

# **Adjusting samples for nonresponse bias: use of non-response surveys in ESS Round 3**

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# Structure of presentation

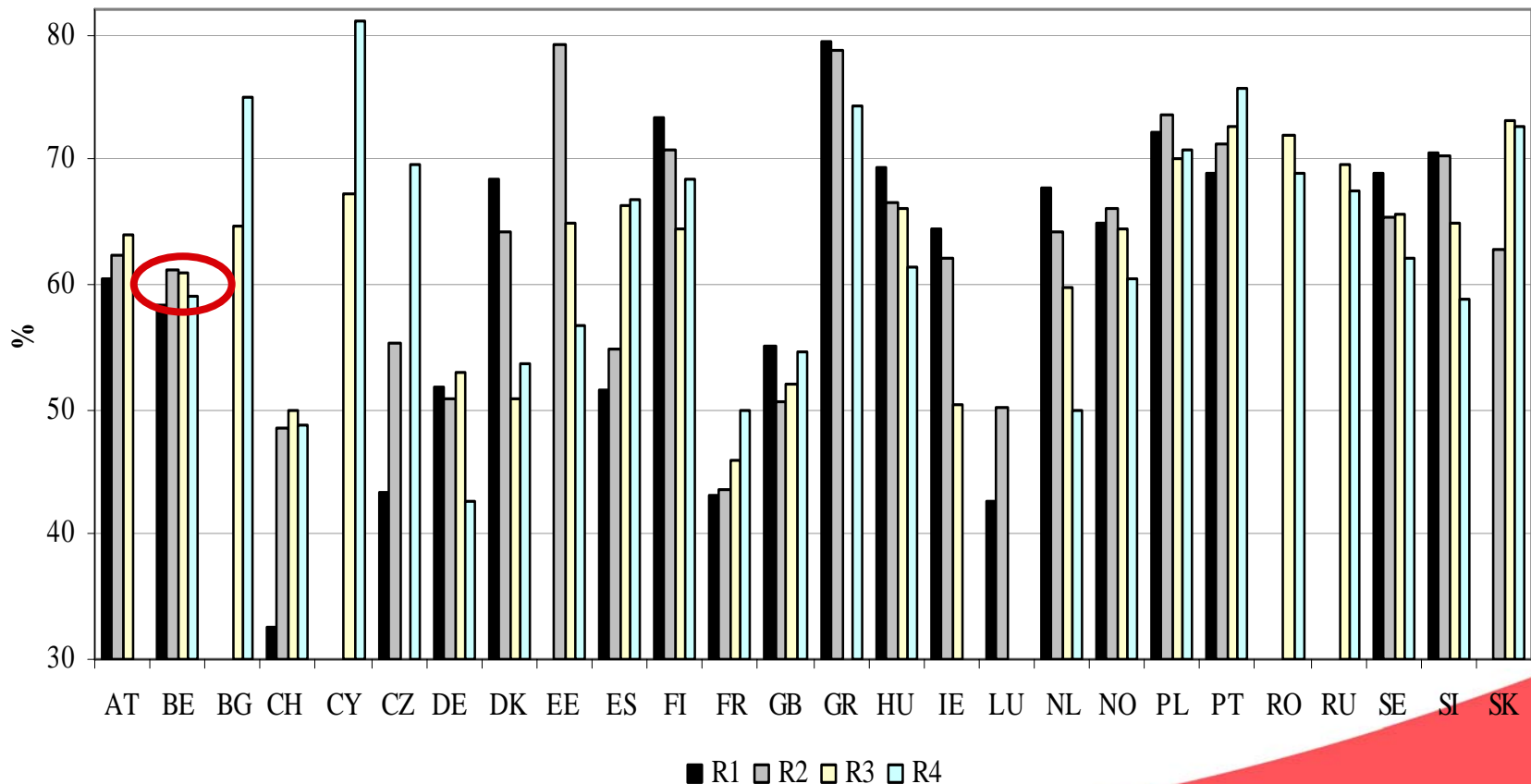
1. Introduction
2. Short Overview
3. Data and method
4. Key results
5. Conclusion & discussion

# 1. Introduction

## Analysis of nr bias still needed:

WHY? Still large differences in RR (NR) rates based on CF R1-R4

Response rates



## 2. Short overview (1)

- How to deal with nonresponse bias is proposed by Groves (2006) on 5 different methods
- Short overview of approaches to the assessment of bias applied in ESS (*Billiet, Matsuo, Beullens & Vehovar, Research & Methods. ASK. vol 18 (1, 2009), pp. 3-43*).

*Within the context of ESS Joint Research Activities (JRA) on nonresponse bias, 4 methods for bias detection and estimation are studied:*

### **In all rounds (R1, R2, R3, R4.....)**

1. Bias as deviation between obtained sample and population (or 'Golden standard' survey) = post-stratification and evaluations of samples before and after weighting
2. Bias as difference between cooperative and converted refusals collected via refusal conversion = comparison of cooperative with reluctant respondents (converted refusals)
3. Bias as difference in 'observable' data among all sampling units (collected in contact forms) = sample based comparison between all respondents and all nonrespondents

## 2. Short overview (2)

### In context of R3

4. Bias as difference between respondents and **non-respondents** collected via post hoc nonresponse survey = surveys among nonrespondents after R3  
in PL, NO and CH (real NRS)  
in BE (at moment of refusal only among refusals = **Doorstep Questions Survey**)

## **National Co-ordinators\* and their respective team members in Non Response Survey**

|                    |   |
|--------------------|---|
| <b>Belgium</b>     | <b>Marc Jacquemain*, Geert Loosveldt*,<br/>Sebastiane Fontaine, Frederic<br/>Herremans, Hideko Matsuo,<br/>Katrien Symons, Lee Vandecasteele,</b> |
| <b>Norway</b>      | <b>Kristen Ringdal*, Frode Berglund,<br/>Einar Bjørshol, Øyvin Kleven</b>   |
| <b>Poland</b>      | <b>Pawel Sztabinski*, Franciszek<br/>Sztabinski, Anna Dyjas-Pokorska<br/>Teresa Zmijewska-Jedrzejczyk</b>   |
| <b>Switzerland</b> | <b>Dominique Joye*, Alexandre Pollien,<br/>Nicole Schöbe</b>  |

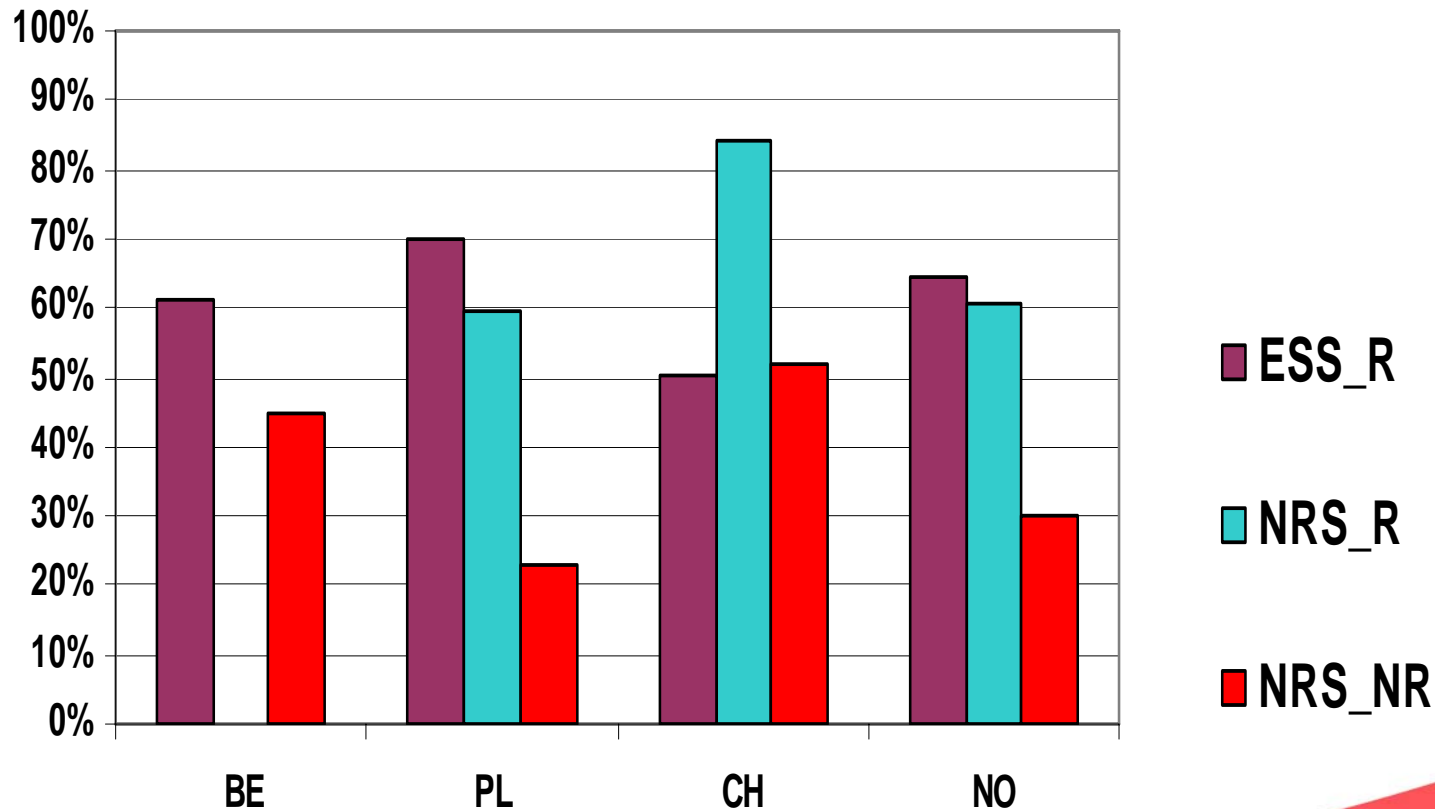
# 3. Data and method (1)

## Survey among nonrespondents

|    | Target group     | Timing      | Mode            | Use of Incentives | Type of questionnaire | Sample size | Response Rates (R/NR)             |
|----|------------------|-------------|-----------------|-------------------|-----------------------|-------------|-----------------------------------|
| BE | ESS3 refusers    | Same as ESS | PAPI at door    | NO                | 1 short               | 303         | DQS_R: 44.7%                      |
| CH | ESS3_R & ESS3_NR | After ESS   | Mail/ Web/ CATI | 10 Swiss FR.      | 2 short & long        | 1023        | NRS3_R: 84%<br>NRS3_NR: 51.8%     |
| NO | ESS3_R & ESS3_NR | After ESS   | Mail/ Web/ CATI | NO                | 1 long                | 487         | NRS3_R: 60.79%<br>NRS3_NR: 30.25% |
| PL | ESS3_R & ESS3_NR | After ESS   | Mail            | Notepad           | 2 short & long+       | 1208        | NRS3_R: 59.04%<br>NRS3_NR: 23.24% |

### 3. Data and method (2)

Response rates between ESS respondents and ESS nonrespondents who participated in NRS





## 3. Data and method (3)

### The questions

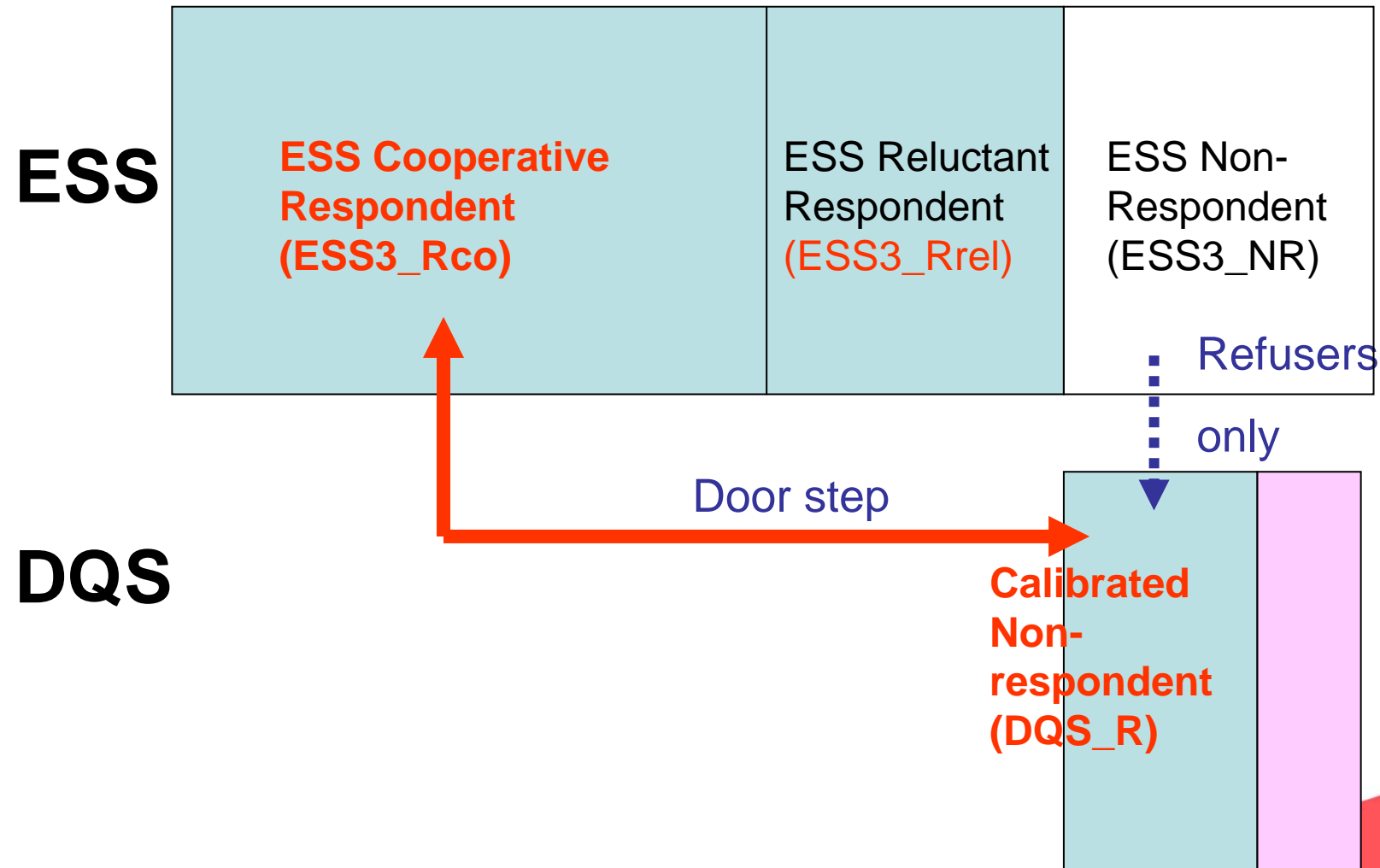
Key questions procedure (*Pedaksi approach*)

Short 7 question module (+ at door): work situation, highest level of education, # of members in household, frequency of social activities, feeling (un)safe, interest in politics, attitude towards surveys

Normal 16 questions module: same as short + gender, year of birth, TV watching, voluntary work, trust in people, satisfied with democracy, trust in politicians, immigration good/worse for country, (+ reasons for refusal (closed) in one subgroup)

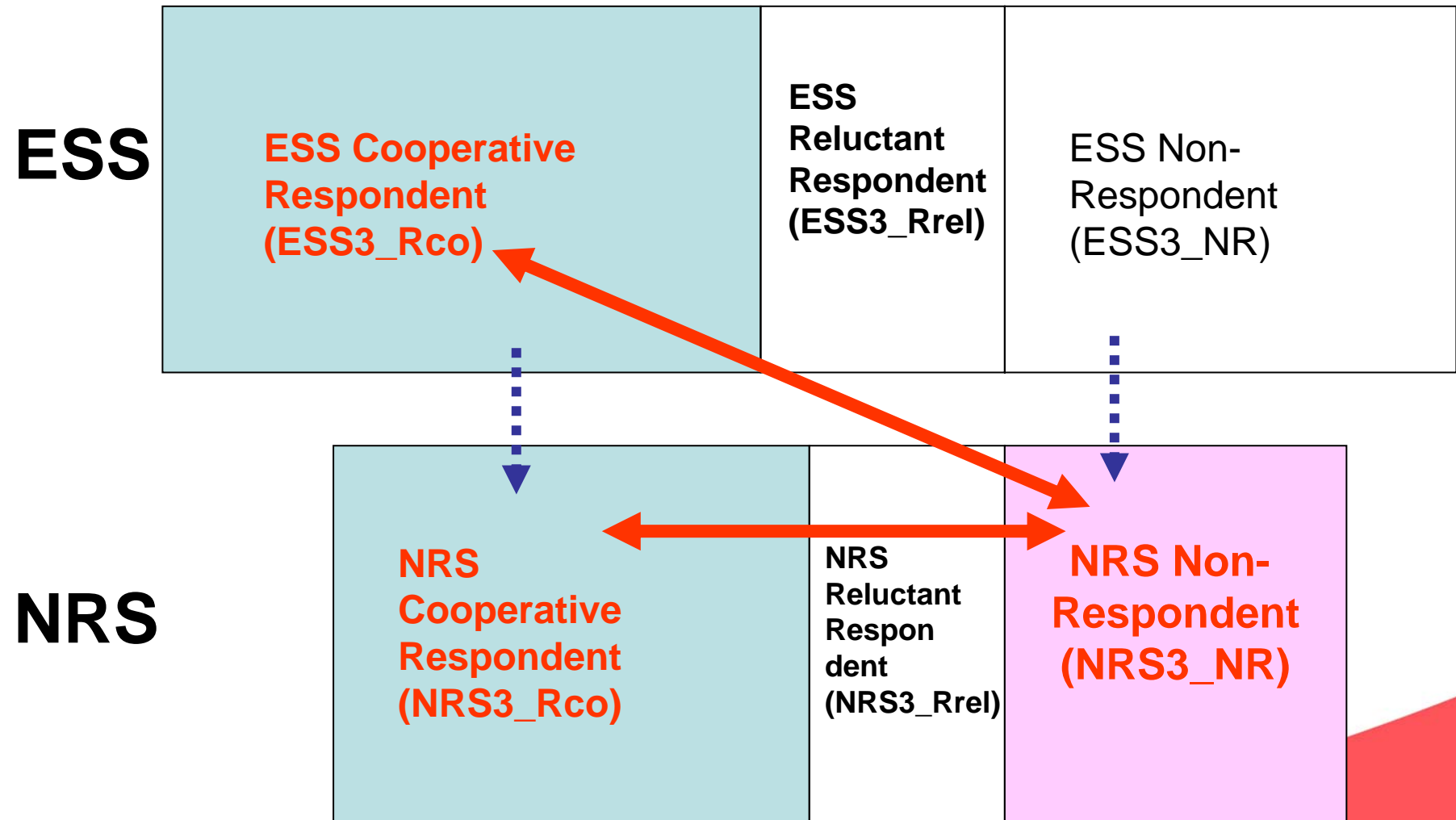
### 3. Data and method (4)

#### Kinds of respondents in data analyses [BE]



# 3. Data and method (5)

Kinds of respondents in data analyses [NO, CH & PL]



### 3. Data and method (6)

Kinds of respondents in NRS/DQS

decisions to take in view of computing propensity scores for weighting the sample

NRS/(cooperative vs. nrs)

NRS/(cooperative vs. main)

(NRS+reluctant) vs (cooperative (nrs or main?))

NRS/cooperative vs reluctant/cooperative

### 3. Data and method (7)

#### Method used for adjusting the sample for nonresponse bias

1. **Identify** survey **response differences** on key explanatory variables between types of respondent (*'nonrespondent vs. cooperative respondent'*).
2. Study **net effects** of key explanatory variables on **response probabilities** via logistic regression model (*dependent variable: prob ratio's 'nonrespondent/cooperative'*).
$$\log \left[ e(\mathbf{x}) / (1 - e(\mathbf{x})) \right] = \alpha + \beta' f(\mathbf{x})$$
3. Obtain **propensity scores** on all cases on non-response probabilities via logistic regression model (*dependent variable: prob ratio's 'cooperative/nonrespondent'*).

4. Transform propensity scores into **weights via stratification method** (*Rosenbaum & Rubin 1984; Little 1986; Lee & Vaillant 2008*):
  - ✓ Form 10 strata with equal number of cases after sorting on ps;
  - ✓ Assign each sample unit into correct corresponding sub-strata
  - ✓ Weight = expected probability/observed probability of the coop. respondent (or nonrespondent) in the corresponding sub-strata.

5. **Evaluate effects of propensity score weighting** via two main criteria:

- ✓ Tests between unweighted & weighted sample on cooperative respondents (NRS3\_Rco & ESS3\_Rco).  
1b. In case of significant differences: test differences between parameters of relevant substantive explanatory models
- ✓ Study differences in distributions on key questions between types of respondents (*NRS3\_Rco vs NRS3\_NR or ESS3\_Rco vs. NRS3\_NR*).

# 4. Key Results(1): Differences (ESS coop & nr)

|  | Belgium           |                              | Norway           |                            |
|--|-------------------|------------------------------|------------------|----------------------------|
|  | ESS coop (N=1658) | DQS res (N=303)              | ESS coop(N=1646) | NRS nr (N=242)             |
| <b>(Age)</b>                             |                   |                              |                  |                            |
| 14-29                                    | 23.40             | 8.25                         | 22.24            | 17.77                      |
| 30-39                                    | 16.04             | 21.45                        | 17.25            | 14.05                      |
| 40-49                                    | 20.69             | 16.83                        | 21.26            | 21.07                      |
| 50-59                                    | 16.22             | 18.81                        | 17.07            | 19.83                      |
| 60+                                      | 23.64             | 34.65                        | 22.17            | 27.27                      |
| <i>Chi<sup>2</sup> ; df = 4; prob.**</i> |                   | 47.544; <i>p &lt; 0.0001</i> |                  | 7.534, <i>p=0.110</i>      |
| <b>(Gender)</b>                          |                   |                              |                  |                            |
| Male                                     | 46.68             | 47.52                        | 51.64            | 46.28                      |
| Female                                   | 53.32             | 52.48                        | 48.36            | 53.72                      |
| <i>Chi<sup>2</sup> ; df = 1; prob.**</i> |                   | 0.073; <i>p=0.787</i>        |                  | 2.783; <i>p=0.095</i>      |
| <b>(Educational level)<sup>[1]</sup></b> |                   |                              |                  |                            |
| Lower (basic)                            | 25.41             | 33.92                        | (1+2)            | (1+2)                      |
| Lower sec (hum.)                         | 10.56             | 9.19                         | 17.77            | 34.30                      |
| Higher secondary                         | 35.67             | 33.22                        | 35.61            | 34.71                      |
| Higher tertiary                          | 28.36             | 23.67                        | 46.62            | 30.99                      |
| <i>Chi<sup>2</sup> ; df = 3; prob.**</i> |                   | 9.349; <i>p=0.025</i>        |                  | 49.920; <i>p&lt;0.0001</i> |
| <b>(Work status)</b>                     |                   |                              |                  |                            |
| Employed                                 | 49.76             | 49.65                        | 67.60            | 56.43                      |
| Unemployed                               | 50.24             | 50.35                        | 32.40            | 43.57                      |
| <i>Chi<sup>2</sup> ; df=1; prob.**</i>   |                   | 0.034; <i>p=0.853</i>        |                  | 13.728; <i>p=0.0002</i>    |
| <b>(HH composition)</b>                  |                   |                              |                  |                            |
| One person household                     | 11.59             | 15.57                        | 19.10            | 19.50                      |
| More person household                    | 88.41             | 84.43                        | 80.90            | 80.50                      |
| <i>Chi<sup>2</sup> ; df=1; prob.**</i>   |                   | 3.651; <i>p=0.056</i>        |                  | 0.025; <i>p=0.874</i>      |



# 4. Key Results (2): Differences (ESS coop & nr)

|  | Belgium            |                             | Norway             |                            |
|--|--------------------|-----------------------------|--------------------|----------------------------|
|  | ESS coop(N=1658)   | DQS res (N=303)             | ESScoop(N=1646)    | NRS nr (N=242)             |
| <i>(Neighbourhood security)</i>          |                    |                             |                    |                            |
| Very safe                                |                    |                             |                    |                            |
| Safe                                     | 19.84              | 18.18                       | 50.91              | 45.00                      |
| Unsafe                                   | 60.07              | 61.89                       | 40.83              | 44.17                      |
| Very safe                                | 17.06              | 16.78                       | 6.01               | 8.33                       |
|  | 3.02               | 3.15                        | 2.25               | 2.50                       |
| <i>Chi<sup>2</sup> ; df =3; prob.**</i>  |                    | 0.499; p=0.919              |                    | 4.517; p=0.211             |
| <i>Means/SD</i>                          | <u>2.033/0.700</u> | <u>2.049/0.689</u>          | <u>1.596/0.704</u> | <u>1.683/0.732;</u>        |
| <i>T-value; df; prob.**</i>              |                    | 0.36;df=1937;p=0.716        |                    | -1.79;df=1884;p=0.074      |
| <i>(Social participation)</i>            |                    |                             |                    |                            |
| Much less than most                      | 15.30              | 27.27                       | 3.28               | 12.45                      |
| Less than most                           | 29.20              | 24.36                       | 17.69              | 17.43                      |
| About the same                           | 35.25              | 37.09                       | 61.16              | 60.17                      |
| More than most                           | 15.90              | 6.55                        | 16.05              | 8.30                       |
| Much more than most                      | 4.35               | 4.73                        | 1.82               | 1.66                       |
| <i>Chi<sup>2</sup> ; df = 4; prob.**</i> |                    | 36.294; p<0.0001            |                    | 70.776; p<0.0001           |
| <i>Means/SD</i>                          | <u>2.648/1.055</u> | <u>2.371/1.094</u>          | <u>2.954/0.735</u> | <u>2.693; 0.855;</u>       |
| <i>T-value; df; prob.**</i>              |                    | -4.01; df=1927;<br>p<0.0001 |                    | 5.05; df=1884;<br>p<0.0001 |
| <i>(Political interest)</i>              |                    |                             |                    |                            |
| Very interested                          | 8.75               | 4.55                        | 9.72               | 3.32                       |
| Quite interested                         | 37.15              | 19.58                       | 39.00              | 31.12                      |
| Hardly interested                        | 33.17              | 31.12                       | 44.29              | 50.21                      |
| Not at all interested                    | 20.93              | 44.76                       | 6.99               | 15.35                      |
| <i>Chi<sup>2</sup> ; df = 3; prob.**</i> |                    | 84.070; p<0.0001            |                    | 40.047; p<0.0001           |
| <i>Means/SD</i>                          | <u>2.663/0.904</u> | <u>3.161/0.896</u>          | <u>2.485/0.764</u> | <u>2.776/0.741</u>         |
| <i>T-value; df; prob.**</i>              |                    | 8.61;df=1942;p<0.0001       |                    | -5.53; df=1885; p<0.0001   |

# 4. Key Results (3): Differences in NO

|  | ESS res.(N=1646)   | NRS nr.(N=242)  |
|--|--------------------|---|
| How satis. Democracy works<br>(0: dissatisfy- 10: satisfy) $Chi^2$ ; $df =10$ ; $prob.$ **<br><u>Means/SD</u><br><i>t-value; df; prob.**</i>                             | <u>6.632/1.941</u> | <b>70.060; <math>p &lt; 0.0001</math></b><br><u>5.907/2.119</u><br><b>5.31; <math>df=1864</math>; <math>p &lt; 0.0001</math></b>  |
| Trust in politicians<br>(0: No trust-10: complete trust) $Chi^2$ ; $df =10$ ; $prob.$ **<br><u>Means/SD</u><br><i>t-value; df; prob.**</i>                               | <u>4.457/1.997</u> | 26.044; $p=0.004$<br><u>4.261/2.226</u><br>1.40; $df=1876$ ; $p=0.162$  |
| Imm. Make country worse/better place to live<br>(0: worse – 10: better) $Chi^2$ ; $df =10$ ; $prob.$ **<br><u>Means/SD</u><br><i>t-value; df; prob.**</i>                | <u>5.117/2.040</u> | <b>119.682; <math>p &lt; 0.0001</math></b><br><u>4.356/2.558</u><br><b>5.17; <math>df=1871</math>; <math>p &lt; 0.0001</math></b> |
| TV watching time per day<br>(0: No time – 7: more than 3 hours) $Chi^2$ ; $df =7$ ; $prob.$ **<br><u>Means/SD</u><br><i>t-value; df; prob.**</i>                         | <u>3.709/1.764</u> | <b>27.349; <math>p=0.0003</math></b><br><u>4.248/1.750</u><br><b>-4.38; <math>df=1878</math>; <math>p &lt; 0.0001</math></b>      |
| Involved in work for vol. and charity org.<br>(0: at least once a week – 6: never) $Chi^2$ ; $df =5$ ; $prob.$ **<br><u>Means/SD</u><br><i>t-value; df; prob.**</i>      | <u>4.211/1.735</u> | <b>14.634; <math>p=0.012</math></b><br><u>4.531/1.625</u><br><b>-2.69; <math>df=1885</math>; <math>p=0.007</math></b>             |
| Most people trusted /can't be too careful (0: can't be too careful – 10: most trusted) $Chi^2$ ; $df =10$ ; $prob.$ **<br><u>Means/SD</u><br><i>t-value; df; prob.**</i> | <u>6.844/1.805</u> | <b>59.173; <math>p &lt; 0.0001</math></b><br><u>6.600/2.250</u><br><b>1.89; <math>df=1884</math>; <math>p=0.058</math></b>        |

# 4. Key Results(4): Summary in 4 countries

|                       | BE        | CH     | NO        | PL     |
|-----------------------|-----------|--------|-----------|--------|
| Age                   | ***       | N.A.   | N.S.      | N.A.   |
| Gender                | N.S.      | N.A.   | N.S.      | N.S.   |
| Education level       | *         | N.S.   | ***       | **     |
| Work status           | N.S.      | ***    | **        | *      |
| Household composition | N.S.      | **     | N.S.      | N.S.   |
| Neighborhood security | N.S./N.S. | **/**  | N.S./N.S. | **/**  |
| Social participation  | ***/**    | ***/** | ***/**    | ***/** |
| Political interest    | ***/**    | **/**  | ***/**    | ***/** |

(X<sup>2</sup>/T-tests): NA: not applicable; NS: not significant; \*\*\* p<.0001;

\*\*p<.01; \*p<.05

# 4. Key Results (5): BE

## Logistic regression model: nr/cooperative

| R <sup>2</sup> =0.055 / H&L= 10.979 |  | Odds ratio's    |
|-------------------------------------|--|-----------------|
| Age                                 | 30-39  | <b>1.451*</b>   |
|                                     | 40-49  | 0.836           |
|                                     | 50-59  | 1.199           |
|                                     | 60+  | <b>1.793**</b>  |
|                                     | <i>Ref: 14-29</i>  |                 |
| Education                           | Lower secondary  | 0.801           |
|                                     | Higher secondary   | 1.002           |
|                                     | Higher tertiary  | 0.917           |
|                                     | <i>Ref: Lower basic educ.</i>  |                 |
| Work                                | employed<br><i>Ref: unemployed</i>   | 1.205           |
| Household composition               | One<br><i>Ref: more than one.</i>  | 1.113           |
| Social participation                | Almost the same  | 1.223           |
|                                     | More than most/much more than most<br><i>Ref: much less than most/less than most</i> | <b>0.722*</b>   |
| Political interest                  | Hardly/not at all interested<br><i>Ref: very /quite interested</i>                   | <b>1.574***</b> |



# 4. Key Results (7): CH/PL

## Logistic regression model: nr/cooperative

|  | CH Odds ratio's<br>R <sup>2</sup> =0.036 / H&L= 3.907 | PL Odds ratio's<br>R <sup>2</sup> =0.042 / H&L= 3.8355 |
|--|---|--|
| Education<br>Lower secondary<br>Higher secondary<br>Higher tertiary<br><i>Ref: Lower basic educ.</i>                             |   | 0.894<br>1.365*<br>1.772**                             |
| Work<br>employed<br><i>Ref: unemployed</i>   | 0.860**   | 0.742**  |
| Household composition<br>One<br><i>Ref: more than one.</i>   | 0.777**   |  |
| Feeling unsafe after dark<br>Safe<br>Unsafe&very unsafe<br><i>Ref: very safe</i>   | 1.151*<br>0.961                                       | 1.335*<br>1.344*                                       |
| Social participation<br>Almost the same<br>More than most<br>Much more than most<br><i>Ref: much less t'n most/less t,n most</i> | 0.793**<br>0.760**<br>0.834                           | (2 categories)<br>0.548***<br>1.287                    |
| Political interest<br>Hardly/not at all interested<br><i>Ref: very /quite interested</i>   | 1.099*  | 0.895  |

## 4. Key Results (8)

### Evaluation of the propensity score weighting

**Approach 1:** Is the weighted sample of ESS coop res significantly different from the unweighted sample?

Yes means that the adjustment had effect on sample estimates

**Results:** No significant differences ( $p < 0.05$ ) at all.

## 4. Key Results (9)

### Evaluation of the propensity score weighting

**Approach 2:** does the initial significant differences by type of respondents in the unweighted sample disappear in the weighted sample?

(NMAR to MAR?)

Yes means that the adjustment had effect on sample estimates

**Results: Largely successful:** all differences disappeared except for some variables (**look further**)



## 4. Key Results (10)

### Evaluation of the propensity score weighting Belgium example: ESS coop vs DQS res

|                             | Unweighted       |        | Weighted         |        |
|-----------------------------|------------------|--------|------------------|--------|
|                             | Chi <sup>2</sup> | prob   | Chi <sup>2</sup> | prob   |
| Age categories (df=4)       | 47.544           | <.0001 | 2.008            | 0.734  |
| Educational level (df=3)    | 9.349            | 0.025  | 3.887            | 0.274  |
| Social participation (df=4) | 36.295           | <.0001 | 17.912           | <.0001 |
| Political interest (df=3)   | 84.070           | <.0001 | 25.938           | <.0001 |

all differences disappeared

except social participation & political interest

## 4. Key Results (11)

### Evaluation of the propensity score weighting Norwegian example 1: ESS coop vs NRS nr

|                             | Unweighted       |        | Weighted         |       |
|-----------------------------|------------------|--------|------------------|-------|
|                             | Chi <sup>2</sup> | prob   | Chi <sup>2</sup> | prob  |
| Education category (df=2)   | 40.552           | <.0001 | 1.813            | 0.404 |
| Work status (df=1)          | 11.594           | 0.0007 | 0.470            | 0.493 |
| Political interest (df=3)   | 33.014           | <.0001 | 13.247           | 0.010 |
| Social participation (df=4) | 48.105           | <.0001 | 2.301            | 0.681 |

all differences disappeared  
except political interest

## 4. Key Results (12)

### Evaluation of the propensity weights

### Norwegian example 2: ESS coop vs NRS nr

|   | Unweighted |        | Weighted |       |
|---|------------|--------|----------|-------|
|   | T-value    | prob   | T-value  | prob  |
| How satisfied democracy<br>(df=1864)    | 5.31       | <.0001 | 1.01     | 0.313 |
| Imm. make worse/better<br>(df=1871)     | 5.17       | <.0001 | 0.56     | 0.577 |
| TV watching time per day<br>(df=1878)   | -4.38      | <.0001 | -0.81    | 0.420 |
| Involved in voluntary work<br>(df=1885) | -2.69      | 0.007  | -0.69    | 0.492 |

all differences disappeared

## 4. Key Results (13)

### Evaluation of the propensity score weighting on approach 2: summary in all countries

|                      | BE   | CH   | NO   | PL   |
|----------------------|------|------|------|------|
| Age categories       | N.S. | N.A. | N.A. | N.A. |
| Education level      | N.S. | N.S. | N.S. | N.S. |
| Work status          | N.A. | N.S. | N.S. | N.S. |
| Neighb. security     | N.A. | N.S. | N.A. | N.S. |
| Household comp.      | N.A. | N.S. | N.A. | N.A. |
| Social participation | **   | N.S. | N.S. | ***  |
| Political interest   | ***  | N.S. | *    | ***  |

NA: not applicable; NS: not significant; \*\*\*  $p < .0001$ ; \*\*  $p < .01$ ; \*  $p < .05$

## 4. Conclusion & discussion (1)

### Conclusion from the study

1. Number of variables are detected for non-response bias (education/work/social participation/political interest);
2. Characteristics of nonrespondents (vs. cooperative respondent) are country specific (PL case);
3. Adjustments of propensity score weighting were mostly effective (approach 2); BUT some not;

## 4. Conclusion & discussion (2)

### Discussion

1. Response propensities may take different form;
2. Evaluating weights were performed through 2 approaches,
  - a. Rather small adjustments: small nonresponse bias or small NRS sample size;
  - b. Different approaches to evaluate effectiveness of weights can be explored: use of variables from contact file – it is crucial to study which information to use
3. Future research
  - a. Follow-up NRS/DQS study may be possible through standardized sample design (cost-effective?);
  - b. Use of observable data – data quality enhancement proposed for Round 5.