Innovation and R&D indicators in the post-Soviet states:
Problems of transition to the international standards

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Key tasks of the R&D and Innovation Statistics in the Region

a) Reflect of the situation in R&D

b) Provide comparability with international standards

c) Need to be used effectively in the processes of management in different levels and in different sectors.

Positive features of the 'old' system

- State –sponsored system of organization of statistical surveys with multi (3) level of organization of statistical services

- Regular surveys and unified approach (standard statistical forms)

- Scientific –based sampling and centralized system of data processing

- Qualified and stable staff

Negative features of the Soviet-type statistics

- Rigidity in approaches (examples: problems with new output tables or even samplings)
- Difficulties in changes of indicators and forms
- Deviation from international standards (Examples: candidate and doctorate degrees, calculations of FTE, levels of education and so on)
- The willingness to serve political interests

Functional classification of R&D indicators

- Input Indicators (cadres, finances)
- Process Indicators (number of projects)
- Output Indicators (publications, citations, patents)
- Indicators that describe the connections with other subsystems of the society (results of the opinion polls about the role of S&T)

Sectoral distribution of scientific organizations

SOVIET-TYPE STANDARDS

- Academies of sciences
- Universities and colleges
- Branch sector
- Enterprise sector

INTERNATIONAL STANDARDS

- Government sector
- Higher Education sector
- Business sector
- Private non-profit sector

R&D statistics and SNA (Financial Aspects)

- Differences between OECD Manuals and System of national Accounts:

Key Dilemma:

1. R&D expenses = Consumption
2. R&D expenses = Investment

No examples of R&D satellite accounts in the post-Soviet states

Statistics of R&D Expenses

- R&D Budgets (again: distribution according to sectors)
- Sources of errors:

- money from internal contracts – double counting of subcontractors

- money from foreign sources – manipulations with VAT return

- selection of the currency (local versus foreign)

- PPP versus nominal exchange rate

Indicators of cadre potential

- Types of personnel (distribution by categories)
- Full-time equivalent (problems with information about the real level of employment)
- Degree's comparability

- General data on R&D manpower
- Calculations 'per head'
- Traditional system of the Soviet-type degrees and its transformation in the post-Soviet states

Sources of Information:

- Traditional statistical forms (not in line with new realities)
- Data from sociological surveys (often – fragmented)
- Information from special databases (not in adequate format)
- Information from foreign sources

(not oriented on the needs of the country - DHS)

Differentiation within scientific communities in CIS states (source: sociological surveys)

- scientists -entrepreneurs who have their small enterprises that operate in domestic and foreign markets
- old Soviet directors and top managers
- active researchers, who have western grants and who can continue scientific activities
- researchers, who are still formally associated with the research institutes, but are working outside the scientific sphere
- non-active researchers of pension age
- Young researchers with intention to work in S&T
- Young researchers, who does not consider jobs in R&D as their perspective occupations

Statistics of Migration and work for foreign contractors

- Sources of data (research institutes, Ministry of Internal Affairs, alternative: foreign sources)
- The need to update the existing forms:
- Introduction of new forms to catch 'temporary' ('contract') migration
- Changes in existing forms to obtain data on migration of young scientists and graduate students
- New forms and surveys to understand 'Bangalore-type' activities

Problem of Statistics of emigration of scientists and engineers from the former Soviet Union

- 'professional' rather than 'ethnic' change of directions of emigration
- Changes in the age patterns: intention to emigrate is stronger among young scientists and students
- inappropriate statistics of emigration in the post-Soviet states (the gap between the leave of work and the real departure)

Statistics of equipment and infrastructure

- Problems with selection of the right set of indicators (financial versus physical)
- The age of equipment: the rate of depreciation
- Expenses on equipment in the R&D budgets
- Level of renewal of equipment
- Access to communications

Table 1
Expenses on R&D as a share of GDP in the post- Soviet countries, 1991-2004 (Source: Statistical Bulletin of NIS №17 (368), 2005, p. 9-22 and the Belorussian Economic Journal, 2003, N4, p. 137)

Country	1990	1991	1995	2000	2002	2005
Azerbaijan	1,01	0,75	0,31	0,35	0,3	0,2
Armenia	2,54	1,09	0,08	0,26	0,3	0,3
Belarus	2,27	1,43	0,95	0,81	0,7	1,2
Georgia	1,20	1,10	0,11	0,19	0,2	0,1
Kazakhstan	0,74	0,56	0,27	0,17	0,3	0,3
Kyrgyzstan	0,73	0,33	0,26	0,13	0,2	0,2
Moldova	1,57	1,03	0,75	0,58	0,5	0,4
Russia	2,98	1,89	0,81	1,28	1,4	1,2
Tajikistan	0,73	0,44	0,11	0,07	0,05	0,1
Turkmenistan	0,65	0,48	0,26	-	-	-
Uzbekistan	1,22	1,16	0,39	-	-	-
Ukraine	2,33	1,81	1,34	1,14	1,1	1,1

Table 2.
Dynamics of number of specialists involved in R&D in post-Soviet states in 1995-2004, (Level of 1991 = 100%, calculated on the base of data from Statistical Bulletin of NIS №17 (368), 2005, p. 9-22 and the database of the State Committee of Statistics of Ukraine, 2006).

Country	1995	2000	2002	2005
Azerbaijan	79,9	70,7	72	81,9
Armenia	39	29,1	31,4	31,4
Belarus	45,4	37,6	34,7	34,7
Georgia	75,9	44,6	53	47,3
Kazakhstan	65,2	37	38,8	47,3
Kyrgyzstan	63,2	40,4	40,4	42,1
Moldova	45	31,8	24,8	22,6
Russia	57,5	46,4	45,3	42,3
Tajikistan	40,9	56,8	56,8	53,4
Turkmenistan	70,2	38,6	-	-
Uzbekistan	40,9	37	-	-
Ukraine	60,9	40,9	36,4	35,8

Output indicators

- Problems with calculations of the number of publications (international statistics versus internal statistics)
- General problems with statistics of publications (language of publication, complementary citations, negative citations and so on)
- Propositions on changes in statistical forms
- Patent statistics (national patens, European patens, US patents, 'tryadic family' patents)
- Other output indicators

The growth of the number of scientific publications in Ukraine in 1991- 2005
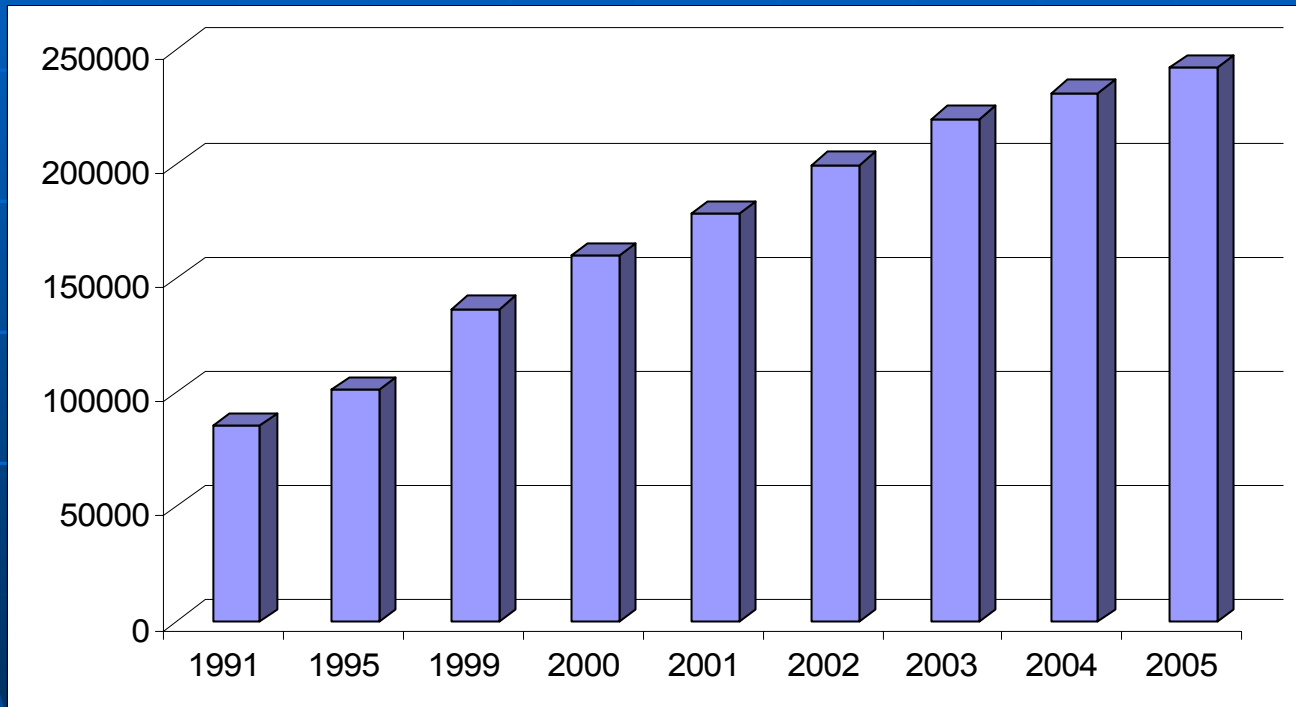
Changes in number of publications of Ukrainian authors in foreign countries (Raw 1) and in the ISI journals (Raw 2), 1991-1999 .
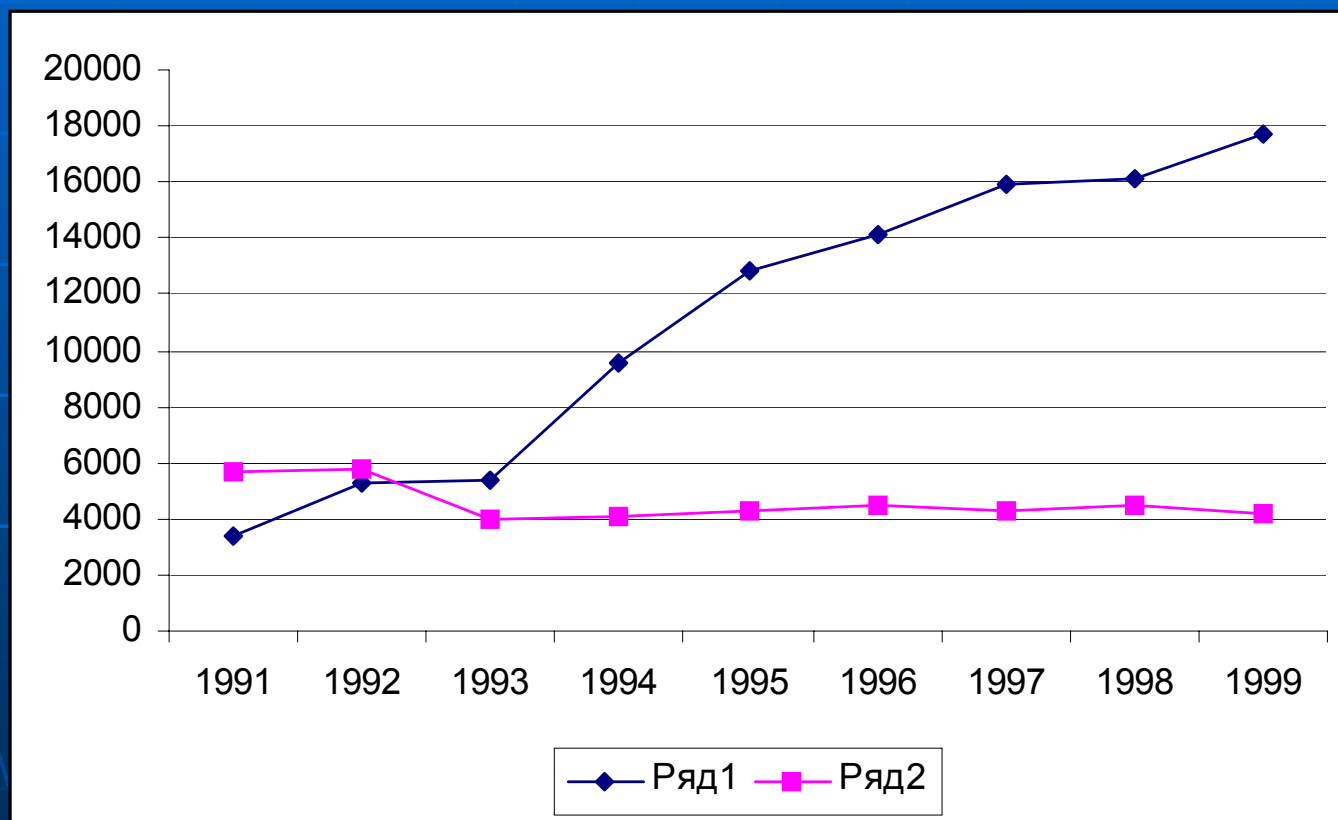
Table 3
Scientific publications in the Former Soviet Union and Eastern European countries in 1996-2000 (from NSI database)

Rating of the country in the world	Country	The share in world publications, %	Total number of publications	The share of cited publications, %	Impact - factor
8	Russia	3,52	125 530	37,75	1,58
31	Ukraine	0,52	18 441	35,13	1,23
45	Belarus	0,15	5 425	33,88	1,27
57	Estonia	0,07	2 525	55,29	2,97
63	Lithuania	0,05	1 929	49,66	2,41
68	Uzbekistan	0,05	1 671	27,77	0,77
69	Latvia	0,04	1 592	46,23	2,21
73	Armenia	0,04	1 323	39,68	1,65
80	Georgia	0,03	1 034	40,14	1,70
81	Kazakhstan	0,02	888	27,48	0,81
82	Moldova	0,02	870	38,85	1,27

Table 3
Scientific publications in the Former Soviet Union and Eastern European countries in 1996-2000 (Continuation)

87	Azerbaijan	0,02	777	20,34	0,60
128	Tadjikistan	0,01	183	21,32	0,54
135	Kirgizistan	0	145	26,21	0,89
157	Turkmenistan	0	49	28,59	0,71
20	Poland	1,14	40 540	51,59	2,27
30	Czech Rep.	0,53	18 944	51,62	2,32
34	Hungary	0,49	17 448	54,24	2,76
39	Slovakia	0,27	9 667	44,92	1,88
41	Romania	0,21	7 651	43,39	1,53
43	Bulgaria	0,2	7 175	49,52	1,83
46	Slovenia	0,15	5 211	47,94	2,07
47	Croatia	0,14	4 894	47,22	1,76
49	Yugoslavia	0,12	4 389	42,76	1,35

Table 4
Some relative indicators of publication activities in Russia, Ukraine and some countries of Eastern Europe, 1995-2000.

Country	Number of publications per 1000 inhabitants	Number of publications per 1 mln. USD Of GDP	Number of publications per 1 mln. USD of GERD (average figures for the period)
Ukraine	0,38	0,24	1,61
Slovenia	1,85	0,18	-
Hungary	1,49	0,20	4,6
Slovakia	1,43	0,27	4,2
Czech Rep.	1,32	0,14	2,3
Estonia	1,27	0,19	-
Bulgaria	0,91	0,24	-
Croatia	0,91	0,23	-
Poland	0,88	0,13	3,5
Russia	0,84	0,18	-

Availability of the EU Trendchart indicators for Ukraine.

N	Indicator		Possibility of calculations or assessment
			Ukraine
1.1	S&E graduates in 20-29 year old population		Not available, but it is possible to be assessed
1.2	Share of economically active population with 3rd level education		Not available, but it is possible to be assessed
1.3	Share of working population, involved in training programs		Not available
1.4	Share of employment in high-tech manufacturing		Could be calculated on the base of existing statistics
1.5	Share of employment in high-tech services		Could be calculated

Continuation of the previous table

2.1	Public R&D funding/GDP	Available
2.2	Business expenditure on R&D/GDP	Available (assessment)
2.3	EPO high-tech patents/population	Could be obtained from international sources only
2.4	USPTO high-tech patents/population	Could be obtained from international sources only

Continuation of the previous table

3.1	Share of SMEs innovating in-house	Not available
3.2	Share of SMEs, which are involved in co-operative innovation	Not available
3.3	Share of innovation expenditure/total sales	Could be calculated on the base of existing statistics

Continuation of the previous table

4.1	Share of venture capital/GDP	Could be assessed on the base of existing statistics
4.2	Share of new capital/GDP	Not available
4.3	Share of new-to-market products/total sales	Could be calculated on the base of existing statistics
4.4	Home internet access (access to broadband internet – now)	Could be assessed on the base of expert surveys
4.5	Share of ICT markets/GDP	Could be calculated on the base of commercial information
4.6	Changes in high-tech/value added	Could be calculated on the base of existing statistics

3 'NEEDS' (Conclusion)

- The need of implementation of the international standards for the purposes of comparative analysis

- The need to preserve (partially) 'old' indicators, as they reflect local realities. Thus, 'local' and 'international' indicators would co-exist for (at least) some period.

- The need to develop new indicators , which will reflect real processes in R&D and innovation spheres better