

**SMALL-AREA ESTIMATION IN THE SURVEY ON THE INFORMATION  
SOCIETY IN COMPANIES IN THE BASQUE COUNTRY**



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# Introduction

Aware of the growing demand for ever more disaggregated quality statistics, Eustat set up a research team in 2003 made up of members of Eustat and the Public University of Navarra. The aim was to work on improving estimation techniques in different statistical operations, and to introduce small-area estimation techniques based on models in the statistical production. One result of this project was the application of the small-area estimation system to the Annual Industrial Statistics, published by Eustat in 2005 in a Technical Handbook; in the Survey on the Population in Relation to Activity, published by Eustat in a Technical Handbook in 2008; in the Survey on Information Society – Families, published in a Technical Handbook in 2009; and in Information Technology Survey, published in a handbook in 2010.

This path that we started many years ago, is still fully valid, given that these methodologies have become a support for the respondent burden reduction. Their application, combined with information from administrative registers, allow higher levels of disaggregation of the estimations, with no need of larger samples. In this way, we contribute to the cost reduction and to the efficiency in our surveys.

This estimation methodology has been applied to another statistical operation which is equally relevant within Eustat's statistical production: the Survey on Information Society in companies. The aim of this operation is to provide social agents with a series of indicators that determine and allow them to measure the implementation and use of information and communication technologies in companies in the Basque Country. Small-area estimation methods allow us to give information on the statistics regions into which the Basque Country is divided, and on different geographical areas, including the capitals of the three provinces.

The aim of this publication is to provide material of use to all interested users referring to knowledge and usage of methods for small areas.

The document is divided into two separate parts. The first part describes the methodology used, together with certain aspects specific to the estimators and auxiliary information used. The second part is a presentation of the results for 2010, 2011 and 2012.

Vitoria-Gasteiz, November, 2012

Francisco Javier Forcada Sainz

General Director

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# Introduction

Official statistics currently have to meet a demand for more and more disaggregated quality information relating to social and economic indicators.

One method of tackling the demand for more disaggregation is to increase the sample size, with the corresponding rise in costs, and to continue applying the design-based estimators currently used in official statistics.

Another alternative currently being researched is to use more complex estimation techniques, as the model-assisted and model-based estimators.

The purpose of this Handbook is to disseminate the results of the fifth operation undertaken by using this method in EUSTAT: the Survey on Information Society in Companies (hereinafter referred to as ESIE).

In general, there is a move in the international arena towards accepting small-area estimations as official statistics, considered as the ones that comply with all the requirements of the Code of Good Practice for official statistics. On one hand, this implies new challenges for research into these methods, and on the other hand, an adequate presentation and explanation of these results to the users.

This document is an introduction to several aspects. There are two sections in the theoretical part: the main characteristics of the Survey of Information Society in Companies will first be presented alongside the error and result estimators used (Chapter 2), followed by a presentation of the system of small-area estimation applied in the ESIE (Chapter 3).

The section on application includes a commentary on the results obtained from said survey, using this methodology for the Basque Country regions. The results are shown for the following magnitudes: Internet connection, carry out procedures with the public administration online and use e-commerce (buying and selling) (Chapter 4). Finally, conclusions are drawn from the project (Chapter 5), and a Bibliography is included. The Appendix provides a list of the division of the municipalities into regions in the Basque Country.

# Survey on the Information Society in Companies (ESIE)

## 2.1 Description of the Survey on Information Society in Companies in the Basque Country

The Survey on Information Society in Companies (ESIE) was implemented in 2001 to find out the level of penetration of the new technologies in the fabric of the Basque economy; and to monitor said penetration in view of the current and future revolutionary importance and scope of technological changes.

The information is obtained for the main characteristics at the level of the provinces, in line with the sampling design – commented in further detail later – and specific data collected from a questionnaire.

The ESIE's reference population is establishments of any size and sector of activity that carry out their activity in the Basque Country, except for the primary sector and Home Help. The survey comes under the framework of the Directory of Economic Activities in the Basque Country.

The initial sample in the ESIE, which would become a panel, was selected in 2001. It included around 7,500 establishments, and applied pre-established criteria to the most updated directory of economic activities that existed up to that period, keeping sampling errors to minimal levels.

Due to several incidents (substitutions, non-response, etc.) and variations in the establishment population the Basque Country (new entries, cancelled entries and modifications), the original distribution deteriorated, giving rise to empty strata on the one hand and over-representation, on the other.

Therefore, the panel is updated annually according to a new sample distribution that, while respecting the original design, shows the new distribution of the population and the sample of title-holders in the strata needed to complete ones that are empty and over-represented.

In turn, to replace those that fail in the field, a sample of substitutes from the openings that were shown the year before in the Directory of Economic Activities in the Basque Country, with the same sample design as the current sample.

Technical Datasheet

Sampling units: The establishments listed in the Directory of Economic Activities.

Sample size: Around 7,500 establishments, distributed according to three variables: province, activity and employment stratum.

Sample type: Stratified

Allocation: Optimal

Drawing: Random within each province, employment stratum and activity. The sectorisation of activities is specific for this survey, based on the A38 classification of the National Classification of Economic Activities CNAE 2009 for this survey and disaggregating some services sectors (65 branches of activity).

There are six employment strata:

0-5, 6-9, 10-19, 20-49, 50-99, >=100. The stratum of older than 99 employed is for census purposes. The rest of the strata arose from the combination of the results of an ad hoc study on optimal stratification, according to the data in the 2000 survey, to ensure comparability with the characteristics of the surveys in other European countries.

## 2.2 Estimators used in the Survey on Information Society in Companies (ESIE) in the Basque Country

### 2.2.1 Definition of estimators and weighting formulas

To estimate survey characteristics, an estimator based on the establishments in each grouped stratum is considered. The grouped strata are made up of the resulting combinations of the 3 provinces, 64 branches of activity and 3 employment strata. (Six employment strata are grouped into three so the number of strata will not be too high). Thus, the result is a theoretical matrix of 585 strata. Those that are not represented in the directory are eliminated, and the calculation of the elevators continues.

A direct estimator, specifically, the Horvitz-Thompson estimator is used to calculate the estimations. The estimation for the total in a population of the variable being studied and using the Horvitz-Thompson estimator is defined as

$$\hat{y}_{HT} = \sum w_j y_j$$

In the case of the ESIE, given that the aim is not only to obtain an estimator for the total population, but also for different domains that make up that population (province, activity sector, employment stratum, etc.), the Horvitz- Thompson estimator is defined for any domain d as follows:

$$\hat{y}_{dHT} = \sum_j^{n_d} w_{dj} y_{dj}$$

where:

$j$  indicates the establishment

$d$  the domain for which the estimation is to be obtained

$y_{dj}$  is the value of the variable being studied in establishment  $j$  of domain  $d$ ,

$w_{dj}$  is the relevant population weight, and

$n_d$  the sampling size in domain  $d$

## 2.2.2 Estimation method of the sampling errors

The Taylor Expansion Method was used. It enables the calculation of sampling error estimates for totals, means and ratios in samples with stratification, clusters and unequal probabilities. The method obtains linear approximations of the estimator and calculates the variance by using it as an estimate of the sampling variance.

The expression for calculating the estimate variance for the mean population is as follows:

$$\bar{V}(\hat{\bar{Y}}) = \sum_{h=1}^H \frac{n_h(1-f_h)}{n_h-1} \sum_{i=1}^{n_h} (e_{hi\cdot} - \bar{e}_{h\cdot\cdot})^2$$

where:

$$e_{hi\cdot} = \left( \sum_{j=1}^{m_{hi}} w_{hij} (y_{hij} - \hat{\bar{Y}}) \right) / w_{\dots}$$

$$\bar{e}_{h\cdot\cdot} = \left( \sum_{i=1}^{n_h} e_{hi\cdot} \right) / n_h$$

and

$$w_{\dots} = \sum_{h=1}^H \sum_{i=1}^{n_h} \sum_{j=1}^{m_{hi}} w_{hij}$$

Notation:

$h = 1, 2, \dots, H$  indicates the stratum with a total of  $H$  strata.

$i = 1, 2, \dots, n_h$  indicates the number of clusters in stratum  $h$ , with a total of  $n_h$  clusters.

$j = 1, 2, \dots, m_{hi}$  indicates the unit number within cluster  $i$  of stratum  $h$ , with a total of  $m_{hi}$  units

$$n = \sum_{h=1}^H \sum_{i=1}^{n_h} m_{hi}$$

is the total number of observations in the sample.

$w_{hij}$  indicates the weighting of observation  $j$  in cluster  $i$  of stratum  $h$

$Y_{hij} = (Y_{hij}(1), Y_{hij}(2), \dots, Y_{hij}(P))$  are the observed values of variable  $Y$  in observation  $j$  of cluster  $i$  of stratum  $h$ . (categorical and numerical variables).

This calculation was performed using the PROC SURVEYMEANS procedure from the SAS statistical package (Sas Institute Inc. 2004).

## The Small-Area Estimation Method in the ESIE

### 3.1 Estimator Study

The estimation methodology was established using the analysis of various estimators, both classic and model-assisted and model-based, to estimate several variables of the survey in 20 regions of the Basque Country and in the 3 provincial capitals.

The variables analysed were:

- Internet Connection (YES/NO)
- Online procedures with the Public Administration (YES/NO)
- E-commerce (YES/NO) purchases and sales

Auxiliary information is provided by the directory of economic activities. The total populations of the total number of establishments in each stratum (province, activity and employment stratum) per region are needed in order to obtain the final forecasts in each region.

The estimators were evaluated by comparing the mean squared error and the final results were calibrated to the results of the direct estimator at Provincial level.

#### 3.1.1 Design-based estimators

##### 3.1.1.1 Direct:

$$\hat{y}_d^{directo} = \frac{\sum_{j=1}^{n_d} \tilde{w}_j y_j}{\sum_{j=1}^{n_d} \tilde{w}_j} N_d$$

where:

$y_j = 1$  (YES in the study variable)  $y_j = 0$  (NO in the study variable)

$N_d$  number of companies.

$n_d$  sample size in the region d.

$d$  is the small area (region)

$\tilde{w}_j$  weight calibrated in terms of the design weight

### 3.1.1.2 Post-stratified

$$\hat{y}_d^{post} = \sum_g \hat{y}_{dg} N_{dg}$$

where:

$N_{dg}$  number of companies in region d and stratum g.

$\hat{y}_{dg}$  is the mean calculated with the aforementioned direct estimator,  $\hat{y}_{dg} = \frac{\sum_{j \in s_{dg}} w_j y_j}{\sum_{j \in s_{dg}} w_j}$

### 3.1.1.3 Synthetic

$$\hat{y}_d^{syn t} = \sum_g \hat{y}_g N_{dg}$$

where

$N_{dg}$  number of companies in region d and stratum g.

$\hat{y}_g$  is the mean calculated with the aforementioned direct estimator,

### 3.1.1.4 Composites

$\hat{y}_d^{dep} = \lambda_d \hat{y}_d^{post} + (1 - \lambda_d) \hat{y}_d^{syn t}$  where  $\hat{y}_d^{post}$  is the post-stratified direct estimator and  $\hat{y}_d^{syn t}$  is the synthetic estimator calculated using the mean per group of the total in the area calculated with the direct estimator.

Where  $0 \leq \lambda_d \leq 1$  is given by  $\lambda_d = \begin{cases} 1 & \text{si } \hat{N}_d \geq \alpha N_d \\ \frac{\hat{N}_d}{\alpha N_d} & \text{en otro caso} \end{cases}$

$\hat{N}_d = \sum_d w_j$  is the total population estimated in each area d and  $\alpha$  is a parameter. The composite estimator is worked out for different values of  $\alpha = 2/3, 1, 1.5$  y  $2$ .

### 3.1.2 Model-based estimators

#### Estimators based on fixed effect log-linear models

The model selected is based on the fixed effect log-linear model that makes use of the employment stratum, economic activity and the region. Where sufficient information is not available, and sample size or result accuracy is insufficient, a model with a higher geographic aggregation is selected: a log-linear model that makes use of the employment stratum, economic activity and the territory.

First level

$$\text{logit}(p^1) = \log \frac{p^1}{1-p^1} = \beta_0 + \beta_1 x_1 + \dots + \beta_{47} x_{47}$$

where:

- $p^1$  proportion of establishments that respond affirmatively to a variable.
- $\beta_0$  is the intercept.
- $\beta_1, \dots, \beta_{19}$  are the coefficients of the explanatory variables for the 20 regions.
- $\beta_{20}, \beta_{21}$  are the coefficients of the explanatory variables for the employment strata.
- $\beta_{22}, \dots, \beta_{47}$  are the coefficients of the explanatory variables for the 27 economic activities.

Second level or geographic aggregate

$$\text{logit}(p^2) = \log \frac{p^2}{1-p^2} = \beta_0 + \beta_1 x_1 + \dots + \beta_{30} x_{30}$$

where:

- $p^2$  proportion of establishments that respond affirmatively to a variable.
- $\beta_0$  is the intercept.
- $\beta_1, \beta_2$  are the coefficients of the explanatory variables for the 3 provinces.
- $\beta_3, \beta_4$  are the coefficients of the explanatory variables for the employment strata.

- $\beta_5, \dots, \beta_{30}$  are the coefficients of the explanatory variables for the 27 economic activities.

This calculation was performed using the PROC GENMOD procedure from the SAS statistical package (Sas Institute Inc. 2004). The model specifies the TYPE3 option that makes a separate contrast for each of the model's effects.

## 3.2 Estimation of the mean squared error

The bootstrap re-sampling method was used to calculate the mean squared error. Resampling methods are based on the evaluation of the statistics in resamples or sub-samples obtained from the original data and these values are used to obtain estimators of the accuracy measurement or of the sampling distribution of the statistics.

In the case of the bootstrap method, sub-samples are obtained using stratified random sampling, where the strata are defined by the province, activity and the 3 employment strata.

The population used to calculate the mean squared error is based on the sample data, simulating the structure of establishments in the Basque Country for the study variables.

Bootstrap calculation of the standard error:

$$e.e.(\hat{\theta}_d) = \sqrt{\frac{1}{R-1} \sum_{i=1}^R (\hat{\theta}_d^i - \bar{\hat{\theta}}_d)^2}$$

where:

$\theta_d$  is the total population of a certain variable in region d.

R Number of repetitions used in the bootstrap method (R = 200)

i is the repeated number (i = 1, 2, ..., R)

• d is the region

•  $\hat{\theta}_d^i$  the estimator in the i-th bootstrap sample of said total in region d

$\bar{\hat{\theta}}_d$  is the mean in each region d  $\bar{\hat{\theta}}_d = (\hat{\theta}_d^1 + \dots + \hat{\theta}_d^R) / R$

They are considered as different values of R. It can be observed that no differences in behaviour exist with regards to the sizes of R. In view of the results, it was decided to use  $R=200$ .

### 3.3 Conclusions

Once the study was conducted with all the estimators, the more appropriate estimator by regions was seen to be the fixed-effect log-linear model at two geographic levels (the region and province). The estimator's temporal and geographic coherence, combined with the high correlation of the study variables with the establishment's economic activity and the number of employees lend weight to the choice of the current estimator.

The results obtained for 20 regions and 3 provincial capitals show acceptable levels of error; the coefficients of variation in most of the results are lower than 10%.

### 3.4 Software used

A computer program based on SAS was used to analyse this methodology and the application of the aforementioned estimators. Specific macro programs were written which execute the different tasks outline: production of estimations by region and the calculation of the mean squared errors for the different methods

The macro provides estimations calculated using the estimator based on the fixed-effect log-linear direct estimator a provincial level, and coefficients of variation calculated using the remodel calibrated to the spective bootstrap method.

Other input parameters of this macro are: the variables to be estimated, and the option of calibrating the region-level estimations to the provincial ones through the direct estimation of the survey and the mean squared error estimation method (and, in the case of the bootstrap, the value of R, number of sub-samples).

## 2010-2012 Regional estimations

### 4.1 Definitions

The estimations obtained applying the aforementioned estimation system for the Survey on Information Society in Companies (ESIE) for 2010, 2011 and 2012 are set out below.

The estimations refer to the percentage of companies that have an Internet connection, carry out procedures with the public administration online and use e-commerce (buying and selling), in the 20 regions of the Basque Country and the provincial capitals, by sex. Along with the estimations, the tables for their coefficients of variation (CV) are also included.

The official division of the Basque Country into regions is as follows:

Alava: Valles Alaveses, Llanada Alaveses, Montaña Alaveses, Rioja Alaveses, Estribaciones del Gorbea and Cantábrica Alaveses:

Bizkaia: Arratia-Nervión, Gran Bilbao, Duranguesado, Encartaciones, Gernika-Bermeo, Markina-Ondarroa and Plentzia-Mungia

Gipuzkoa: Bajo Bidasoa, Bajo Deba, Alto Deba, Donostia-San Sebastián, Goierri, Tolosa and Urola Costa

(See Appendix for the list of regions and municipalities)



The most notable results are set out below.

## 4.2 Results

### Establishments with 10 or more employees with Internet connection. Estimation (%) and Coefficients of Variation. 2010-2012

|                                         | 2010        |             | 2011        |             | 2012        |             |
|-----------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                         | Estimation  | CV          | Estimation  | CV          | Estimation  | CV          |
| <b>C.A. de Euskadi</b>                  | <b>96,2</b> | <b>0.00</b> | <b>97,2</b> | <b>0.00</b> | <b>96,7</b> | <b>0.00</b> |
| Vitoria - Gasteiz                       | 94,4        | 0.01        | 95,7        | 0.01        | 96,5        | 0.01        |
| Bilbao                                  | 95,5        | 0.01        | 95,5        | 0.01        | 97,5        | 0.01        |
| Donostia - San Sebastian                | 95,9        | 0.01        | 95,8        | 0.01        | 97,1        | 0.01        |
| <b>Araba/Álava</b>                      | <b>94,7</b> | <b>0.01</b> | <b>95,9</b> | <b>0.01</b> | <b>95,8</b> | <b>0.01</b> |
| Arabako Ibarak / Valles Alaveses        | 98,0        | 0.01        | 99,3        | 0.01        | 98,7        | 0.01        |
| Arabako Lautada / Llanada Alavesa       | 94,1        | 0.01        | 95,5        | 0.01        | 96,2        | 0.01        |
| Arabako Mendialdea / Montaña Alavesa    | 98,6        | 0.01        | 99,3        | 0.01        | 98,2        | 0.01        |
| Errioxa Arabarra / Rioja Alavesa        | 95,1        | 0.03        | 96,9        | 0.02        | 92,9        | 0.04        |
| Gorbeia Inguruak / Estribac. del Gorbea | 98,8        | 0.01        | 94,1        | 0.04        | 97,2        | 0.01        |
| Kantauri Arabarra / Cantábrica Alavesa  | 98,0        | 0.02        | 96,3        | 0.02        | 92,6        | 0.03        |
| <b>Bizkaia</b>                          | <b>96,0</b> | <b>0.01</b> | <b>97,1</b> | <b>0.01</b> | <b>96,6</b> | <b>0.01</b> |
| Arratia Nerbioi / Arratia-Nervión       | 96,8        | 0.02        | 99,0        | 0.01        | 94,2        | 0.03        |
| Bilbo Handia / Gran Bilbao              | 95,6        | 0.01        | 96,3        | 0.01        | 96,4        | 0.01        |
| Durangaldea / Duranguesado              | 99,2        | 0.00        | 99,9        | 0.00        | 99,5        | 0.01        |
| Enkartzazioak / Encartaciones           | 94,1        | 0.04        | 93,2        | 0.04        | 92,7        | 0.05        |
| Gernika-Bermeo                          | 99,6        | 0.00        | 99,3        | 0.00        | 94,3        | 0.03        |
| Markina-Ondarroa                        | 99,6        | 0.01        | 99,2        | 0.01        | 98,7        | 0.01        |
| Plentzia-Mungia                         | 96,6        | 0.01        | 96,0        | 0.03        | 95,8        | 0.01        |
| <b>Gipuzkoa</b>                         | <b>97,2</b> | <b>0.01</b> | <b>97,8</b> | <b>0.01</b> | <b>97,4</b> | <b>0.01</b> |
| Bidasoa Beherea / Bajo Bidasoa          | 96,9        | 0.02        | 98,3        | 0.01        | 95,0        | 0.02        |
| Deba Beherea / Bajo Deba                | 99,3        | 0.00        | 99,9        | 0.00        | 100,0       | 0.00        |
| Deba Garaia / Alto Deba                 | 96,0        | 0.02        | 99,9        | 0.00        | 100,0       | 0.00        |
| Donostialdea                            | 97,2        | 0.01        | 96,6        | 0.01        | 97,4        | 0.01        |
| Goierri                                 | 97,6        | 0.01        | 97,7        | 0.02        | 97,9        | 0.02        |
| Tolosaldea / Tolosa                     | 98,9        | 0.00        | 99,7        | 0.00        | 98,0        | 0.02        |
| Urola-Kostaldea / Urola Costa           | 94,8        | 0.02        | 98,0        | 0.00        | 94,1        | 0.03        |

Source: EUSTAT. Survey on the Information Society -ESI Companies.

**Establishments with 10 or more employees that carry out procedures with the public administration online. Estimation (%) and Coefficients of Variation. 2010-2012**

|                                         | 2010        |             | 2011        |             | 2012        |             |
|-----------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                         | Estimation  | CV          | Estimation  | CV          | Estimation  | CV          |
| <b>C.A. de Euskadi</b>                  | <b>84,9</b> | <b>0.01</b> | <b>85,2</b> | <b>0.01</b> | <b>87,8</b> | <b>0.01</b> |
| Vitoria - Gasteiz                       | 85,4        | 0.03        | 85,5        | 0.02        | 85,1        | 0.02        |
| Bilbao                                  | 85,4        | 0.02        | 84,0        | 0.02        | 87,8        | 0.02        |
| Donostia - San Sebastian                | 85,7        | 0.03        | 87,7        | 0.02        | 88,4        | 0.02        |
| <b>Araba/Álava</b>                      | <b>84,9</b> | <b>0.02</b> | <b>86,1</b> | <b>0.02</b> | <b>86,0</b> | <b>0.02</b> |
| Arabako Ibarak / Valles Alaveses        | 90,8        | 0.05        | 88,7        | 0.04        | 84,2        | 0.07        |
| Arabako Lautada / Llanada Alavesa       | 85,0        | 0.03        | 85,9        | 0.03        | 85,1        | 0.02        |
| Arabako Mendialdea / Montaña Alavesa    | 84,0        | 0.08        | 73,4        | 0.10        | 86,5        | 0.02        |
| Errioxa Arabarra / Rioja Alavesa        | 93,0        | 0.04        | 91,4        | 0.03        | 91,3        | 0.05        |
| Gorbeia Inguruak / Estribac. del Gorbea | 87,0        | 0.06        | 87,4        | 0.05        | 86,7        | 0.03        |
| Kantauri Arabarra / Cantábrica Alavesa  | 77,1        | 0.05        | 84,1        | 0.04        | 92,2        | 0.04        |
| <b>Bizkaia</b>                          | <b>84,6</b> | <b>0.02</b> | <b>83,7</b> | <b>0.02</b> | <b>87,2</b> | <b>0.02</b> |
| Arratia Nerbioi / Arratia-Nervión       | 83,8        | 0.03        | 88,2        | 0.02        | 90,7        | 0.04        |
| Bilbo Handia / Gran Bilbao              | 84,4        | 0.02        | 83,4        | 0.02        | 86,7        | 0.02        |
| Durangaldea / Duranguesado              | 85,9        | 0.04        | 84,7        | 0.03        | 88,3        | 0.03        |
| Enkartzazioak / Encartaciones           | 77,1        | 0.07        | 75,7        | 0.09        | 81,5        | 0.07        |
| Gernika-Bermeo                          | 88,7        | 0.04        | 81,4        | 0.05        | 93,7        | 0.03        |
| Markina-Ondarroa                        | 85,9        | 0.05        | 92,7        | 0.03        | 89,6        | 0.04        |
| Plentzia-Mungia                         | 87,1        | 0.03        | 87,2        | 0.05        | 91,5        | 0.03        |
| <b>Gipuzkoa</b>                         | <b>85,2</b> | <b>0.02</b> | <b>87,0</b> | <b>0.02</b> | <b>89,5</b> | <b>0.02</b> |
| Bidasoa Beherea / Bajo Bidasoa          | 80,2        | 0.04        | 80,5        | 0.05        | 83,5        | 0.05        |
| Deba Beherea / Bajo Deba                | 84,1        | 0.05        | 81,8        | 0.05        | 89,9        | 0.04        |
| Deba Garaia / Alto Deba                 | 90,8        | 0.03        | 95,9        | 0.02        | 97,3        | 0.01        |
| Donostialdea                            | 85,4        | 0.02        | 88,0        | 0.02        | 89,5        | 0.02        |
| Goierri                                 | 89,0        | 0.03        | 89,5        | 0.04        | 93,1        | 0.03        |
| Tolosaldea / Tolosa                     | 87,3        | 0.03        | 85,8        | 0.04        | 88,1        | 0.04        |
| Urola-Kostaldea / Urola Costa           | 79,5        | 0.06        | 84,2        | 0.05        | 85,4        | 0.05        |

Source: EUSTAT. Survey on the Information Society -ESI Companies.

**Establishments with 10 or more employees that use e-commerce. Estimation (%) and Coefficients of Variation. 2010-2012**

|                                         | 2010        |             | 2011        |             | 2012        |             |
|-----------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                         | Estimation  | CV          | Estimation  | CV          | Estimation  | CV          |
| <b>C.A. de Euskadi</b>                  | <b>23,7</b> | <b>0.05</b> | <b>23,1</b> | <b>0.04</b> | <b>24,9</b> | <b>0.04</b> |
| Vitoria - Gasteiz                       | 23,6        | 0.10        | 22,2        | 0.09        | 21,4        | 0.09        |
| Bilbao                                  | 22,9        | 0.08        | 22,7        | 0.08        | 23,1        | 0.08        |
| Donostia - San Sebastian                | 25,0        | 0.08        | 25,0        | 0.08        | 27,7        | 0.08        |
| <b>Araba/Álava</b>                      | <b>23,2</b> | <b>0.09</b> | <b>22,8</b> | <b>0.09</b> | <b>21,4</b> | <b>0.09</b> |
| Arabako Ibarak / Valles Alaveses        | 10,8        | 0.24        | 22,5        | 0.20        | 16,3        | 0.17        |
| Arabako Lautada / Llanada Alavesa       | 23,0        | 0.10        | 21,8        | 0.09        | 21,2        | 0.09        |
| Arabako Mendialdea / Montaña Alavesa    | 19,6        | 0.13        | 16,8        | 0.17        | 16,7        | 0.10        |
| Errioxa Arabarra / Rioja Alavesa        | 26,0        | 0.19        | 18,7        | 0.26        | 21,2        | 0.24        |
| Gorbeia Inguruak / Estribac. del Gorbea | 20,2        | 0.21        | 33,5        | 0.19        | 24,9        | 0.15        |
| Kantauri Arabarra / Cantábrica Alavesa  | 28,2        | 0.13        | 29,1        | 0.14        | 23,5        | 0.12        |
| <b>Bizkaia</b>                          | <b>24,3</b> | <b>0.07</b> | <b>23,6</b> | <b>0.07</b> | <b>23,2</b> | <b>0.07</b> |
| Arratia Nerbioi / Arratia-Nervión       | 16,7        | 0.14        | 17,8        | 0.13        | 19,2        | 0.17        |
| Bilbo Handia / Gran Bilbao              | 23,9        | 0.07        | 23,3        | 0.07        | 23,6        | 0.07        |
| Durangaldea / Duranguesado              | 29,1        | 0.11        | 27,1        | 0.11        | 21,6        | 0.12        |
| Enkartazioak / Encartaciones            | 11,4        | 0.34        | 4,7         | 0.60        | 5,3         | 0.48        |
| Gernika-Bermeo                          | 28,6        | 0.17        | 29,9        | 0.13        | 22,8        | 0.15        |
| Markina-Ondarroa                        | 26,7        | 0.18        | 27,4        | 0.16        | 33,3        | 0.12        |
| Plentzia-Mungia                         | 26,6        | 0.15        | 27,3        | 0.15        | 28,6        | 0.15        |
| <b>Gipuzkoa</b>                         | <b>23,2</b> | <b>0.08</b> | <b>22,4</b> | <b>0.07</b> | <b>29,1</b> | <b>0.06</b> |
| Bidasoa Beherea / Bajo Bidasoa          | 13,7        | 0.20        | 16,3        | 0.17        | 17,0        | 0.18        |
| Deba Beherea / Bajo Deba                | 26,0        | 0.13        | 23,8        | 0.14        | 42,8        | 0.11        |
| Deba Garaia / Alto Deba                 | 30,1        | 0.10        | 24,5        | 0.10        | 32,4        | 0.09        |
| Donostialdea                            | 23,7        | 0.08        | 23,2        | 0.08        | 27,7        | 0.07        |
| Goierri                                 | 15,3        | 0.15        | 19,9        | 0.14        | 26,6        | 0.14        |
| Tolosaldea / Tolosa                     | 23,8        | 0.14        | 18,7        | 0.16        | 32,2        | 0.13        |
| Urola-Kostaldea / Urola Costa           | 27,4        | 0.14        | 25,9        | 0.12        | 32,4        | 0.12        |

Source: EUSTAT. Survey on the Information Society -ESI Companies.

## Conclusions

The growing demand for disaggregated information and need not to overburden the informants mean a progressively greater use of model-based estimation methods in official statistics.

Obtaining estimations of the figures related to activity in small areas such as regions, as described in this paper, is a step forward in the implementation of the new model-based estimation methods by the Statistics Office.

In general, the results set out here offer acceptable levels of quality in terms of accuracy. Most of the coefficients of variation (CV) obtained in the estimations did not exceed 10% and many did were lower than 5%.

Eustat will now be able to provide region-level estimations based on specific surveys, with the increased efficiency that this implies.

The estimations may be improved as better auxiliary information becomes available. The availability of appropriate auxiliary information is fundamental to small-area techniques and, therefore, it is important to have suitable frame and access to information from the administrative files.

Eustat seeks to continue to make progress in the study and implementation of model-based estimation methods in order to be able to provide increasingly disaggregated quality information.

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## APPENDIX

### ALAVA/ARABA

**Arabako Ibarrak / Valles Alaveses:** Añana, Armiñón, Berantevilla, Kuartango, Lantarón, Ribera Alta, Ribera Baja/Erribera Beitia, Valdegovía/Gaubea, Zambrana

**Arabako Lautada / Llanada Alavesa:** Alegría-Dulantzi, Arrazua-Ubarrundia Asparrena, Barrundia, Elburgo/Burgelu, Iruña Oka/Iruña de Oca, Iruraiz-Gauna, Salvatierra/Agurain, San Millán/Donemiliaga, Vitoria-Gasteiz, Zaldondo

**Arabako Mendialdea / Montaña Alavesa:** Arraia-Maeztu, Bernedo, Campezo/Kanpezu, Harana/Valle de Arana, Lagrán, Peñacerrada-Urizaharra

**Errioxa Arabarra / Rioja Alavesa:** Baños de Ebro/Mañueta, Elciego, Elvillar/Bilar, Kripan, Labastida/Bastida, Laguardia, Lanciego/Lantziego, Lapuebla de Labarca, Leza, Moreda de Álava, Navaridas, Oyón-Oion, Samaniego, Villabuena de Alava/Eskuernaga, Yécora/Iekora

**Gorbeia Inguruak / Etribaciones del Gorbea:** Aramaio, Legutiano, Urkabustaiz, Zigoitia, Zuia

**Kantauri Arabarra / Cantábrica Alavesa:** Amurrio, Artziniega, Ayala/Aiara, Laudio/Llodio, Orondo

### BIZKAIA

**Arratia Nerbioi / Arratia-Nervión:** Arakaldo, Arantzazu, Areatza, Arrankudiaga, Artea, Dima, Igorre, Orozko, Otxandio, Ubide, Ugao-Miraballes, Urduña-Orduña, Zeanuri, Zeberio

**Bilbo Handia / Gran Bilbao:** Abanto y Ciérvana-Abanto Zierbena, Alonsotegi, Arrigorriaga, Barakaldo, Basauri, Berango, Bilbao, Derio, Erandio, Etxebarri, Galdakao, Getxo, Larrabetzu, Leioa, Lezama, Loiu, Muskiz, Ortuella, Portugalete, Santurtzi, Sestao, Sondika, Valle de Trápaga-Trapagaran, Zamudio, Zaratamo, Zierbena

**Durangaldea / Duranguesado:** Abadiño, Amorebieta-Etxano, Atxondo, Bedia, Berriz, Durango, Elorrio, Ermua, Garai, Iurreta, Izurtza, Lemoa, Mallabia, Mañaria, Zaldibar

**Enkartzioak / Encartaciones:** Artzentales, Balmaseda, Galdames, Gordexola, Güeñes, Karrantza Harana/Valle de Carranza, Lanestosa, Sopuerta, Trucios-Turtzioz, Zalla

**Gernika-Bermeo:** Ajangiz, Arratzu, Bermeo, Busturia, Ea, Elantxobe, Ereño, Errigoiti, Forua, Gautegiz Arteaga, Gernika-Lumo, Ibarangelu, Kortezubi, Mendata, Morga, Mundaka, Murueta, Muxika, Nabarniz, Sukarrieta

**Markina-Ondarroa:** Amoroto, Aulesti, Berriatua, Etxebarria, Gizaburuaga, Ispaster, Lekeitio, Markina-Xemein, Mendexa, Munitibar-Arbatzegi Gerrikaitz-, Ondarroa, Ziortza-Bolibar

**Plentzia-Mungia:** Arrieta, Bakio, Barrika, Fruiz, Gamiz-Fika, Gatika, Gorliz, Laukiz, Lemoiz, Maruri-Jatabe, Meñaka, Mungia, Plentzia, Sopelana, Urduliz

## GIPUZKOA

**Bidasoa Beherea / Bajo Bidasoa:** Hondarribia, Irun

**Deba Beherea / Bajo Deba:** Deba, Eibar, Elgoibar, Mendaro, Mutriku, Soraluze Placencia de las Armas

**Deba Garaia / Alto Deba:** Antzuola, Aretxabaleta, Arrasate/Mondragón, Bergara, Elgeta, Eskoriatza, Leintz-Gatzaga, Oñati

**Donostialdea / Donostia-San Sebastián:** Andoain, Astigarraga, Donostia-San Sebastián, Erreenteria, Hernani, Lasarte-Oria, Lezo, Oiartzun, Pasaia, Urnieta, Usurbil

**Goierri:** Altzaga, Arama, Ataun, Beasain, Ezkio-Itsaso, Gabiria, Gaintza, Idiazabal, Itsasondo, Lazkao, Legazpi, Mutiloa, Olaberria, Ordizia, Ormaiztegi, Segura, Urretxu, Zaldibia, Zegama, Zerain, Zumarraga

**Tolosaldea / Tolosa:** Abaltzisketa, Aduna, Albiztur, Alegia, Alkiza, Altzo, Amezketa, Anoeta, Asteasu, Baliarrain, Belauntza, Berastegi, Berrobi, Bidegoian, Elduain, Gaztelu, Hernialde, Ibarra, Ikaztegieta, Irura, Larraul, Leaburu, Legorreta, Lizartza, Orendain, Oresa, Tolosa, Villabona, Zizurkil

**Urola-Kostaldea / Urola Costa:** Aia, Aizarnazabal, Azkoitia, Azpeitia, Beizama, Errezil, Getaria, Orio, Zarautz, Zestoa, Zumaia