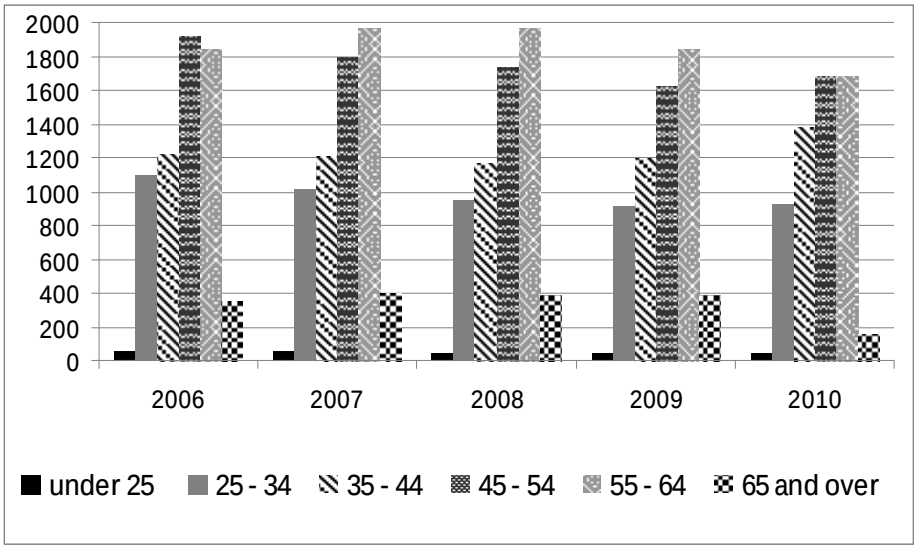

Fig. 3. - Distribution of researchers in Bulgaria by age groups over the period 2006-2010

The average age of researchers in 2005 was 47,9% and it smoothly grew in 2009. The data on the distribution of researchers by age has established: temperate variation which varies around 24%. The intensity of structural changes has been estimated through the integral coefficient of structural changes. The results show that in the structure of researchers by age very small changes occur ($K_{S2007/06} = 0{,}0457$; $K_{S2008/07} = 0{,}049$; $K_{S2009/08} = 0{,}05$), i.e., there is an almost constant structure. The analysis of researchers` distribution by gender shows an almost equivalent representation of the two genders.

With Bulgaria`s membership in the EU research and development activity enters into a new stage of its development in which the national policy should develop in line with the Lisbon strategy and particularly with the strategy “Europe 2020” Over the period 2000-2010 the funds invested for research and development activity in Bulgaria are about 0,5% of GDP and they are almost fourfold less than the average level for the EU-27 /Table 2/. Bulgaria is crucially lagging behind, and only Cypress and Romania are behind her. The funds earmarked for scientific research in Latvia, Lithuania, Poland and Slovakia are also under 1% of the GDP and they considerably lag behind the average level for the EU /2%/. These problems are typical not for Bulgaria, but also for most of the newly accessed countries. Undoubted leaders under this indicator in the EU are Finland, Sweden, Germany, Denmark, Austria and France.

As a result of the conducted analysis of the research and development activity in Bulgaria over the period 2000-2010 it was determined that the core problems before scientific research in Bulgaria are linked to not only financing, but also to the available scientific infrastructure and as well to the policy carried out towards scientist, the age structure of the employed in this field, the increasing of the efficiency of invested funds, the stimulating of the implementation of scientific results in the production, the improvement of the link between science and businesses,

etc…Those problems are typical not only for Bulgaria, but for most of the newly accessed countries as well.

Table 2

Research and development expenditure % of GDP

Countries	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
EU (27 countries)	1,87	1,88	1,87	1,83	1,83	1,85	1,85	1,92	2,01	2,0
Euro area (17 countries)	1,86	1,88	1,87	1,85	1,84	1,87	1,88	1,96	2,06	2,06
Belgium	2,07	1,94	1,87	1,86	1,83	1,86	1,89	1,97	2,03	1,99
Bulgaria	0,46	0,48	0,48	0,48	0,49	0,46	0,45	0,47	0,53	0,6
Czech Republic	1,16	1,15	1,2	1,2	1,35	1,49	1,48	1,41	1,48	1,56
Denmark	2,39	2,51	2,58	2,48	2,46	2,48	2,58	2,85	3,06	3,06
Germany	2,47	2,5	2,54	2,5	2,51	2,54	2,53	2,69	2,82	2,82
Estonia	0,7	0,72	0,77	0,85	0,93	1,13	1,08	1,28	1,43	1,62
France	2,2	2,24	2,18	2,16	2,11	2,11	2,08	2,12	2,26	2,26
Latvia	0,41	0,42	0,38	0,42	0,56	0,7	0,6	0,62	0,46	0,6
Lithuania	0,67	0,66	0,67	0,75	0,75	0,79	0,81	0,79	0,83	0,79
Hungary	0,93	1,0	0,94	0,88	0,94	1,01	0,98	1,0	1,17	1,16
Austria	2,05	2,12	2,24	2,24	2,46	2,44	2,51	2,67	2,72	2,76
Poland	0,62	0,56	0,54	0,56	0,57	0,56	0,57	0,6	0,68	0,74
Romania	0,39	0,38	0,39	0,39	0,41	0,45	0,52	0,58	0,47	0,47
Slovakia	0,63	0,57	0,57	0,51	0,51	0,49	0,46	0,47	0,48	0,63
Finland	3,32	3,36	3,44	3,45	3,48	3,48	3,47	3,7	3,92	3,87
Sweden	4,13	3,9	3,8	3,58	3,56	3,68	3,4	3,7	3,61	3,42
United Kingdom	1,79	1,79	1,75	1,68	1,73	1,75	1,78	1,79	1,86	1,77

Source: Eurostat, Research and development expenditure, by sectors of performance % of GDP

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Key words: scientific research and development activity, scientific inquiry, innovations, competitiveness, structural changes and statistical indicators.

Ключові слова: науково-дослідні, дослідно-конструкторські та технологічні роботи, наукові дослідження, інновації, конкурентоспроможність, структурні зміни, статистичні показники.

Ключевые слова: научно-исследовательские, опытно-конструкторские и технологические работы, научные исследования, инновации, конкурентоспособность, структурные изменения, статистические показатели.