PROBLEMS OF MEASUREMENT OF R&D EMPLOYMENT IN FULL-TIME EQUIVALENT IN POST-SOVIET STATES[1]

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The paper deals with the problem of introduction of the indicator of full-time equivalent (FTE) of R&D personnel in statistics of post-Soviet and some other countries. Existing practice of recalculations is considered and assessed. Several possible ways for solving problem, how to switch to internationally comparable indicators are proposed.

Problem of measurement of R&D employment in full-time equivalent is a central one in statistics of R&D personnel in the post-Soviet states, as well, as in some other countries, including Central and Eastern European states. Its correct solving is of high importance for assessment of the real potential of scientific communities and comparative analysis with other countries and regions of the world.

According to Frascati Manual, full-time equivalent (FTE) for R&D personnel should be calculated on the basis of the total amount of time spent for doing R&D, irrespective of a research organization where R&D is done. It is emphasized that 'no one person can represent more than 1 FTE (in a year) and hence cannot perform more than 1 FTE'[1]. Thus, the indicator of time spent for doing R&D per specialist (in a year) cannot exceed one equivalent of the full working time, spent during the year.

It is evident that FTE is in a sense an artificial construct, which was pointed out by G. Sirilli, a well-known specialist from Italy, in late 1990s. He, above all, emphasized that many university lecturers successfully combined main work with commercial and research activities. As proved by data from sociological studies, these activities tend to be interlinked and have positive feedback effects. The overall work efficiency of a researcher grows, but combining various activities, according to recommendations of Frascati Manual, would automatically require use of diminishing coefficients in statistical accounting of time spent for doing R&D[2].

Because FTE is used for a reliable measurement of R&D personnel on the basis of integrated approaches, it is widely used in international comparisons. FTE lays the basis for constructing many secondary ('derivative') indicators, which are used for evaluation of research activities, such as number of publications per researcher etc. It should be noted that the method for breaking work time between various activities prevents from overestimation of the real time, which is spent on R&D in many countries[3]. Thus, for a university professor in developed countries, the total amount of compensation is derived first, and thereafter calculations of time to be spent on students' training, administrative matters and research are made, and this is used to calculate R&D share of the total compensation. Scientists can, of course, be engaged in other activities, such as consulting. This work is paid, but not "counted" as doing R&D[1].

At the same time, the situation with employment and salaries in developing countries and in the post-Soviet states (most of them are also considered as developing ones by the international organizations) is complicated. Very often one (official) job does not bring enough money to keep even average living standards. That is why the same specialist may have a job in several education or research centers. In that case, his/her work at the main job place is not counted with the diminishing coefficient, and

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his/her compensation in the primary place of work may not be reduced. Although being in a way contradictory, this practice does not entail the situation, when the employment of one specialist is accounted with the coefficient exceeding 1. The estimate of the total R&D personnel is, therefore, comes to be higher in the statistics of these countries, than the estimate of R&D personnel in FTE.[3]

Specific definitions are still used in R&D statistics of personnel in the post-Soviet states.

1. Full-time employed means that the person receives full ('standard') salary for its work on R&D according to the levels, established by the government for particular categories of research personnel. Private sector could establish different level of salaries but the absolute majority of R&D specialists are working for the state –controlled institutions, including higher education establishments. It is assumed that these specialists are working full 'standard' working time (usually, eight hours per day) in the institutions, where they are 'full-time employed'.

2. At the same time, there are a number of specialists, who are working part-time in research establishments or on research projects in higher education sector. In the case of university, they, for instance, preserve their 'full-time salaries' as university professors plus receive extra salary for research. Similar situation is in research establishments. One specialist can receive full salary in one place plus half or quarter of regular salary in some other (or even the same) research institute. As a rule, the part-time employment is not permanent, in contrast with full –time employment.

In post-Soviet countries, calculations of R&D employment used to be made by a different method that required separated measurement of employment in R&D as the main activity and employment in R&D "part-time". A specialist used to be counted as "unit" at his/her main job place, whereas his/her additional employment was added to this "unit" (usually with respective diminishing coefficients). These figures are summed up, resulting in a higher FTE measure (even with accounting of the diminishing coefficients for employed "part-time"), than a total employment measure.

The main reason for emergence of such contradiction is based in existing practice of working time calculations, which is used in these countries. The data on R&D statistics is supplied along with other economic information to the statistical offices by all research organizations. Data have to show correspondence between the number of standard full-time and part-time positions and the salaries of employees. Diminishing coefficients will lead to automatic decline of salaries for those specialists, who are involved in R&D. Specialized surveys are not used to obtain more realistic picture on real time distribution of R&D personnel. In reality, specialists do not spend 'standard' time on their primary places of work or announced part of 'standard' time in their secondary place of work. As a result, institutes report higher figures on employment in R&D. However, these figures correspond fully with data on salaries of employees.

The UNESCO Institute of statistics and its predecessors did not agree with such approach, and they did not include respective data in FTE equivalent on post-Soviet countries in its official publications.

The situation has changed slightly only in recent years. Some countries[*] have entered the position "person-hours worked" on R&D in the official statistical questionnaires. It is a definitely right step allowing for sound measurement of formal employment of part-time employees and more correct estimation of FTE indicator. Yet, the overwhelming majority of studies continue to use only the measure of R&D

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[*] Kazakhstan, Ukraine, Moldova and some others. Not all of them use this indicator for all R&D employees, This indicator is used more actively for those, who are involved in R&D as part-time employees.

employment at the main job place. This cannot allow for a sound evaluation of the situation in R&D.

It is important to note that such countries, as Ukraine, Uzbekistan, Kazakhstan and Moldova have declared they have started to use FTE calculations[4]. However, their methods of calculations have to be reconsidered to obtain data according to the OECD standards.

Let's consider Ukrainian example and contradictions of the FTE measurement in this country. The need to make changes in traditional statistics was a result of transformations in the structure of employment in the country during two recent decades. Ukraine featured two times growth in the number of "part-time" employees in 1991-2007. This growth went contrary to the nearly threefold reduction in the total R&D employment at the main job place in the same period. Therefore, "part-time" employment might be in a way considered as a response of R&D system on unfavorable change in "external environment". Estimations (on the basis of data for 2007) of real employment of "part-time" workers in FTE were made for the first time in 2008. It was estimated 35129 (given the formal engagement in R&D of 76856 "part-time" workers). This variation is well explainable, as part-time workers are not fully engaged in R&D, their average engagement being 45.7% of the salary of those engaged in R&D as the main activity. 80% of part-time performers have been traditionally engaged in higher education (HE) sector of science[5]. Note, that the overwhelming majority of part-time workers are researchers, but not ancillary personnel. The number of part-time R&D performers has been rapidly approaching the number of researchers doing R&D as the main activity. Basically, part-time R&D performers account for more than 37,7% of researchers in Ukrainian science. This raises concern in Ukraine, along with the well-known problem of ageing of research staff[6]. The research activity has become far less "professional", "being combined" with other categories of work, whereas reduction of research personnel has been on largely due to reduction of the ones whose main activity in R&D is related with applied research. It is true that combining of research and other activities can be found elsewhere in the world, but its scales are nevertheless lower than in Ukraine or some other post-Soviet countries.

Basically, it can be concluded that the problem faced by most part of post-Soviet countries when calculating FTE is than one and the same person can be counted several times in various research organizations, and sometimes in the same organization. As it was mentioned above, in reality a lot of these people are working full-time in one place or pert-time in another, bearing in mind time spending. However, as a result, the aggregated coefficient of employment often exceeds 1. It means that according to the accounting method adopted in these countries, employment at the main job place is usually counted as 1, and a person receives salary as the one employed full-time. However, this person may be registered as an employed half of "usual" working time in another organization, and in this organization he/she may receive salary for 25% of "usual" working time. The salary of a person working in R&D may even be increased, considering that he/she works intensively and combines several functions in the same organization. This is registered in the accounting as the employment with increased coefficient. All the activities are summed up, and one person may be counted in this way with the coefficient 1,75. Therefore, a paradox occurs in counting the total R&D employment: a lower estimate of 'physically' employed than an estimate derived by FTE formulas. Basically, the existing accounting practice inevitably leads to overestimations of the real R&D employment. On the other hand, this leads to underestimation of head count, as in many cases official statistics tends to take into account only those, who are working in R&D sphere as in their 'primary places of work'.

Work in several jobs is in a way a needed step aiming to allow for a good level of compensation, but this cannot solve the problem of eliminating "double counting". Yet, statistical questionnaires ('forms') inadequately account for the possibility of part-time work of the main activity employees; this aspect of accounting the research personnel is emphasized by increasing numbers of researchers in reaching the pension age. In many post-Soviet countries, these researchers have the right to preserve their full (state) pensions and receive salaries at the same time. This situation stimulates pensioners to stay longer in research institutes. In conditions of overall decline in research positions, this leads to extra constraints for careers of young researchers.

Variations in approaches to measurement of R&D personnel do not allow for correct comparisons of a series of derived indicators, especially ones of the research efficiency. Some these indicators such, as number of publications per capita, or R&D expenditures per capita are not comparable with indicators of countries, which use FTE. However, the main reason of relatively low research efficiency in post-soviet countries does not lie in the peculiarities of statistical accounting of R&D personnel. The key factor is inadequate evaluation of R&D results and traditional approaches to allocation of funds, especially budgetary ones, when the main criterion for calculating the amount of funds is the total number of personnel in a research institution. Also, the size of research institutions determines the amount of their "due" overheads. Imperfectness of systems for research performance evaluation and strictness of procedures for allocation of funds in research institutes are the main reasons for fictitious R&D employment in post-soviet countries. Of course, the existing situation needs to be changed.

The following measures can be used as a solution to the problem of FTE calculation in short-term period.

1.Part-time job within one research organization (internal part-time job) has not to be counted.

2.Data on R&D employment of lecturers in education institutions are to be collected by use of Frascati Manual approaches. This assumes clear delineation of the share of time devoted by lecturer to research, and by abandoning "double" or "triple" counting. This will allow for replacing the system that counts the number "salaries" by the system that counts the personnel as such.

3. The personnel can be counted only at the main job place, by use of coefficients diminishing the main job place in case of "secondary" employment. Basically, this can be tried by counting (for reference purposes) secondary employment in R&D in a separate line at the main job place in the existing forms of statistical accounting. For instance, if someone working in second working place for half salary, this has to be mentioned. In this case, his/her work in 'primary place of work' will be considered not as equivalent of one 'unit' but only 2/3 of one unit, while the work in the secondary place would be equal to 1/3 of the 'unit', nit half of the unit. It, however, may be expected that such an approach will not be welcomed by researches preferring not to show off with "secondary" employment. Also, this will be inconsistent with the existing accounting norms.

4. The below given procedure can be also offered as a temporary measure allowing for more accurate measurement of R&D personnel on the basis of the available statistical data. This will not solve the problem of correct calculation of FTE but make calculations closer to real figures. When calculating FTE, the data on part-time workers should be multiplied by the average share of compensation (part of "salary") which they receive at secondary job places, and this figure should be added to the employment at the main job place. The calculation will take the following form in Ukraine: the number part-time workers, multiplied by $\approx 0,4$ (average amount of compensation received at secondary job places), plus the total number of R&D employment at the main job place.

It is important to note that recently Russian experts have proposed to use similar approach to calculate FTE to all OECD countries[7]. The proposed formula is working for the bulk of the OECD countries, which have no such serious problem with multiple – employment and miscalculation of real working time, as post-Soviet countries have. For more reliable accounting of formal employment in R&D, additional items should be entered in statistical reporting forms, which allow for disaggregated information about the real employment, and for exclusion of the same persons from the national statistical reporting.

A more radical step, although a more grounded one, would be adoption of special surveys on the basis of samples constructed for the purpose.

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