Nonresponse Analysis using Social Security Administration Records

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Motivation

- ▶ In order to analyze nonresponse bias, data on nonrespondents is needed
- ▶ Panel data: initial nonresponse is different from attrition
- ▶ Cross sectional data: data is sparse and/or highly aggregated
- ▶ PASS survey: for the first time in Germany, complete *individual* data from the Social Security System administration[1] could be used for analysis of nonresponse
- ▶ We will analyze differences between respondents and nonrespondents to the initial wave of PASS and compare different nonresponse correction techniques

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[1]provided by the Institute for Employment Research IAB, Nuremberg (www.iab.de)

Motivation

- ▶ Project is a part of the '"Priority Program 'Survey Methodology' (PPSM)"'
- ▶ and funded by the German Research Foundation DFG
- ▶ Project is in cooperation with the Research Data Centre FDZ
- ▶ This enables us to use and analyse non-standard datasets provided by the FDZ:
  PASS gross data, administration data (IEB)
- ▶ all computations had/have to be done at the FDZ

Motivation

Figure 1: data available and used for nonresponse analysis

	Respondents	Nonrespondents
sampling frame data	✔	✔
contact history data	✔	✔
interviewer data	✔	✔
administration data[1] **(x)LHG, BeH, LeH**	✔	✔
PASS survey data[1] **not used**	(✔)	✘

[1]: Also for Respondents no linkage of survey data (without permission of respondents)

Survey data

- ▶ PASS (Panel Survey Labour Market and Social Security), conducted by the IAB, Nürnberg[2]
- ▶ PASS started 2006/2007 to study effects of the reformed German system of social security
- ▶ PASS focuses on the life situation of households receiving social welfare benefits
- ▶ Of special interest are transitions out and into receipt of unemployment benefits ('UB-II')
- ▶ PASS consists of two independent samples:
    1. sample of households receiving social security benefits
    2. SES-stratified sample of households of the general population
- ▶ We will concentrate on Sample 1
- ▶ mixed-mode: CATI and CAPI
- ▶ The overall response rate ist low: 29% of sample I households

[2]Scientific-Use-File available (currently 3 waves) from the Research Data Center FDZ

Administration data

- ► Administrative data of the German Federal Employment Agency was used.
- ► 'LHG'-database + 'Beh'-database
    - ► covers all households receiving UB-II
    - ► individual and household characteristics of welfare receiving unit
    - ► employment histories of all persons ever employed and liable to social security
    - ► individual characteristics of head of household
- ► By a special permission of the data protection agencies, this data was linked to the response status within PASS
- ► Due to legal restrictions:
    - ► No further survey data could be linked
    - ► Administrative data is available only for Sample I

Details of administration data

- time points
  - t_0: date of sampling
  - t_1: date of last household contact
- events between t_0 and t_1
  - changes in household size and composition
  - changes in employment or marital status
  - changes in benefit receipt or sanctions
- information by missing data
  - households not in LHG at t_1: have left receipt
  - persons not in BeH-database at t_0 or t_1: not/not yet/never been employed
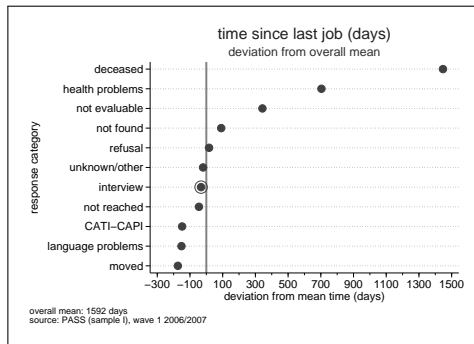
Individual demographic characteristics

Figure 2: Age (head of household, mean, in years)
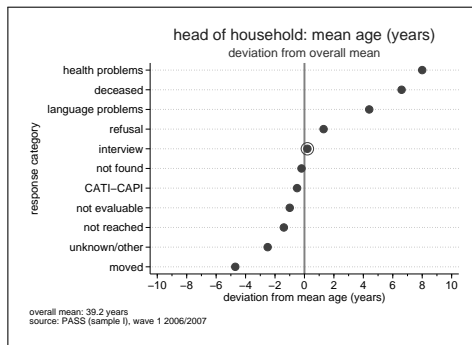
- ▶ no bias in mean age of head of household
- ▶ heads of moved households younger than respondents
- ▶ refusals slightly older, but only with small effect size
- ▶ nonrespondents due to language ($+4$) or health problems ($+8$) are older
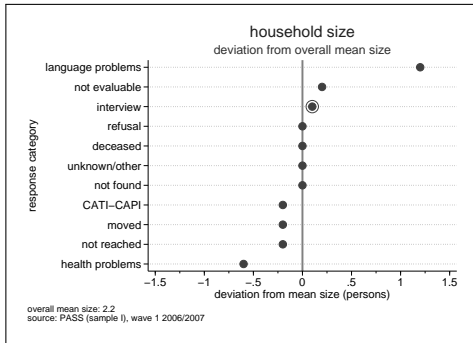
Individual demographic characteristics

Figure 3: Time since last job (mean, in days)

- ▶ relative bias of 2%
- ▶ small effect size of $d = 0.02$
- ▶ refusals differ significantly but only with small effect size
- ▶ large differences of other categories: deceased, language, health, relocated

Individual demographic characteristics

Figure 4: Household size

- ▶ respondents differ significantly but small in magnitude and effect size
- ▶ large differences for nonrespondents due to
    - ▶ language problems (+1.2)
    - ▶ health problems (-0.6)
- ▶ refusals do not differ significantly

Individual demographic characteristics: conclusions

- ▶ significant differences between respondents and nonrespondents
- ▶ overall low effect sizes of differences
- ▶ different groups of nonrespondents differ considerably
    - ▶ respondents with language problems
    - ▶ respondents with health problems
    - ▶ moved households
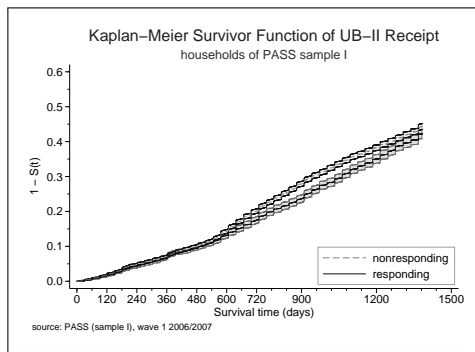- ▶ Refusals (about 41% of sample I nonrespondents) show only small differences with small effect sizes

Survival functions of UB-II-receipt for 1st wave PASS households

Figure 5: Survival Functions of PASS Households
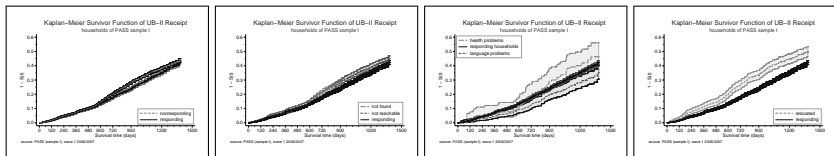
Survival functions of UB-II-receipt
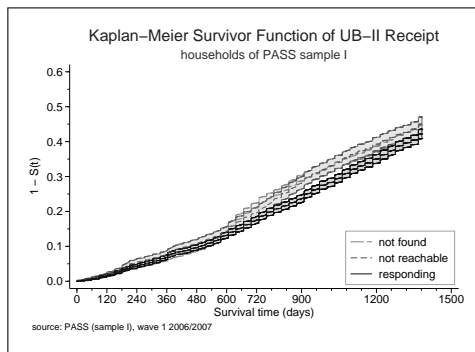
Figure 6: overall nonrespondents

- ▶ overall Log-Rank test significant
- ▶ until 2 years confidence bands do overlap
- ▶ after 4 years confidence bands do overlap
- ▶ not shown: Curve of refusals do not differ significantly ($p > 0.05$)

▸ back to figures

Survival functions of UB-II-receipt

Figure 7: Nonresponse due to noncontact
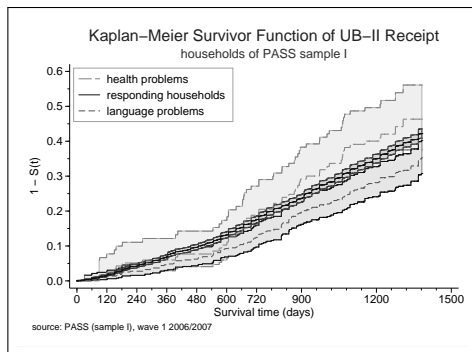

- ▶ curves differ significantly from curve of respondents
- ▶ differences are small
- ▶ again, until 2 years and after more than 4 years, confidence bands do overlap

▸ back to figures

Survival functions of UB-II-receipt

Figure 8: Nonresponse due to health or language problems

Kaplan–Meier Survivor Function of UB–II Receipt
households of PASS sample I

- health problems
- responding households
- language problems

1 – S(t)

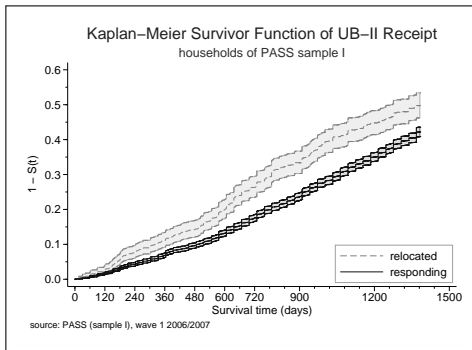Survival time (days)

source: PASS (sample I), wave 1 2006/2007

▸ back to figures

- ▶ Health problems: Log-Rank test not significant
- ▶ Language problems: nonrespondents leave UB-II less frequent than respondents
- ▶ Knowledge of the German language is crucial for transitions into the labour market, but the problematic group might me more often missing in surveys

Survival Functions of UB-II-receipt

Figure 9: Nonresponse due to change of address

- ▶ This group differs strongly from respondents
- ▶ This group leave UB-II more frequent than respondents
- ▶ younger persons: higher regional and economical mobility

Nonresponse correction techniques

- all techniques rely on assumptions about the nonresponse process, usually MAR (i.e. random, given observable characteristics)
- Most popular technique is weighting (typically used for unit nonresponse): count *observed* cases *n*-times to represent *unobserved* cases
- Imputation (typically used for item nonresponse): *substitute* missing values with one (or more) *reasonable* estimates

Nonresponse correction techniques

1. raking: reproduce *marginal totals* of overall sample or population in two- or more-dimensional tables

2. post-stratification: reproduce *cell counts* of overall sample or population in two or more dimensions (e.g. cell counts of cross tabulation)

3. propensity weighting: estimate contact and cooperation *probabilities* and use the *inverse* of their product as weighting factors

4. multiple imputation via hotdeck (as implemented in Stata '"hotdeck"')

Nonresponse correction

Table 1: means

| method	time since last job (days)	household size (persons)	transitions out of UB-II (in %)
full sample	1592.4	2.19	17.8
respondents	1560.8	2.26	14.8
raking *(psu x age x sex)*	1541.7	2.24	15.3
poststratification *(psu x age x sex)*	1548.4	2.23	14.6
propensity weights *(12 variables)*	1555.8	2.20	17.7
multiple imputation *(psu x age x sex), m=10*	1524.1	2.24	14.6

PASS sample I, wave 1 2006/2007

Nonresponse correction: hazard rates

Figure 10: Raking and post-stratification
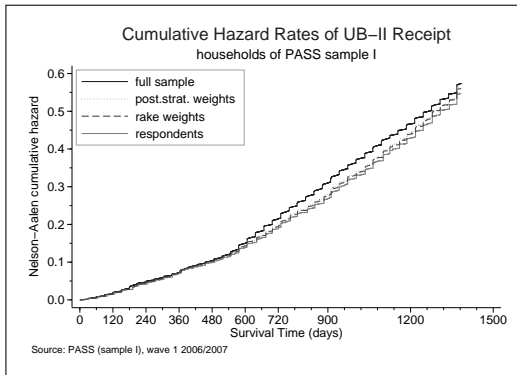
Nonresponse correction: hazard rates

Figure 11: Propensity weights

Source: PASS (sample I), wave 1 2006/2007
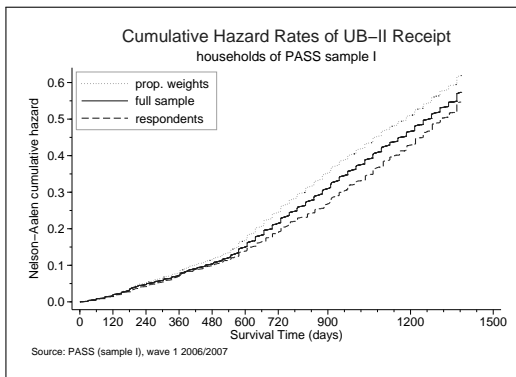
Conclusions

▶ bias is small, despite overall low response rates and significant differences

▶ very small bias due to refusal

▶ bias is specific to some variables
  ▶ all nonresponse techniques (but propensity weighting) results in
    ▶ underestimation of time since last job
    ▶ underestimation of welfare terminations
  ▶ multiple imputation results in largest underestimation
  ▶ propensity weighting overestimates harzard rates

▶ Based on this limited data, we would recommend propensity weighting

▶ We recommend to improve fieldwork procedures for relocated households or persons not able to participate rather than concentrate on refusals

Appendix

- ▶ response status: ▸ go to table
- ▶ flowchart contacting households ▸ go to flowchart

Response status

Table 2: Household count by sample and response code

| response code	sample I count	sample I %	sample II count	sample II %	total count	total %
interview	6 844	28.7	6 030	23.7	12 874	26.2
address not found	3 486	14.6	2 189	8.6	5 675	11.5
no contact	3 091	13.0	3 593	14.1	6 684	13.6
phys. or mental problems	146	0.6	408	1.6	554	1.1
language problems	469	2.0	99	0.4	568	1.2
refused	7 006	29.4	11 653	45.9	18 659	37.9
unknown/other	1 544	6.5	1 018	4.0	2 562	5.2
hh moved/dissolved	915	3.8	220	0.9	1 135	2.3
deceased	45	0.2	76	0.3	121	0.3
mode switch to CAPI	206	0.9	20	0.1	226	0.5
not evaluable	60	0.3	97	0.4	157	0.3
total	23 812		25 043		49 215	

PASS wave 1 2006/2007

Response status

- ▶ differences between samples visible: e.g. share of refusal, noncontacts, moved households, language problems
- ▶ different sampling frame: address sample vs. sample of households
- ▶ different target population: welfare receiving households vs. general (low status) population households

Contacting households

Figure 12: Flowchart: contacting households
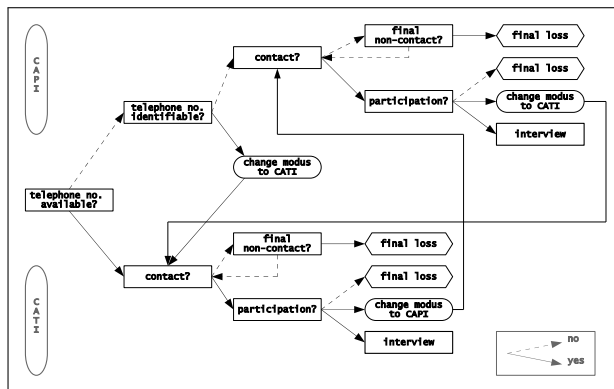
Contacting households

- ▶ same contact scheme for both samples
- ▶ different sampling frames
- ▶ different proportions of survey modes
- ▶ different target population
  - ▶ welfare receiving households
  - ▶ general population households, disportional stratified (high sampling fraction of low income groups)