What’s my wage again?
Comparing survey and administrative data to validate earnings measures.

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Session “Linking PIAAC data to administrative data and other large-scale assessments”
In a Nutshell

Motivation
- Earning measures from surveys widely used as a basis for research and political recommendations although measures are error-prone.
- Administrative data as a “true measure” to validate survey information.

Research Question
- Do we find bias in regression results when using survey versus administrative data on earnings?

Main Results
- Bias in regression coefficients which highlights the importance to validate survey measures and findings with external data.
Importance of Survey Data

- Surveys are one of the most important data source for social science researchers.

- Earnings as an important and frequently used variable.

- Based on earnings information, research on, e.g.,
  - Social (in)equality (Atkinson, 2003),
  - Human capital models (Becker, 1962), and
  - Labor supply (Bound & Krueger, 1989).

- Policy recommendations and evaluations are based on this research
  → high quality standards for survey data are necessary.
Measurement Error in Survey Data

- Measurement error (ME) = difference between true and observed values.

- ME can arise due to respondents’ characteristics, question and survey design, or interviewer presence.

- Earnings question are particularly error-prone:
  - Sensitive question.
  - Difficult task to recall detailed information.
  - Unclear earnings concept (gross/net, …).

- ME in earnings might obscure true economic relationships, bias surveys findings, and, thus, impact substantive conclusions.
Benefits of Data Linkage

- Data linkage: Extending survey data with administrative data.

- Two main benefits of data linkage (e.g., Calderwood & Lessof, 2009):
  - Extend survey data without increasing respondents’ burden.
  - Assessing validity of survey measures and estimates.

- (German) administrative data considered as a less-error prone data source (e.g. Antoni & Bethmann, 2018; Sakshaug & Kreuter, 2012):
  - Basis for calculating amount of social insurance and pension entitlement.

Present study: Does the comparison of survey and administrative measures reveal a bias in estimation results?
Data I

- **Survey data:** Programme for the International Assessment of Adult Competencies (PIAAC) 2012 (OECD, 2013; Zabal, 2014).
- Focus: Adults cognitive skills and labor market participation.
- Representative sample of working-age population (16-65 years).
- German sample N = 5,465.
Data II

- **Administrative data:** Integrated Employment Biographies (IEB); provided by German Federal Employment Agency (see, e.g., Antoni et al., 2016).

- Individuals between 13 and 75 years.

- One of the following employment status since 1975:
  - Employment subject to social security,
  - Marginal part-time employment,
  - Benefit recipient (SGB II or III),
  - Officially registered as job-seeking, or
  - Participation in active labour market policies.

- Basis for calculating amount of social insurance and pensions.
Data III

- Both data sets contain information on individual earnings.
  - PIAAC: Hourly/weekly/monthly/annual/per piece
  - IEB: Daily
  - IEB * 30.5 to obtain monthly earnings in both data sets

- Challenge: multiple spells in IEB data match “PIAAC period”.

- Strategy to identify correct period:
  1. Matching according to occupational group.
  2. Choose spell with the smallest wage difference.

→ 1,323 matched individuals.
Methods

1. Correlation $me$ and “typical” covariates.

2. Correlation $me$ and true earnings $y^*$. 

3. Separate OLS models using survey and administrative earnings as a dependent variable.
## Results: ME correlates with...

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.002</td>
</tr>
<tr>
<td>Age</td>
<td>-0.083**</td>
</tr>
<tr>
<td>Years of education and training</td>
<td>-0.077**</td>
</tr>
<tr>
<td>Working experience</td>
<td>-0.067*</td>
</tr>
<tr>
<td>Literacy</td>
<td>-0.056*</td>
</tr>
<tr>
<td>Numeracy</td>
<td>-0.066*</td>
</tr>
<tr>
<td>y*</td>
<td>-0.420***</td>
</tr>
<tr>
<td>N</td>
<td>1,232</td>
</tr>
</tbody>
</table>
## Results: Biased Regressions

<table>
<thead>
<tr>
<th>Covariate</th>
<th>PIAAC</th>
<th>IEB</th>
<th>Chow Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable: Monthly earnings</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-694.717***</td>
<td>-692.153***</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(70.777)</td>
<td>(78.695)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>25.152***</td>
<td>28.914***</td>
<td>11.53***</td>
</tr>
<tr>
<td></td>
<td>(2.716)</td>
<td>(2.936)</td>
<td></td>
</tr>
<tr>
<td>Years of education and training</td>
<td>238.316***</td>
<td>257.274***</td>
<td>6.15*</td>
</tr>
<tr>
<td></td>
<td>(14.437)</td>
<td>(15.563)</td>
<td></td>
</tr>
<tr>
<td>Working experience</td>
<td>29.601***</td>
<td>32.628***</td>
<td>6.54*</td>
</tr>
<tr>
<td></td>
<td>(2.724)</td>
<td>(3.002)</td>
<td></td>
</tr>
<tr>
<td>Literacy</td>
<td>5.163***</td>
<td>5.938***</td>
<td>4.50*</td>
</tr>
<tr>
<td></td>
<td>(0.884)</td>
<td>(0.970)</td>
<td></td>
</tr>
<tr>
<td>Numeracy</td>
<td>7.001***</td>
<td>7.836***</td>
<td>5.22*</td>
</tr>
<tr>
<td></td>
<td>(0.808)</td>
<td>(0.885)</td>
<td></td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>1,232</td>
<td>1,232</td>
<td>1,232</td>
</tr>
</tbody>
</table>
Results: Mincer Equation
Summary of Results

- Overall, more similarities than disparities:
  - General direction (positive/negative) of coefficients remains the same.
  - SD and significance level remain the same.

- But: Size of the (absolute value of the) coefficients is larger when using wages from the administrative data as DV.

- Chow test suggests statistically significant differences.

- Several robustness checks due to “spell challenges”.
  - IEB spell with smallest difference to PIAAC earnings for all respondents.
  - Only respondents who indicated monthly income in PIAAC.
    → Confirm our main results.
Conclusion I

- High similarity probably due to high accuracy/complexity in (earnings) data collection and high interview standards in PIAAC.

- Nevertheless some differences → shows that relying on error prone survey measure could lead to misjudging economic relationships, erroneous recommendations, and ineffective political implications.

- Data linkage as one opportunity to validate survey measures (and findings).

- Alternatively: Cross-checking results with further survey data.
Conclusion II

Of course, some limitations and room for further research:

- Linking survey and administrative data requires respondents‘ consent (*Daikeler et al. 2020*):
  - Our results cannot be generalized to population at large.
  - Evaluate strategies to increase linkage consent or develop correction methods.

- Matching “earnings period” between administrative data and survey data might be challenging.

- Lacking cross-country generalizability:
  - Quality of administrative data differs across countries.
  - Cross-national perspective as a next step in this line of research.


Would you like to learn more?

Thank you for your attention!