INSTITUT FÜR ARBEITSMARKT- UND BERUFSFORSCHUNG
Die Forschungseinrichtung der Bundesagentur für Arbeit

A DEEPER LOOK INTO EDUCATION BIAS IN WEB SURVEYS

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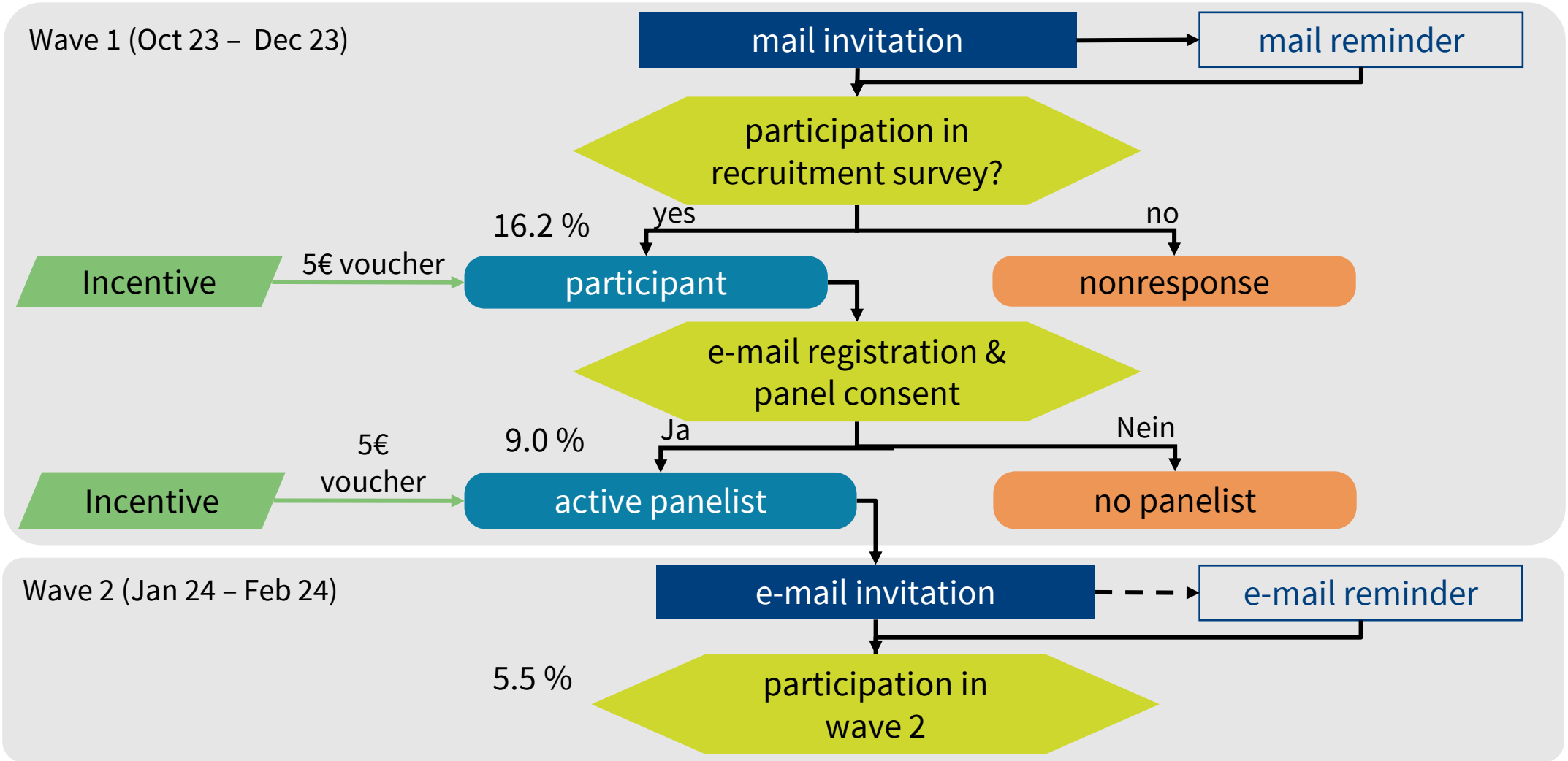
BACKGROUND

- IAB-OPAL started in 2023
  - New probability online panel for labour market research
  - Offline recruitment from admin data of the Federal Employment Agency
    - Integrated Employment Biographies (IEB): based on obligatory employer notifications for social insurance and unemployment benefit / insurance administration
    - Excellent coverage of target population: labour force minus civil servants & self-employed
- This sampling frame contains information usually not available for nonrespondents
  - Education, nationality, age
  - Employment history: times of unemployment, benefit receipt, occupational status, daily wage, ...

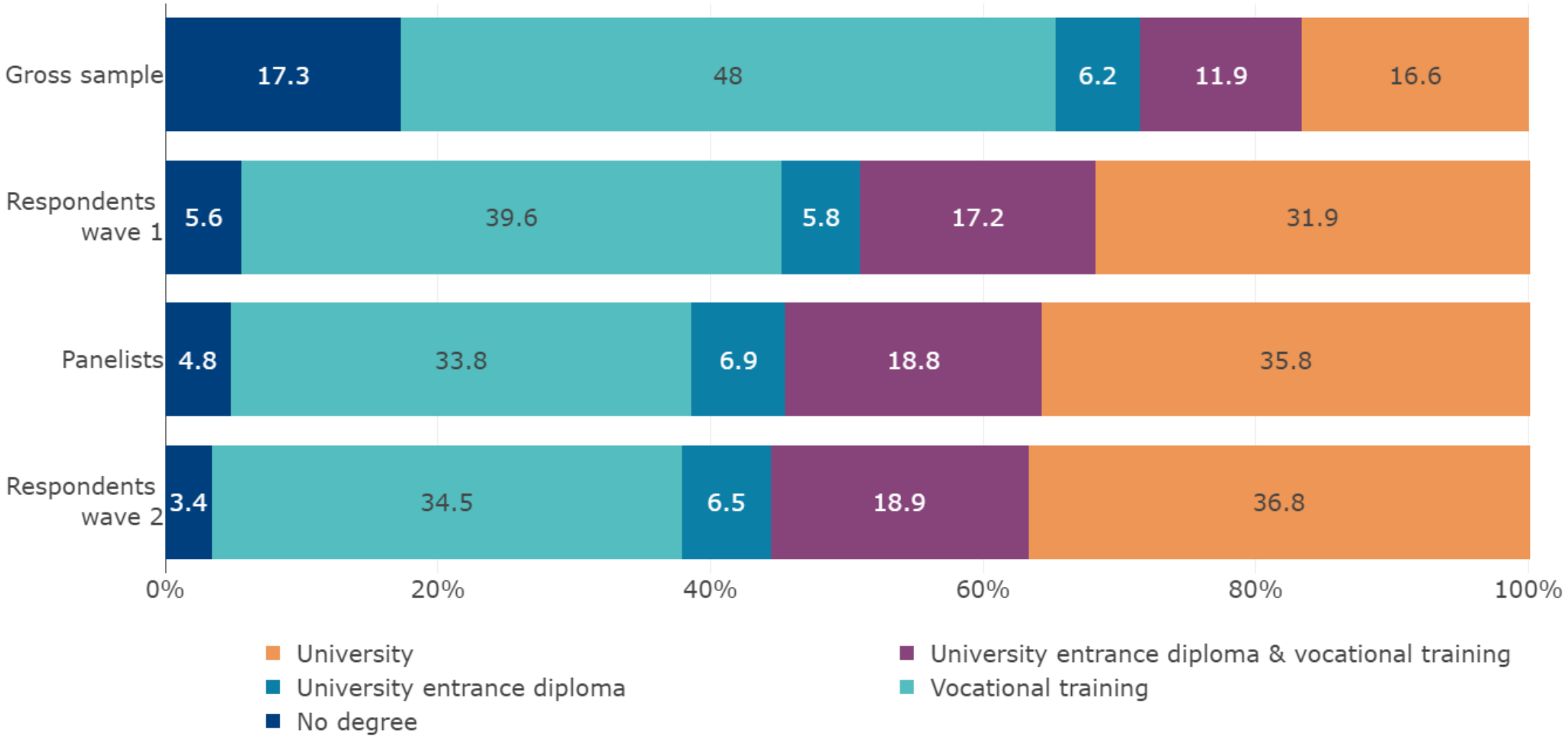
RESEARCH QUESTION

- Focus on education bias
  - Education bias frequently documented in all survey modes, particularly in web surveys (e.g. Schnell 1997, Luijkx et al. 2021, Stein et al. 2024)
  - Most web surveys use (weighting) adjustments via calibration/post-stratification to known population totals/proportions from benchmark statistics
    - Usually require MAR (Rubin 1976) mechanism
    - Access to usually unobserved variables allows us to test this assumption
- RQ1: How do the different stages of the recruitment process for an online panel contribute to education bias?
- RQ2: Are there specific subgroups within the low educated who are even less likely to participate?
- RQ3: Are there interaction effects between education and other predictors of nonresponse?

RECRUITMENT FOR IAB-OPAL



EDUCATION DISTRIBUTION AT DIFFERENT STAGES



ESTIMATION METHOD: PROBIT MODEL

Probit model: $\mathbb{P}(y = 1|\boldsymbol{x}', A) = \Phi(\boldsymbol{x}', A)$

(1) Model 1: No interaction effects

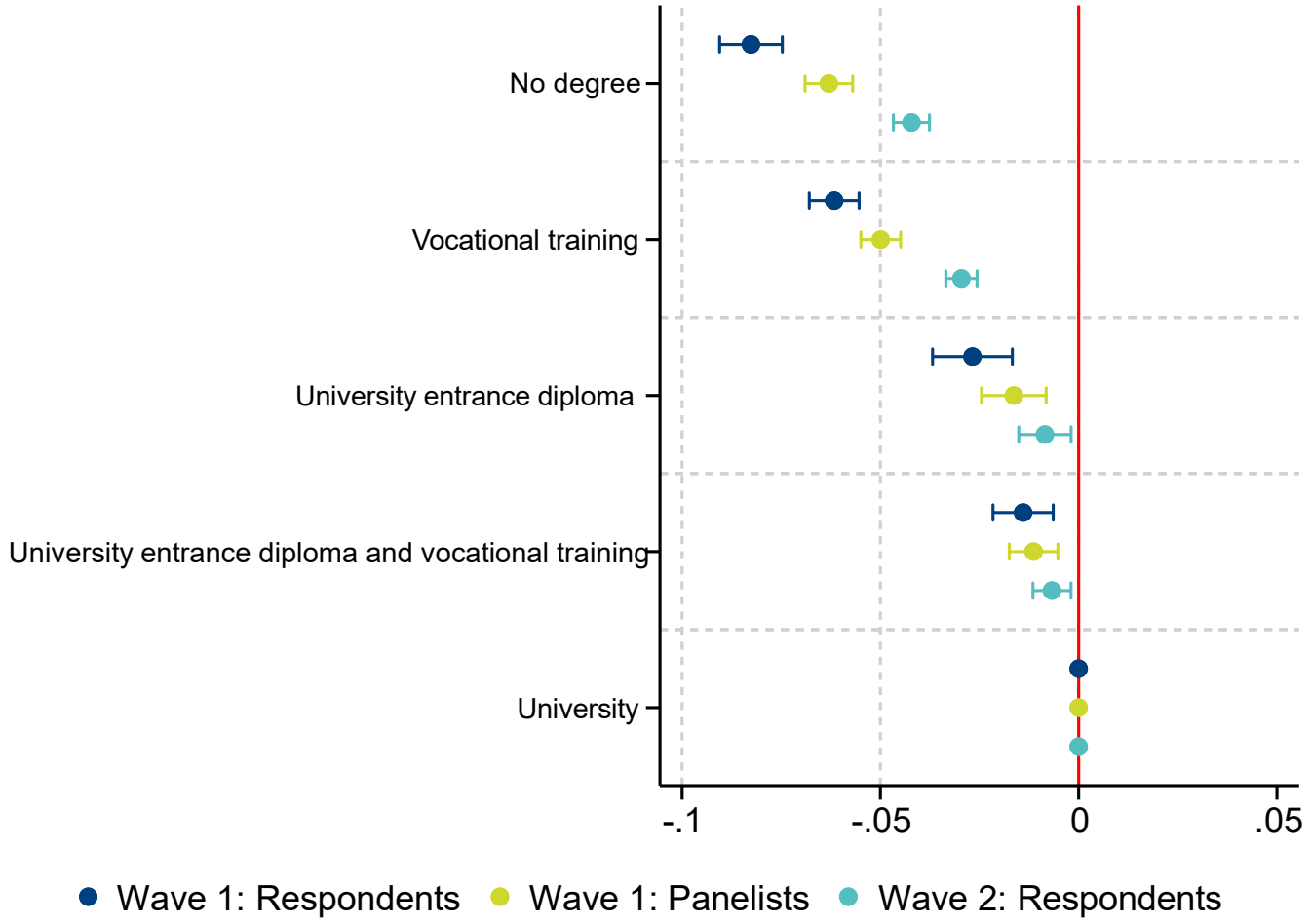
$$y^\star = \boldsymbol{x}'\boldsymbol{\beta} + \gamma \cdot education + \epsilon \quad , y = 1[y^\star > 0]$$

(2) Model 2: interaction effects with education

$$y^\star = \boldsymbol{x}'\boldsymbol{\beta} + \gamma \cdot education + (education \times \boldsymbol{x}')\boldsymbol{\delta} + \epsilon \quad , y = 1[y^\star > 0]$$

- Dependent variables: Participation in recruitment wave / active panelist / wave 2 response
- Explanatory variables from sampling frame:
  - Socio demographic: education, sex, age, nationality
  - Employment: employment status, occupational status, daily wage, supervisory function
  - Unemployment experience: benefit receipt, unemployment duration
  - Other controls: region, printing batch, shipping batch

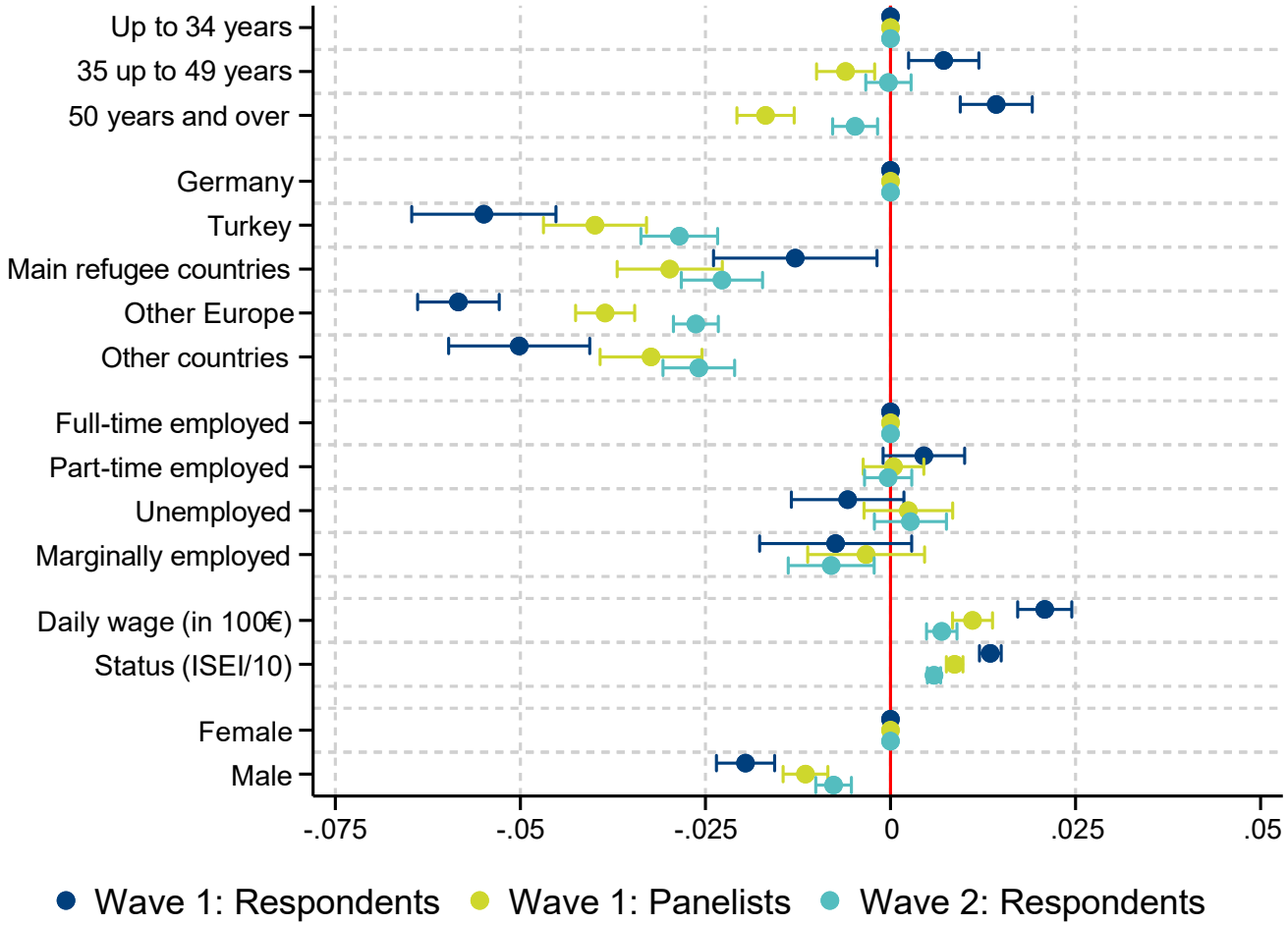
MODEL 1: AVERAGE MARGINAL EFFECTS (AME) OF EDUCATION



Notes: 95% confidence intervals; all control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

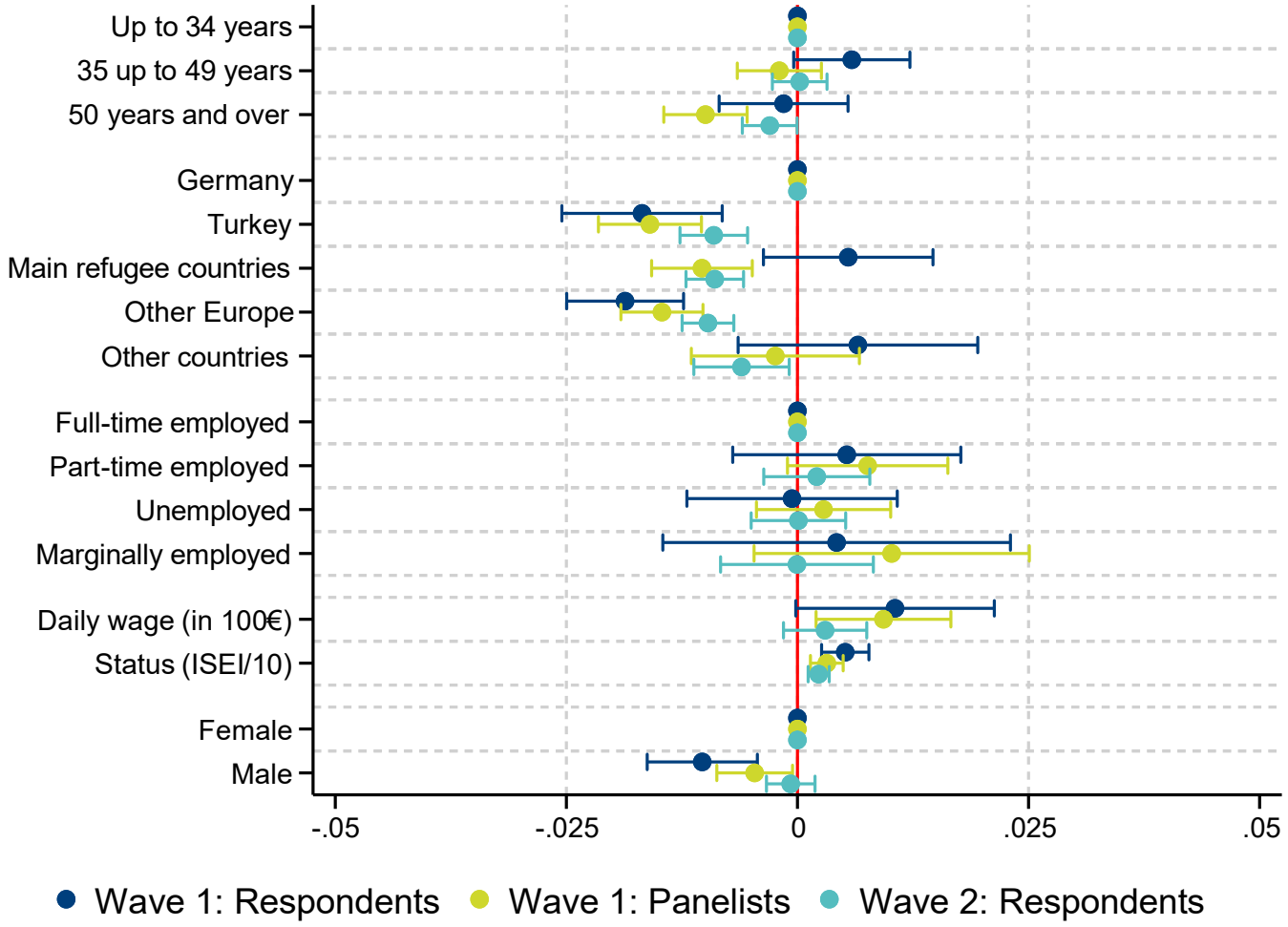
MODEL 2: AME OF OTHER PREDICTORS



Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

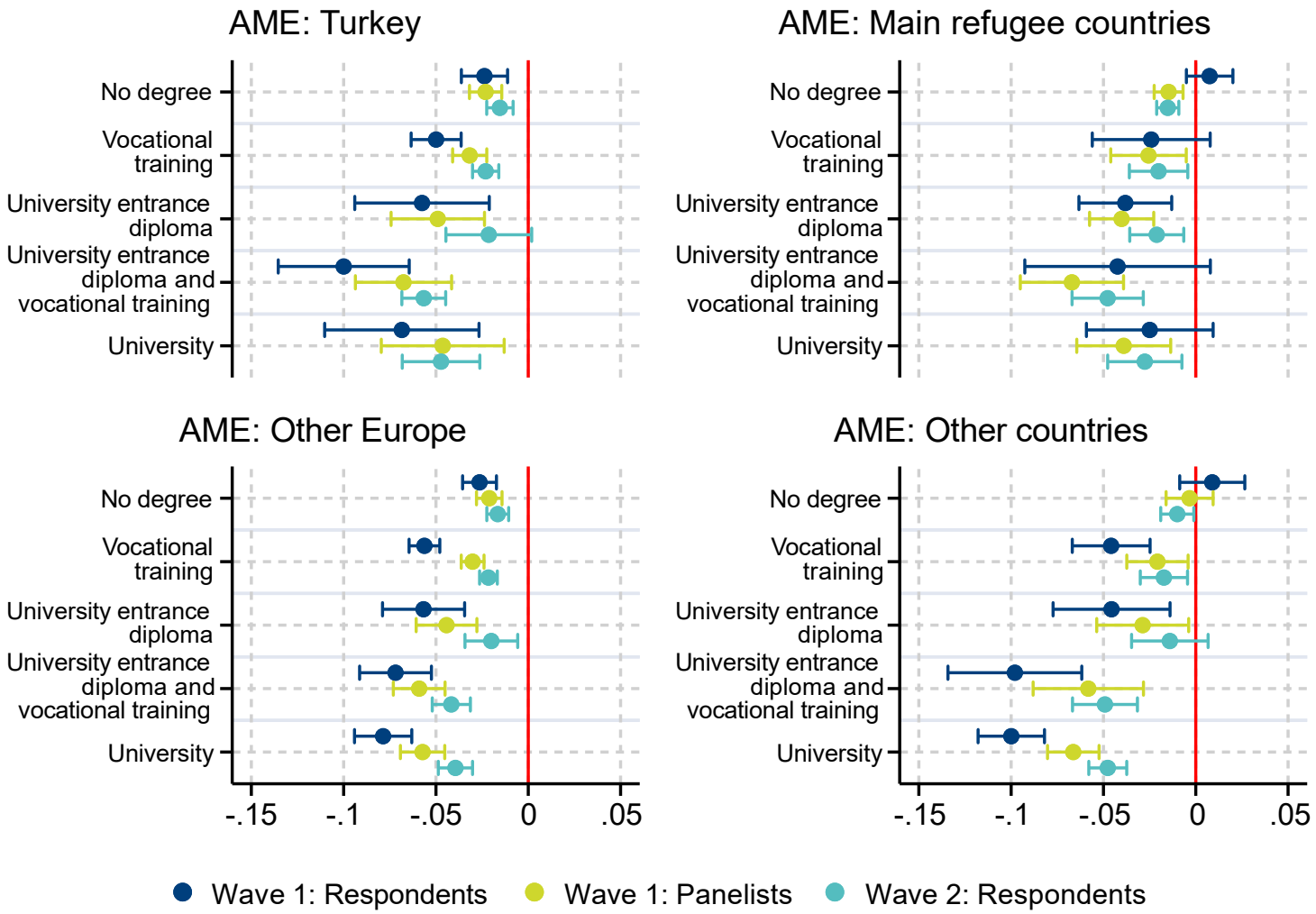
MODEL 1: AME OF OTHER PREDICTORS FOR LOWEST EDUCATION



Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 19,995

MODEL 2: SELECTED INTERACTION EFFECTS: NATIONALITY × EDUCATION

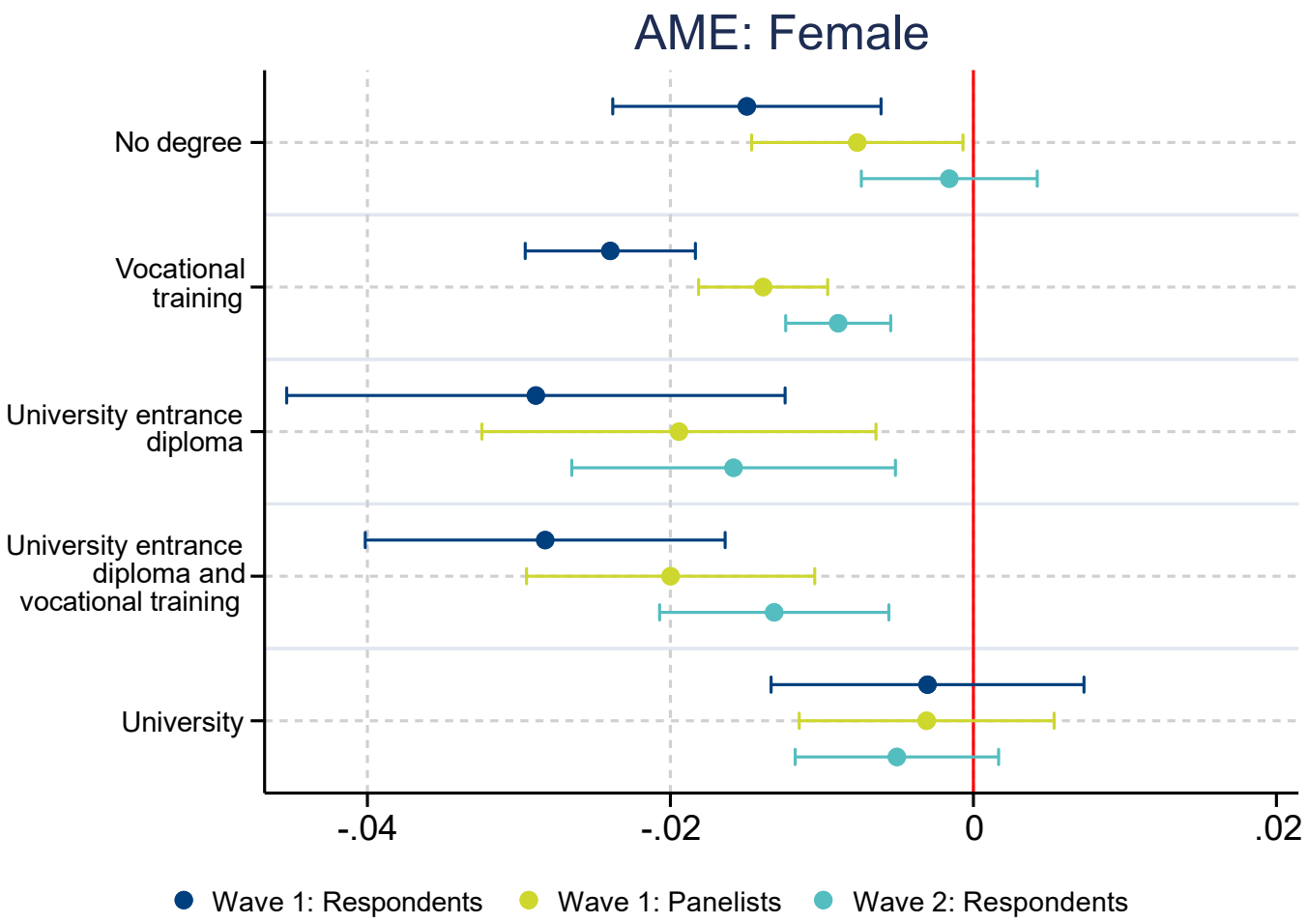


Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Reference category: Germany

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

MODEL 2: SELECTED INTERACTION EFFECTS: SEX × EDUCATION

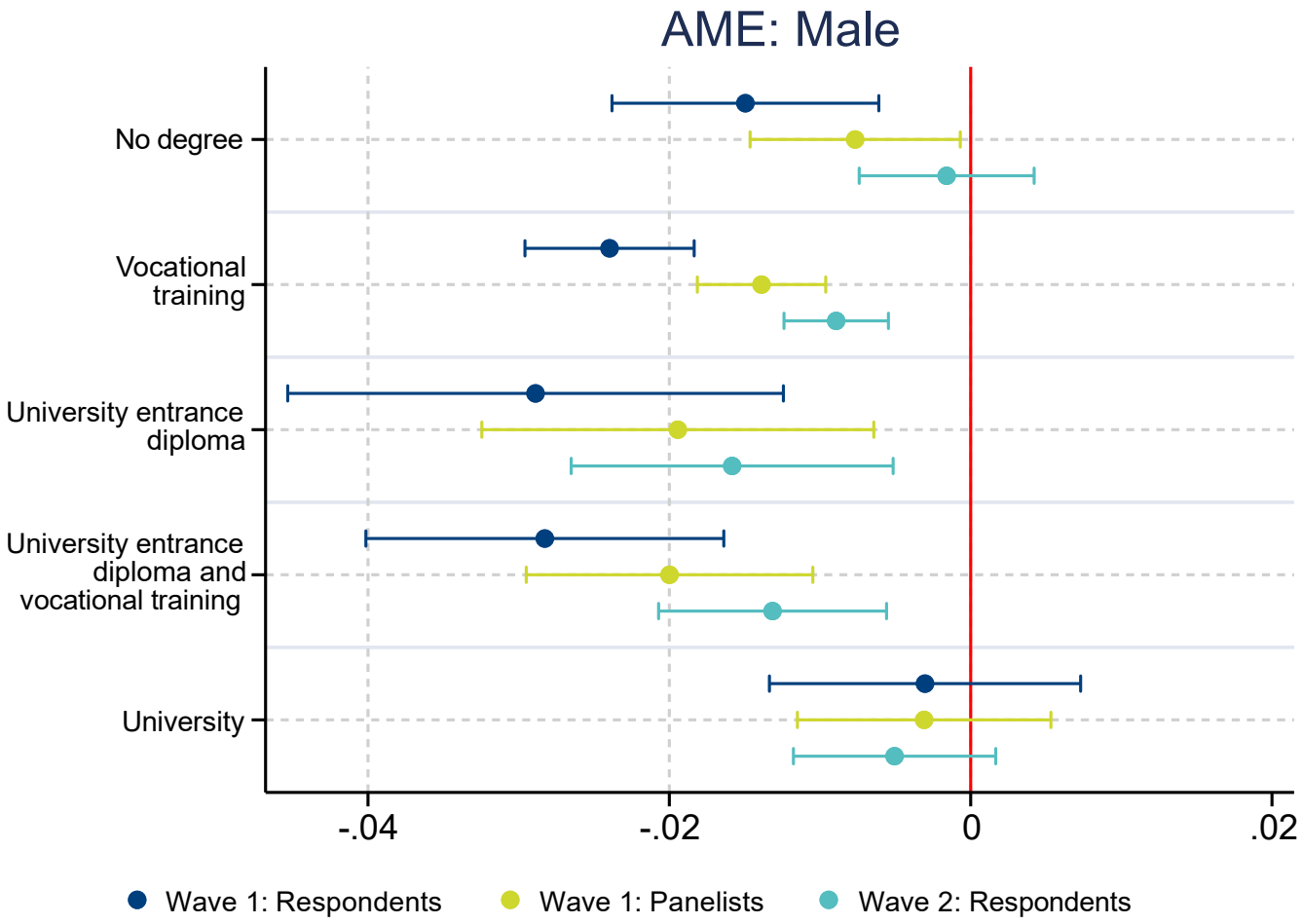


Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Reference category: Male

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

MODEL 2: SELECTED INTERACTION EFFECTS: SEX × EDUCATION



Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Reference category: Female

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

Conclusion

- Education bias cumulates at every stage of the recruitment process
- Unit-Nonresponse among low educated is stronger for
  - men
  - foreign nationals
  - Low wage and low occupational status
- Nationality plays a stronger roll for the highly educated
- Men less likely to participate unless high education
- Older respondents with high education more likely to participate, but less likely to become active panelists than their younger counterparts
- Implications
  - Strongest interaction effects with demographics: advice to use multidimensional margins for calibration adjustments
  - Use frame data to inform adaptive designs countering cumulative loss of low educated

THANK YOU!

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REFERENCES

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Rubin, D.R. (1976). Inference and missing data. *Biometrika*, 63(3), 581–592, https://doi.org/10.1093/biomet/63.3.581

Schnell, R. (1997). Nonresponse in Bevölkerungsumfragen: Ausmaß, Entwicklung und Ursachen. Leske + Budrich.

Stein, A. et al. (2024). Education Bias in 56 large-scale probability-based general population surveys in Germany. Unpublished Manuscript.

APPENDIX

EDUCATIONAL BIAS ACROSS THE RECRUITMENT PROCESS

Recruitment step	No degree	Vocational training	University entrance diploma	University entrance diploma & vocational training	University
Absolute Bias (in percentage points)					
Respondents in wave 1	-11.7	-8.4	-0.4	5.3	15.3
Panelists	-12.5	-14.2	0.7	6.9	19.2
Respondents in wave 2	-13.9	-13.5	0.3	7	20.2
Relative Bias (in percentage)					
Respondents in wave 1	-67.6	-17.5	-6.45	44.5	92.2
Panelists	-72.3	-29.6	11.3	58	116
Respondents in wave 2	-80.3	-28.1	4.84	58.8	122

Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

METHOD

Probit: Average Marginal Effects

(1) Continuous variable X_j:

$$\tau_{X_j} = \frac{\partial \mathbb{P}(y = 1|\boldsymbol{x}')}{\partial X_j}$$

(2) Discrete variable X_j:

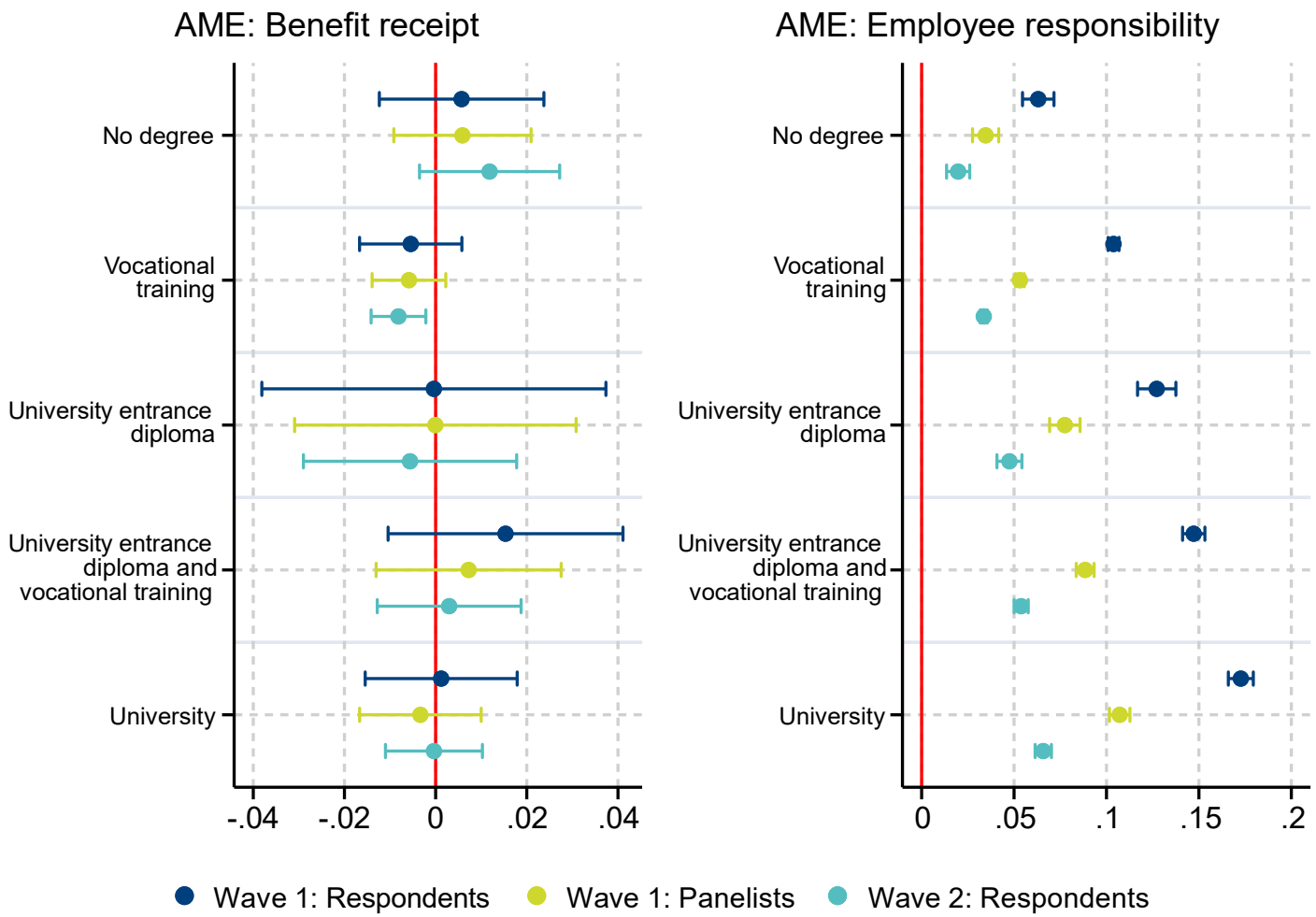
$$\tau_{X_j} = \mathbb{P}(y = 1|\boldsymbol{x}')|_{x_j=1} - \mathbb{P}(y = 1|\boldsymbol{x}')|_{x_j=0}$$

(3) Discrete variable X_j conditioned on discrete variable X_k :

$$\tau_{X_j} = \mathbb{P}(y = 1|\boldsymbol{x}')|_{x_j=1,x_k=d} - \mathbb{P}(y = 1|\boldsymbol{x}')|_{x_j=0,x_k=d}$$

... with $d \in \mathbb{D}_{x_k}$

MODEL 2: SELECTED INTERACTION EFFECTS: EDUCATION × BENEFIT RECEIPT, EDUCATION × SUPERVISORY FUNCTION

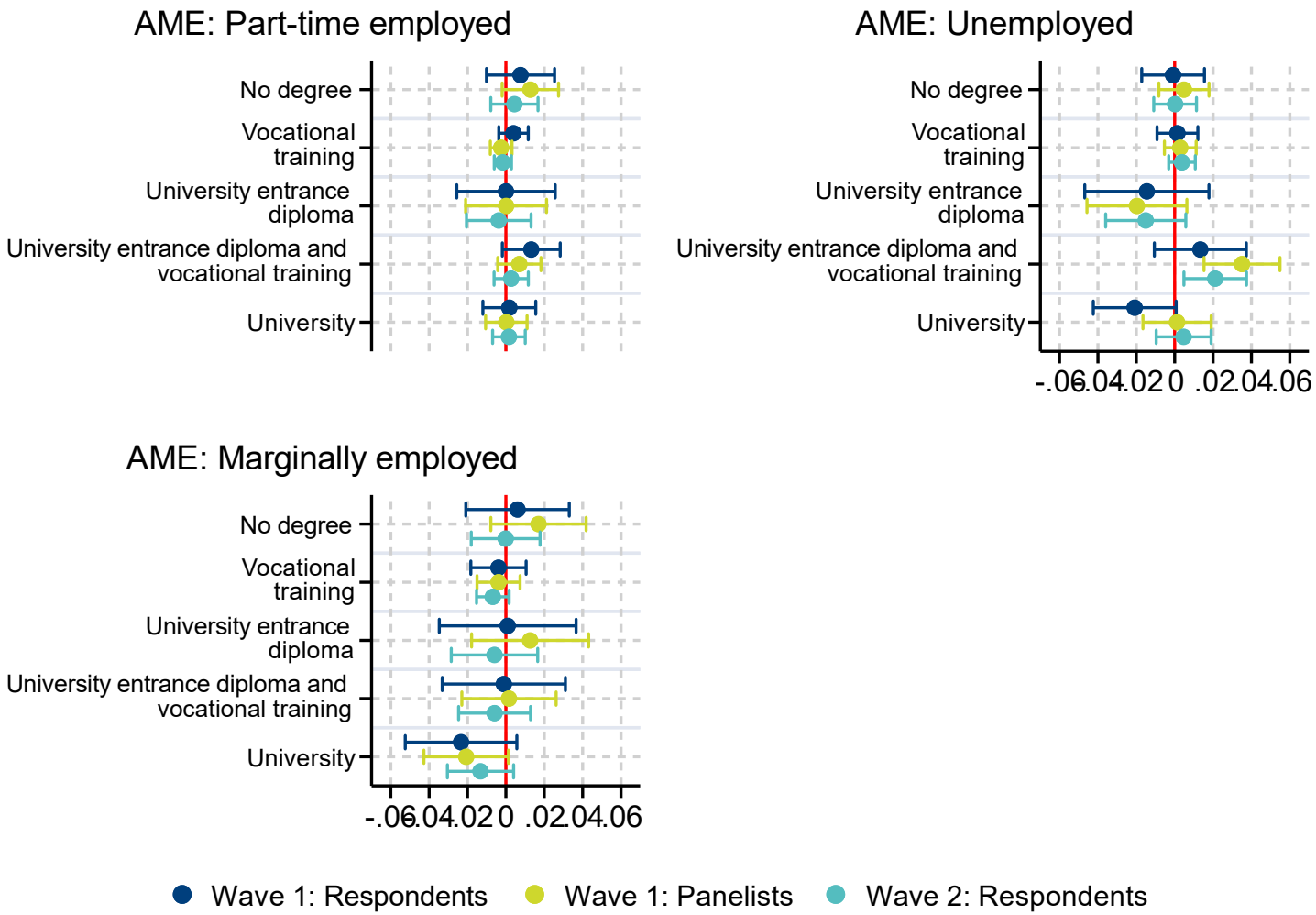


Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

Reference category: No benefit receipt and no employee responsibility

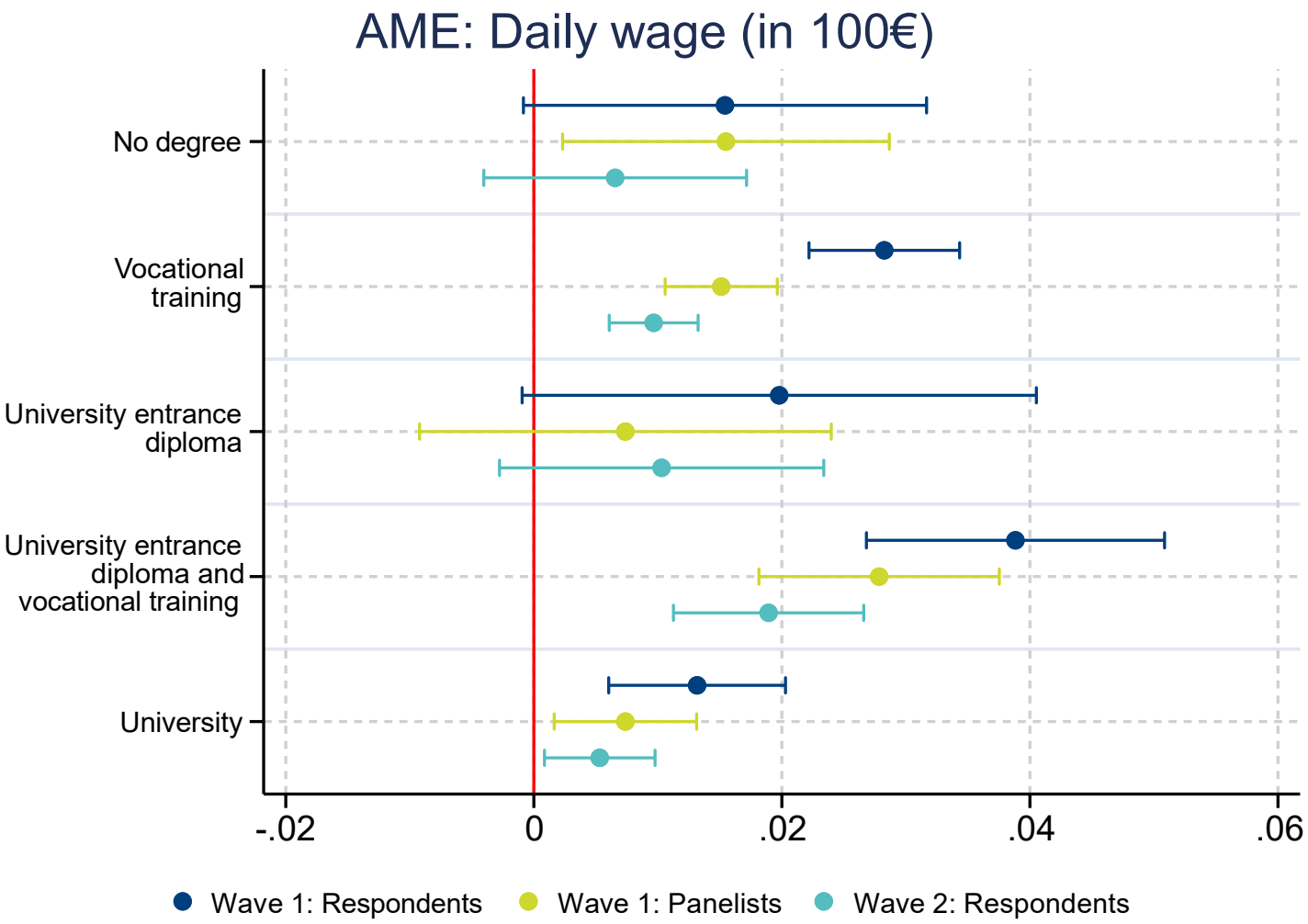
Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

MODEL 2: SELECTED INTERACTION EFFECTS: EDUCATION × EMPLOYMENT STATUS



Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.
Reference category: Full-time employed
Source: Integrated Employment Biographies 2021, IAB-OPAL wave 1-2, own calculations. N = 115,610

MODEL 2: SELECTED INTERACTION EFFECTS: EDUCATION × DAILY WAGE



Notes: 95% confidence intervals; all other control variables taken into account; panelists = respondents of wave 1 with panel consent and registration on the survey portal.

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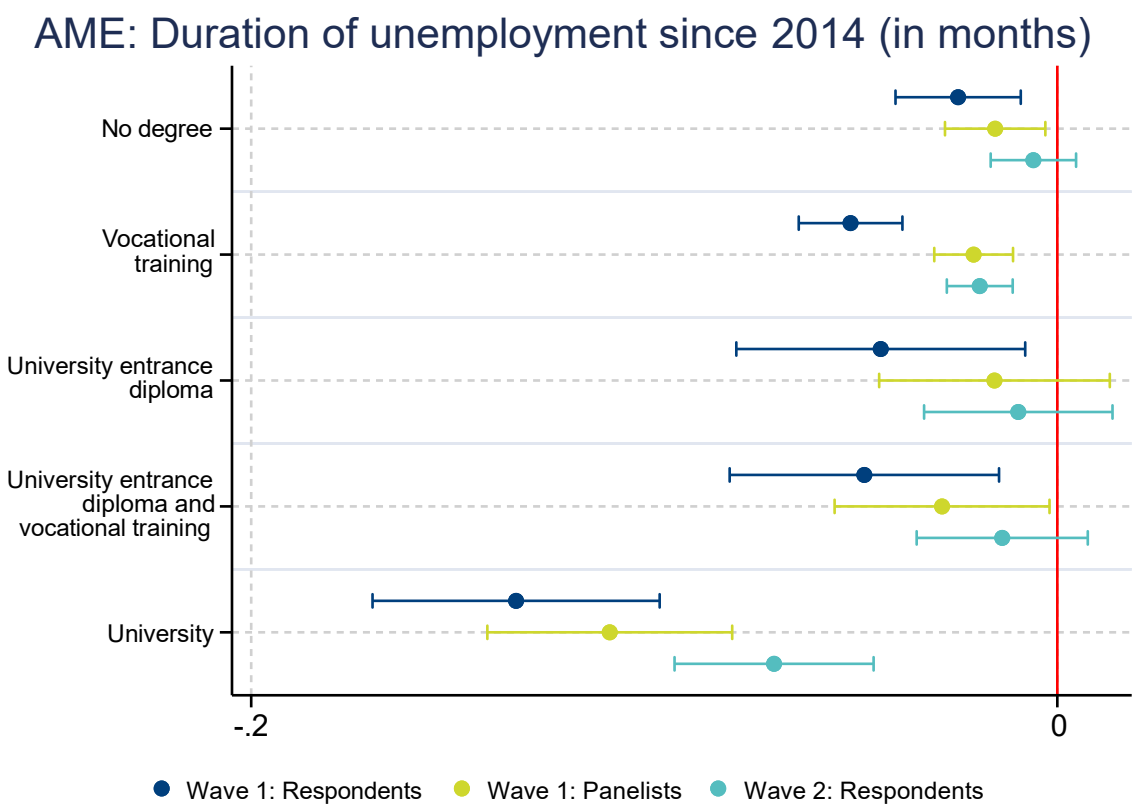
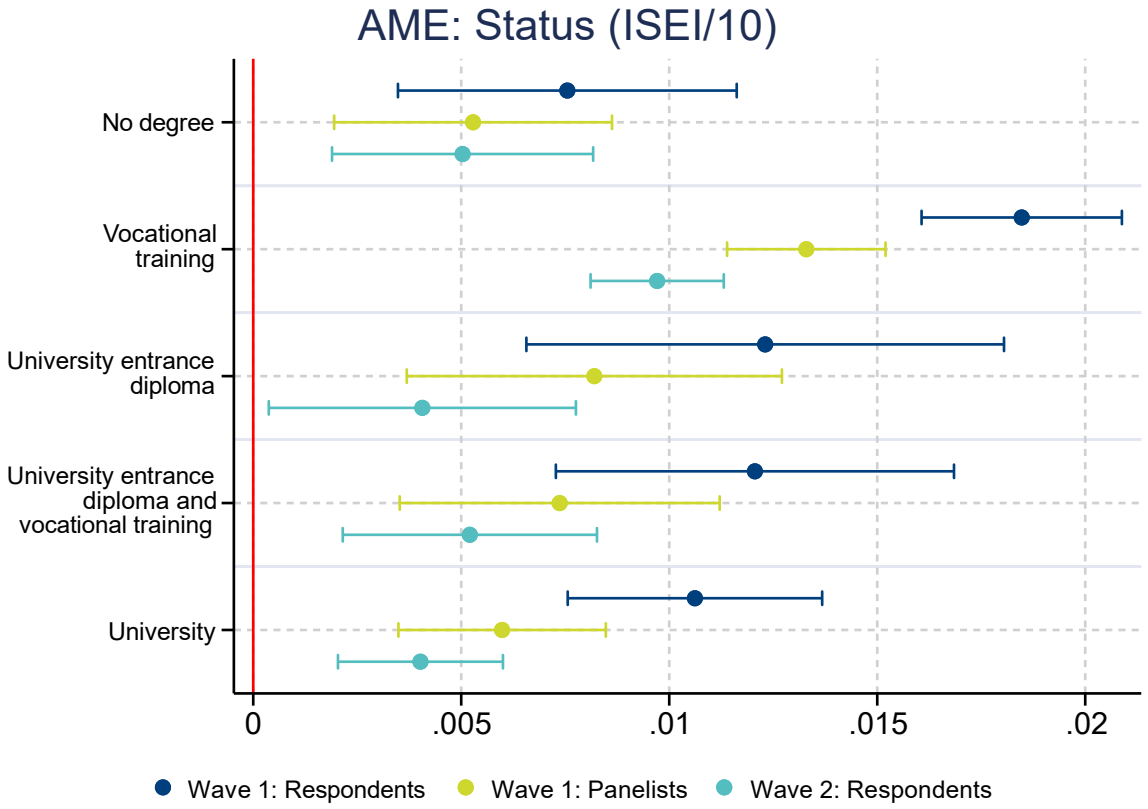
MODEL 2: SELECTED INTERACTION EFFECTS: EDUCATION × UNEMPLOYMENT DURATION, EDUCATION × STATUS





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