Robust and model-assisted small area estimation methods: an application to the Banca d'Italia Survey of Industrial and Service Firms.

M. Bottone, C. Casciani, E. Fabrizi, S. Filiberti, A. Neri , M. Rinaldi, N. Salvati

Banca d'Italia has a long-standing tradition in the use of business surveys to collect information to support its decisional processes. The main one is the Survey of Industrial and Service Firms (SISF) and it is conducted since 1972. The survey gathers information on investments, gross sales, workforce, expectations and other economic variables relating to Italian industrial and service firms with 20 or more employees. Even though it was initially designed to produce indicators at national level, over the years it has has been increasingly used to compute statistics at regional (NUTS 1) level.

In this paper we examine the robustness of regional indicators by exploiting auxiliary information produced by Italian Statistical office.

We consider small area models based on specifying a regression model for the relationship between the target and the auxiliary variable at the unit (firm) level. As normality is likely to fail because of skewness and the presence of outliers we focus on robust methods and specifically on M-quantile regression methods as they allow for the estimation of pseudo-area effects without recourse to any distributional assumptions. We consider small area estimators that, although model based keep important design properties, namely design consistency. With respect to previous literature we study design consistent robust predictive methods that are more effective in reducing bias induced by representative and unrepresentative outliers.