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Explaining Cross-Country Differences in Survey Contact Rates: Application of Decomposition Methods¹

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Introduction

Cross-national comparisons of fieldwork outcomes in the European Social Survey (ESS) uncover differences in contact rates across countries (e.g. Billiet et al. 2007); however, to date the reasons for these cross-country differences have not been identified. Differences can be due to (1) differences in the way the survey was implemented (that is differences in the distribution of survey characteristics), (2) differences in the distribution of population characteristics associated with the propensity to be contacted, and (3) differences in processes, that is in the effect of (1) or (2) on the propensity to be contacted (for example making contact attempts on Sundays may be very helpful in one country but have no effect in another country) (Blom et al. forthcoming). Conventional methods for analyzing the differences in contact rates only examine the *processes* within each country, *differences in processes* across countries (for example by comparing the coefficients of separate within-country models), or look at country-level differences in response outcomes. However, in cross-country analyses *differences in the distributions of survey and population characteristics* are usually ignored.

This paper proposes the use of decomposition analyses (also known as counterfactual analyses) to identify characteristics associated with differences in contact rates across countries. Using contact data from the European Social Survey (ESS) differences in contact rates are decomposed into differences due to differential survey characteristics, differential population characteristics, differential coefficients (or processes) and a pseudo-interaction. The findings shed light on the extent to which the manipulable aspects of the contacting process are comparable across countries. Furthermore, they distinguish factors explaining contact propensity within a country from those explaining differences in contact rates across countries.

Method

The analyses consist of three components. First, I looked at distributional differences across countries in the survey and sample unit characteristics that might be associated with contact propensities. Second, I modeled contact propensity in each country in a logit model and examined differences in the optimal specification across countries. Contact was defined as a dummy variable where 1 denoted that in-person contact with the household was established. Finally, I carried out the central analysis of this paper: a decomposition of differences across

¹ The full working paper (Blom, A.G. (2009) Understanding Cross-Country Differences in Contact Rates, *ISER Working Paper 2009-08*, Colchester: University of Essex) is available at <http://www.iser.essex.ac.uk/publications/working-papers/iser/2009-08>

countries in contact rates into (1) differences due to differences in survey and (2) sample-unit characteristics (*characteristics effect*), (3) differences due to the differential effect of these characteristics on contact propensity (*coefficients effect*), and (4) differences due to a pseudo-interaction between (1) or (2) and (3). In addition, a detailed decomposition of the characteristics effect looked at the contribution of each individual characteristic to the total characteristics effect. Since the decomposition method is not a standard analysis technique in survey research (cf. Nicoletti and Buck 2004), it is described in the following.

Aggregate decomposition

The general aim of the aggregate decomposition is to separate out differences in the outcome (contact propensity) into differences due to distributional differences in the sample characteristics (the variables included in the model) and those due to differences in the coefficients.

Contact is the binary dependent variable. In a logit model, the predicted contact propensity \hat{y}_i for each sample unit i is estimated by

$$\hat{y}_i = F(\beta, X) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}},$$

where β is the vector of all coefficients estimated for the matrix of characteristics X_i . A country's predicted contact rate then corresponds to the mean predicted contact propensity \bar{y} .

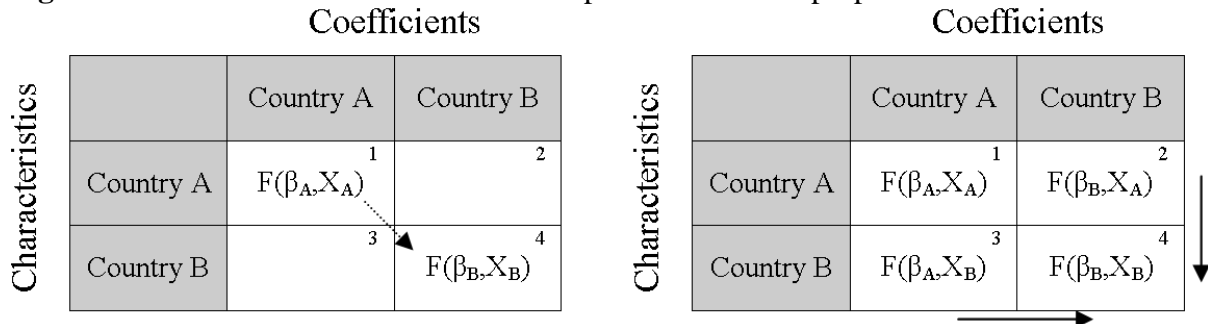
$$\bar{y} = \frac{1}{N} \sum_{i=1}^N \hat{y}_i$$

The difference in mean predicted contact propensity between two countries A and B is a function of the coefficients and the characteristics in the country models.

$$\bar{y}_A - \bar{y}_B = F(\beta_A, X_A) - F(\beta_B, X_B). \quad (1)$$

Figure 1 illustrates the country difference in mean predicted contact propensity that is decomposed. I aim to describe how the mean predicted contact propensity would change, if both the characteristics X and the coefficients β changed from those of country A to those of country B (dotted arrow in panel 1). The analysis investigates the extent to which country differences in contact rates are due to differences in characteristics and to what extent they are due to differences in coefficients. For this I estimate the mean predicted contact propensity associated with the characteristics of country A evaluated at the coefficients of country B (box 2 in panel 2) and the mean predicted contact propensity associated with the characteristics of country B evaluated at the coefficients of country A (box 3 in panel 2). Changing the coefficients from those of country A to those of country B (box 1 – box 2 or box 3 – box 4) describes coefficients effects. Changing the characteristics from those of country A to those of country B (box 1 – box 3 or box 2 – box 4) describes characteristics effects.

Figure 1. Illustration of differences in mean predicted contact propensities



In mathematical notation we expand the right-hand side of equation (1) by adding and subtracting $F(\beta_B, X_A)$, $F(\beta_A, X_B)$ and $F(\beta_B, X_B)$.

$$\begin{aligned} & \bar{y}_A - \bar{y}_B \\ &= [F(\beta_A, X_A) - F(\beta_B, X_B)] + [F(\beta_B, X_A) - F(\beta_B, X_A)] + [F(\beta_A, X_B) - F(\beta_A, X_B)] + [F(\beta_B, X_B) - F(\beta_B, X_B)] \end{aligned} \quad (2)$$

By rearranging the addends in (2) we get (Even and Macpherson 1993)

$$\begin{aligned} & \bar{y}_A - \bar{y}_B \\ &= \underbrace{[F(\beta_B, X_A) - F(\beta_B, X_B)]}_{\text{characteristics effect}} + \underbrace{[F(\beta_A, X_B) - F(\beta_B, X_B)]}_{\text{coefficients effect}} + \underbrace{[F(\beta_A, X_A) - F(\beta_B, X_A) + F(\beta_B, X_B) - F(\beta_A, X_B)]}_{\text{pseudo-interaction effect}} \end{aligned} \quad (3)$$

The difference in the mean predicted contact rate between countries A and B is therefore composed of three parts. The first addend describes the difference in predicted probabilities arising from a change in characteristics assuming that the coefficients remain unchanged (*characteristics effect*). This characteristics effect indicates how many percentage points the predicted contact rate in country B would have been higher (lower) if country B had had the survey and sample-unit characteristics of country A. The second addend describes the difference in predicted probabilities arising from a change in coefficients assuming that the characteristics remain unchanged (*coefficients effect*). This coefficients effect indicates how many percentage points the predicted contact rate in country B would have been higher (lower) if country B had had the coefficients of country A. The third addend reflects the extent to which these two assumptions are simultaneously broken; this means that some variables simultaneously have different coefficients and different distributions. This is similar to an interaction effect in regression analyses.²

The reference country

The comparison of two subgroups is the standard type of comparison and makes sense when comparing subgroups that are inherently binary, for example men and women. However, comparing contact rates across countries is not a binary problem and a reference country has to be chosen. The UK was chosen as reference country for all the decompositions.

Detailed decomposition of the characteristics effect

We can further decompose the characteristics effect in the aggregate decomposition by looking at the contribution of individual characteristics. The total characteristics effect is the sum of the effects of each separate characteristic r (Even and Macpherson 1993; Yun 2004).

$$F(\beta_C, X_{UK}) - F(\beta_C, X_C) = \left[\sum_{r=1}^{r=K} \frac{\beta_C^r (\bar{X}_{UK}^r - \bar{X}_C^r)}{\beta_C (\bar{X}_{UK} - \bar{X}_C)} \right] [F(\beta_C, X_{UK}) - F(\beta_C, X_C)].$$

Findings and Conclusions

The data allowed the fitting of logit models of contact in seven countries and decompose the differences in contact rates between the UK and the other six countries. Tables 1, 2 and 3 present the results of the descriptive statistics, logit models and decompositions respectively.

² Note that the predicted characteristics and coefficients effects differ depending on whether $\bar{y}_A - \bar{y}_B$ or $\bar{y}_B - \bar{y}_A$ is estimated. In the former the characteristics effect expresses a change in characteristics from country A to country B evaluated at the coefficients of country B. In contrast, in the latter comparison the characteristics effect expresses a change in characteristics from country B to country A evaluated at the coefficients of country A. Equivalently, a change in coefficients between country A and B is evaluated at the characteristics of country B in the first and at the characteristics of country A in the second case.

The analyses yielded four main findings: (1) the main characteristics associated with cross-country differences in contact rates are the number and timing of contact attempts; (2) in most country comparisons differences in processes play a major role; (3) the meaning of some of the variables differs across countries; and (4) a cross-national comparison between the UK and Finland is hindered by fundamental differences in fieldwork approaches.

The analyses found that the number of in-person contact attempts made to a sample unit and their timing correlate with both contact propensity within countries and differences in contact propensities across countries. The number and timing of contact attempts are the only variables consistently correlated with both within-country contact propensities and cross-country differences in contact propensities.

In all decompositions I found sizable coefficients or pseudo-interaction effects. This can mean any of three things: (1) processes differ across countries (in other words the characteristics have different effects), (2) the indicators included in the models measure different concepts across countries, or (3) the models are missing key variables for explaining cross-country differences in contact rates. Although differences in processes are to be expected, the analyses also found some evidence for differences in measurement and missing variables. Models with additional interviewer variables showed that pseudo-interaction and coefficients effects are somewhat reduced when additional relevant variables are controlled for. Furthermore, the decompositions detected variables with different meanings across countries, notably the urbanicity indicator. If urbanicity is to distinguish the tranquility of country life from the bustle of the city, then the proportion of single-unit housing might not accurately reflect this in a cross-country comparison.

Finally, the analyses raise awareness to the risk of comparing apples and oranges in cross-country analyses of fieldwork strategies. In the UK-Finland decomposition I found very large coefficients and pseudo-interaction effects indicating that contacting processes differ strongly between the two countries. In Finland the ESS fieldwork relied heavily on contact attempts by phone, while this is hardly practiced in the UK. Consequently, the Finnish and UK fieldwork strategies are too dissimilar to warrant a sensible comparison.

The application of the decomposition method allows reaching some important conclusions about the correlates of cross-national differences in contact rates. Decomposition methods are valuable to survey research, because they enable us to address the problem of a joint influence of the distribution of characteristics and the associated processes on group differences.

References

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Table 1. Descriptive statistics

	UK	Belgium	Finland	Greece	Ireland	Portugal	Spain	Total
Contact rate (%)	95.0	95.3	95.7	98.0	93.3	96.4	89.7	94.6
Timing of contact attempts								
% of cases ever attempted on a weekday daytime (before 5pm)	88.8	63.8	82.2	62.8	75.0	54.7	77.4	72.9
% of cases ever attempted on a weekday evening (after 5pm)	23.0	29.6	17.0	28.5	23.9	31.5	35.7	27.2
% of cases ever attempted on Saturday	25.2	22.8	2.9	21.7	20.4	50.0	19.1	22.7
% of cases ever attempted on Sunday	9.0	3.0	1.6	20.6	4.3	32.7	12.2	11.4
Mean number of in-person contact attempts per sample unit	2.4	1.4	1.1	1.6	1.7	2.4	2.1	1.8
Mean interviewer cooperation rate (%)*	47.5	59.6	72.6	77.6	70.3	72.4	52.4	63.5
<i>Missing (n)</i>	2			1	1			4
Mean interviewer workload (cases worked on)*	29.1	21.2	23.4	25.1	32.2	47.3	47.4	32.0
Mean % of cases in workload phoned by the interviewer*	0.4	8.9	90.7	0.7	1.9	4.4	0.5	12.4
Interviewer calling strategy								
Mean % of an interviewer's in-person calls on a weekday daytime (before 5pm)*	67.8	55.1	79.1	51.3	61.2	33.8	58.0	58.5
Mean % of an interviewer's in-person calls on a weekday evening (after 5pm)*	14.2	23.9	16.5	20.4	16.9	17.8	22.6	19.0
Mean % of an interviewer's in-person calls on a Saturday*	13.2	17.6	2.9	14.3	13.3	28.4	12.1	14.3
Mean % of an interviewer's in-person calls on a Sunday*	4.7	2.4	1.4	13.9	2.6	19.9	7.3	7.1
Intercom/entry phone at the address (%)	9.9	21.9	10.3	38.1	4.4	42.3	68.1	28.0
State of buildings in the area (%)								
Good state	63.0	67.0	72.9	40.2	73.5	48.8	51.3	59.3
Satisfactory state	33.6	28.2	24.4	50.3	22.9	44.1	40.5	35.1
Bad state	3.4	4.8	2.7	9.5	3.6	7.1	8.2	5.7
<i>Missing (n)</i>	1	26	18		30	3	62	140
State of sampled address compared to the area (%)								
Better	11.0	17.6	15.7	20.9	21.2	16.7	16.2	17.0
Same	82.2	74.1	77.2	68.1	70.7	75.4	77.6	75.1
Worse	6.7	8.3	7.2	11.0	8.1	7.9	6.2	7.9
<i>Missing (n)</i>	4	29	29		33	3	69	167
Urbanicity								
Mean % cases of multi-unit housing in interviewer assignment	16.6	14.6	37.2	47.2	2.1	41.4	67.6	32.0
Mean % cases of single-unit housing in interviewer assignment	80.8	80.0	55.5	52.2	81.7	53.6	29.4	62.4
Mean % cases of farms in interviewer assignment	0.5	2.3	6.1	0.4	11.5	0.9	2.9	3.4
<i>Base</i>	3,592	2,984	2,276	3,219	2,995	2,132	3,288	20,486

Note: * weighted for all sample units

Table 2. Logit models of contact

	UK	Belgium	Finland	Greece	Ireland	Portugal	Spain
Ever called in the evening	1.747 *	0.563	0.345	-0.377	0.328	-5.128 ***	-0.231
Ever called on a Saturday	4.635 ***	-0.039	-0.989	-2.072	-0.142	-0.857	0.156
Ever called on a Sunday	-0.423	0.466	1.327	-2.516	-1.504 *	-5.412 ***	0.798
Log (# in-person contact attempts)	-0.619 **	-1.624 ***	-1.597 ***	-4.483 ***	-2.479 ***	-6.821 ***	-1.193 ***
Log(attempts)*evening	-1.446 **	-0.969 **	-1.792 **	-0.008	-0.465	3.108 ***	-0.451
Log(attempts)*Saturday	-2.698 ***	-0.123	-0.175	1.266	0.262	0.573	-1.122 ***
Log(attempts)*Sunday	-0.092	-0.694	-2.215	1.392	1.398 *	3.147 ***	-1.28 **
Interviewer workload	0.001	-0.021 *	-0.005	0.005	0.01	0.008	0.001
Interviewer cooperation rate	0.005	0.033 ***	0.053 ***	0.024 ***	0.009	-0.02 *	-0.007
Interviewer calling strategy:							
Evening calling	0.034 **	0.006	0.016	0.004	0.019 **	-0.04 *	0.011
Saturday calling	-0.006	0.001	-0.026	0.006	0.02 *	-0.018	0.005
Sunday calling	0.01	-0.011	0.081	-0.003	0.012	-0.034	0.007
Interviewer phone contacting	-0.031	0.01	-0.04 *	-0.022	0.024	-0.002	0.005
Any intercom	-0.433	-0.233	0.158	0.555	0.127	-0.903 **	0.346
Physical state of building:							
Satisfactory	-0.046	-0.189	-0.142	-0.192	-0.055	-0.316	-0.047
Bad	-1.165 **	-0.035	-1.408 *	0.843	-0.742	0.098	-0.21
Comparative state of building:							
Better	0.191	1.258 ***	-0.147	0.641	0.976 ***	0.185	0.001
Worse	0.465	-0.071	0.162	-0.235	0.485	-0.876	-0.591
Urbanicity (farms, single-unit housing)	0.001	0.003	0.013 *	-0.01	0.021 **	-0.015 *	0.003
Constant	3.457 ***	2.199 ***	2.846	7.619 ***	0.798	17.657 ***	4.087 ***
Chi ²	512.499	293.206	195.093	290.437	437.913	239.01	930.042
Pseudo R ²	0.362	0.258	0.243	0.468	0.299	0.361	0.425
N	3590	2984	2276	3218	2994	2132	3288

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

Table 3. Results from the aggregate and detailed decompositions $\bar{y}_{UK} - \bar{y}_C$

	Belgium	Finland	Greece	Ireland	Portugal	Spain
Predicted probabilities	%	%	%	%	%	%
(1) (β_{UK}, X_{UK})	95.0	95.0	95.0	95.0	95.0	95.0
(2) (β_C, X_C)	95.3	95.7	98.0	93.4	96.4	89.7
(3) (β_{UK}, X_C)	98.2	83.2	98.3	98.3	96.1	96.5
(4) (β_C, X_{UK})	82.6	90.1	91.3	84.1	98.4	87.6
(5) $(\beta_{UK}, X_{UK}) - (\beta_C, X_C)$	-0.23	-0.70	-3.00	1.69	-1.35	5.38
Aggregate decomposition	% points	% points	% points	% points	% points	% points
Characteristics: $(\beta_C, X_{UK}) - (\beta_C, X_C)$	-12.63	-5.63	-6.77	-9.22	2.00	-2.11
Coefficients: $(\beta_{UK}, X_C) - (\beta_C, X_C)$	2.96	-12.52	0.24	4.96	-0.25	6.80
Pseudo-interaction: $(\beta_{UK}, X_{UK}) - (\beta_C, X_{UK}) + (\beta_C, X_C) - (\beta_{UK}, X_C)$	9.44	17.45	3.53	5.95	-3.10	0.69
Detailed decomposition (characteristics)	% points	% points	% points	% points	% points	% points
Timing of calls * # of calls	-6.42	-5.55	-6.19	-3.91	6.94	-1.04
Interviewer workload	-1.29	0.04	-0.02	-0.27	0.07	-0.10
Interviewer cooperation rate	-3.12	0.00	0.00	-1.61	0.00	0.25
Interviewer calling strategy (% cases called weekday evenings / weekend)	-0.65	-0.16	0.00	-0.25	-0.25	-0.76
Interviewer phone contacting	-0.65	-0.06	-0.01	-0.30	-0.01	0.00
Any intercom	0.22	0.14	-0.54	0.06	-4.70	-1.54
Physical state of building	-0.08	-0.03	-0.01	-0.04	-0.03	0.10
Comparative physical state of building	-0.63	0.00	0.00	-0.84	-0.01	-0.03
Urbanicity	-0.02	0.00	0.00	-2.04	0.00	1.02

Notes:

The first part of the table displays the mean predicted contact propensity for the UK model (row 1), for the country models (row 2), and the mean predicted contact propensity when evaluating each country's characteristics at UK coefficients (row 3) and when evaluating UK characteristics at the coefficients of each country (row 4). The fifth row displays the difference in mean predicted contact propensities between the UK model and the model in each of the other countries. These are the differences in estimated contact rates that the decompositions aim to disentangle. Although these differences are rather small, exploring whether they are due to differences in survey characteristics is relevant, since this is an indication of differences in the composition of the contacted sample due to differences in fieldwork.

Below this the aggregate decomposition is presented. The measurement unit is the percentage-point difference in contact rates explained by the composite parts. For example, the Greek aggregate decomposition (third column) shows that the majority of the 3.00 percentage-points difference in contact rate between the UK (95.0 percent) and Greece (98.0 percent) is due to a difference in characteristics. In fact, had Greece had UK characteristics, the Greek contact rate would have been 6.77 percentage points lower $((\beta_C, X_{UK}) - (\beta_C, X_C))$ or row 4 – row 2).

Finally, the detailed decomposition displays the percentage-point contribution of each characteristic to the characteristics effect. In the UK-Greece comparison the characteristics effect is largely due to the timing and number of calls, which are associated with a higher contact rate in Greece. According to the detailed decompositions Greece would have had a 6.19 percentage points lower contact rate, if the Greek interviewers had followed similar calling patterns as the UK interviewers.