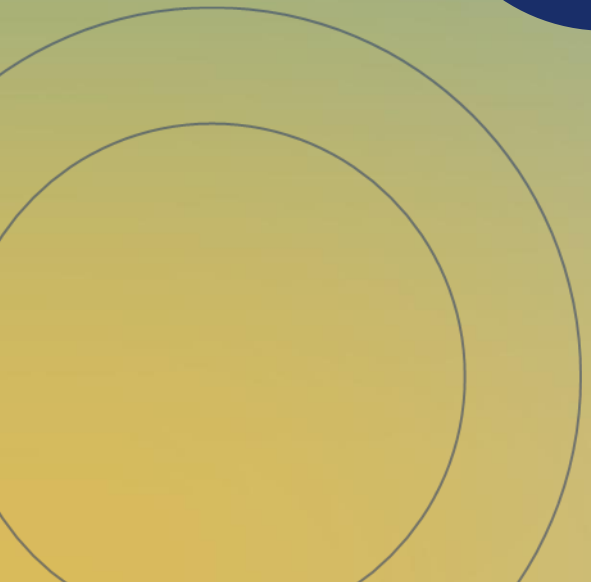
EUROPEAN CONFERENCE ON QUALITY IN OFFICIAL STATISTICS

2024 ESTORIL - PORTUGAL



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Integration of administrative and survey data in a Short-Term Business Statistics with statistical learning algorithms

Sandra Barragán, David Salgado, Sergio Pardina, Esther Puerto

S.G. for Methodology and Sampling Design

Statistics Spain

June 2024

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- Introduction
- Input Quality
- Methodology
- Results
- Conclusions

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Introduction: motivation

- Use case in a short-term business statistics: Services Sector Activity Indicators (SSAI)
  - Monthly
  - Target: turnover
- Use of Administrative registers (monthly VAT):

Quality dimensión	Goal	Reality in Admin Reg (monthly)
Burden reduction	Remove questionnaire	Only large enterprises
Timeliness	m+30d	Available in m+35d

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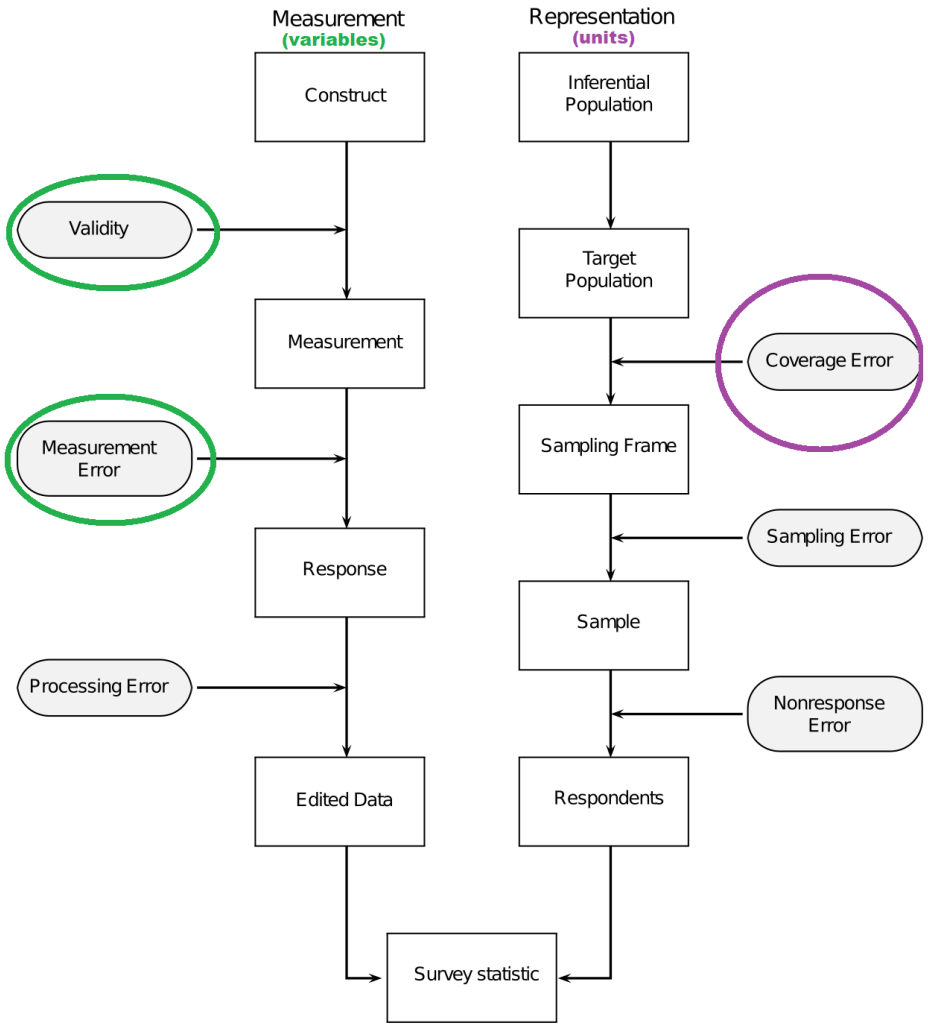
Introduction: the problem

- In the administrative registers the errors are not kept under control due to the external mechanism of data generation.

Total Error model (see [Groves and Lyberg, 2010] and the two-phase life-cycle model by Zhang [2012])



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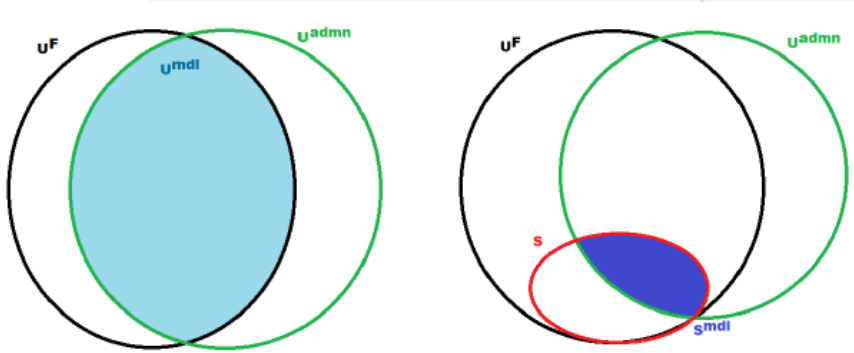
Introduction: notation

- U the finite population of analysis.
- $U_F \subset SBR$ the frame population from the Statistical Business Register (SBR).
- U^{adm} the set of business units contained in the tax register.
- $U^{mdl} = U^{adm} \cap U_F$ the set of statistical units in the tax register.
- $S^{mdl} = S \cap U^{mdl}$ the set os statistical units in the training data set.
- y is the statistical variable of interest (turnover in this use case).
- y^{stat} denotes the values obtained with the survey.
- y^{adm} denotes the values obtained with the administrative register.



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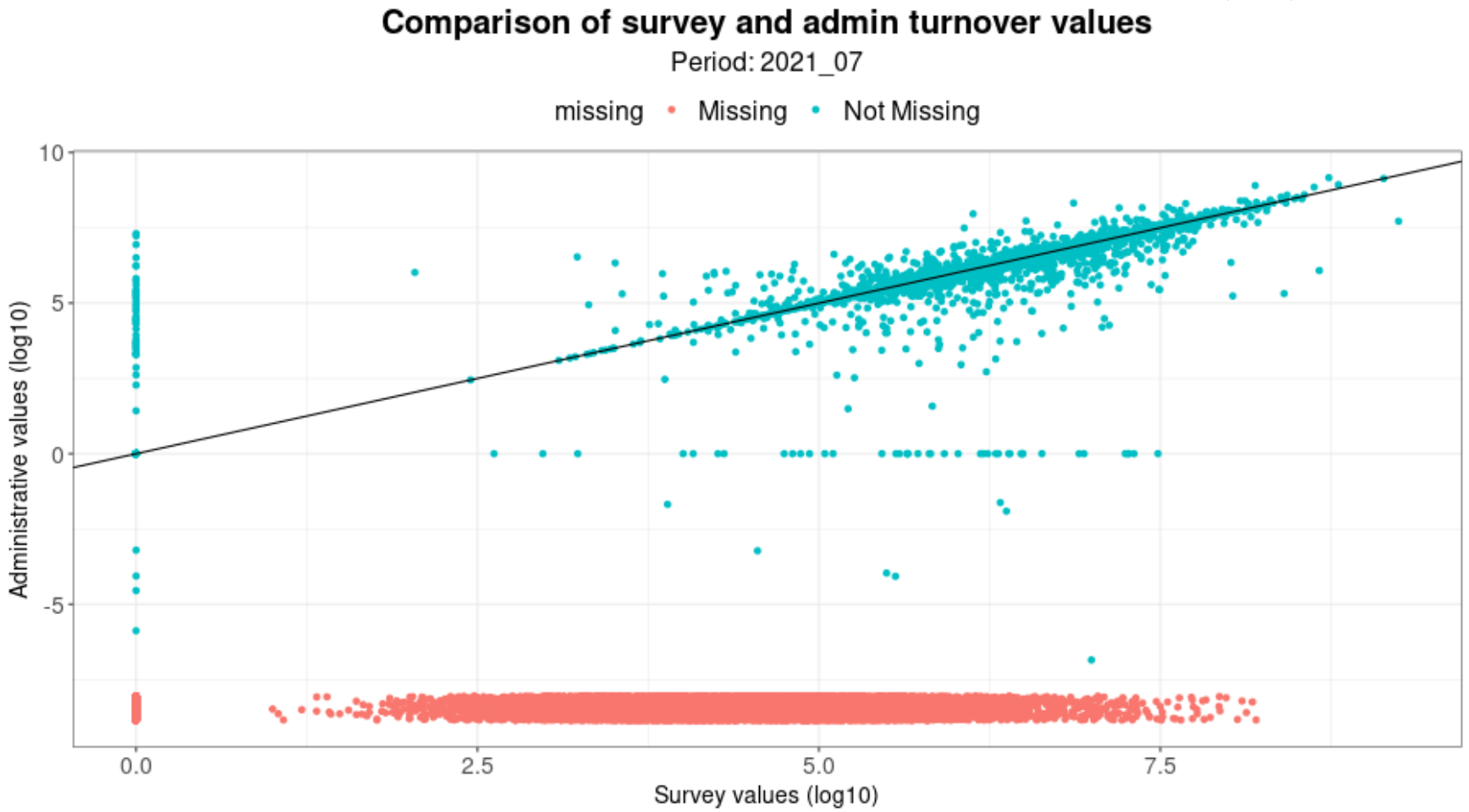
Input quality: microdata

For details, see the session of this conference Q2024:

Measuring the quality of administrative sources: at macro level with novel indicators and micro level with distributions comparison. (Nieto et al.)

Session 7 - Quality of administrative data, June 5, 2024, 14:00-15:30



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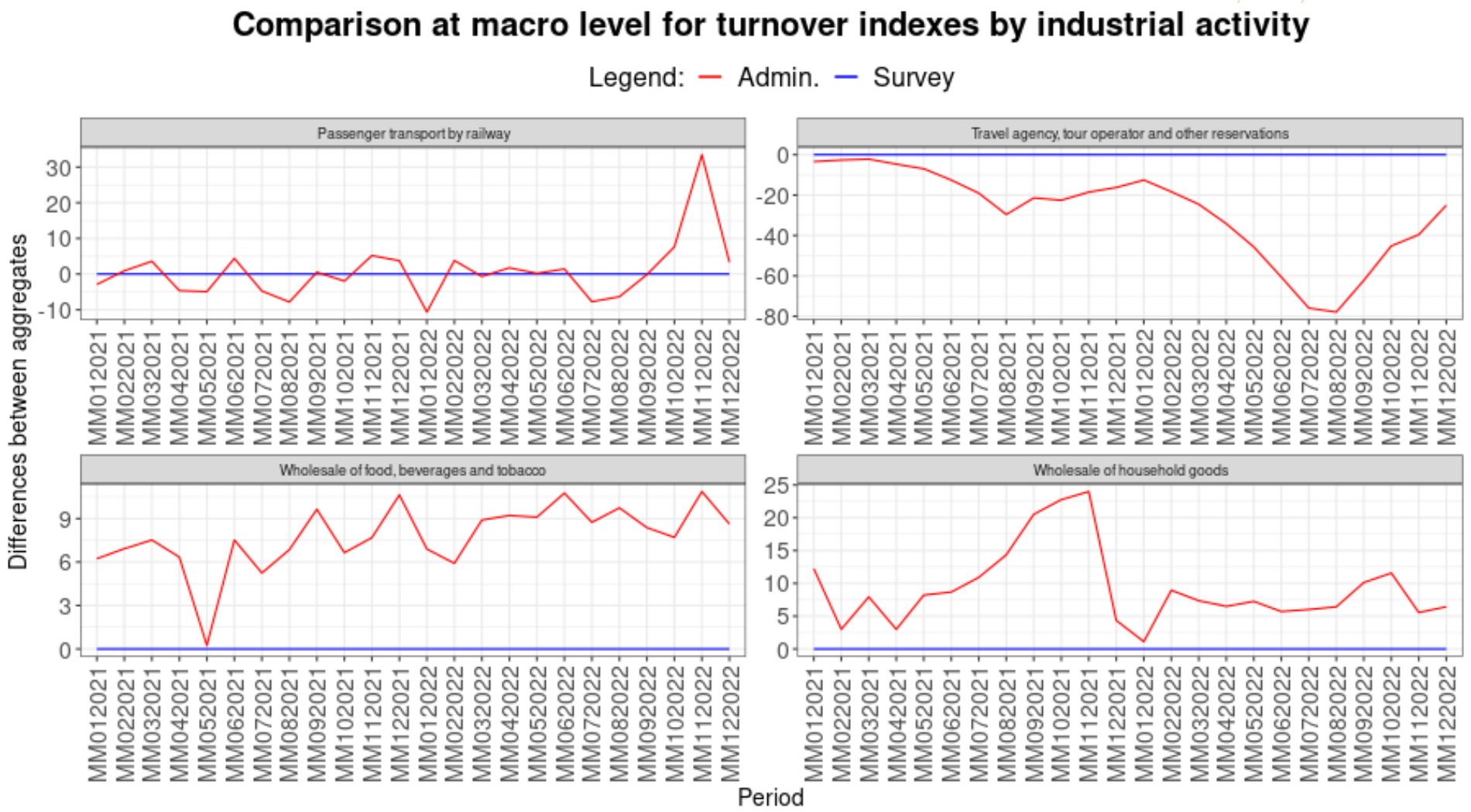
Input quality: macrodata



Methodology

- REPRESENTATION: coverage error $k \in S^{mdl} = S \cap U^{adm}$
- MEASUREMENT: Validity and measurement errors. The statistical variable is predicted by the synthetic target $y^{\circ} = f\left(y^{adm}; \mathbf{x}\right) + \epsilon$

  which is calculated as follows:

$$\hat{y}_{kt}^{\circ} = \hat{f}\left(y_{kt}^{adm}; x_k\right) \; k \in S_{22} \subset S^{mdl}$$

Then, the predictions $\hat{y}_{kt}^{\circ}$ are validated to be used in the computation of the aggregates and in the training dataset of the following reference periods $t+1, t+2 \ldots$

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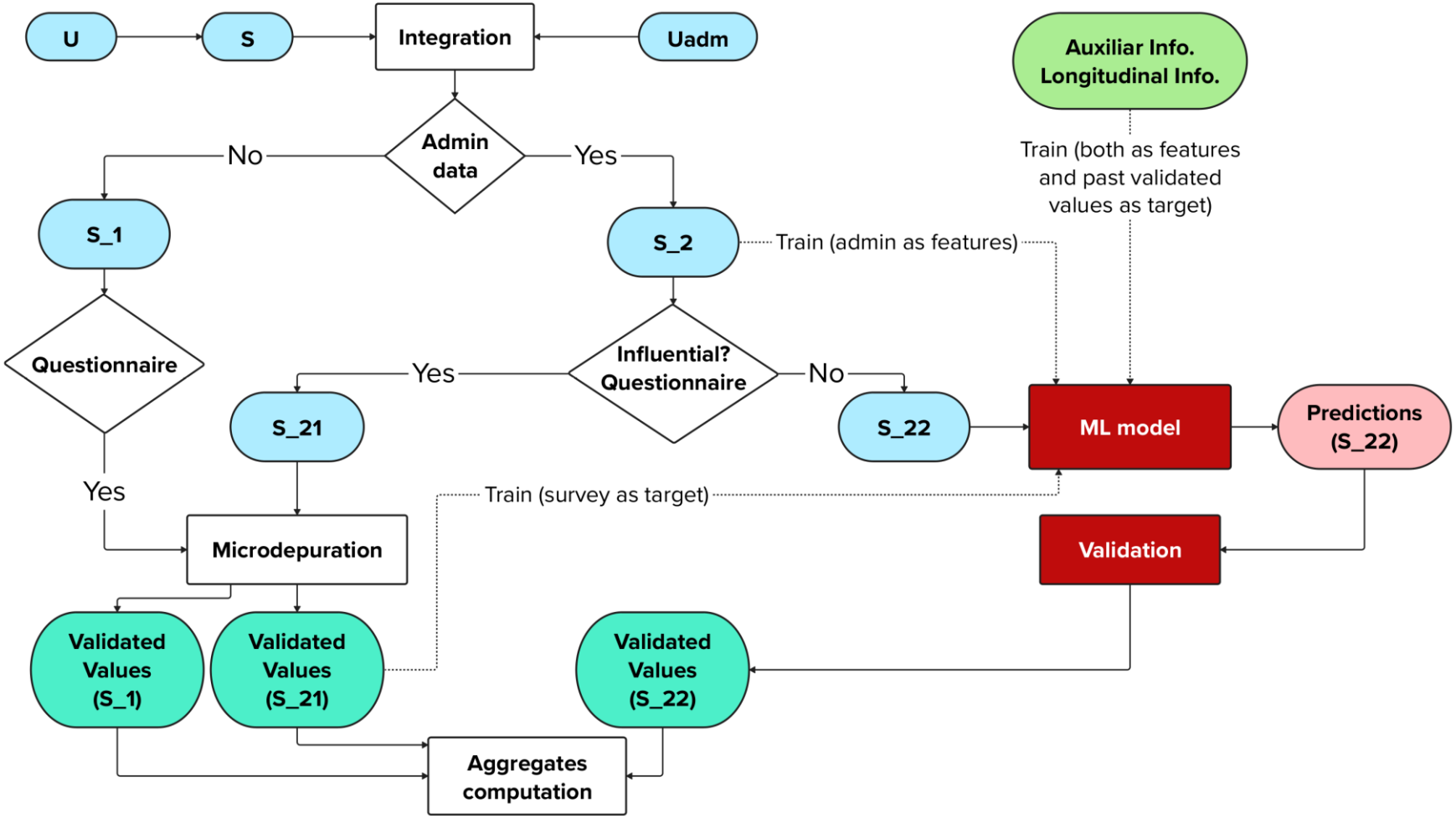
Methodology: proposed process



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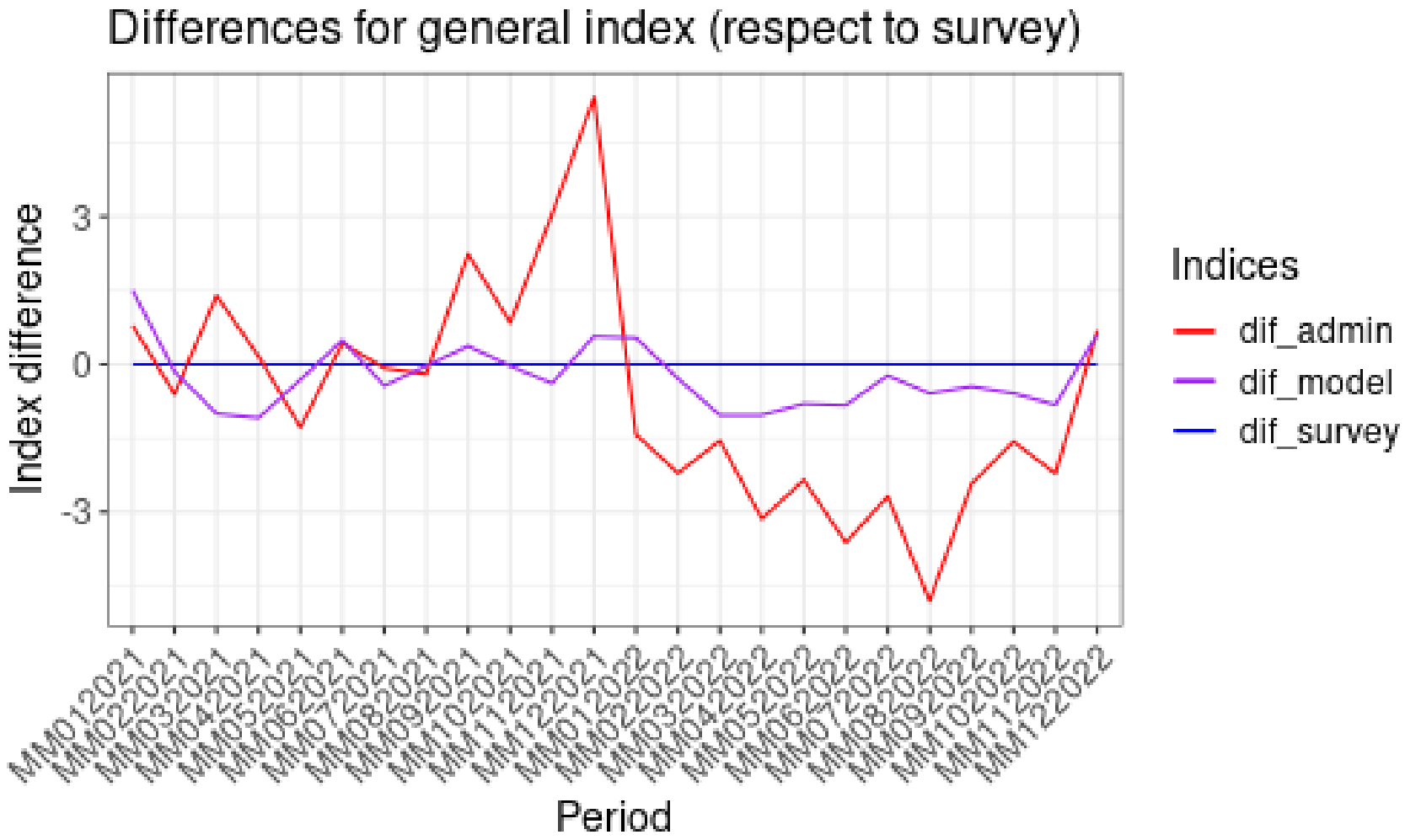
Results



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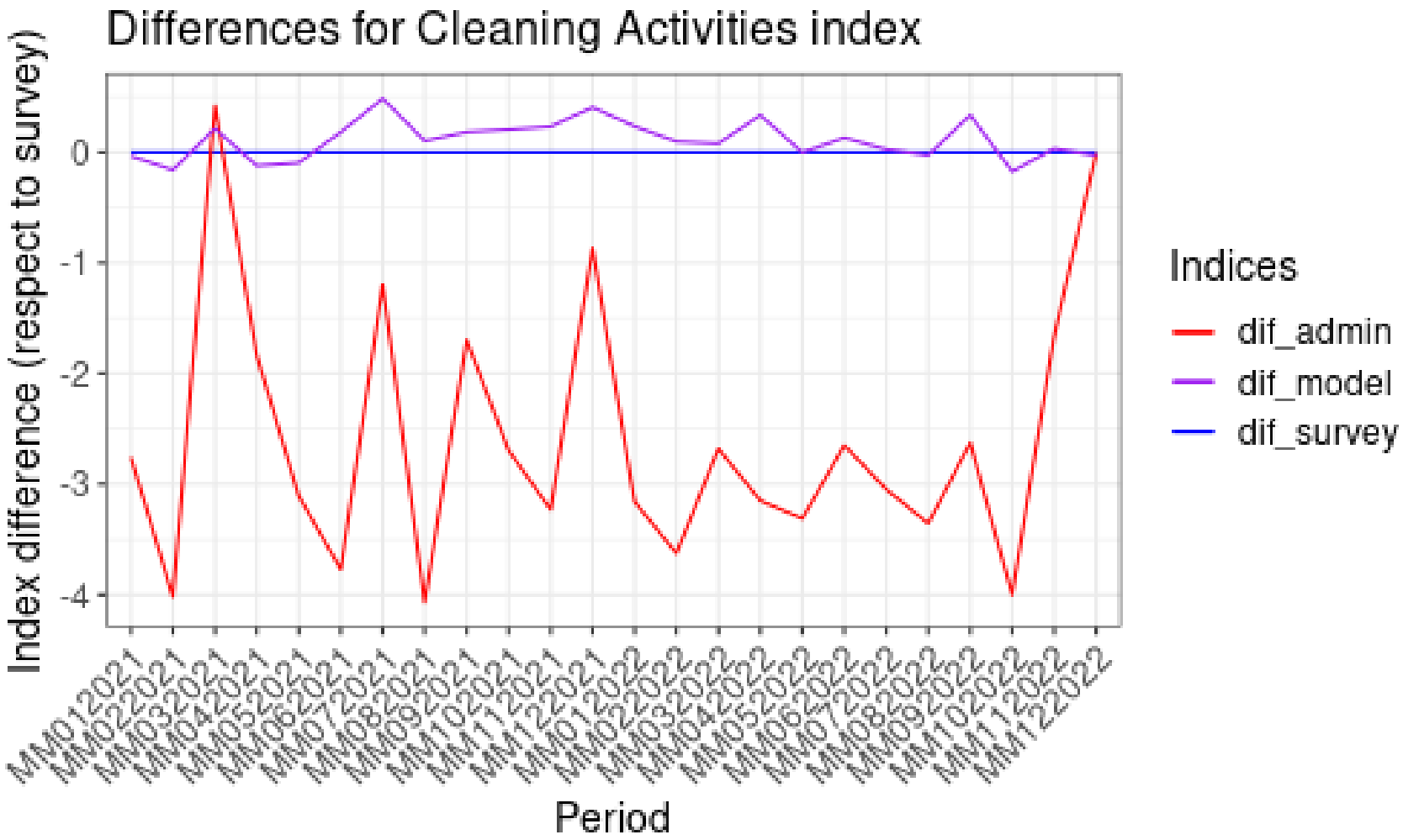
Results



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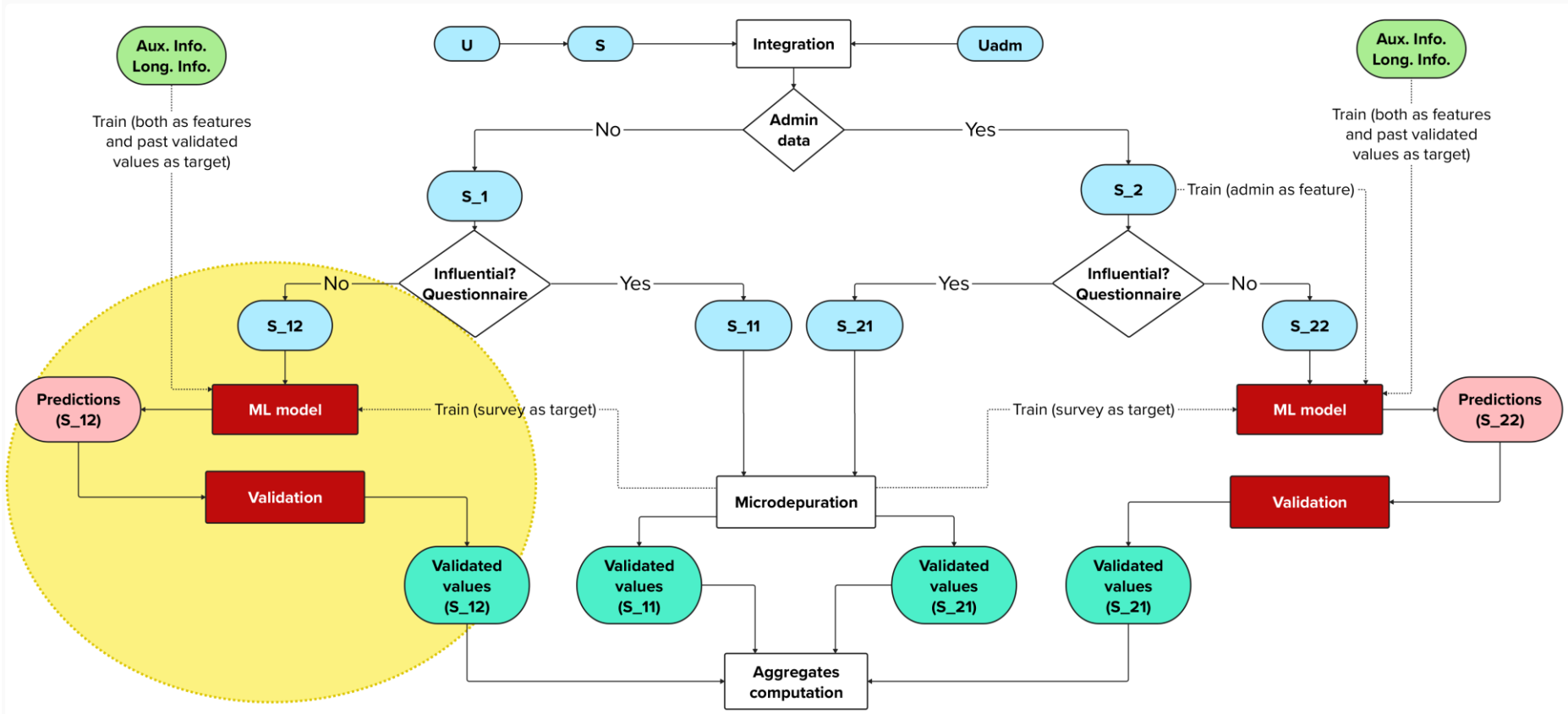
Conclusions: future work

- Indicator to evaluate the quality of data sources across multiple dimension
- Estimate variances and MSE when combine sampling designs and model predictions
- Accuracy (lack of measurement errors) and response burden reduction



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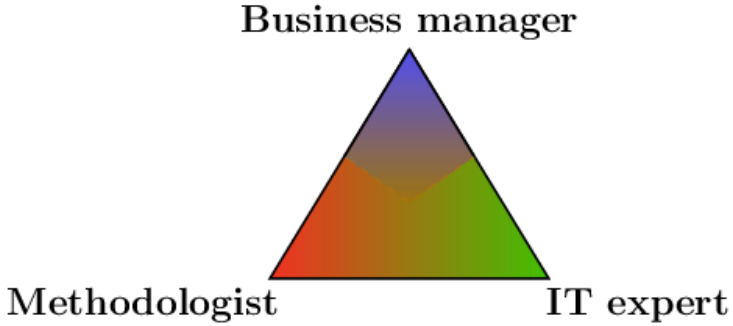
Conclusions

- The differences observed in the exploration of the input quality cautiously **discourage** the use of the administrative values by **mere substitution** as the statistical values.
- End-to-end statistical production process **integrating administrative data with survey data** in a probability sample where synthetic values are computed **using a statistical learning model** by using the administrative data as regressors as well as longitudinal information.
- To account for validity and measurement errors in administrative data using statistical learning models aiming at response burden reduction, a **selection of units** maintaining the model quality is advised.



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