

## Structural Business Survey on shipping companies

### TYPE

Sampling survey

The enterprises were selected from the sampling frame that was based on the updated business register of the NSSG. The enterprises included in the survey were stratified as following:

- a) By region-NUTS II
- b) By size class of the enterprises. In each of the major strata (geography x size class), the enterprises were stratified into H=6 size strata, according to their size, determined by their annual turnover, as follows:

Class	Turnover description (amounts in Euros)		
1	1	Through	49.999
2	50.000	Through	199.999
3	200.000	Through	599.999
4	600.000	Through	1.999.999
5	2.000.000	Through	4.999.999
6	5.000.000	Through	Highest

The enterprises belonging to size class 6 were surveyed exhaustively.

### Survey characteristics estimation

#### a. Symbols

In each stratum let:

$y_{hi}$ : the value of the characteristic  $y$  of enterprise of order  $i$  belonging to the stratum  $h$

$N_h$ : the total number of enterprises belonging to the stratum  $h$

$n_h$ : the number of the respondent enterprises

$Y_h$ : the total of the variable  $y$  for all enterprises in stratum  $h$

$Y$ : the total of the variable  $y$  for all enterprises in all strata. That is:

$$Y = \sum_h Y_h$$

#### b. Estimation process

The estimation of  $Y_h$  and  $Y$  is given by the following formulas:

$$\hat{Y}_h = \frac{N_h}{n_h} \sum_{i=1}^{n_h} y_{hi}$$

$$\hat{Y} = \sum_h \hat{Y}_h$$

#### c. Variance estimation

The variance estimation of  $\hat{Y}_h$  and  $\hat{Y}$  is given by:

$$V(\hat{Y}_h) = \frac{N_h(N_h - n_h)}{n_h} S_h^2,$$

Where:

$$S_h^2 = \frac{1}{n_h - 1} \left[ \sum_{i=1}^{n_h} y_{hi}^2 - \frac{\left( \sum_{i=1}^{n_h} y_{hi} \right)^2}{n_h} \right],$$

$$V(\hat{Y}) = \sum_h V(\hat{Y}_h)$$

The coefficient of variation (%) of total estimation  $\hat{Y}$  is given by:

$$CV(\hat{Y}) = \frac{\sqrt{V(\hat{Y})}}{\hat{Y}} * 100$$