Asking Sensitive Questions Using the Crosswise Model: Some Experimental Results

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Outline

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  - Asking Sensitive Questions
  - Plagiarism

- Using Dejeopardizing Techniques to Measure Plagiarism
  - Study A: Randomized Response Technique
  - Study B: The Crosswise Model

- Conclusions
Asking Sensitive Questions

- “A question is sensitive when it asks for a socially undesirable answer, when it asks, in effect, that the respondent admits he or she has violated a social norm” (Tourangeau/Yan 2007: 860).

- Some respondents are unwilling to give truthful self-reports to sensitive questions. They distort their answers towards the social norm. This leads to social desirability bias in prevalence estimates of the sensitive behavior (e.g. systematic underestimation).

- Dejeopardizing question techniques such as Randomized Response (RRT, Warner 1965) were proposed to reduce social desirability bias in sensitive self-reports.

- We will present results for a further technique called the Crosswise Model (Yu et al. 2008) which, to our knowledge, has not yet been empirically evaluated.
Plagiarism

- What is plagiarism?

**Definition of the U.S. National Academy of Sciences**

“Appropriation of another person’s ideas, processes, results, or words without giving appropriate credit, including those obtained through confidential review of others’ research proposals and manuscripts”

- In the age of the Internet, Wikipedia, etc. Universities increasingly begin to worry about plagiarism in student papers and homework assignments.
Art. 2 Violations of the Disciplinary Code

This Disciplinary Code is applicable when a person:

a. acts fraudulently in assessment tests, that is, attempts in an illicit way to gain an advantage for himself/herself or a third party;

b. hands in a written assignment that he/she has not written himself/herself, or in which he/she passes off as one's own the results and insights of another (plagiarism);

c. disturbs lectures or events organized by the ETH Zurich, or otherwise disrupts the operation of the ETH Zurich;
Plagiarism

Information Notice for Students

(adapted from “Information notice on dealing with plagiarism” issued on 30 April 2007 by the Teaching Committee, University of Zurich)

Decreed in November 2008 by the Rector, ETH Zurich

Disciplinary measures

According to Art. 3 of the ETH Zurich Disciplinary Code, the following disciplinary measures can be imposed:

- issuing a reprimand
- declaring performance assessments as failed
- suspending the person from courses or from using ETH facilities for a maximum of three years
- threatening to suspend the person from ETH Zurich
- suspending the person from ETH Zurich for a maximum of three years
- divesting the person of an academic title if acquired illicitly.
Approaches to Estimate the Prevalence of Plagiarism

- Direct questions
  - Self-reports (past behavior; intentions)
  - Other-reports (plagiarism of other students)

- Dejeopardizing question techniques
  - Randomized Response, Item Count Technique, etc.

- Data collection without asking questions
  - Official number of students found guilty
  - Systematic inspection of a sample of student papers via specialized software (e.g. TurnItIn; Plagiarism-Finder)
Some Previous Results on Plagiarism

- Krohn/Schlombs/Taubert (2003):
  - In the context of a course at the University of Bielefeld, Faculty of Technology, 10 out of 39 group seminar papers (N=150 students) were identified as either partial or severe plagiarism.
  - Method: systematic screening of seminar papers using “Google”

(Source: Krohn/Schlombs/Taubert 2003)
Some Previous Results on Plagiarism

- Sattler (2007):
  - In the context of a lecture at the University of Leipzig, Department of Sociology, 19.5% of the participating students (N=159) submitted seminar papers that were identified as partial plagiarism.
  - Method: systematic screening of seminar papers via the software “Plagiarism-Finder”

- Knoop (2006):
  - Survey of a convenience sample of students at the University of Münster, Social Sciences and History, indicates that 32.3% of the respondents (N=192) know at least one plagiarizing fellow student.
  - Method: self-administered questionnaire; self- and other-reports
  - Problems: Weights that correct for multiple counts of a particular plagiarist were not used (see nominative technique)
We now present results from two studies in which dejeopardizing techniques were used to estimate the prevalence of plagiarism.

- Study A: Randomized Response Technique
- Study B: The Crosswise Model

Both studies were implemented as methodological experiments using direct questioning as control condition.
The Randomized Response Technique (RRT)
(Warner 1965; also see, e.g., Fox and Tracy 1986)

- Basic idea: anonymity through randomization.

- Depending on the outcome of a randomization device (e.g. roll a dice), the respondent has to answer the sensitive question or give an automatic “yes” or “no” answer (or answer an unthreatening question of which the distribution is known).

- Since only the respondent knows the outcome of the randomization device, a “yes” answer cannot be interpreted as an admission of guilt.

- However, the proportion of the sample that has engaged in the behavior of interest can be calculated with knowledge of the properties of the randomizing device.
Using RRT to Measure Plagiarism

- Web-Survey among ETH students in 2005
- Response rate: 33 Percent
- Research team: Elisabeth Coutts, Andreas Diekmann, Georg Böcherer, Stefan Senn, Philipp Stadelmann, Diego Stutzer
- Used RRT-design:
Nimm bitte eine Münze zur Hand und führe einen Münzwurf durch. Beantworte gemäss Ergebnis die entsprechende Frage:

Hast du Kopf geworfen, dann beantworte bitte die folgende Frage:

Hast du in einer dieser Arbeiten (Semester-, Bachelor-, Master- oder Diplomarbeit) schon einmal bewusst ein Zitat nicht gekennzeichnet?

Hast du Zahl geworfen, dann beantworte bitte die folgende Frage:

Bitte nimm nochmals die Münze zur Hand und führe einen Münzwurf durch. Ist das Ergebnis 'Kopf' so beantworte die Frage mit Ja. Im anderen Fall beantworte die Frage mit Nein.

○ Ja ○ Nein
### Results: plagiarism prevalence estimates (in percent)

<table>
<thead>
<tr>
<th>Type</th>
<th>Direct Questions</th>
<th>RRT</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>seminar/term paper, diploma thesis</td>
<td>12.0 (2.0)</td>
<td>3.7 (4.0)</td>
<td>-8.3 (4.4)</td>
</tr>
<tr>
<td></td>
<td>N = 266</td>
<td>N = 495</td>
<td></td>
</tr>
<tr>
<td>other written assignments</td>
<td>19.4 (1.4)</td>
<td>17.6 (2.4)</td>
<td>-1.8 (2.8)</td>
</tr>
<tr>
<td></td>
<td>N = 826</td>
<td>N = 1521</td>
<td></td>
</tr>
</tbody>
</table>

(standard errors in parentheses)
Using RRT to Measure Plagiarism

- Explanations for the unexpected results:
  - difficulties understanding RRT, no trust in RRT
  - Web-surveys already anonymous enough?
  - “Self-protective no” bias: Respondents who did not commit plagiarism are reluctant to give a “yes” answer to the non-sensitive question.

- Approaches to deal with the “self-protective no” bias
  - directly approach the problem using specific instructions
  - apply methods to detect cheaters and correct the RRT estimates
  - use alternative methods that are not (or less) affected by the “self-protective no” bias
The Crosswise Model
(Yu, Tian, and Tang 2007)

- Very simply idea: Ask a sensitive question and a non-sensitive question and let the respondent indicate . . .
  - A: whether the answer is “yes” to both questions or “no” to both questions
  - B: whether the answer is “yes” to one questions and “no” to the other

<table>
<thead>
<tr>
<th>sensitive question</th>
<th>non-sensitive question</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>A</td>
</tr>
<tr>
<td>yes</td>
<td>B</td>
</tr>
<tr>
<td>yes</td>
<td>A</td>
</tr>
<tr>
<td>no</td>
<td>B</td>
</tr>
</tbody>
</table>

- In either case, the researcher does not know whether the answer to the sensitive question is “yes” or “no” for a specific respondent.
- The prevalence of the non-sensitive item must be unequal 0.5 and known (furthermore, the non-sensitive item must be independent of the sensitive item).
The Crosswise Model
(Yu, Tian, and Tang 2007)

- Let
  - $X$ be the observed answer ("A" or "B")
  - $Y$ be the sensitive question with $\pi_Y = \Pr(Y = \text{yes})$
  - $Z$ be the non-sensitive question with $\pi_Z = \Pr(Z = \text{yes}) \neq 0.5$
  - $\text{Cov}(Y, Z) = 0$

- Then: $\pi_A = \Pr(X = A) = (1 - \pi_Y)(1 - \pi_Z) + \pi_Y \pi_Z$

- Hence: A natural estimator for $\pi_Y$ is

$$\hat{\pi}_Y = \frac{\hat{\pi}_A + \pi_Z - 1}{2\pi_Z - 1} \quad \text{Var}(\hat{\pi}_Y) = \frac{\text{Var}(\hat{\pi}_A)}{(2\pi_Z - 1)^2}$$

- Note that formally the crosswise model is identical to Warner’s model.
Using the Crosswise Model to Measure Plagiarism

- Classroom survey (written questionnaire) at different Universities (ETH Zurich, University Leipzig, LMU Munich), Spring/Summer 2009
- Total sample size approx. 500.
- 3/4 crosswise model, 1/4 direct questions
- Research team: Ben Jann, Julia Jerke, Ivar Krumpal (thanks to Norman Braun and Jochen Groß from LMU Munich for their support).
Using the Crosswise Model to Measure Plagiarism

<table>
<thead>
<tr>
<th>Block 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Question: Is your mother’s birthday in January, February or March?</td>
</tr>
<tr>
<td>2. Question: When writing an assignment (e.g. seminar paper, term paper, thesis), have you ever intentionally adopted a passage from someone else’s work without citing the original?</td>
</tr>
</tbody>
</table>

How are your answers to the two questions?

- (A) No to both questions or Yes to both questions
- (B) Yes to one of the two questions and No to the other one

<table>
<thead>
<tr>
<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Question: Is your father’s birthday in October, November or December?</td>
</tr>
<tr>
<td>2. Question: Did you ever have someone else write a large part of an assignment for you or hand in someone else’s work (e.g. from <a href="http://www.hausarbeiten.de">www.hausarbeiten.de</a>) as your own?</td>
</tr>
</tbody>
</table>

How are your answers to the two questions?

- (A) No to both questions or Yes to both questions
- (B) Yes to one of the two questions and No to the other one
Results: plagiarism prevalence estimates (in percent)

<table>
<thead>
<tr>
<th></th>
<th>direct questions (N = 96)</th>
<th>crosswise (N = 310)</th>
<th>difference (standard errors in parentheses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>partial plagiarism</td>
<td>7.3 (2.7)</td>
<td>22.3 (5.5)</td>
<td>15.0 (6.1)</td>
</tr>
<tr>
<td>full plagiarism</td>
<td>1.0 (1.0)</td>
<td>1.6 (5.0)</td>
<td>0.6 (5.1)</td>
</tr>
</tbody>
</table>
Using the Crosswise Model to Measure Plagiarism

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. cwlogit plagiat1 crosswise zurich munich female bachelor semester //
> journals internet students proofread goodgrades, pyes(pyes) nolog

Crosswise model logistic regression
Number of obs = 379
Nonzero outcomes = 189
P(surrogate "yes") = pyes
Zero outcomes = 190
LR chi2(11) = 20.83
Prob > chi2 = 0.0352
Log likelihood = -202.9246 Pseudo R2 = 0.0488

|                | Coef.  | Std. Err. | z     | P>|z|   | [95% Conf. Interval] |
|----------------|--------|-----------|-------|-------|---------------------|
| plagiat1       |        |           |       |       |                     |
| crosswise      | 1.90966| .5951165  | 3.21  | 0.001 | .7432529 3.076067   |
| zurich         | 1.20571| .8628404  | 1.40  | 0.162 | -.4854224 2.89685   |
| munich         | -.29354| .9339085  | -0.31 | 0.753 | -2.123962 1.536892  |
| female         | .131031| .6306861  | 0.21  | 0.835 | -1.105091 1.367153  |
| bachelor       | .0719657| .7070102 | 0.10  | 0.919 | -1.313749 1.45768   |
| semester       | -.151177| .1316926 | -1.15 | 0.251 | -1.4092904 1.069352 |
| journals       | -.0420907| .7151018| -0.06 | 0.953 | -1.443665 1.359483  |
| internet       | 1.34571| 2.364382  | 0.57  | 0.569 | -3.288394 5.979814  |
| students       | 1.35031| .6117542  | 2.21  | 0.027 | .1512942 2.549326   |
| proofread      | .0769544| .7458451  | 0.10  | 0.918 | -1.384875 1.538784  |
| goodgrades     | -.8288506| .8247797| -1.00 | 0.315 | -2.445389 .7876879  |
| _cons          | -3.575383| 2.508581 | -1.43 | 0.154 | -8.492112 1.341346  |
```
Conclusions

- Compared to the RRT, the Crosswise Model is easier to implement for both interviewer and respondent:
  - A randomizing device (e.g. coins, cards, dice) is not required
  - Lower complexity of interviewer instructions
  - Lower cognitive burden for the respondent

- Due to its lower complexity, the Crosswise Model seems better suited for application in self-administered questionnaires.

- Most importantly, the Crosswise Model appears to generate a higher sense of protection and is better suited to overcome the “self-protective no” bias (there is no obvious self-protective answering strategy).
References


