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Can Paradata Predict Interviewer Effects?

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Can paradata predict interviewer effects?

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Question

How do we spot interviewers contributing to interviewer effects early in a survey's fieldwork?
(*'interviewer effects' -> interviewer measurement error variance*)

Obstacles: Unstable estimates when based on partial data + Production pressures.

Proposed method

Use paradata measures as proxies of interviewer effects

(*'paradata' -> keystroke data + time-stamps*)

- Intuition: Differences in paradata measures among interviewers are associated with differences in interviewing behaviors that drive interviewer effects.
- Prior research showed that paradata patterns capture interviewing behaviors associated with interviewing quality.
- Focus on panel surveys or repeated cross-sectional surveys.

Study survey

- 2015 wave of the Panel Study of Income Dynamics (PSID).
- 9000+ CATI interviews, 96 interviewers.
- Average interview has 350 items and lasts 80 minutes.

Paradata measures

Created 13 interviewer-level measures for each of 11 analysis items:

Time-based measures

- Time to the first keystroke (mean and CV across interviews). An approximation of the time it takes the IWER to ask the question, probe the respondent etc., and for the respondent to answer.
- Time from the first keystroke until exiting the item (mean and CV across interviews). An approximation of data entry time.

Non-time measures

- Count of visits made to the item (mean and CV).
- Count of keystrokes (mean and CV).
- Count of mouse clicks (mean and CV).
- Prop. of IWs for which the IWER entered a remark.
- Prop. of IWs for which the IWER accessed help.
- Prop. of IWs for which either a soft check or hard check message occurred.

Models

For a continuous response, fitted the following models:
(logistic models have a similar model structure)

Base model (interviewer i , interview j)

$$y_{ij} = \beta_0 + u_i + X_{ij}^T \beta_X + \epsilon_{ij} ; u_i \sim N(0, \sigma_{iwer}^2)$$

↓
Respondent covariates to approximate interpenetration
↓
Substantive data (pre-imputation/pre-edit)

Full model

$$y_{ij} = \beta'_0 + u'_i + X_{ij}^T \beta'_X + P_i^T \beta_P + Z_i^T \beta_Z + \epsilon'_{ij}$$

$$u'_i \sim N(0, \sigma_{iwer}^{\prime 2})$$

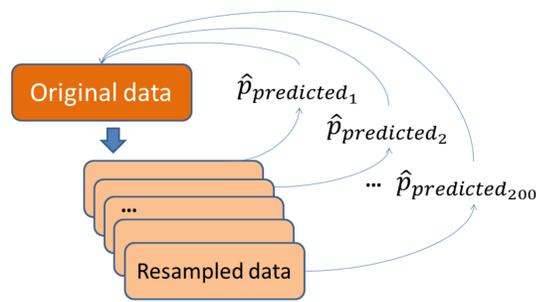
↓
Paradata measures
↓
Non-paradata variables
Sex, Age, Gender, Total workload,
Mean and CV of daily workload.

Separate "only-paradata" and "only non-paradata" models were also fit.

Estimand : $p = \frac{\sigma_{iwer}^2 - \sigma_{iwer}^{\prime 2}}{\sigma_{iwer}^2}$

Computing more realistic predictions

- Generate 200 data frames from the original data via bootstrapping.
- Fit models to each resampled data frame with predictors selected using Adaptive LASSO.
 - Initially include all two-way interactions and quadratic transformations.
- Use the selected predictors to fit equivalent models to the original data.

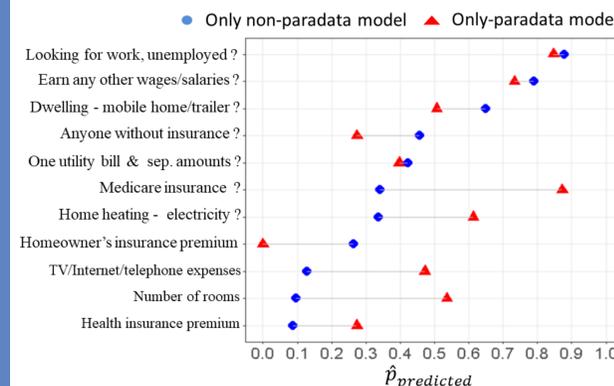


$$\hat{p}_{predicted} = \sum_{r=1}^{200} \hat{p}_{predicted_r} / 200$$

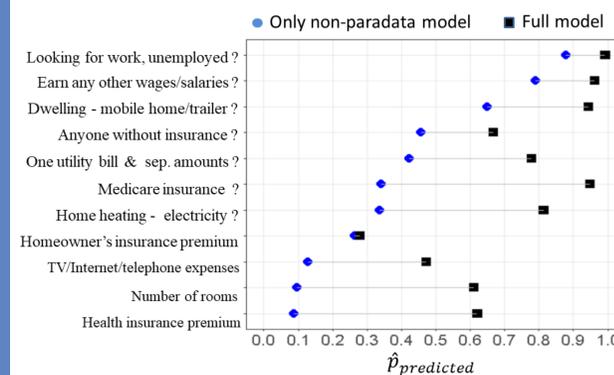
Frequency of selection of a paradata measure and the mean magnitude of its coefficient (inputs were standardized) is an indicator of its importance in predicting interviewer effects.

Five key results

1. On average across items, paradata measures explain half the estimated interviewer variance.
2. Paradata measures generally outperform non-paradata variables in explaining the estimated interviewer variance.



3. Paradata measures and non-paradata variables together explain 74% of the estimated interviewer variance.



4. For 7 of the 11 items, the non-time paradata measures outperform the time-based paradata measures: Mean $\hat{p}_{predicted}^{Non-Time}$ of 0.47 versus mean $\hat{p}_{predicted}^{Time}$ of 0.22.

5. Important paradata measures:

- Mean 'Time to the first keystroke'.
- CV of 'Time from the first keystroke until exiting the item'.
- Mean count of item visits.
- CV of count of item visits.
- Mean count of mouse clicks (for items with a binary or multiple-choice response option).
- Proportion of IWs for which the IWER entered a remark.

Summary

- Evidence that paradata measures are reasonably good proxies of interviewer effects.
- Paradata seem to be capturing behaviors associated with interviewer effects that are at least partially independent from those arising due to IWER characteristics such as sex, age, etc.
- Results encourage the creation of active and efficient monitoring systems using paradata to control interviewer effects.
- Paves the way for more objective and systematic use of paradata.
- Non-time paradata measures are essential.

Limitations

- How good is the approximation to interpenetration?
- Do associations of paradata with interviewer effects change with time?
- ...

Implementation

Previous wave

Step 1
Estimate σ_{iwer}^2 for all items.

Step 2
For items with significant $\hat{\sigma}_{iwer}^2$, set-up predictive models using **P** and **Z**.

Current wave

Step 3
Plug-in incoming **P** and **Z** into the full model

Step 4
Zero-in on predicted values with large absolute values.

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