# Asking Sensitive Questions Using the Crosswise Model: Some Experimental Results

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# Outline

# 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.

# Plagiarism

**Disciplinary Code**
**of the Swiss Federal Institute of Technology Zurich**
**(ETH Zurich Disciplinary Code)**

of 2 November 2004

[. . . ]

**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:

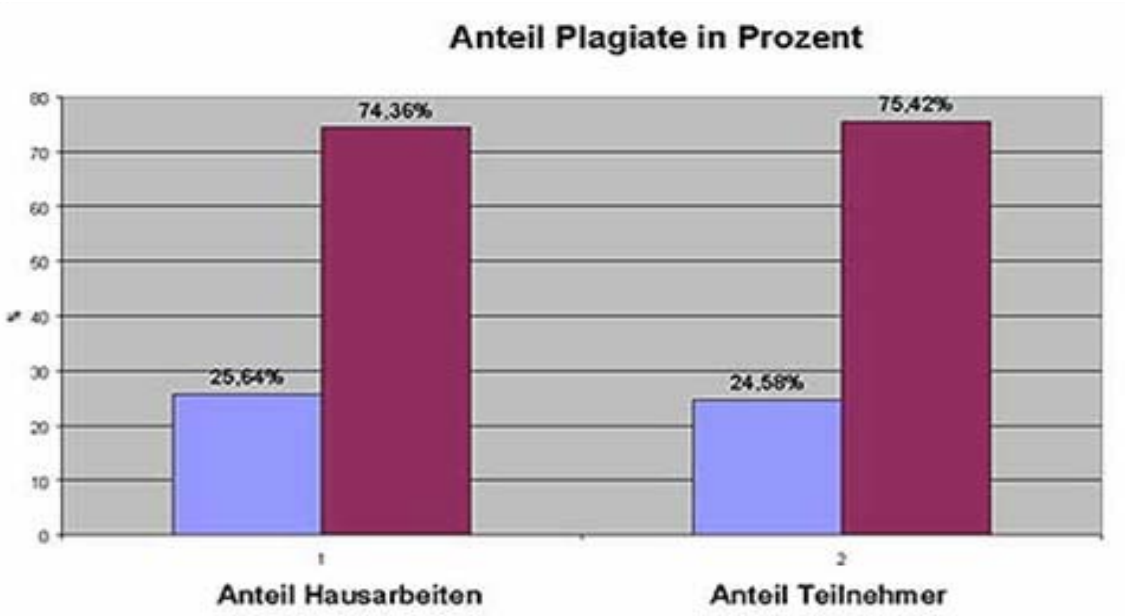
- issuing a reprimand
- declaring performance assessments as failed
- suspending the person from courses or from using ETH facilities for a maximum of three years
- threatening to suspend the person from ETH Zurich
- suspending the person from ETH Zurich for a maximum of three years
- divesting the person 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)

# Using Dejeopardizing Techniques to Measure Plagiarism

- 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.

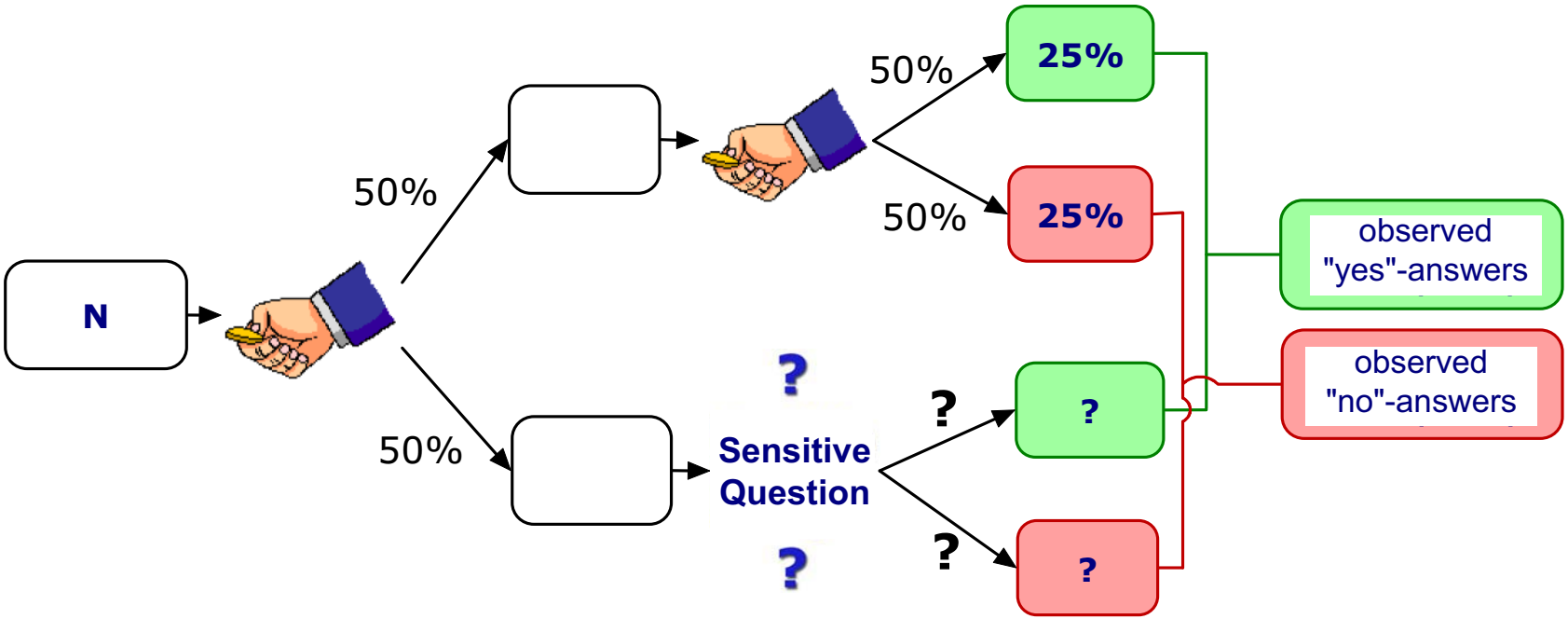
# The Randomized Response Technique (RRT)

(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:



# Using RRT to Measure Plagiarism

**Nimm bitte eine Münze zur Hand und führe einen Münzwurf durch. Beantworte gemäss d 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

# Using RRT to Measure Plagiarism

- Results: plagiarism prevalence estimates (in percent)

| | direct questions | RRT | difference |
|---|---|---|---|
| seminar/term paper, | 12.0 | 3.7 | −8.3 |
| diploma thesis | (2.0) | (4.0) | (4.4) |
| | N = 266 | N = 495 | |
| other written | 19.4 | 17.6 | −1.8 |
| assignments | (1.4) | (2.4) | (2.8) |
| | N = 826 | N = 1521 | |

(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

| | | non-sensitive question: no | non-sensitive question: yes |
|---|---|---|---|
| sensitive question | no | **A** | **B** |
| | yes | **B** | **A** |

- 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: $\pi_A = \Pr(X = \text{A}) = (1 - \pi_Y)(1 - \pi_Z) + \pi_Y \pi_Z$
- Hence: A natural estimator for $\pi_Y$ is

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

- 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

**Block 1**

1. Question: *Is your mother's birthday in January, February or March?*

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?*

**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**

**Block 2**

1. Question: *Is your father's birthday in October, November or December?*

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 www.hausarbeiten.de) as your own?*

**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**

# Using the Crosswise Model to Measure Plagiarism

- Results: plagiarism prevalence estimates (in percent)

| | direct questions (N = 96) | crosswise (N = 310) | difference |
|---|---|---|---|
| partial plagiarism | 7.3 | 22.3 | 15.0 |
| | (2.7) | (5.5) | (6.1) |
| full plagiarism | 1.0 | 1.6 | 0.6 |
| | (1.0) | (5.0) | (5.1) |

(standard errors in parentheses)

# 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
```

| plagiat1 | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| crosswise | 1.90966 | .5951165 | 3.21 | 0.001 | .7432529 | 3.076067 |
| zurich | 1.205714 | .8628404 | 1.40 | 0.162 | -.4854224 | 2.89685 |
| munich | -.2935347 | .9339085 | -0.31 | 0.753 | -2.123962 | 1.536892 |
| female | .1310311 | .6306861 | 0.21 | 0.835 | -1.105091 | 1.367153 |
| bachelor | .0719657 | .7070102 | 0.10 | 0.919 | -1.313749 | 1.45768 |
| semester | -.1511776 | .1316926 | -1.15 | 0.251 | -.4092904 | .1069352 |
| 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).

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