Sample survey of wages on professions and positions: experience of carrying out in the Republic of Belarus

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Abstract

In this paper two-level sampling are considered. At the first stage are sampled enterprises, at the second stage are sampled workers. Weighting on two stages are considered. The basic sampling results are shown.

Keywords: Sample, wages on professions and positions, weighting, results of sample.

1   Introduction

Sample survey in sphere of labour statistics plays the important role for supervision of an economy condition and a population standard of living, survey of indicators of qualitative structure of wages. In Belarus the branches sampling of the enterprises have started to be carried out since 2006 in sphere of labour statistics:

The survey for the purpose of distribution of number of workers on the sizes of wages was carried out annually since 2007, since 2009 once in two years. However since November 2011 this survey is caring out continuous method.

The survey of structure of number of workers on sex, educational level, training and age in small enterprises was carried out in 2007 and 2008. Since 2009 the National statistical committee of the Republic of Belarus planned to carry out sample survey once in two years. However in 2009 committee substituted a sample method of survey on a continuous method.

One more sampling in sphere of labour statistics is sample survey of wages on professions and positions. The International Labour Organization recommended the realisation of this survey in Republic of Belarus. Since 2006 the National statistical committee of the Republic of Belarus carries out survey two times in five years.

Since 2012 the National statistical committee of the Republic of Belarus carries out quarterly sample survey of households for the study of employment problems.

Unfortunately now in Belarus sample survey is carried out only for the analysis of wages on professions and positions and for the study of employment problems in sphere of labour statistics.

Only the wages survey on professions and positions investigates the differentiation of wages. Results of this survey are necessary for international comparisons of purchasing capacity of wages on correlation of data about monthly wages of workers of surveyed professions with the prices of the basic food goods, for transition working out to new system of a payment with the account complexity, work intensity of workers and differentiation of wages on professions and positions.

2 Sampling design

Two-level sampling is used for survey of wages on professions and positions. At the first step territorial multivariate simple casual sampling of the enterprises is formed in the National statistical committee of the Republic of Belarus, at the second step workers are sampled by mechanical sampling algorithm in each enterprise.

2.1 The first stage

At the first stage objects of statistical survey are enterprises, their isolated divisions with number of workers more 16 persons of all patterns of ownership and small enterprises of not state pattern of ownership are an exception.

Sampling frame is a list of the enterprises representing the monthly state statistical report on labour (general aggregate of the enterprises). The enterprises with very small number of workers (till 4 workers) are excluded from the sampling frame for elimination potential non-responses.

The sampling frame is stratified into homogeneous groups of the enterprises by:

- regions of Belarus − 6 areas and Minsk-City and then
- economic activities − mining industry; manufacturing; production and distribution of electricity, gas and water; construction; transport and communication.

In each region of Belarus the small number of the enterprises is engaged mining industry therefore they were surveyed all.

Then sample of the enterprises is carried out in each region and economic activities contemporaneously on two indicators − wage fund and number of workers.

For survey can be used the combination of univariate sample (for large non-uniform general aggregate (over 400-500 units) and for very small size of a general aggregate (about 30-40 units)) and multivariate sample (for average non-uniform aggregate). The cluster analysis can be used for multivariate sample. For this survey was used the multivariate sample, but the cluster analysis was not used, because the stratified aggregates included a small number of enterprises.

The stratified aggregates were divided into uniform groups by the indicator «wage fund» for reduction of a sampling error. Sample is not carried out in groups with small number of the enterprises (till 6 units).

At the same time, the liquidation or temporary stoppage of activity of the enterprises often occurs in the process of sampling. Thus it is necessary to exclude the risks-enterprises from the general aggregate for reduction of non-responses. Sample updating is carried out taking into account several principles:

- risks-enterprise is replaced by other enterprise with approximately identical wage fund of the risks-enterprise; reweighing procedure is not executed;

- risks-enterprise is not replaced by other enterprise in two cases: 1) the wage fund of risks-enterprise is small and will slightly affect on the sampling error; 2) no enterprises to replace in corresponding group of the enterprises in a general aggregate; reweighing procedure is executed;

- if the number of the risks-enterprises makes more than 15 units in surveyed region and an economic activity, new sample of the enterprises is carried out in this region and an economic activity.

2.2 The second stage

At second stage the objects of statistical supervision are workers of sampled enterprises at the first stage. The sampling frame is a list of workers who worked full surveyed month (October).

Workers were ranged under personnel number of the worker. The name of professions and positions of workers are taken from the Nation-wide classifier of the Republic of Belarus «Professions of workers and positions of employees». It contains about 15 thousand professions and positions. Therefore the list of workers is stratified by categories: heads, experts, other employees, laborers.

The required number of sample workers is necessary to calculate. It number varied from 8 to 64 people and depends on the number of all surveyed workers. Sample is carried out in each layer (i) through the interval (S):

$$S = \frac{M_i}{m_i} \tag{1}$$

Here M_i – workers who worked full surveyed month (October),

$\qquad m_i$ – the required number of workers for sample.

Number of initial worker is a random number (RN). It is chosen on drawing lots. All subsequent numbers are calculated as:

the second number:

$$RN + S \tag{2}$$

third:

$$(RN \cdot S) + S \tag{3}$$

fourth:

$$(RN \cdot 2 \cdot S) + S \tag{4}$$

last number:

$$RN + S\,(m_i - 1) \tag{5}$$

Economists of each sampled enterprises fill special state statistical report «The report on wages of workers on professions and positions for October». As a result of the previous survey report form has been changed. Additional column "Number of workers in this profession (position) who worked full surveyed month (October)" was added. In a previous survey the individual worker weight was calculated on categories of

workers: heads, experts, other employees, laborers. But this method increased the sampling error. Additional column added for calculate of the individual worker weight on each profession (position).

The report consists of two parts. The first part contains information on the number and wages of all workers on categories. The second part contains the data stratified by professions for all surveyed workers: sex, education, experience, wage fund, number of worked hours and number of workers in this profession (position) who worked full surveyed month (October).

The report is filled from documents of the primary account and is sent to statistical offices.

3 Weighting and extrapolation

In the National statistical committee of the Republic of Belarus the obtained report data have been systematized, extrapolated and estimated at republican level on means of the special software developed for this survey.

Extrapolation is carried out with application of the aggregate weigh for a finite unit (worker):

$$x_{eij} = x_i \cdot k_{ai} \tag{6}$$

Here x_{eij} – the extrapolated value of x for i-th profession (position) of workers on j-th enterprise,

x_i – value of x for worker i-th profession (position),

k_{ai} – aggregate weight for i-th profession (position). Calculated as:

$$k_{ai} = k_e \cdot k_w \tag{7}$$

Here k_e – enterprise weight:

$$k_e = \frac{N_{ij}}{n_{ij}} \tag{8}$$

N_{ij} – number of the enterprises in a general aggregate for i-th economic activity of j-th region,

n_{ij} – number of the enterprises in a sample for i-th economic activity of j-th region,

k_w – individual worker weight for i-th profession (position). Calculated as:

$$k_w = \frac{T_i}{t_i} \tag{9}$$

T_i – total number of workers of i-th profession (position) who worked full surveyed month,

t_i – sampling number of workers of i-th profession (position).

4   Results

Results of sample survey of wages on professions and positions in 2011 have shown:

- as a whole on economic activities:

the sampling fraction varied from 21,4% to 41,7%,

the sampling error varied from 0,0% to 3,1% for indicator «wage fund», from 0,1% to 3,7% for indicator «number of workers»,

- as a whole on regions of Belarus:

the sampling fraction varied from 26,7% to 33,1%,

the sampling error varied from 0,2% to 1,2% for indicator «wage fund», from 0,1% to 2,0% for indicator «number of workers»,

- as a whole on the Republic of Belarus:

the sampling fraction amounted 29,5%,

the sampling errors amounted 0,2% for indicator «wage fund», 0,5% for indicator «number of workers».

By results of sample survey the bulletin is formed in National statistical committee of the Republic of Belarus. But it is used for office using and does not take places on an official site of statistical committee.

However results of survey in 2011 are not comparable with previous results due to the transition from a survey of industrial branches to the survey of some economic activities.