ESS ERIC DELIVERABLE

ESS ERIC WORK PROGRAMME 02 DECEMBER 2015 – 31 MAY 2017

DELIVERABLE NUMBER: D7.3

DELIVERALBE TITLE: Response based quality report ESS R7

WORK PACKAGE Number: WP7

SUBMITTED BY: KU LEUVEN

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DISSEMINATION STATUS:

SUBMITTED: 28 February 2017

ACCEPTED: 10 April 2017

Classes of Nonrespondents in the ESS: Which Classes are Prioritized and Which Classes should be Prioritized in order to reduce nonresponse bias?

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Abstract: For many years now, survey methodologists have argued that response rates in social surveys are declining. Trends from ESS response rate data up to round 7 confirm that there is a slow decrease, despite the increased fieldwork efforts. Also, in some countries, there are indications of substantial bias due to nonresponse. Most (increased) fieldwork efforts target refusals and noncontacts. This paper examines whether this strategy is adequate in order to reduce nonresponse bias and whether a shift towards other classes of nonrespondents may optimize a bias reduction strategy. The results, based on round 7 of the ESS, suggest that refusal conversion hardly reduces bias and that an attention shift toward nonrespondents due to language barriers may be recommended.

Keywords: Nonresponse bias, classes of nonrespondents, European Social Survey.

1 Introduction

In recent years, nonresponse error has received more attention because of an increasing inabil- ity to contact sample units or the growing unwillingness of these sample units to participate (Singer, 2006). Survey researchers seem to agree that there is an international trend of declining response rates (Atrostic, Bates, Burt, & Silberstein, 2001; de Leeuw & de Heer, 2002; Rogers, Murtaugh, Edwards, & Slattery, 2004; Curtin, Presser, & Singer, 2005). Also in more recent publications, authors seem to endorse the trend of increasing nonresponse rates (Dixon & Tucker, 2010; Bethlehem, Cobben, & Schouten, 2011; Brick & Williams, 2013; Kreuter, 2013).

Some societal evolutions such as new technologies, changes in family composition or survey fatigue may have eroded the favorable climate in which surveys could successfully recruit respondents.

In self-administered surveys, new technologies are deemed to have had a serious impact on the survey environment and responsiveness. In face-to-face interviews, technology affects predominantly the interviewers. In this respect, Dixon and Tucker (2010) and Schaeffer,

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Dykema, and Maynard (2010) state that survey researchers experience increased difficulty in finding capable interviewers at a reasonable cost. Interviewer skills do not only pertain to technological innovations, but also to changing societal aspects such as diversity of house- hold composition, including language barriers or cultural differences. This means that the expectations towards interviewers are increasing, and that those should be compensated by rigorous interviewer selection, training and remuneration.

Apart from the interviewer capacity issue, some important societal factors may contribute to the presumed decline of response rates. Contactability issues may arise from the increase of obstacles or impediments in order to lock unwanted visitors out. Also, so-called gated communities (Tourangeau, 2004) contribute to this problem. Anecdotal evidence from field-work directors from Switzerland or France in the European Social Survey suggests that this growing problem is particularly prominent in bigger cities. Also, at-home patterns affect the ease with which sampled cases can be contacted. This can be related to variables such as labour force participation, life stage, socio-economic status, health and gender (Smith, 1983). According to Goyder (1987), being single, having a paid job, living in an apartment or in a big city and belonging to higher SES groups means that people are harder to contact, while the elderly and larger families are easier to contact. Similar findings can be found in Campanelli, Sturgis, and Purdon (Campanelli et al., 1997). Groves and Couper (1998) ob- serve that families with young children and elderly people are more likely to be at home and are therefore easier to contact. Contactbility may also simply be a function of the number of household members. The larger the household, the more likely at least someone is at home to answer the call/door (Stoop, 2005). Therefore, Dixon and Tucker (2010) argue that as the household size on average declines additional fieldwork efforts may be required to successfully contact the target persons. Similarly, from the observations of Tucker and Lepkowski (2008), one may conclude that the increase of labour market participation among women may have had a detrimental effect on contactability. Slow societal evolutions such as the increase of the proportion of singles, or phenomena such as double-income couples or ageing may further weigh on the recruitment success of surveys.

In many instances, not contactability but cooperation is the major reason for survey nonresponse. In this regard, survey reluctance may be increasingly caused by an increasing number of survey requests and growing awareness or resistance against privacy or confiden-tiality issues (Singer & Presser, 2008).

Apart from contacting and establishing cooperation, ability as a third category of non-response can be discussed. Some people are not mentally or physically able to participate, others may not participate because of language barriers. This implies that in ageing societies or countries with increasing levels of immigration, this source of nonresponse may become more important.

There may be valid reasons to explain why response rates are decreasing, such as the growing resistance toward surveys because of privacy or confidentiality issues, transforming household structures leading to less contactability or the ageing of western societies. Nonethe-less, some authors have posited some doubts about the presumed trend of declining response rates (Groves, 1989; Groves & Couper, 1998; Stoop, 2005). First, response rates are not al- ways consistently calculated or as Smith (1995) states: 'Time series often in whole or in part reflect apple-and-orange comparisons of the past to the present. Even many of presumably consistent time series comparisons are distorted in often uncertain ways by changes in defi- nition of respondent, mode, content, and other procedures'. Second, evolutions of response rates are sometimes rather erratic instead of showing a monotone decrease. Third, fieldwork efforts also evolve over time (in order to anticipate response rate decline) and may strongly affect the evolution of the response rates.

The decline of response rates has set the focus towards the risk of bias due to nonresponse

(Singer, 2006). This growing awareness of the risk of nonresponse bias has also led to increased attention in the Central Scientific Team (CST) of the ESS. One of the initiatives that have been taken in order to assess such bias, is the collection of auxiliary variables on the level of the sample cases. These variables are observed by interviewers (vandalism/litter in the neighbourhood, physical state of the dwelling, entry impediments to the buildings) and in some countries, gender and age information is available from the sample frames.

This paper seeks to zoom in on the so called 'classes of nonrespondents' approach (Lin & Schaeffer, 1995), which assumes that not all nonrespondents are similar (an assumption that is more in line with the 'continuum of resistance' model). Classes of nonrespondents may be refusals, noncontacts, language barriers, illness, etc. and because of their specific nature, they may contribute differently to nonresponse bias. As a consequence, different prioritization routines during conversion attempts may have a different impact on nonresponse bias at the end of fieldwork. Therefore, this deliverable seeks to find optimal prioritization schemes, minimizing nonresponse bias and compare these with the prioritization routines that are applied in ESS7.

First, this deliverable will provide descriptive information about ESS response rates until round 7, and will document the increased fieldwork efforts in order to (try to) maintain response rates rates. Then, a nonresponse bias analysis is provided for round 7. Subsequently, the prioritization of the different classes of nonrespondents is discussed for round 7, providing optimal fieldwork routines that should have been carried out in order to minimize nonresponse bias. Finally, the classes of nonrespondents are also compared regarding their answers to questions from the main questionnaire.

2 Evolution of response rates and fieldwork efforts in the European Social Survey

The ESS requirements state that each participating country should aim for a response rate of 70% or more. The response rates are calculated as the total number of completed inter- views divided by the sample size from which the identified ineligible cases are subtracted (AAPOR RR1). Ineligibles are defined as 'Respondent deceased', 'Respondent moved out of the country', 'Derelict or demolished house', 'Not yet built, not ready for occupation', 'Not occupied', 'Address not residential: business', 'Address not residential: institution', and 'other ineligible'.

Figure 1 gives an overview of the obtained response rate in each participating country of round 7 of the ESS. The benchmark of 70% is clearly marked in the figure.

The graph clearly shows that, except Israel, none of countries were capable of achieving the prescribed 70% response rate. Only six countries were able to exceed 60%.

In Figure 2, the red lines are the response rates for each particular country. The blue and the gray lines are identical in each country. The blue line represents the response rate objective of 70%. As can be seen, many countries have never or rarely achieved this 70% response rate objective. In fact, in only 43 out of 182 country-round combinations the actual response rate exceeds the objective. The gray line is the trend line over all countries. This is modelled as $rr_{ij} = \gamma_{00} + \gamma_{10}R_i + \mu_{0j} + \varepsilon_{ij}$, where rr_{ij} represents the response rate for ESS round i and for country j. γ_{00} is the overall intercept of the model, γ_{10} represents the effect of the round (R_i 1 to 7). The random effect μ_{0j} accommodates for the country differences and is necessary because not all countries participated in all seven rounds. The parameter estimates for R_i are are added (or subtracted) from γ_{00} in order to construct the trend-line. When specifically considering round 7, a clear decline of response rates compared to round 6 can be observed in Estonia, Hungary, Ireland, Lithuania, Poland, Portugal, Slovenia and the United Kingdom. Some other countries such as Belgium, Czech Republic, Denmark, France,

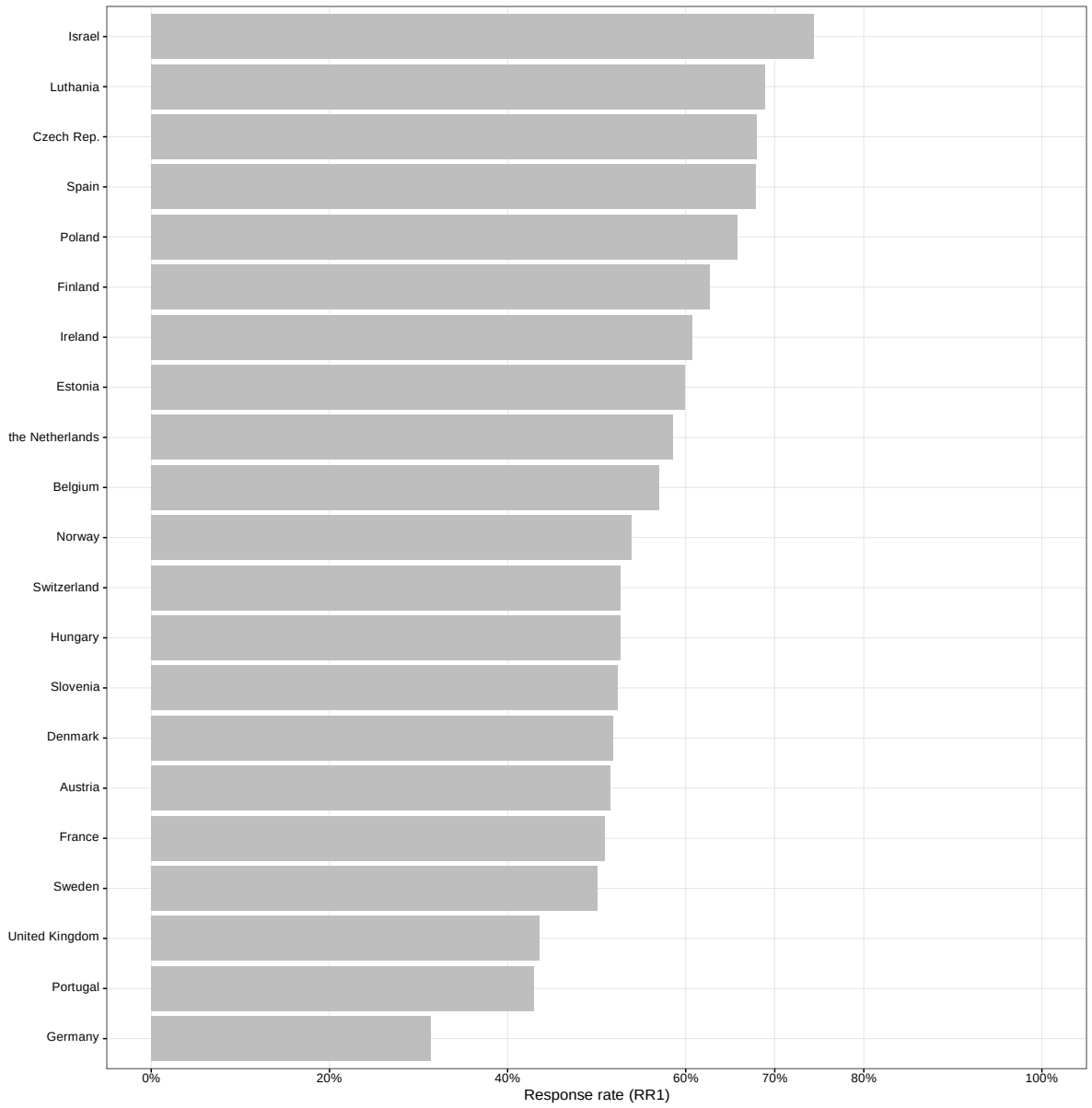

Figure 1: Response rates per country, ESS7[1]

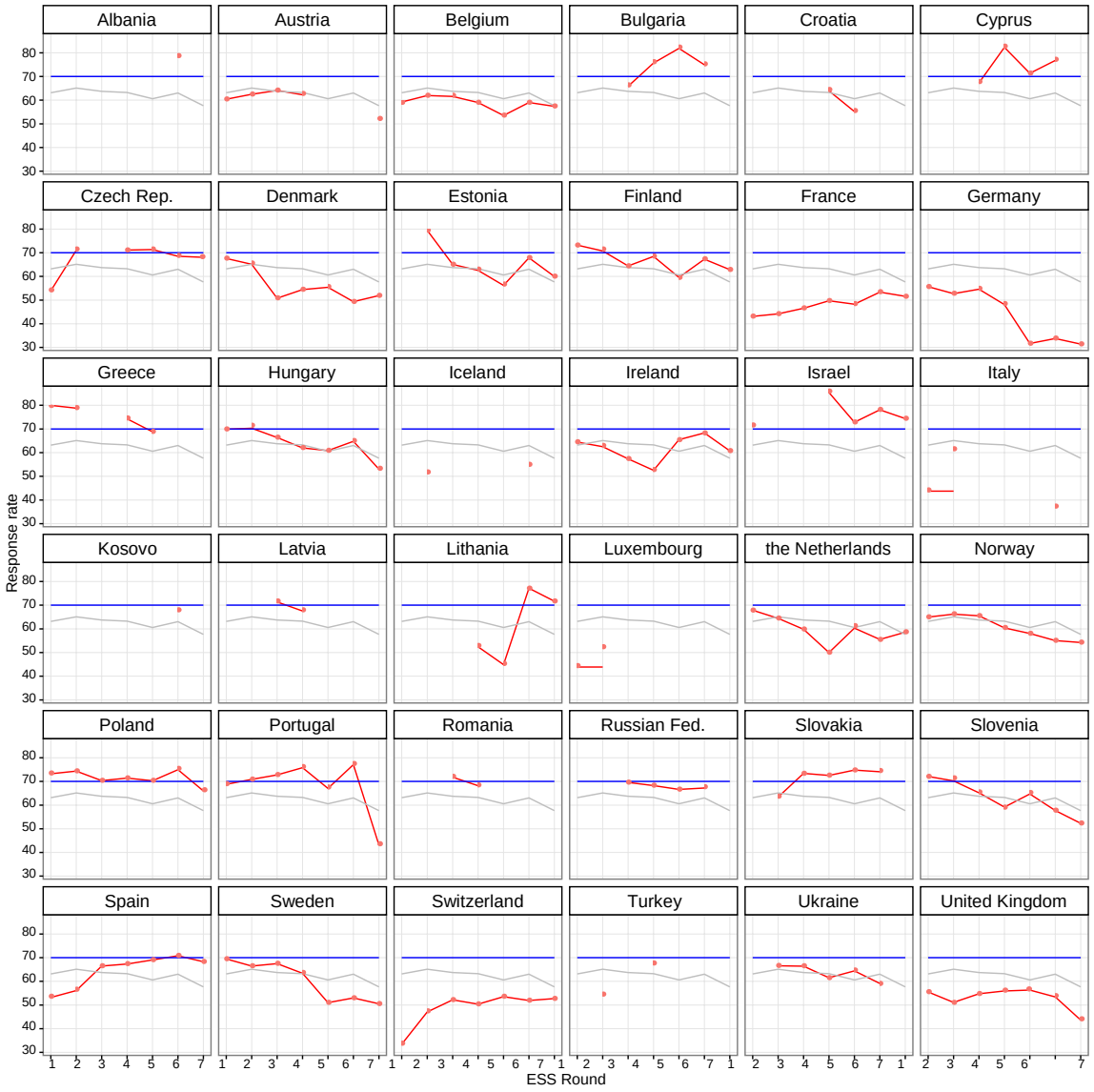

Figure 2: Response rates, ineligibles excluded, over 7 different ESS rounds

Germany, the Netherlands, Spain, Sweden and Switzerland could keep their response rates relatively stable as compared to round 6. Clearly in the last ESS rounds increasing response rates are hard to observe in Figure 2 and this might explain why there is a downward trend of the grey line, representing the overall response rate, particularly between round 6 and 7.

This unfavourable response rate trend may (partially) be explained by a deteriorating survey climate in many European countries. Feedback from national coordinators (NC Forum and Fieldwork Direction meetings) tell that it has become increasingly difficult to make contact with and persuade people to establish an interview. In some countries, there are indications that it also becomes increasingly difficult to maintain interviewer capacity.

The evolution of response rates may also be affected by the fieldwork strategies countries deploy, as some countries may have altered fieldwork efforts over the years in order to attain better response rates or in order to anticipated response deterioration.

Figure 3 provides the evolution of seven indicators of fieldwork efforts, many showing increasing trends[2].

[2]As well as the overall response rate trend line, these effort indicators are modelled as $\boldsymbol{eff}_{ij} = \gamma_{00} +$

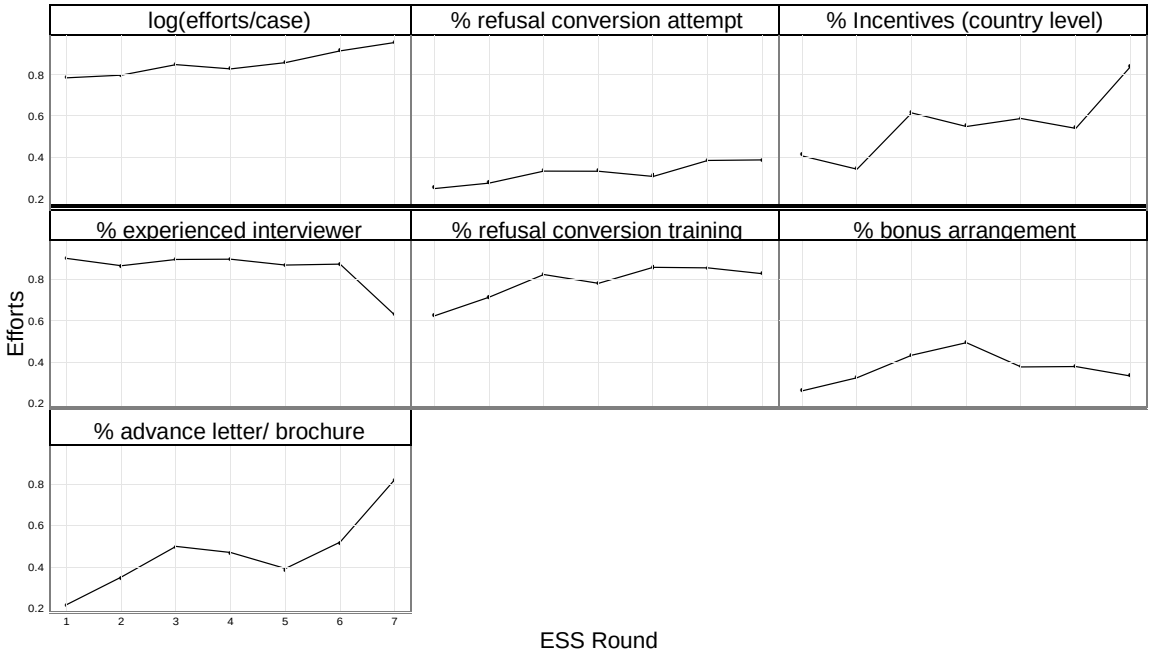

Figure 3: Fieldwork efforts, over different ESS rounds

- There seems to be an increasing trend regarding the number of contact efforts (at- tempts) per case ('log(efforts/case)'). This indicator is directly measured from the contact forms. There is a risk that these forms are filled out more consistently over the rounds so that first rounds of ESS have more under-reporting. Therefore, this last indicator should be carefully interpreted.
- The 'conversion probability' (expressed as the the average re-approach probability after a first refusal) also seems to be almost consistently increasing.
- 'Respondent incentives (%)' (the percentage of countries providing an incentive[3] for respondents) strongly ascends between round 2 and 3 and behaves relatively stable after that, between round 6 and 7, a sudden increase of countries providing incentives can be observed again.
- Quite striking is the fact that after a reasonably stable percentage of experienced in- terviewers during the first 6 rounds of ESS, round 7 has deployed substantially less experienced interviewers.
- Refusal conversion training has increased in the beginning of the ESS (rounds 2 and 3), but remains quite stable since round 3.
- Bonus payments to interviewers have peaked in round 4.
- It also appears that the use of advance letters has strongly increased in ESS7 as com- pared to ESS6.

$\gamma_{10} R_i + \mu_{0j} + \varepsilon_{ij}$, where eff_{ij} represents on the effort indicators for ESS round i and for country j. γ_{00} is the overall intercept of the model, γ_{10} represents the effect of the round (R_i 1 to 7). The random effect μ_{0j} accommodates for the country differences and is necessary because not all countries participated in all seven rounds. The parameter estimates for R_i are used to construct the trendline.

[3] All kinds of incentives are taking into account here: monetary as well as non-monetary, conditional as well as unconditional

Generally, a steady increase of response enhancement activities or efforts can be observed throughout the different rounds of ESS, apart from the deployment of experienced interviewers[4]. Despite these increased efforts, response rates are still declining, suggesting a deterioration of the general survey climate. Also, other aspects such as privacy concerns or legislation may play an unfavourable role.

3 Nonresponse bias in the European Social Survey, round 7

Nonresponse bias occurs when the obtained set of respondents deviates from the full sample. An overall estimate of the bias for variable a can be obtained by calculating the difference between the means among respondents only and the full sample. That bias is then standardized by dividing it by the standard deviation of variable a. Formally, the bias can be denoted $\frac{1}{8}\sum_{j=1}^{8}\frac{\bar{a}_{r,j}-\bar{a}_{f,j}}{\sigma_{a_j}}$, where for the j^{th} auxiliary variable a, the difference is determined between the respondent mean $\bar{a}_r$ and the full sample mean $\bar{a}_f$, and standardized by dividing by σ_a. Equivalently, the contrast (between respondents and nonrespondents) is determined by $\frac{1}{8}\sum_{j=1}^{8}\frac{\bar{a}_{r,j}-\bar{a}_{nr,j}}{\sigma_{a_j}}$, where $\bar{a}_{nr,j}$ is the nonrespondent mean. The underlying reason for nonresponse bias to occur is when nonresponse is not at random (= if every sampled case had an equal probability or propensity to respond). As soon as response propensities are unequal, there is a risk of nonresponse bias.

For each country in ESS7, there is a maximum of eight auxiliary variables available for which bias can be measured. Table 1 provides an overview of these available variables and indicates the extent to which respondents (first proportion in each column) deviate from the full sample (second proportion in each column; between parentheses). For example, in Aus- tria the proportion of cases of whom vandalism was reported by the visiting interviewer was 15.8% among respondents and 14.9% among the full eligible sample. For 0.7% of the respon- dents, no valid information was registered by the interviewer regarding the vandalism variable (0.4% of the full sample). The countries for which the most substantial differences between respondents and full sample can be observed are Belgium ('closed gate', 'entry phone' and 'apartment'), Denmark (state of the dwelling), Estonia (age and gender), Finland ('apart- ment'), France ('apartment'), Hungary (gender), Norway (age), Sweden and most of the variables in Switzerland.

Figure 4 provides a nonresponse bias analysis as a function of the number of contact attempts per case. The first dot on the left hand side of each graph indicates what the bias and contrast would be in the case where all sample case are attempted only once. The second dot provides bias, contrast and response rate information if cases are attempted twice or less[5], the third, and so forth. Therefore, the x-axis of the graphs indicate the progress of the response rates of each country as a function of increased contact efforts per case.

Only auxiliary variables have been used for which at 90% is available. So, as soon as there is 10% item nonresponse (not observed or filled out by the interviewer) for a variable, it is not taken into account in Figure 4. That is why an analysis can not be presented for a few countries.

A first observation related to Figure 4 is that countries differ regarding the number of contact attempts per case. Countries such as Austria and the Czech Republic on average make only two contact attempts per case while Sweden, France or Finland register on average more than 5 contact attempts per case. In Figure 4, this results in many more dots in country- specific graphs for these latter countries.

[4] Although it not sure that deploying experienced interviewers guarantees an increase in response rates.

[5] In the event that a second attempt never took place

Table 1: Nonresponse analysis for eight auxiliary variables in ESS7

	VANDA			LITTER			PHYS			LOCKED GATE		
	++	–	NA	++	–	NA	++	–	NA	Yes	No	NA
Austria	0.158 (0.149)	0.835 (0.848)	0.007 (0.004)	0.212 (0.207)	0.781 (0.789)	0.007 (0.004)	0.379 (0.351)	0.613 (0.645)	0.007 (0.004)	0.276 (0.292)	0.717 (0.705)	0.007 (0.004)
Belgium	0.057 (0.060)	0.943 (0.938)	.–– (0.002)	0.144 (0.140)	0.856 (0.858)	.–– (0.002)	0.363 (0.358)	0.637 (0.640)	.–– (0.002)	0.180 (0.221)	0.820 (0.777)	.–– (0.002)
Switzerland	0.077 (0.099)	0.923 (0.901)		0.202 (0.222)	0.798 (0.778)		0.249 (0.237)	0.751 (0.763)		0.660 (0.671)	0.340 (0.329)	
Czech R.	0.306 (0.296)	0.694 (0.704)		0.392 (0.381)	0.608 (0.619)		0.314 (0.312)	0.686 (0.688)		0.615 (0.604)	0.385 (0.396)	
Germany	0.053 (0.079)	0.653 (0.714)	0.294 (0.207)	0.111 (0.153)	0.595 (0.641)	0.294 (0.207)	0.189 (0.177)	0.517 (0.617)	0.294 (0.207)	0.286 (0.345)	0.420 (0.448)	0.294 (0.207)
Denmark	0.063 (0.076)	0.936 (0.917)	0.001 (0.008)	0.128 (0.153)	0.870 (0.840)	0.001 (0.007)	0.380 (0.311)	0.620 (0.682)	0.001 (0.007)	0.116 (0.134)	0.882 (0.858)	0.001 (0.007)
Estonia	0.095 (0.088)	0.905 (0.850)	.–– (0.062)	0.186 (0.175)	0.814 (0.763)	.–– (0.062)	0.336 (0.308)	0.664 (0.631)	.–– (0.062)	0.337 (0.346)	0.663 (0.592)	.–– (0.062)
Spain	0.183 (0.202)	0.817 (0.798)		0.182 (0.203)	0.818 (0.797)		0.225 (0.197)	0.771 (0.796)	0.004 (0.006)	0.217 (0.220)	0.778 (0.774)	0.004 (0.006)
Finland	0.031 (0.038)	0.965 (0.931)	0.003 (0.031)	0.071 (0.076)	0.925 (0.892)	0.004 (0.032)	0.291 (0.263)	0.703 (0.705)	0.006 (0.032)	0.179 (0.200)	0.804 (0.757)	0.017 (0.042)
France	0.102 (0.130)	0.898 (0.870)		0.138 (0.163)	0.862 (0.837)		0.336 (0.314)	0.664 (0.686)		0.161 (0.194)	0.839 (0.806)	
UK	0.079 (0.091)	0.921 (0.889)	.–– (0.021)	0.232 (0.246)	0.768 (0.733)	.–– (0.021)	0.241 (0.204)	0.759 (0.775)	.–– (0.021)	0.078 (0.101)	0.922 (0.876)	0.000 (0.023)
Hungary	0.149 (0.132)	0.851 (0.868)		0.322 (0.282)	0.678 (0.718)		0.141 (0.150)	0.859 (0.850)		0.762 (0.799)	0.238 (0.201)	
Ireland	0.065 (0.063)	0.935 (0.937)		0.153 (0.148)	0.847 (0.852)		0.557 (0.546)	0.443 (0.454)		0.064 (0.086)	0.936 (0.914)	
Israel	0.352 (0.350)	0.648 (0.650)		0.448 (0.449)	0.552 (0.551)		0.347 (0.337)	0.653 (0.663)		0.232 (0.243)	0.768 (0.757)	
Luthania	0.151 (0.166)	0.843 (0.829)	0.007 (0.005)	0.318 (0.346)	0.676 (0.649)	0.007 (0.005)	0.116 (0.107)	0.877 (0.888)	0.007 (0.005)	0.322 (0.321)	0.665 (0.670)	0.012 (0.009)
Netherl.	0.082 (0.087)	0.912 (0.873)	0.006 (0.039)	0.187 (0.205)	0.805 (0.754)	0.008 (0.041)	0.360 (0.326)	0.633 (0.633)	0.007 (0.041)	0.048 (0.055)	0.939 (0.899)	0.013 (0.046)
Norway			1.000 (1.000)			1.000 (1.000)			1.000 (1.000)			1.000 (1.000)
Poland	0.230 (0.223)	0.752 (0.672)	0.018 (0.105)	0.230 (0.215)	0.752 (0.680)	0.017 (0.104)	0.272 (0.247)	0.711 (0.652)	0.017 (0.102)	0.398 (0.333)	0.585 (0.565)	0.017 (0.102)
Portugal	0.082 (0.082)	0.898 (0.897)	0.020 (0.021)	0.142 (0.147)	0.842 (0.837)	0.017 (0.016)	0.225 (0.209)	0.758 (0.775)	0.017 (0.016)	0.692 (0.677)	0.292 (0.307)	0.016 (0.015)
Sweden			1.000 (1.000)			1.000 (1.000)			1.000 (1.000)			1.000 (1.000)
Slovenia	0.078 (0.096)	0.919 (0.891)	0.002 (0.013)	0.118 (0.138)	0.881 (0.849)	0.002 (0.013)	0.182 (0.152)	0.817 (0.836)	0.002 (0.012)	0.464 (0.476)	0.534 (0.512)	0.002 (0.012)

	ENTRY PHONE			DWELLING UNIT			GENDER			AGE				
	Yes	No	NA	Single	Multi	NA	Female	Male	NA	<20	21-40	41-60	>60	NA
Austria	0.583 (0.570)	0.410 (0.426)	0.007 (0.004)	0.485 (0.484)	0.508 (0.510)	0.008 (0.006)	0.525 (0.505)	0.475 (0.495)		0.044 (0.023)	0.308 (0.159)	0.360 (0.186)	0.284 (0.147)	0.003 (0.485)
Belgium	0.232 (0.288)	0.768 (0.710)	.–– (0.002)	0.848 (0.794)	0.151 (0.203)	0.001 (0.004)	0.493 (0.514)	0.507 (0.486)		0.076 (0.061)	0.300 (0.305)	0.339 (0.341)	0.285 (0.292)	
Switzerland	0.365 (0.395)	0.635 (0.605)		0.482 (0.423)	0.508 (0.559)	0.010 (0.018)	0.501 (0.516)	0.499 (0.484)		0.097 (0.072)	0.293 (0.315)	0.341 (0.352)	0.270 (0.260)	
Czech R.	0.607 (0.604)	0.393 (0.396)		0.502 (0.515)	0.497 (0.484)	0.000 (0.001)	0.541 (0.457)	0.448 (0.390)	0.011 (0.153)	0.087 (0.073)	0.322 (0.273)	0.341 (0.290)	0.245 (0.215)	0.005 (0.149)
Germany	0.356 (0.414)	0.351 (0.379)	0.294 (0.207)	0.399 (0.392)	0.307 (0.401)	0.294 (0.207)	0.495 (0.514)	0.505 (0.486)	.–– (0.000)	0.071 (0.057)	0.246 (0.272)	0.356 (0.353)	0.301 (0.302)	0.026 (0.015)
Denmark	0.201 (0.225)	0.798 (0.767)	0.001 (0.007)	0.727 (0.673)	0.272 (0.323)	0.001 (0.005)	0.481 (0.507)	0.519 (0.493)		0.088 (0.086)	0.283 (0.300)	0.352 (0.332)	0.277 (0.282)	
Estonia	0.569 (0.534)	0.431 (0.405)	.–– (0.062)	0.263 (0.247)	0.736 (0.690)	0.000 (0.063)	0.593 (0.564)	0.407 (0.436)		0.055 (0.057)	0.291 (0.327)	0.323 (0.319)	0.331 (0.296)	
Spain	0.739 (0.752)	0.257 (0.242)	0.004 (0.006)	0.375 (0.346)	0.621 (0.650)	0.004 (0.004)	0.486 (0.496)	0.514 (0.504)		0.079 (0.065)	0.308 (0.323)	0.359 (0.348)	0.254 (0.263)	
Finland	0.102 (0.110)	0.881 (0.847)	0.017 (0.042)	0.665 (0.603)	0.332 (0.367)	0.003 (0.030)	0.514 (0.515)	0.486 (0.485)		0.062 (0.072)	0.245 (0.280)	0.324 (0.325)	0.369 (0.323)	
France	0.432 (0.476)	0.568 (0.524)		0.595 (0.531)	0.401 (0.465)	0.004 (0.004)			1.000 (1.000)					1.000 (1.000)
UK	0.105 (0.134)	0.895 (0.843)	0.000 (0.023)	0.838 (0.793)	0.162 (0.185)	0.000 (0.023)			1.000 (1.000)					1.000 (1.000)
Hungary	0.324 (0.368)	0.676 (0.632)		0.713 (0.678)	0.287 (0.322)		0.571 (0.529)	0.429 (0.471)						1.000 (1.000)
Ireland	0.055 (0.081)	0.945 (0.919)		0.923 (0.899)	0.074 (0.099)	0.003 (0.002)			1.000 (1.000)					1.000 (1.000)
Israel	0.284 (0.289)	0.716 (0.711)		0.343 (0.335)	0.657 (0.665)				1.000 (1.000)					1.000 (1.000)
Luthania	0.244 (0.248)	0.744 (0.743)	0.012 (0.009)	0.462 (0.465)	0.532 (0.530)	0.006 (0.004)			1.000 (1.000)					1.000 (1.000)
Netherl.	0.194 (0.221)	0.793 (0.733)	0.013 (0.046)	0.752 (0.682)	0.239 (0.275)	0.010 (0.042)			1.000 (1.000)					1.000 (1.000)
Norway			1.000 (1.000)			1.000 (1.000)	0.468 (0.496)	0.532 (0.504)		0.100 (0.093)	0.290 (0.322)	0.350 (0.335)	0.260 (0.250)	
Poland	0.394 (0.417)	0.589 (0.482)	0.017 (0.102)	0.584 (0.479)	0.402 (0.422)	0.014 (0.099)	0.542 (0.533)	0.458 (0.467)		0.072 (0.063)	0.331 (0.349)	0.321 (0.316)	0.276 (0.272)	
Portugal	0.513 (0.564)	0.471 (0.421)	0.016 (0.015)	0.643 (0.564)	0.357 (0.430)	.–– (0.006)			1.000 (1.000)					1.000 (1.000)
Sweden			1.000 (1.000)			1.000 (1.000)	0.504 (0.508)	0.496 (0.492)		0.070 (0.077)	0.291 (0.311)	0.309 (0.313)	0.330 (0.299)	
Slovenia	0.262 (0.309)	0.736 (0.678)	0.002 (0.012)	0.729 (0.669)	0.266 (0.312)	0.006 (0.019)	0.540 (0.509)	0.460 (0.491)		0.069 (0.058)	0.278 (0.290)	0.331 (0.327)	0.322 (0.324)	

Proportion among respondents (proportion among full eligible sample)

VANDAA: '++': Much vandalism/graffiti observed in the immediate vicinity by the visiting interviewer; '–' not much vandalism/graffiti observed)

LITTER: '++': Much litter/rubbish observed in the immediate vicinity by the visiting interviewer)

PHYS: '++': Good physical state of the building of the sample case, as observed by the visiting interviewer; '–' bad physical state)

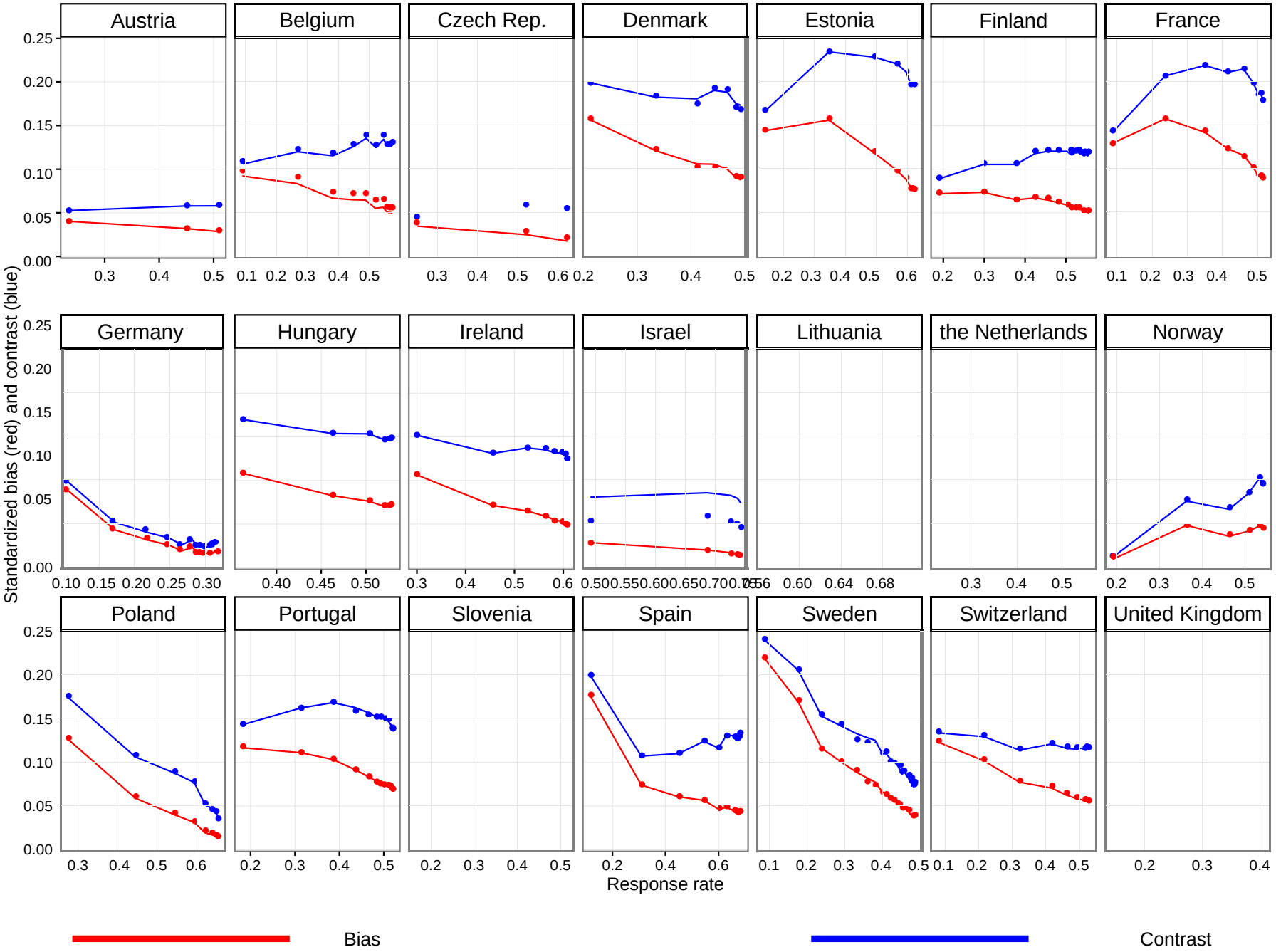

Figure 4: Nonresponse bias evolution and response rate, as a function of contact attempts per case, ESS7

Given an auxiliary variable a, the expression for its bias is $\frac{n_{nr}}{n}(\bar{a}_r - \bar{a}_{nr})$[6]. Bias reduction can be obtained by (1) reducing the nonresponse rate or (2) reducing the contrast between respondents and nonrespondents.

The second strategy may apply to Germany, Sweden and Poland, where additional con- tact attempts per case seem to pay off in terms of reduced bias. Clearly, the bias reduction is primarily realized by reducing the contrast between respondents and nonrespondents. Provided that these countries (Germany in particular) have a low response rate, the bias does not seem to be severely affected by that low response rate.

Belgium and Finland clearly belong the group of countries where the response rate is the main contributor to the reduction of bias. The contrast in these countries does not decrease (or may even increase) as a result of increased fieldwork efforts. Also Austria, the Czech Republic, Switzerland and Denmark show a similar pattern. Comparing Belgium and Germany, where bias, contrast and response rate were relatively similar after the first contact attempt, Germany considerable succeeded in reducing its bias, through contrast reduction, even though its response rate was eventually relatively low. Because Belgium only increased its response without reducing its contrast, the bias is still considerable at the end of the fieldwork. This may coincide with the fieldwork strategy in Belgium that has applied refusal conversion, mainly to increase the response rate, rather than combating bias.

The evolution of Estonia, France (and to some extent Norway) is much harder to interpret. Bias and contrast clearly increase between the first and second contact attempt, after which the bias (not the contrast) starts to reduce again.

4 Classes of nonrespondents

Increasing the fieldwork efforts per case case by approached through two different theoretical starting points (Lin & Schaeffer, 1995). First, the continuum of resistance model assumes a (strong) correlation between the effort during the fieldwork and the characteristics of the respondents. This means that late responders are more like the final nonrespondents or that converted refusals are also more like final refusers (Smith, 1984). Under this assumption, the composition of the sample is expected to improve as more fieldwork efforts are made. Second, the classes of nonparticipants model rejects the starting point that there is only one single mechanism that explains survey participation (namely effort), and advances the idea that there are a variety of factors that contribute to the decision of whether to participate. This latter perspective is therefore obviously more skeptical about the usefulness of additional survey efforts in order to assess the effects of nonresponse. In addition, consideration should be given to the fact that additional fieldwork efforts may be directed toward the cases that are deemed more responsive, leaving a potentially different group of persistent nonrespondents out of the picture. Therefore, the classes-of-participants model anticipates an improvement of the sample composition only if the relevant classes of nonrespondents are identified and additional efforts are made to pursue the equality of participation.

The results as shown in Figure 4 can be considered as an example of the 'continuum of resistance' model, as opposed to the 'classes of nonrespondents' model. Under this model, it can be assumed, for example, that nonresponse due to health issues may relate more to variables such as age, well-being or alcohol use, nonresponse due to a language barrier may affect variables related to migration or discrimination, noncontact may relate to type of housing, population density, etc.

Revisiting Figure 4, one might consider that in some countries the conversion of initially nonresponding cases only added 'more of the same', leaving specific groups out of the eventual

[6] $\frac{n_{nr}}{n}$ expression of the nonresponse rate and $\bar{a}_r - \bar{a}_{nr}$ expression the contrast between respondents (r) and nonrespondents (nr) related to auxiliary variable a.

respondent set.

Therefore, this paper seeks to assess

- how nonresponse bias can be reduced by optimally prioritizing different classes of pending nonrespondents,
- how ESS fieldwork currently prioritizes these classes, and
- to what extent these classes differ regarding the target variables of the ESS questionnaire.

4.1 Defining classes of nonrespondents

Survey requests may not be successful at the first attempt, but may need additional attempts leading to an interview. Therefore, after an unfruitful first attempt, many cases are still pending. Depending on the specific outcome of that first attempt (such as refusal, noncontact, illness, language barrier, . . .) the expected success rate for further attempts may vary. The following list provides definitions for such (pending) classes of initial nonrespondents. Cases can be assigned to one of these classes based on information obtained from the contact form dataset.

- **Hard refusals:** The refusal is assessed by the interviewer as being very unlikely to be successfully converted (not assessed are also included in this class)
- **Moderate refusals:** The refusal is assessed by the interviewer as being rather unlikely to be successfully converted
- **Soft refusals:** The refusal is assessed by the interviewer as being rather likely to be successfully converted
- **Noncontact:** There was no contact at all with the case
- Case is **unavailable**/not at home until …
- Mentally/physically unable/**ill**/sick (**short term** and therefore could revisit during the fieldwork period)
- Mentally/physically unable/**ill**/sick (**long term** and would be unable to complete interview during the fieldwork period)
- **Partial** interview
- Case has **moved out of country**
- Case **moved to unknown destination**
- Case **has moved, still in country**
- **Language** Barrier
- **Broken** appointment
- **Deceased**
- **Invalid** address
- **Other** reason for nonresponse

In principle, the class to which the initially nonresponding case is assigned is coded at the first contact attempt. However, as this leads to a large-sized group of noncontacts, the code may also be assigned at the second or third attempt, on the condition that previous attempts have resulted in a noncontact. For example, a case with an event history of noncontact - noncontact - hard refusal will be assigned to the class of hard refusals. Similarly, when an appointment is made at the first contact attempt, and is not followed by an interview, the assigned code for the nonrespondent class is determined at the second attempt. For exam- ple, the contact sequence appointment - unavailable will be coded as unavailable. 'Broken appointment' is only coded in cases where broken appointments are followed by noncontacts. Figure 5 provides an overview of these initial nonresponse classes per country. The num- bers in the cells of the grid indicate the number of cases that have been observed for the particular nonresponse class in each country. For example, in Austria, 111 cases were initially (after the first contact attempt) coded as 'not available'. Also remark that the last column of the grid displays the number of initially completed interviews. The intensity of the colour of the cell expresses the probability of converting a case if it would be selected for conversion attempts. Thus, cases that have not been reissued have not been taken into account in order to determine the conversion likelihood. As a reference, note that success percentage for 'not available' in Austria is 50.2%.

In some countries, the initial response is quite considerable, only leaving a relatively modest amount of pending nonrespondent cases. This applies to the Czech Republic, Estonia, Israel and Lithuania. In countries such as Belgium, Denmark, Finland, France, Germany, The Netherlands, Norway, Spain, Sweden, Switzerland or the UK, the initial response is rather low, leaving many cases to be candidates to be re-issued. Classes of nonrespondents that are generally frequently observed include 'not available', 'broken appointment', 'noncontact' and 'hard refusal'. Some classes are rather exceptional such as long and short term disability, language barrier, partial interviews or mild refusals. For some classes, the frequencies strongly vary between countries, of which the 'other' category is a good example.

Conversion success (indicated by darker shades in Figure 5) is more likely for the 'not available' class, the broken appointments, the (known) moved cases and the partial interviews. Long term disability, language barriers, invalids and most refusal classes tend to be harder to convert. Also, for some of the classes of nonrespondents, conversion success is strongly country dependent.

Whether or not cases are re-issued is the main subject of this deliverable and will be documented later on.

4.2 Method: How to optimally assign follow-up attempts to the different classes of nonrespondents in order to reduce nonresponse bias?

With the following set of model specification, we wish to simulate fieldwork extensions that add converted cases to the initial respondents, trying the keep the nonresponse bias below a certain threshold, while minimizing the number of contact attempts. As a result of this simulation, we quantify the extent to which the different classes of nonrespondents should be prioritized in follow-up fieldwork efforts in order to minimize nonresponse bias. The reason why some classes may be prioritized is that some classes have distinct characteristics that can improve the composition of the eventually obtained set of respondents after the follow-up efforts.

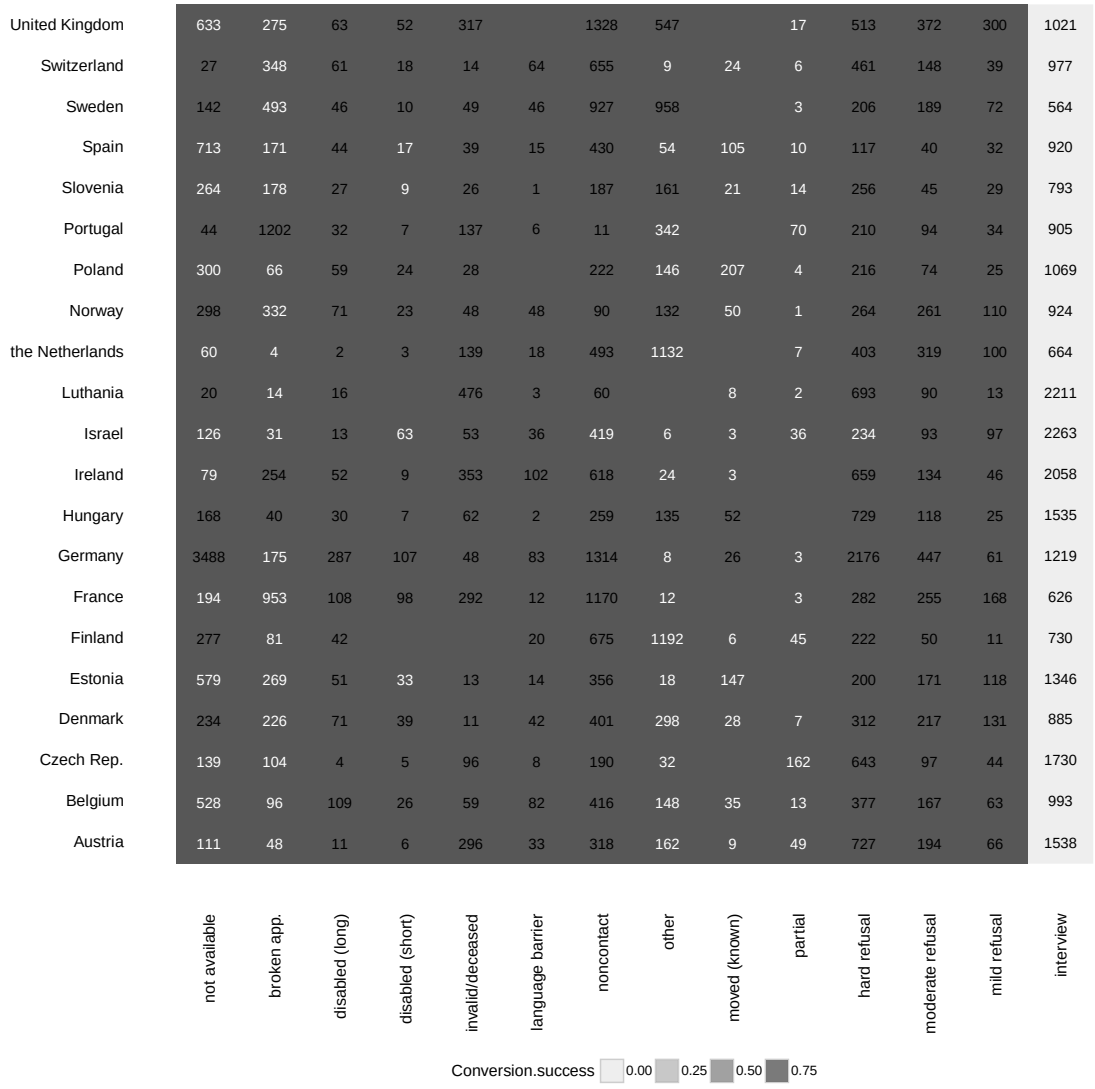

Figure 5: Classes of nonrespodents, frequencies and conversion success, ESS7

$$n_{final} = n_{initial} + \sum_{c=1}^{13} n_c(1-(1-\rho_c)^{k_c}) \quad (1)$$

$$bias_{final} = \frac{1}{n} \sum_{j=1}^{A} \frac{\bar{a}_{final,j} - \bar{a}_{f,j}}{\sigma_{a_j}} \quad (2)$$

$$min(E = \sum_{i=1} k_i) \quad (3)$$

$$bias_{final} < \alpha \quad (4)$$

Expression 1 defines how converted cases are added to the initially recruited set of respondents. For each class of nonrespondents c an amount of efforts k_c will be determined, with which a probability will be obtained ($1-(1-\rho_c)^{k_c}$) of converting a case from class c. The underlying statistical distribution is the geometric distribution. For example, if the success rate of class c is 0.22 (= ρ_c) and if for a case from that nonrespondent class 3 contact attempts are projected, the expected conversion success is $1-(1-0.22)^3 = 0.5254$. Multiplying this conversion success with the number of cases in class c gives the expected number of converted cases in that class.

The bias of the eventually obtained set of respondents can be determined by taking the average standardized bias that applies to the available auxiliary variables. $\bar{a}_{f,j}$ and σ_{a_j} represent the mean and standard deviation of the auxiliary variable a in the full sample (respondents and nonrespondents). $\bar{a}_{final,j}$ is the mean of the auxiliary variable a for the realized set of respondents after the additional fieldwork efforts are applied. An important assumption in this regard is that all cases of the same class have an equal probability to be converted, implying that the eventually converted cases of class c are representative of the entire class c. For example, if 20% of the cases of the class 'mild refusals' in Austria live in apartments, then this percentage also applies to the cases of this class that are eventually converted and will belong to the the set of final respondents.

In other words, the bias can be reduced by selecting the optimal number of cases per class of nonrespondents. This optimal number can be obtained by choosing the optimal number of additional contact attempts for all cases in the same class, taking the success rate ρ_c of that class into account.

The simulation study will be illustrated by means of a simple fictitious situation, presented in Table 2. In a sample of n=2000, 1000 cases have been interviewed after the first contact attempt (see column 'n' in Table 2). There are three classes of nonrespondents: 400 cases are identified as refusals, there are 300 noncontacts and 300 'others'. In the full sample, 50% of the cases are men, although among the initially recruited cases, only 45% are men. As a consequence, a bias of 5 percentage points is observed or $\alpha = (0.50 - 0.45)/\sqrt{0.5 \times (1-0.5)} = 0.1$. Among the refusals, the distribution of men and women is very similar as compared to the initial respondents, so that converting refusals is probably not very likely to the improve the gender distribution in the finally obtained set of respondents (initial + converted). Among the noncontacts, and particularly the 'other' class of nonrespondents, many more men can be found. This makes these latter two classes more appropriate to try to convert additional cases from. It is also known that the different classes of nonrespondents have different response propensities. The probability of converting a refusal (ρ) at the next contact attempt is 30% is this example, whereas noncontacts have a higher conversion success (50%) and the 'other' class only 10%. These estimates can in practice be derived from former rounds of data collection. In the case of ESS7, these estimates will be obtained from ESS6.

Table 2: Illustration of optimization in order to minimize nonresponse bias, fictitious data

Situation after first contact attempt (α = 0.10):

	n	%man	ρ
initial	1000	0.45	
refusals	400	0.46	0.30
noncontacts	300	0.52	0.50
other	300	0.70	0.10
full sample	2000	0.50	
α		0.10	

Follow-up optimized towards α = 0.03:

	k_c	k_i	# converted cases	updated n	%man
Initial + converted				1287.67	0.485
refusals	0.00	0.00	0.00	400.00	0.46
noncontacts	297.67	0.99	149.19	150.81	0.52
other	1762.89	5.88	138.48	161.52	0.70
full sample				2000	0.50
α					0.03

Follow-up optimized towards α = 0.01:

	k_c	k_i	# converted cases	updated n	%man
Initial + converted				1379.69	0.495
refusals	0.00	0.00	0.00	400.00	0.46
noncontacts	373.14	1.14	173.33	126.67	0.52
other	3082.01	10.27	198.37	101.63	0.70
full sample				2000	0.50
α					0.01

The first optimization in Table 2 allows a final bias of $\alpha = 0.03$, while minimizing the number of follow-up contact attempts to stay below this level of bias. Therefore, the class of noncontacts is attributed 297.67[7] additional contact attempts, or 0.99 attempts per individual in this class (297.67/300). These efforts generate $300 \times (1 - (1 - 0.50)^{0.99}) = 149.19$ cases that can be added to the pool of recruited respondents (initial + converted). Similarly, the 1762.89 attempts to be divided over 300 'other' pending nonrespondents generates 138.48 completed cases. In total, 1289.67 cases are completed, 400 are unattended refusals, 150.81 remain in the noncontacts class, 161.52 in the 'other' class of nonrespondents. Now, it is assumed that among the newly recruited cases from the initial class of noncontacts, the gender distribution is the same as in the total class of noncontacts, or $0.52 * 149.19 = 77.58$ men will be recovered and 71.61 women from the initial noncontact class will be added to the respondent set. This will drive the proportion of men in the obtained respondent set toward the proportion of the full sample, particularly because the newly recruited member from the 'other' class of nonrespondents contains substantially more men than women. Finally, the proportion of men among initially and converted respondents is 0.485 (the standardized equivalent or $\alpha = 0.03$). In order to achieve this, a minimum of $297.67 + 17.62.89 = 2060.65$ were needed.

The last part of Table 2 shows the result for the case where $\alpha = 0.01$. Here, in total 3455.16 follow-up attempts are needed, to be divided over noncontacts (373.14) and 'other' (3082.01), or respectively 1.24 and 10.27 additional contact attempts per individual. As an expected result, these effort recruit another 173.33 initial noncontacts and 198.37 'others'. The total number of finally obtained respondents will therefore be 1371.69.

The analysis will be a numerical optimization algorithm[8] that minimizes the total number of additional contact attempts E, as indicated by the expression 3. The crucial constraint of the algorithm is that it is forced to keep the average standardized bias below a pre-specified threshold α. Multiple optimizations will be run, where α={0.010, 0.015, 0.020, 0.025, 0.030, 0.035}[9].

4.3 Illustrative example: Belgium

We use the Belgian case of ESS7 to illustrate the results of such an analysis. Table 3 provides per class of initial nonrespondents the frequency ($n_{initial}$) and the probability (ρ_c) with which a case was converted at the next contact attempts. These ρ's have been determined based on the real contact data events. The next three columns show what has been done in the real fieldwork in order to enhance the response. k_c shows the total additional contact attempts for each class and k_i shows the average number of contact attempts per case of each class. For example, among all initially nonresponding cases that are coded as 'not available' (n=528), 1786 additional contact attempts have been registered, resulting in on average 3.4 attempts per case of that class of nonrespondents. As a result, and provided that this class of nonrespondents has a conversion probability of 0.22, 298 cases could be converted. The classes that are relatively prioritized in the observed Belgian fieldwork are 'not available' (3.4 attempts per case), 'broken appointments' (3.8), 'disabled (short)' (3.3), 'noncontact' (4.2), 'other' (3.3) and 'mild refusals'. The classes 'disabled (long)' (0.2), 'invalid/deceased' (0.9), and 'language barrier' (0.1) have been re-approach very rarely.

The optimization algorithm seeks to allocate a minimal number of additional contact attempts, while constraining the bias under a pre-specific threshold, in this particular case

[7]Strictly speaking, fractions of contact attempts (or even fractions of individuals) are not realistic. Rounding to the nearest integer might therefore be more appropriate.

[8]Obtained through the solnp-function of the Rsolnp package in R

[9]For each α and each country separately, the optimization algorithm is run 10 times, using randomly chosen starting points. This is needed since the algorithm has a risk of ending up in local rather than a global optimum. The most optimal result is used

Table 3: Observed fieldwork strategy vs. optimized ($\alpha = 0.025$) fieldwork strategy, ESS7 Belgium

			Observed			Optimal		
	$n_{initial}$	ρ_c	k_c	k_i	n_{conv}	k_c	k_i	n_{conv}
not available	528	0.22	1786	3.4	298	0.0	0.0	0.0
broken app.	96	0.29	365	3.8	69	164.3	1.7	42.0
disabled (long)	109	0.12	19	0.2	2	0.0	0.0	0.0
disabled (short)	26	0.14	85	3.3	10	0.0	0.0	0.0
invalid/deceased	59	0.06	52	0.9	3	73.3	1.2	4.3
language barrier	82	0.18	12	0.1	2	668.5	8.2	65.1
noncontact	416	0.12	1752	4.2	178	523.8	1.3	63.8
other	148	0.24	488	3.3	88	103.2	0.7	25.8
moved (known)	35	0.29	48	1.4	13	147.7	4.2	27.0
partial	13	0.68	25	1.9	12	0.0	0.0	0.0
hard refusal	377	0.11	566	1.5	60	0.0	0.0	0.0
moderate refusal	167	0.10	227	1.4	22	0.0	0.0	0.0
mild refusal	63	0.17	154	2.4	22	19.1	0.3	3.4
	2119		5579		781	1700.1		231.4

$\alpha < 0.025$. The results of this allocation are provided in the last three columns of Table 3. Rather different from the observed fieldwork strategy, the optimization strategy does not prefer the allocate additional contact attempts to the classes 'not available', 'disabled (short)' or the different classes of refusals. Instead, it tends to prioritize 'broken appointments', initially invalid cases, noncontacts, and others. The most important classes of nonrespondents to be converted are 'language barriers' and 'moved (known)'.

The reasons why the latter two categories are so important can be found in Table 4. The table shows the distributions of all available auxiliary variables for the full sample, the initial respondents, the classes of initial nonrespondents, the finally observed sample and the obtained sample after applying the optimization simulation. For example, for the auxiliary variable 'entry phone' the sample of initial respondents is strongly biased (21% entry phones as compared to 29% in the full sample). Converting nonrespondent classes such as 'not available' or 'broken appointments' will probably not improve the bias regarding this variable, whereas 'language barriers' (57%) or 'moved (known)' (38%) and noncontact (40%) have much more potential to remedy this bias. 'Language barriers' are also a preferred choice in order to reduce the bias regarding the age class 24-44, multi-unit houses, detached houses or the physical conditions of the houses. It also seems that in many instances, classes of nonrespondents that are not prioritized by the optimized strategy would rather lead to a status quo regarding the bias (if not aggravate the bias) instead of mitigating it. This certainly applies to the class 'not available'.

4.4 Results for all countries

The results of Tables 3 and 4 only apply to the Belgian fieldwork of ESS7 and to only one bias benchmark ($\alpha < 0.025$). This optimization strategy will now be expanded to more ESS7 countries and more levels of tolerated bias (α=0.010, 0.015, 0.020, 0.025, 0.030, 0.035), without showing the details of the distributions of the various auxiliary variables. Nevertheless, an overview is provided as to which auxiliary variables are being used in the different countries (see Table 5). Since not all countries have (complete) data on all eight auxiliary variables, a

Table 4: Composition of full, initial, final observed and optimized sample, ESS7 Belgium

		Age (%)				Women	Entry	Locked	Residence type (%)				Neighbourhood		Condition	
	#	<25	24-44	45-64	>64	(%)	phone (%)	gate (%)	Multi-unit	Detached	Semi-detached	Terraced	Litter	Vandalism	house	Bias
Full sample	3267	0.12	0.31	0.34	0.23	0.51	0.29	0.22	0.20	0.36	0.17	0.26	3.83	3.93	1.90	0.0000
Initial respondents	993	0.14	0.27	0.34	0.25	0.50	0.21	0.20	0.13	0.42	0.19	0.25	3.84	3.94	1.86	0.0660
Pending nonrespondents																
not available	528	0.19	0.33	0.36	0.12	0.48	0.26	0.19	0.15	0.42	0.17	0.25	3.85	3.94	1.84	
broken app.	96	0.11	0.47	0.33	0.08	0.50	0.25	0.16	0.23	0.30	0.19	0.28	3.81	3.93	1.95	
disabled (long)	109	0.07	0.12	0.19	0.62	0.56	0.26	0.19	0.19	0.29	0.19	0.33	3.89	3.95	2.01	
disabled (short)	26	0.00	0.19	0.54	0.27	0.65	0.27	0.27	0.23	0.35	0.15	0.27	3.92	4.00	1.46	
invalid/deceased	59	0.07	0.45	0.29	0.19	0.31	0.36	0.24	0.43	0.21	0.10	0.26	3.29	3.69	2.93	
language barrier	82	0.05	0.43	0.38	0.15	0.51	0.57	0.39	0.57	0.13	0.09	0.21	3.70	3.80	2.16	
noncontact	416	0.09	0.37	0.34	0.19	0.53	0.40	0.26	0.31	0.31	0.15	0.23	3.78	3.90	1.97	
other	148	0.11	0.43	0.36	0.11	0.55	0.31	0.28	0.20	0.40	0.17	0.23	3.86	3.95	1.72	
moved (known)	35	0.10	0.59	0.17	0.14	0.59	0.38	0.34	0.34	0.28	0.17	0.21	3.79	3.93	2.14	
partial	13	0.15	0.15	0.23	0.46	0.38	0.15	0.23	0.23	0.31	0.38	0.08	3.85	3.92	1.77	
hard refusal	377	0.09	0.23	0.32	0.37	0.53	0.34	0.27	0.25	0.30	0.17	0.28	3.87	3.92	1.92	
moderate refusal	167	0.10	0.26	0.38	0.26	0.51	0.27	0.16	0.14	0.35	0.19	0.31	3.86	3.92	1.78	
mild refusal	63	0.13	0.30	0.32	0.25	0.60	0.38	0.22	0.24	0.38	0.10	0.29	3.79	3.90	1.90	
Final observed sample	1774	0.15	0.29	0.35	0.22	0.49	0.23	0.18	0.15	0.40	0.19	0.26	3.83	3.93	1.88	0.0489
Optimized sample	1224	0.13	0.30	0.34	0.23	0.51	0.25	0.21	0.17	0.39	0.18	0.25	3.83	3.93	1.89	0.0250

Table 5: Auxiliary variables used for nonresponse bias analysis

	Age	Gender	Entry phone	Locked gate	Residence type	Litter	Vandalism	Condition house
Austria		•	•	•	•	•	•	•
Belgium	•	•	•	•	•	•	•	•
Czech Rep.			•	•	•	•	•	•
Denmark	•	•	•	•	•	•	•	•
Estonia	•	•	•	•	•	•	•	•
Finland	•	•	•	•	•	•	•	•
France			•	•	•	•		• Germany
•	•							
Hungary		•	•	•	•	•	•	•
Ireland			•	•	•	•	•	•
Israel			•	•	•	•	•	•
the Netherlands			•	•	•	•	•	•
Norway	•	•						
Poland	•	•	•	•	•	•	•	•
Portugal			•	•	•	•	•	•
Slovenia	•	•	•	•	•	•	•	•
Spain	•	•	•	•	•	•	•	•
Sweden	•	•						
Switzerland	•	•	•	•	•	•	•	•
United Kingdom			•	•	•	•	•	•

selection has been made: countries are included in the analysis only if the auxiliary variable is at least 90% complete.

Figure 6 provides the results of the analyses. For each country, a series of effort-bias combinations is plotted. The blue dot represents the starting point of the bias right after the recruitment of the initial respondents, as no additional fieldwork efforts have been done (only the first contact attempt). In some countries, this initial bias can be quite considerable: Denmark, France, Ireland, the Netherlands, Portugal, Slovenia and Sweden. For example, the initial bias in France (about 0.1) is the difference between the respondents and the full sample and is on average 0.1 standard deviations of a variable. Such a degree of bias coincides with a binary variable that has a 50/50 distribution in the full sample, whereas among the respondents only a 45/55 distribution would apply. For a sample as large as many of the sample of the various ESS7 countries, such a bias easily exceeds the confidence bounds assuming only sampling error.

The red dots indicate the bias at the end of the observed fieldwork in each country and the efforts that have been done in order to achieve this. In the Belgian case, almost two contact attempts per case have been recorded, resulting in a reduction of bias from 0.0660 to 0.0489. Countries that have done many additional contact attempt per pending nonre- spondent (> 2 attempts) include Finland, France, Germany, Sweden and the UK. However, in many countries, the reduction of bias is relatively poor. In countries such as Denmark, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland and the UK the observed bias reduction is quite substantial. Still, the bias can be considerable.

Usually, the optimization simulations (black series of dots) combine less bias with less fieldwork efforts, as the red dots are situated above the black dots. In countries such as Belgium, Finland, France, Germany, the Netherlands and the UK, the improvement of the bias-effort combinations are quite considerable as compared to the actual fieldwork. This indicates that there is still some potential to efficiently ameliorate the fieldwork by prioritizing the most appropriate classes of initial nonrespondents.

Which classes of nonrespondents should be prioritized is in displayed Figure 7. Consistent with the colour scheme of Figure 6, red dots represent the observed fieldwork prioritization.

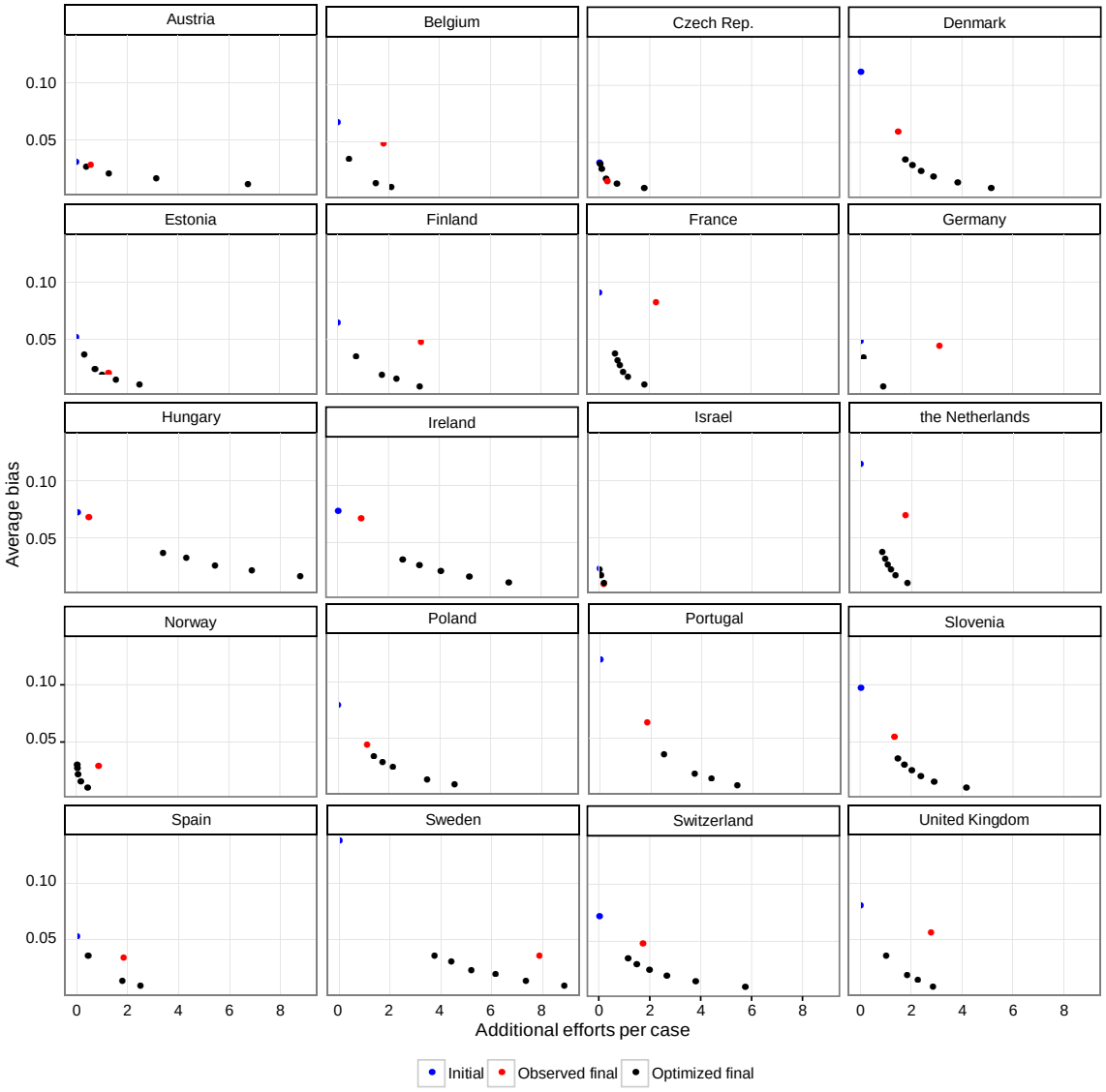

Figure 6: Average nonresponse bias for initial, finally observed and optimized (α=0.010, 0.015, 0.020, 0.025, 0.030, 0.035) fieldwork, ESS7

As can be seen in Figure 7, most countries prioritize 'not available', 'broken appointment', 'disabled (short)', noncontacts, 'other', 'moved (known)', partial interviews and (mild and moderate) refusals. 'Language barriers', 'disabled (long)' and invalids are usually not prioritized. However, as suggested by the optimization algorithms, the actual prioritization of cases is not advisable if the ESS would prefer to reduce nonresponse bias. Generally, all types of initial refusals, 'not available', 'broken appointments' and partial interviews are not recommended by the optimization results to be prioritized for further fieldwork efforts. Conversely, the classes that are not frequently revisited in the actual fieldwork tend be more interesting for bias reduction purposes. These classes include invalids, 'moved (known)', but specifically 'language barriers'.

There is a general trend suggesting to prioritize small nonrespondent classes such as 'language barriers' or 'moved (known)' instead of groups that are usually prioritized such as 'not available' or refusals. These latter classes are usually targeted to increase the response rate. Nevertheless, in some specific countries, specific optimization results are observed. For example, 'disabled (short)' is a nonrespondent class for which in different countries the prioritization is suggested: Switzerland (CH), Denmark (DK), Hungary (HU), the Netherlands (NL) or Portugal (PT). In some countries re-approaching noncontacts is not advised by the optimization results: Czech Republic (CZ), Germany (DE), Estonia (EE), Israel (IL), Norway (NO) and Portugal (PT), although it is required by the ESS specification to do so. Although refusal conversion is suggested in order to enhance response, it hardly contributes to the reduction of nonresponse bias. Only in Hungary (HU) and Portugal (PT) refusal conversion among hard and moderate refusals is advised. In a few more countries, the conversion of mild refusals is also encouraged the the optimization algorithms.

4.5 Are the different classes of nonrespondents different from the initial respondents?

There is always the possibility that the analysis on prioritization is too strongly driven by the available auxiliary variables, and therefore does not necessarily apply to the target variables of ESS. For this reason, we seek to investigate whether the classes of nonrespondents that significantly impact the bias as suggested by the optimizations (e.g. 'language barriers') also generate different answers from their respective converted respondents, and whether classes such as refusals (that where indicated as being quite similar to the initial respondents) are also similar to initial respondents regarding ESS target variables.

For 131 target variables of the ESS7 questionnaire, the difference is measured between any of the nonrespondent classes (or at least their converted members) on the one hand and the initially recruited respondents on the other hand. We only consider the differences on the European level (and not on the country level, since some classes only count a handful of converted cases). The observed squared distance between the mean of nonrespondent class c and the mean of the initially recruited respondents is a combination of the true distance and the variance. This is similar to the the well-known expression that $mse = bias^2 + var$. As a result, only considering the observed differences between the means of class c and the initially recruited respondents will be biased upward, particularly if the class c is rather small. Therefore, the observed squared distance between the means needs to be corrected by subtracting the variance (which is a function of the sample sizes of both groups that are compared) or $bias^2 = mse\_var$. Concretely, 131 ANOVA models have been run, taking each time a different response variable (all 131 target survey questions) and using the classes of nonrespondents as the independent variable (including 'initial respondents' as the reference category). The resulting parameter estimates (differences between the mean of any of the nonrespondent classes and the initial respondents mean) are squared from which the squared standard error is subtracted. Taking the square root of the average over all these corrected 131

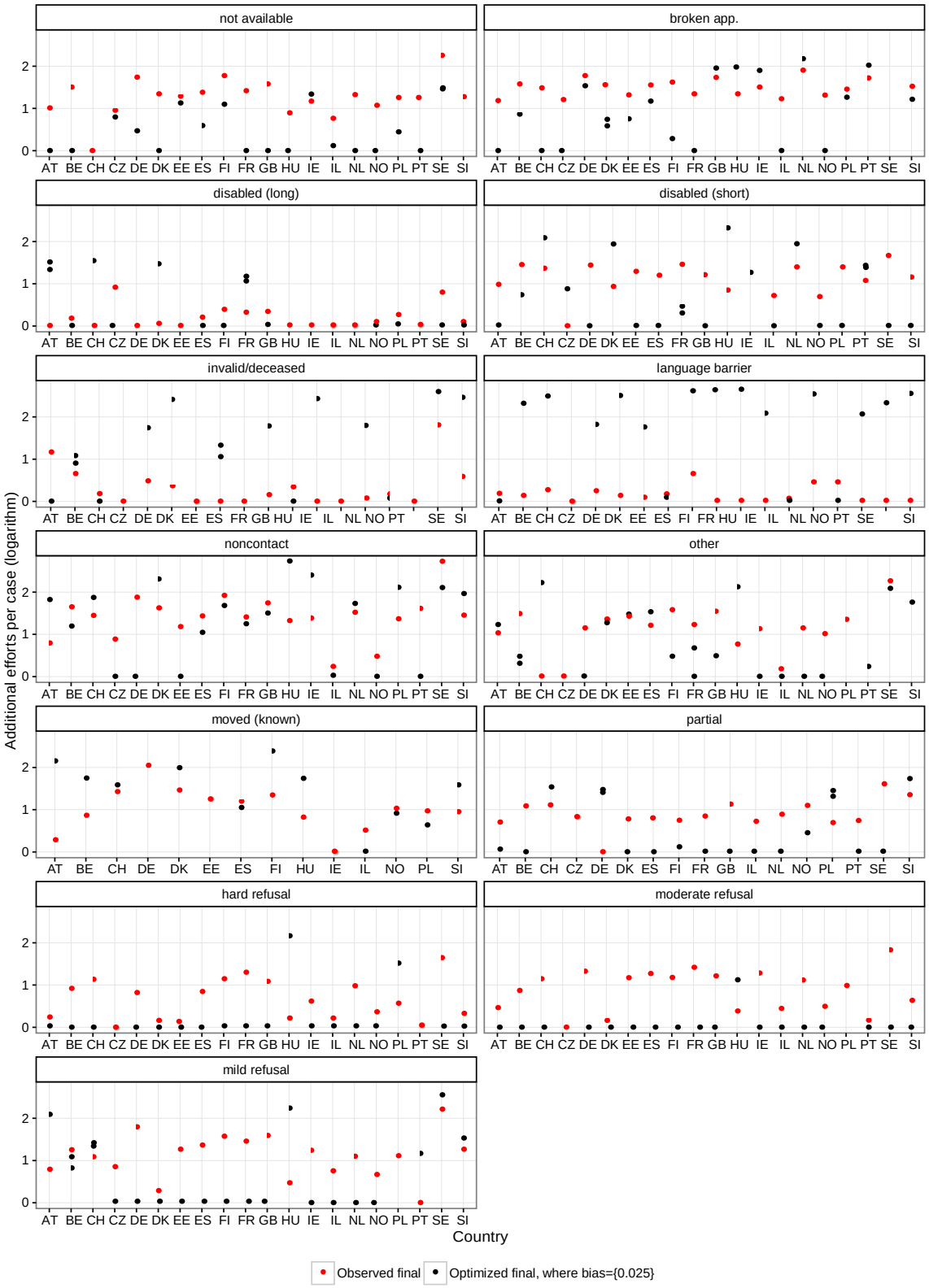

Figure 7: Observed and optimized (α = 0.02) fieldwork efforts, ESS7

Table 6: Average distances between classes of converted nonrespondents and initially recruited respondents, ESS7, all participating countries

Class	Class size	Corrected distance
not available	3925.24	0.08
broken app.	3295.63	0.07
disabled (long)	19.02	0.11
disabled (short)	190.25	0.15
invalid/deceased	33.98	0.12
language barrier	15.74	0.37
noncontact	2877.69	0.08
other	2762.87	0.07
moved (known)	374.16	0.14
partial	355.63	0.05
hard refusal	562.61	0.05
moderate refusal	350.87	0.02
mild refusal	396.07	0.05

distance measures provides an unbiased indication of the distance between all nonrespondent classes and the initial respondents.

Table 6 provides a first impression as to which classes of converted nonrespondents are most (dis)similar from the initially recruited respondents. The table provides the average class size of the converted number of respondents from each class of nonrespondents. This is not a fixed number because of occasional item nonresponse on any of the 131 target variables for which the analysis is done. Most converted respondents initially belonged to 'not available', 'broken appointment', 'noncontact' and 'other'. 'Disabled (long)', invalids and 'language barrier' deliver the smallest groups of converted respondents.

There seems to be some parallelism between the distances as portrayed by Table 6 and the results of optimization strategies. Particularly the 'language barriers' that appeared to be very distinct from the initial respondents in the optimization strategies (only including a maximum of 8 auxiliary variables) also tend to be very distinct regarding the 131 target variables too. It also seems that refusals - which were not highly prioritized by the optimizations in order to reduce nonresponse bias - are not so different again regarding the target variables. Therefore, the analysis as shown by Table 6 is to a large extent in line with the findings of the optimizations based on maximally 8 auxiliary variables.

An impression of which target variables that are different between initial respondents and the different classes of converted nonrespondents can be found in Table 7. For each class of converted nonrespondents the top 10 deviating variables are displayed[10].

One of the most prominent variables for which the initial respondents differ from the converted respondents is the main daily activity. It seems that there are fewer retired people and more people having a paid job among converted respondents, particularly in the classes 'not available', 'broken appointment', 'noncontacts', 'other', 'moved (known)', and 'mild refusal'. Probably, retired people or people without paid jobs are easier to interview at the first request and therefore this variable is likely to be initially biased. Only after follow-up attempts, the presumed bias may be remedied. It is however unclear whether the presumed initial bias is only partially, fully or maybe even over-remedied.

[10]The ranking is based on the p-value criterion.

Table 7: Top 10 differences of target variables between each class of converted nonrespondents and initially recruited respondents, ESS7

not available	
Doing last 7 days: retired	-0.32****
Doing last 7 days: paid work	0.27****
TV watching, total time on average weekday	-0.24****
Different race or ethnic group: contact, how often	0.20****
Household's total net income, all sources	0.23****
Important to seek adventures and have an exciting life	-0.18****
Hampered in daily activities by illness/disability/mental problem	0.16****
Doing last 7 days: education	0.16****
Qualification for immigration: be white	-0.13****
Important to seek fun and things that give pleasure	-0.14****
broken app.	
Doing last 7 days: retired	-0.22****
Doing last 7 days: paid work	0.19****
TV watching, total time on average weekday	-0.18****
Different race or ethnic group: contact, how often	0.17****
Highest level of education, ES - ISCED	0.16****
Household's total net income, all sources	0.16****
Qualification for immigration: be white	-0.12****
Allow many/few immigrants of different race/ethnic group	-0.12****
Important to seek adventures and have an exciting life	-0.12****
Different race or ethnic group: have any close friends	-0.12****
disabled (long)	
Household's total net income, all sources	-0.71**
Doing last 7 days: permanently sick or disabled	0.64**
Qualification for immigration: be white	0.55**
Felt lonely, how often past week	0.57**
Some races or ethnic groups: born less intelligent	-0.56*
Felt depressed, how often past week	0.52*
Feeling about household's income nowadays	0.47*
People of minority race/ethnic group in current living area	0.47*
Hampered in daily activities by illness/disability/mental problem	-0.47*
Felt everything did as effort, how often past week	0.46*
disabled (short)	
Belong to minority ethnic group in country	-0.59****
Allow many/few immigrants of same race/ethnic group as majority	0.41****
Compared to yourself government treats new immigrants better or worse	-0.42****
Member of a group discriminated against in this country	-0.35****
Felt everything did as effort, how often past week	0.33****
How often drink alcohol	0.30****
Religious beliefs undermined or enriched by immigrants	-0.31****
Qualification for immigration: Christian background	-0.27****
Household's total net income, all sources	-0.31****
Most people can be trusted or you can't be too careful	-0.26***
invalid/deceased	
Important to seek adventures and have an exciting life	-0.58**
Important to have a good time	-0.53**
Qualification for immigration: committed to way of life in country	-0.47**
Important to be successful and that people recognize achievements	-0.48**
Important to seek fun and things that give pleasure	-0.45**
Qualification for immigration: be white	-0.40**
Doing last 7 days: retired	-0.43**
Gays and lesbians free to live life as they wish	0.39*
Enjoyed life, how often past week	0.41*
Doing last 7 days: paid work	0.40*
language barrier	
Citizen of country	2.40****
Born in country	1.73****
Different race or ethnic group: have any close friends	-1.29****
People of minority race/ethnic group in current living area	0.87***
Immigrants make country's crime problems worse or better	0.91***
Country's cultural life undermined or enriched by immigrants	0.84***
Belong to minority ethnic group in country	-0.81***
Government should be generous judging applications for refugee status	-0.76**
Worked in another organisation or association last 12 months	-0.69**
Member of a group discriminated against in this country	-0.71**
noncontact	
Doing last 7 days: retired	-0.28****
Different race or ethnic group: contact, how often	0.26****
Doing last 7 days: paid work	0.27****
TV watching, total time on average weekday	-0.21****
Highest level of education, ES - ISCED	0.21****
Different race or ethnic group: have any close friends	-0.18****
People of minority race/ethnic group in current living area	0.17****
Better for a country if almost everyone shares customs and traditions	0.16****
Important to seek adventures and have an exciting life	-0.16****
Qualification for immigration: Christian background	-0.14****

other	
Doing last 7 days: retired	-0.22****
Different race or ethnic group: contact, how often	0.19****
TV watching, total time on average weekday	-0.19****
Doing last 7 days: education	0.17****
Doing last 7 days: paid work	0.16****
Household's total net income, all sources	0.16****
Highest level of education, ES - ISCED	0.14****
Subjective general health	-0.14****
Able to take active role in political group	0.13****
Confident in own ability to participate in politics	0.13****
moved (known)	
Doing last 7 days: retired	-0.45****
TV watching, total time on average weekday	-0.39****
Different race or ethnic group: contact, how often	0.35****
Doing last 7 days: education	0.35****
Subjective general health	-0.33****
Important to seek fun and things that give pleasure	-0.28****
Important to seek adventures and have an exciting life	-0.27****
Different race or ethnic group: have any close friends	-0.27****
Doing last 7 days: paid work	0.27****
Highest level of education, ES - ISCED	0.26****
partial	
Feeling about household's income nowadays	0.17***
How happy are you	-0.16**
Law against ethnic discrim. in workplace good/bad for country	-0.17**
Were happy, how often past week	-0.16**
Enjoyed life, how often past week	-0.15**
Qualification for immigration: be white	0.14**
Important that government is strong and ensures safety	-0.15**
Felt depressed, how often past week	0.15**
How satisfied with life as a whole	-0.14**
People of minority race/ethnic group in current living area	0.13*
hard refusal	
Important to live in secure and safe surroundings	-0.19****
Signed petition last 12 months	0.15***
Important to follow traditions and customs	-0.15***
Important that government is strong and ensures safety	-0.14***
How religious are you	0.13**
Qualification for immigration: good educational qualifications	0.13**
How many people with whom discuss intimate and personal matters	-0.12**
Qualification for immigration: work skills needed in country	0.12**
Taken part in lawful public demonstration last 12 months	0.12**
Immigrants make country's crime problems worse or better	-0.12**
moderate refusal	
Important to be rich, have money and expensive things	-0.17**
Important to show abilities and be admired	-0.15**
How many people with whom discuss intimate and personal matters	0.14**
Important to live in secure and safe surroundings	-0.14**
European Union: European unification go further or gone too far	0.13*
Member of trade union or similar organisation	0.11*
Important to be successful and that people recognize achievements	-0.12*
Worked in political party or action group last 12 months	0.12*
How interested in politics	0.11*
How religious are you	-0.10*
mild refusal	
Different race or ethnic group: contact, how often	0.18***
Doing last 7 days: retired	-0.17***
Different race or ethnic group: have any close friends	-0.16**
Hampered in daily activities by illness/disability/mental problem	0.16**
Citizen of country	-0.15**
Doing last 7 days: paid work	0.15**
Doing last 7 days: education	0.14**
Household's total net income, all sources	0.15**
Some races or ethnic groups: born less intelligent	-0.12*
Some races or ethnic groups: born harder working	-0.12*

****:p<0.0001;***:p<0.001; **: p<0.01; *:p<0.05

Each of the different classes of converted nonrespondents will be briefly discussed.

Generally speaking, the class 'not available' is only moderately dissimilar from the initial respondents. The main differences are situated in the daily activity status of the cases, 'not available'-cases being less retired, more of them having paid jobs or still being in education. This class also tends to watch less TV, has a somewhat higher total income, and find adventures, excitement and pleasure slightly more important than initially recruited respondents.

'Broken appointments' are very much like 'not available'. Similar to 'not available', 'bro- ken appointment' tend to have more contact with people from different ethnic groups. They also tend to have more progressive attitudes towards immigrants.

'Disabled (short)' and 'disabled (long)' are somewhat more dissimilar from initial respondents as compared to the first two classes of nonrespondents. These two classes embodying illness, disability or inability share some similarities. Converted individuals from the 'dis- abled (long)' group tend to worry much more about their low income, have strong feeling of depression and loneliness and tend to be less tolerant of the presence of other ethnic groups. Short term disability is also associated with more disapproving attitudes towards immigrants, and people in this group usually belong the indigenous population. They also tend to have a lower household income and drink more alcohol.

A dubious class of nonrespondents are 'invalid/deceased'. By definition, this class should be considered as frame errors and should be no longer included in the sample, let alone revisiting them for conversion purposes. Nevertheless, they are sometimes re-approached and even converted. The true story behind many of these cases and why they are re-visited is usually quite unclear. Yet, invalid cases are often suggested by the optimization as a valuable class of nonrespondents to spend more fieldwork efforts on. Also, the converted cases of this class tend to be quite distinct. Their profiles resembles the profile of the 'not available' and 'broken appointments' converted cases (hedonism, more paid jobs, less retired), but in a more extreme way.

'Language barriers' are a very important class of nonrespondents in the light of combating nonresponse bias, as suggested by the optimizations; much more effort should be devoted to converting them. They also tend to be the most distinct group of converted respondents as compared to the initially recruited respondents. This class of nonrespondents are usually immigrants and have strong feelings in favour of immigrant issues.

Converted 'noncontacts' are moderately dissimilar from initially recruited respondents. Nevertheless, they are indicated to be a quite important group of nonrespondents by the optimizations, probably because of their distinct characteristics regarding their housing situation (e.g. more apartments, entry phone). They are usually, in accordance with 'not available' and 'broken appointment', less likely to be retired and more likely to be in paid jobs. They also tend to be higher educated as compared to initially recruited respondents.

The 'other' group may not always have the most distinct meaning. As it usually is a residual group, its meaning may also be different across countries. Nevertheless, doing conversion efforts is suggested to be valuable, at least in some particular countries such as Switzerland, Estonia, Spain, Hungary, Sweden and Slovenia. The 'other' class of nonrespondents is very similar to the aforementioned 'not available', 'broken appointments' and 'noncontacts' (less retired, more in paid jobs, more in education, higher educated, higher income). Additionally, they tend to be more healthy and more politically involved.

The class of initial nonrespondents who have moved to a known destination is in many respects similar to the groups that have already been identified such as 'not available', 'broken appointments', 'noncontacts' and 'others'.

Partially interviewed cases are only mildly dissimilar from initially completely interviewed cases. The variables on which they appear to differ from initial respondents do not relate to daily activities, but rather relate to feelings of happiness or depression. 'Partial' is a class

of respondents of which the members tend to be less happy with their lives and report more depression.

As well as partially interviewed cases, refusals tend to be quite similar to initial respondents. Re-approaching them may only result in 'more of the same'. Only in Hungary and Poland, hard and moderate refusals are advised to be re-visited. In a few more countries, also mild refusals may have bias-reduction properties. Hard refusals can be thought of as having rather disapproving attitudes towards immigrants, and share values that mainly relate to safety and tradition. Moderate refusal attach more importance to being rich and admired.

5 Discussion

Nonresponse remains an obstinate problem and this also applies to the ESS. The main problem, caused by its definition, is that the nonresponse problem cannot be seen, or at best only partially. Complete information to investigate the problem of nonresponse is only available for variables that are not of primary interest (such as age or gender). Assessing the impact of nonresponse on target variables can only be done under strong assumptions. The main assumption is that respondents who are converted later in the contact process are informative for cases that could not be converted at all. Distinguishing between different classes of nonrespondents seems to add much more refinement in the assessment of nonresponse, although one can never be sure that projecting the characteristics of converted cases onto the final nonrespondents is a valid action.

But what can we possibly learn from this analysis? First, the ESS requires participating countries to follow strong routines related to the follow-up of noncontacts and strongly advises to try to convert refusals. These large groups of pending nonrespondents are usually targeted in order to increase the response rates. But do the increased efforts towards these two main groups also reduce the bias due to nonresponse? The claim regarding the noncontacts can be supported by this analysis since noncontacts are still quite different from initial nonrespondents in terms of auxiliary variables (and also moderately different in terms of target variables). However, apart from a few countries, refusal conversion activities do not seem to reduce nonresponse bias significantly. Additional fieldwork efforts targeted on refusals may only generate 'more of the same'.

Although noncontacts and refusals are usually perceived as the main classes of nonrespondents, this analysis made clear the minority classes of nonrespondents may have a strong impact on nonresponse bias too. In particular, language barriers may be a prominent class of nonrespondents to focus on in the future, even though it is a relatively small class. Based on the quality reports of ESS7, the Irish NC team decided to focus on the follow-up of language barriers, in particular the Polish community that is expected to be quite large in Ireland. Therefore, Polish questionnaires were designed based on the ones used in Poland, and Polish speaking interviewers were recruited to interview these sampled cases. Hence, the efforts that were done in Ireland in ESS8 should be evaluated (although the results of the fieldwork efforts are not available yet). Obviously additional fieldwork efforts towards these minority cases not only require more contact attempts (more attempts will obviously not make the target person the speak the language of the questionnaire), but predominantly challenge the survey agency, National Coordinator and interviewers to invest in the translation of the questionnaire, sending optimally skilled interviewers to the target sample cases and invest in the command of multiple languages. Therefore, a single-minded focus on the traditional efforts in survey fieldwork may fall short if one wants to reduce nonresponse bias. New techniques in questionnaire design and interviewer management may be preferred in order to successfully target such minority classes of nonrespondents, when the aim is to reduce the bias due to nonresponse.

After all, the ESS is essentially a *social* survey. From this perspective, it should not exclude or discriminate groups that appear to be hard to reach or recruit, such as immigrants, or for example the growing segment of elderly people in modern European societies. If this policy of non-discrimination is endorsed, the fieldwork, questionnaire and interviewing routines have to be adapted accordingly.

Should bias reduction be a main goal in the ESS? Currently, a 70% response rate and 97% contact rate are required by the ESS specifications, objectives that are only met rather occasionally. Moreover, survey literature suggests that high response rates are no guarantee for a reduction of bias (see, for example, the work of Groves (2006)). The analysis in this deliverable suggest to even reduce the overall level of fieldwork efforts (very likely to lead to even lower response rates) but to more meticulously target the fieldwork efforts toward specific groups of nonrespondents.

A last consideration is whether nonresponse bias reduction should be a priority on the quality agenda of the ESS at. On the one hand, nonresponse bias is a prominent problem, since it is not very hard to find confronting examples where the statistics based on (final) respondents only strongly deviate from the full sample equivalent (see for example, among many other examples, the case of multi-unit houses in Belgium). On the other hand, there are many other quality threats to the ESS, such as interviewer effects or potential threats that are currently under-investigated (such as the impact of translation on the collected data).

On a more operational note, the quality of the contact data with which the analyses in this deliverable are done, may also be a subject for concern. Although not explicitly discussed in this deliverable, it can be expected that some/many contacts are not or erroneously reported in the contact data files. Also, the current status of the residual category of nonrespondents 'other' should be better defined, and the current routines to deal with invalid cases (frame errors; which appear to be re-visited) should be updated as well.

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