



---

## **The Effect of Business Demography on Index Numbers Calculation**

Roberto Gismondi

ISTAT (Italian National Statistical Institute), Roma, Italy [gismondi@istat.it](mailto:gismondi@istat.it)

Since 1998, in the European Union (EU) the Short-Term Statistics Regulation is ruling the calculation of index numbers concerning production, turnover and employment. Quality issues are ensured by specific features of consistency and exhaustiveness. However, there are some degrees of freedom in the calculation procedures which may be used by National Statistical Institutes. A relevant problem concerns the effects of business demography, which is not clearly stated in the Regulation and whose statistical treatment may be different depending on the country. The reference population existing in the base year – actually 2010 – changes month by month, because of business demography: some units die (definitive closure, economic activity changes), some modify their economic features (main economic activity, size, location) and others are born. However, almost in every EU country the business register is updated on a yearly basis and with about one year delay. As a consequence, two basic methodological problems should be tackled, resumed as follows. 1) The current monthly or quarterly sample, selected from the target population in the base year, provides information on deaths, but no information on births, so that the infra-year calculation of index numbers cannot be based on proper estimates of the new population size. Through the reference year, sampling weights will refer to the previous year population, which does not take into account balance between births and deaths. 2) New units born along the reference year cannot be observed before the first observation period of the new year, when the new business register lets the possibility to update the sample composition: if the longitudinal profile of new units is different with respect to the already existing units, current estimates may be biased.

With these premises, in this work we first introduce the formalization of the right index number, e.g. the one which takes properly into account the effects of business demography on sampling weights. The increase of sampling variance due to the use of not updated weights is formalized as well. Moreover, the potential bias derived from the exclusion of new units from the current observed sample is quantified according to a super-population approach. Some criteria for correcting the sampling weights in order to overcome the business demography effects are proposed, as well as a simple technique for reducing the potential bias above mentioned. The usefulness of the previous proposals has been tested through an empirical attempt, based on real quarterly wholesale trade turnover data.

**Key Words:** Bias, Sampling, Short-term, Weighting