Survey Research Methods (2019)
Vol. 13, No. 3, pp. 249-265
doi:10.18148/srm/2019.v13i3.7321

ISSN 1864-3361
http://www.surveymethods.org

Linking interview speed and interviewer effects on target variables in face-to-face surveys

Caroline Vandenplas
Centre for Sociological Research
KU Leuven, Belgium

Koen Beullens
Centre for Sociological Research
KU Leuven, Belgium

Geert Loosveldt
Centre for Sociological Research
KU Leuven, Belgium

Data collected via face-to-face surveys suffers from interviewer effects. Interview speed can be expected to be linked to interviewer effects for three reasons: interview speed has been shown to be linked to different aspects of data quality, interviewers are known to affect interview speed and the characteristics of respondent-interviewer interactions can be expected to influence both interview speed and any interviewer effects. In this paper, we relate interview speed to interviewer effects. Using data from the European Social Survey, three interview types are operationalized (slow, moderate and fast), based on the residual speeds from a model controlling for respondent characteristics. The results show greater interviewer effects among slow and fast interviews than among moderate ones, although with differences between variables and countries. To sum up, there is more variance between interviewers in terms of registered answers when an interview is performed too quickly or too slowly. This means that interviewer effects can be conditional. Our results also support the idea that interview speed can be considered as a useful data quality indicator, based on easy to collect types of paradata.

Keywords: interviewer effects; interview speed/duration; paradata; data quality; European Social Survey

1 Introduction

Face-to-face surveys are often seen as the "gold standard", achieving better coverage and response rates than other data collection methods (e.g. Groves et al., 2009, ch. 5). They can also be expected to produce better data quality than self-administered surveys in some aspects. For example, during an interview, the interviewer can support respondents by helping them to navigate correctly through the questionnaire (filter questions), probing answers to ensure that they are recorded correctly and keeping each respondent motivated until the end of the process (e.g. Loosveldt, 2008; Groves et al., 2009, ch. 9). However, self-administered surveys may be more appropriate for sensitive questions.

Nevertheless, research into interviewer effects highlights the influence that interviewers can have, both on the respondent sample composition (West & Olson, 2010; Durrant, Groves, Staetsky, & Steele, 2010; O'Muircheartaigh & Campanelli, 1999) and on the answers obtained from respondents (e.g. Groves & Magilavy, 1986; Beullens & Loosveldt, 2014; Pickery & Loosveldt, 2004). This intentional or unintentional influence on the interview process—and on data quality—is an unwanted repercussion of the interviewer's presence. As a consequence, researchers have sought to understand the mechanisms that cause, or even amplify, interviewer effects. These can be interviewer characteristics (socio-demographics, attitudes, beliefs, expectations, experience, training and workload), question characteristics (sensitivity, complexity and type), respondent characteristics (social conformity and cognitive abilities) or the presence of a third party during the interview (for a review, see West & Blom, 2017).

To try and limit interviewer effects, Fowler and Mangione (1990) introduced the principle of standardized interviews: interviewers have to follow set protocols concerning their interaction with respondents (giving explanations and clarifications about some questions, etc.). Under this principle, respondents' answers should be consistent, regardless of the interviewer carrying out the interview. In parallel, it can be reasonably assumed that if all interviewers interact in the same (standardized) way with the respondents, the interview

Contact information: Caroline Vandenplas, Centre for Sociological Research, KU Leuven, Parkstraat 45 – box 3601, 3000 Leuven, Belgium (Email: caroline.vandenplas@kuleuven.be)

speed should be independent of the interviewer. Hence, after controlling for respondent characteristics that could influence the speed (e.g., cognitive abilities), little variation should be found in the interview speed; in particular, between interviewers.

In the current paper, we link interview speed—a characteristic of the interviewer-respondent interaction—and interviewer effects. We do not claim that the interview speed necessarily explains interviewer effects, but instead that it could be a measurable indicator with which to detect problematic or unusual interviews (e.g., a difficult interviewer-respondent interaction) that are linked to the amplitude of any interviewer effect. If such a link can be established, interview speed could be monitored during data collection, problematic interviews better controlled (e.g., audio records of detected interviews) and interventions could be made before the end of the data collection period, with the aim of reducing interviewer effects.

2 Background: The effect of interview speed

Interview speed is likely to be related to interviewer effects for three main reasons: (1) interview speed is linked to data quality, although in an ambiguous way, (2) interviewers have a large effect on interview speed and (3) the characteristics of the respondent-interviewer interaction can be expected to influence both the interview speed and interviewer effects.

2.1 Interview speed and data quality

Research into the relationship between time and data quality mainly focuses on response latency. Response latency, defined as the time needed by a respondent to answer a question, is known to be related to data quality, although again ambiguously. Long response times can be an indication of ambivalent attitudes (M. Johnson, 2004), lack of knowledge (Heerwegh, 2003) or usability problems (McClamroch, 2011), but also of engaged respondents (Crawford & Lamias, 2001). On the other hand, short response times have been shown to reflect knowledge (Heerwegh, 2003) and accessible attitudes (Grant, Mockabee, & Monson, 2010), but are also considered as possibly indicating respondent satisficing, and being related to "speeding", taking cognitive shortcuts (Roßmann, 2010; Gutierrez, Wells, Rao, & Kurzynski, 2011; Stieger & Reips, 2010) and interviewer falsification and shortcutting (T. P. Johnson, Parker, & Clements, 2001; Penne, Snodgrass, & Barker, 2002). Further, speeding is related to primacy effects (Malhotra, 2008), straightlining (the tendency to give the same answer regardless of the question asked) (Zhang & Conrad, 2014; Conrad, Tourangeau, Couper, & Zhang, 2011), less-detailed answers (Wells, Rao, Link, & Pierce, 2012) and incoherent answers (Revilla & Ochoa, 2015). This ambiguity is probably explained by the relationship between response latency and cognitive effort and abilities on the one hand, and on the other, the relationship between data quality and cognitive effort and abilities.

Research into response latency has unravelled the influence that the respondent, and particularly his or her response behaviour, has on the interview speed. However, research concerning interviewer effects on interview speed shows that interviewers are responsible for a large proportion of the variability in speed (Olson & Peytchev, 2007; Loosveldt & Beullens, 2013b; Vandenplas, Loosveldt, Beullens, & Denies, 2017).

2.2 Interviewer effects on interview speed

The influence of interviewers on interview speed or duration is well-documented in literature (Olson & Peytchev, 2007; Couper & Kreuter, 2013; Loosveldt & Beullens, 2013b; Olson & Smyth, 2015; Wuyts, Vandenplas, & Loosveldt, 2017; Vandenplas et al., 2017). However, less is known about the interviewer characteristics that could explain between-interviewer variance. Younger interviewers and those with more experience tend to deliver faster interviews, although the effects of these variables are not systematically consistent (Couper & Kreuter, 2013; Olson & Peytchev, 2007). Wuyts and colleagues (2017) also found that interviewers' enjoyment of their interaction with respondents is related to slower interviews. Otherwise, little is known about which characteristics influence an interviewer's overall interview speed. In general though, the findings point to the fact that interviewer behaviour can influence the interview speed.

2.3 Interview interaction and interview speed

Interview speed can be influenced by the respondent, by the interviewer or by both, but their influence on interview speed might not be independent. Differences between interviews in terms of duration and speed can be considered as an indication of differences in the way interviewers and respondents interact. One can reasonably assume that the interaction in fast interviews differs from that in slow interviews, and that these differences can have an impact on the response process and the answers obtained.

Complicated or complex interactions could be caused by a technical problem in the CAPI (computer-assisted personal interviewing) system, question characteristics such as difficulty (Olson & Smyth, 2015), the respondent asking for many clarifications (Loosveldt & Beullens, 2013a), the interviewer probing more often (Mangione, Fowler, & Louis, 1992) or repeated interruptions by third parties. Any of these characteristics of the interaction can lead both to longer interviews and lower data quality, in particular, larger interviewer effects. Moreover, interviews that are too fast could be an indication of interviewer or respondent (or both) satisficing. "Interviewer satisficing"—meaning that the interviewer does not expend the necessary effort to carry out the

task as prescribed—can reduce the interview length (Japec, 2006). Interviewers who are satisficing might keep the interaction short, avoid probing and anticipate problems in the questionnaire. This type of interviewer behaviour can influence the respondent's answer, and can contribute to the occurrence of interviewer effects. Interviewer satisficing is often attributed to interviewer burden (Japec, 2006), but the respondent might also be in a hurry, not having much time or interest in the survey and forcing the interviewer to keep the interaction short. There is also empirical evidence that "fast" interviewers are more often responsible for interviews during which more straightlining occurs (Vandenplas et al., 2017).

Accordingly, one can assume that both interviewers and respondents determine the speed and duration of an interview, and that both can be responsible for deviations from the interview duration that would be expected in a standardized interview. One can further assume that these deviations reflect differences in the interviewer-respondent interaction, and that this could in turn affect certain aspects of data quality, and in particular increase interviewer effects. Expressed differently, a deviation from the expected interview speed is assumed to be the consequence of a deviation from the interviewer-respondent interaction under the standardized interview principle, which in turn is hypothesized to lead to larger interviewer effects.

3 Research goals

On the one hand, research shows that survey variables suffer from interviewer effects; that is, a large (more than 5 per cent) proportion of the variance of survey variables can be attributed to the interviewer. This is an undesirable consequence of the presence of an interviewer that affects data quality. On the other hand, interview speed (or equivalently interview duration) is both linked to a variety of data quality indicators (straightlining, consistency, etc.) and suffers from interviewer effects: a large proportion of the variance in interview speed can be attributed to interviewers. To the best of our knowledge, to date no link has been established between interview speed and the effect of the interviewer on survey variables. The aim of the current paper is to establish whether deviation from a normal speed—as a proxy for a problematic interviewer-respondent interaction during an interview—is linked to greater interviewer effects. The interview speed is not considered as an attribute of the interviewer but of the interview (interaction), as the respondent, the interviewer and their interaction may be the cause of the deviation in speed.

The term "interviewer effects" involves a broad concept and refers in general to the impact of interviewers on the answers obtained in surveys (e.g., through suggestive and leading probing). The concept of interviewer effects also has a more specific meaning and refers to the homogeneity of answers within a group of interviewers compared with the differences of the answers between the interviewers. The intraclass correlation coefficient (ICC) is a measurement of this relative homogeneity (Hox, 1994), which we assume to be at least partially created by systematic differences between interviewers as a result of the way they conduct interviews. In the current paper, we use this specific meaning of interviewer effects.

To define the "normal" speed, a pragmatic operational definition can be used: the overall mean interview speed for all respondents in a country after controlling for respondent or interview characteristics that influence interview speed in an acceptable way. One can consider this "residual" mean speed as the normal/moderate speed necessary to interview an "average respondent" according to the principles of standardized interviewing. Any deviation from this mean speed implies that the relevant interview has been conducted too quickly (short interview) or too slowly (long interview), with a higher risk of interviewer effects in these two cases.

The goal of the current paper is to investigate whether interviewer effects are higher among too fast and too slow interviews than among moderate or "normal" interviews. We do not expect a linear relationship, but a U-shaped one between interview speed and any interviewer effects (ICC).

4 Data

To study interview speed and its relationship with interviewer effects, we use data from round 7 of the European Social Survey (ESS7), which was conducted in 21 countries in 2014 (ESS, 2014). There are six modules in the ESS questionnaire. Three core modules (A to C), repeated in every round, two rotating modules (D and E), which capture attitudes and behaviours, and one module about sociodemographic variables (F), also repeated in every round. Module A comprises items about television watching and social trust. Module B deals with politics, including interest in politics, trust, electoral and other forms of participation, party allegiance and sociopolitical orientation. Module C contains items about subjective wellbeing, social exclusion, religion, perceived discrimination, national and ethnic identity, and immigration. In round 7, the first rotating module (D) comprises items about immigration, including attitudes, perceptions and policy preferences. The second rotating module (E) covers health, including health conditions, fruit, vegetable and alcohol consumption, and smoking behaviour. Lastly, module F contains items aimed at defining the sociodemographic profile of the respondents (e.g., household composition, gender, age, marital status and type of residential area).

In addition to its aim of examining changing attitudes in Europe, the ESS strives for high data quality and methodological innovation. Therefore, in addition to the main file containing the respondents' answers to the questionnaire, data is collected about contact attempts during the fieldwork,

data for timings recorded by the computer-assisted systems, and interview information. For our research objectives, we use information from the timers file to calculate the duration and interview speed for each module in the questionnaire. We do not use module A, because it is at the beginning of the questionnaire and too short (only five items), and therefore the duration measurement is not precise enough. In addition, we do not consider module F, because the items it contains are predominantly factual, whereas we are interested in items related to attitudes and opinions, which are more sensitive to interviewer effects (Himelein, 2015; Schaeffer, Dykema, & Maynard, 2010). In addition, we retrieve information about the interviews from the interview files: which interviewer conducted the interview and the language in which it was taken.

Out of the 21 participating countries in the ESS7, 15 used computer-assisted personal interviews (Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, the Netherlands, Norway, Slovenia, Sweden, Switzerland and the UK), whilst the remaining six used, at least partly, paper-assisted personal interviews (Czech Republic, Israel, Lithuania, Poland, Portugal and Spain). The latter countries are excluded from our analysis, because we are interested in module speed data, which is only available for the former. Further, the start and end time of an interview recorded by interviewers suffers from measurement error (rounding) to a larger extent than computer-recorded data (Loosveldt & Beullens, 2013a).

5 Calculating the interview speed in each module, and defining slow, fast and moderate interviews

In the first step, we consider extreme values of interview duration. These are durations that are so large or so small that they are unrealistic, if not impossible. We assume that these outlying values are either due to technical issues (e.g., the interviewer forgot to close the application or there was a software problem), or to an atypical interview (e.g., a partial interview). We regard as "missing", all durations that are outside of the following ranges for the part of the questionnaire considered:

- Full interview (including module A and F): 20 to 180 minutes
- Module B: 4 to 45 minutes
- Module C: 2 to 25 minutes
- Module D: 3 to 30 minutes
- Module E: 3 to 30 minutes

Excluding the extreme duration values leads to less than 6 per cent of missing values for all modules and for all countries except for the Netherlands (2.5 per cent missing values for the full interview, but up to 11.6 per cent at the module level).

In the second step, for each module we calculate the speed over a module M as the number of applicable items in that module q_M divided by the time needed to complete the module t_M in minutes for each respondent i:

$$v_M(i) = \frac{q_M(i)}{t_M(i)} \tag{1}$$

As a result, we obtain the number of items answered per minute. By considering the speed rather than the duration, we avoid imputing variance to different numbers of applicable items, because the number of applicable items is not constant for all respondents due to filter questions. It should be noted that we could also consider the average time needed to answer one item, $\frac{t_M(i)}{q_M(i)}$. However, we prefer to consider the speed as an interview process characteristic.

We chose to use the module rather than the complete interview speed, with the aim of obtaining a speed measured closer to the data quality indicator considered: the interviewer effects in that module. The number of applicable items ranges from 40 to 44 in module B, from 21 to 28 in module C, from 27 to 34 in module D and from 23 to 30 in module E. Table 1 displays the mean and standard deviation of the interview speed for each country and each module. The results of an ANOVA analysis with country and module as grouping variables confirm significant differences between countries and modules (results not shown).

These differences suggest that a separate analysis by country and module is most appropriate. While the speed for module B ranges from 3.20 items per minute in Germany to 5.44 in Ireland, module C speed is higher overall, ranging from 3.49 items per minute in Hungary to 6.62 in Slovenia. However, the tendency is not the same for every country. Hungary and Ireland have a lower speed for module C than for module B. Modules D and E have a lower speed, ranging from respectively 2.72 items per minute for Germany to 4.45 for Slovenia, and from 2.69 items per minute for Sweden to 4.16 for Slovenia. This suggests that modules D and E might be cognitively more demanding.

In the third step, we take the natural logarithm of the speed $v_M(i)$ for each module ($\log(v_M(i))$) at the respondent level, to correct for the skewness to the right of the speed distribution. Then, for each country separately, we model the logarithm of the speed, controlling for respondent and interview characteristics that are known to influence interview speed.

The interview speed is known to be influenced by cognitive abilities, for which we use age and education level as proxies (Loosveldt & Beullens, 2013b; Olson & Bilgen, 2011). Moreover, Vandenplas and colleagues (2017) found that interview speed was lower for women than for men, and when the interview was not taken in the respondent's mother tongue. Further, the rank of the interview (whether it is the first, second, third, etc. interview conducted by an interviewer) is known to have a positive effect on interview speed, demonstrating a learning effect for interviewers (Kirchner & Olson, 2017; Bohme & Stohr, 2014; Loosveldt & Beullens, 2013b; Olson & Peytchev, 2007).

Table 1
Mean interview speed and standard deviation per module and per country

Country	Module B	Module C	Module D	Module E
Austria	4.14	4.83	3.47	3.59
	(1.86)	(2.28)	(1.74)	(1.62)
Belgium	4.18	5.23	3.50	3.36
	(1.36)	(1.84)	(1.11)	(1.07)
Denmark	3.91	4.89	3.30	3.00
	(1.32)	(1.74)	(1.08)	(0.90)
Estonia	4.31	4.77	3.73	2.85
	(1.97)	(2.07)	(1.81)	(1.23)
Finland	4.25	5.08	3.43	3.06
	(1.31)	(1.74)	(0.83)	(1.28)
France	3.71	4.55	3.40	3.31
	(1.16)	(1.49)	(1.14)	(1.09)
Germany	3.20	4.19	2.72	2.70
	(1.11)	(1.46)	(0.90)	(0.80)
Hungary	4.30	3.48	3.68	3.12
	(1.66)	(0.97)	(1.36)	(1.11)
Ireland	5.44	4.10	4.11	2.99
	(1.79)	(1.45)	(1.19)	(0.87)
Norway	3.98	5.34	3.21	3.00
	(1.35)	(1.83)	(1.02)	(0.96)
Slovenia	4.49	6.62	4.45	4.16
	(1.47)	(2.34)	(1.49)	(1.52)
Sweden	3.58	4.56	3.09	2.69
	(1.41)	(1.53)	(1.07)	(0.91)
Switzerland	4.06	5.25	3.41	3.46
	(1.48)	(2.08)	(1.22)	(1.24)
The Netherlands	3.88	4.64	3.21	3.31
	(1.34)	(1.75)	(1.12)	(1.19)
United Kingdom	4.63	5.39	4.00	3.63
	(1.53)	(1.81)	(1.34)	(1.22)

Lastly, we also control for population density and the region in which the interview was conducted. The control variables in the model with ($\log(v_M(i))$) as the dependent variable are: gender, age (centred around 30) and age squared, education level—three categories: tertiary (ISCED level 6–7), upper-secondary (ISCED level 3–5) and other (ISCED level 1–2)—whether the interview was taken in the respondent's mother tongue,[1] the rank (order) of the interview and its square, the density (self-reported population density) and a categorical variable representing the regions based on counties, provinces or other sub-national divisions. We also added some interaction effects that were found to increase the model fit for some modules/countries. The following model (Model 1) is considered:

$$\begin{aligned}\log(v_M(i)) = {} & \beta_0 + \beta_1 \text{rank} + \beta_2 \text{rank}^2 + \beta_3 \text{age} + \beta_4 \text{age}^2 \\ & + \beta_5 \text{edu2} + \beta_6 \text{edu3} + \beta_7 \text{gender} + \beta_8 \text{language} \\ & + \beta_9 \text{edu2} \cdot \text{age} + \beta_{10} \text{edu3} \cdot \text{age} \\ & + \beta_{11} \text{edu2} \cdot \text{gender} + \beta_{12} \text{edu3} \cdot \text{gender} \\ & + \beta_{13} \text{language} \cdot \text{gender} + \beta_{14} \text{language} \cdot \text{age} \\ & + \beta_{15} \text{density} + \beta_{16}^r \text{region}(r) + \epsilon_i \quad ,\end{aligned}$$

with ϵ_i $N(0, \sigma_\epsilon^2)$.

The number of regions is different for every country. Hence the term $\beta_{16}^r \text{region}(r)$ represents a sum of the dummy variables for each category of region r, and the regions can be

[1] We do not have data about the actual mother tongue of the respondents, but we use the primary language spoken at home as a proxy.

different for each country. We then consider the residuals, ϵ_i, which represent the unexplained part of the interaction speed between interviewers and respondents.

The adjusted R^2 is, in general, above 0.10 with some lower values; down to 0.01 (e.g., Austria, module C and the Netherlands, module D). Given that we control for respondent characteristics, the residual variance can be assumed to be less related to respondent characteristics and more determined by interviewer behaviour or differences in interviewer-respondent interactions.

We are interested in the effect of this "unexplained" interview speed on data quality, in particular on the occurrence of any interviewer effects. Therefore we consider three types of interviews: slow, moderate and fast. For each module and for each country, the interview of respondent i is considered as:

- Slow if ϵ_i is smaller than $-\sigma_\epsilon$
- Moderate if ϵ_i is larger than $-\sigma_\epsilon$ but smaller than σ_ϵ
- Fast if ϵ_i is larger than σ_ϵ

This choice has one advantage: the definition of slow and fast is data driven and not set by an arbitrary value. The disadvantage, however, is that the boundaries to define slow, moderate and fast interviews are relative to the situation. If all the interviews in a country run as expected, the distribution of the residuals ϵ_i will be extremely narrow. The standard deviation will therefore be extremely small, meaning that some interviews will be qualified as too fast or too slow, whereas they are not. We argue that, in this ideal case, we would not find any link between the interview speed and any interviewer effect. However, to be thorough, we tested our results by replacing the country dependent value of σ_ϵ by fixed values, namely 0.20, 0.25 and 0.33 items per minute. The general patterns described in Section 7 were not affected by this different approach, with the effects on the amplitude of interviewer effects of fast and slow interviews compared with moderate increasing with larger boundaries.

The analysis is carried out separately for each country and for each module; hence the mean speed among one particular type of interview in one country could be different from the mean speed among interviews of the same type in another country. This is a choice that we made, given the large differences in mean speed for all modules between countries. Another possible approach would be to use deviations from the mean speed across countries. This alternative approach is not considered in the current paper.

6 Calculating interviewer effects among slow, moderate and fast interviews

In the next step, we focus on the differences in interviewer effects among slow, moderate and fast interviews. Accordingly, we calculate the intra-interviewer correlation coefficients for a subset of items in each module (27 items in module B, 8 in module C, 15 in module D and 5 in module E) for each interview type (slow, moderate and fast), for each country and for each module. The same analytical approach is used to evaluate the link between interviewer effects and different age groups (Beullens, Vandenplas, & Loosveldt, 2018).

All the items examined have at least 5-point scale answer options and are ordinal. It is therefore reasonable to consider them as continuous for the purposes of this analysis (for a complete list of the items, see appendix A2). Moreover, as we want to calculate the interviewer effects on substantive items, we remove from the analysis all respondents where the corresponding interviewer had only one or two respondents for the corresponding interview type. In other words, for each country, for each module and for each interview type, all the interviewers used in the analysis performed at least three interviews of the relevant type (fast, moderate or slow). As a result, for all countries and all modules, there are enough respondents and enough interviewers to allow calculation of the intra-interviewer correlation for each type of interview. However, it should be kept in mind that in the subset of slow and fast interviews, the average number of respondents per interviewer is smaller than among the moderate interviews (see Appendix A3), as this might have an impact on any interviewer effects.

To evaluate the interviewer effects for the items in each module, a multilevel model can be specified separately for each interview type in each country, with respondents at the first level and interviewers at the second. The multilevel model we use has a random intercept and fixed effects that account for possible differences in the respondent group clustered in interviewers.

Interviewer effects can be confounded with area affects (Brunton-Smith, Sturgis, & Leckie, 2016; Vassallo, Durrant, & Smith, 2016; Schnell & Kreuter, 2005). To disentangle interviewer and area effects, an interpenetrating design is preferable (Vassallo et al., 2016; O'Muircheartaigh & Campanelli, 1998; Groves & Magilavy, 1986). However, such a design was not applicable to the data used here. One way to (partly) circumvent this is to control for relevant respondent characteristics. The intertwining between interviewer and area effects arises from each interviewer conducting interviews in the same area, in which people may be socio-demographically, economically and culturally similar. Therefore, the respondents of one interviewer in the same area might possibly give answers to the survey that are more similar than those of respondents from another area interviewed by another interviewer. The between-interviewer variance that would lead to detecting interviewer effects would actually be, at least partially, caused by differences between areas and not between interviewers. Accordingly, controlling for socio-demographic variables such as age, education and gender helps to reduce the indicated variance between interviewers that might be due to differences in the

socio-demographic composition of their respondent sample. Similarly, controlling for population density and region reduces the variance between interviewers caused by cultural differences between areas.[2]

Hence, for each target variable y of a particular module we consider the following model (Model 2) for each interview type and for each country:

$$\begin{aligned} y_{i,j} =& \beta_{0,j} + \gamma_1 \text{lang} + \gamma_2 \text{age} + \gamma_3 \text{edu2} \\ &+ \gamma_4 \text{edu3} + \gamma_5 \text{gender} + \gamma_6 \text{language} \\ &+ \gamma_7^r \text{region} + \gamma_8 \text{density} + \epsilon_{i,j} \\ \beta_{0,j} =& \gamma_0 + u_{0,j} \quad , \end{aligned}$$

where i represents the respondents j the interviewer, and with $\epsilon_{i,j}\, N(0, \sigma_w^2)$ and $u_{0,j}\, N(0, \sigma_B^2)$. This model is applied for each country and for respondents where the interview belongs to type V, with V being fast, moderate or slow. Hence, the intra-interviewer correlation coefficient for target variable y, for country c, for interview type V is given by:

$$\text{ICC}(y, c, V) = \frac{\sigma_B^2}{\sigma_B^2 + \sigma_W^2}$$

Moreover, we consider module B $\text{ICC}_B(y, c, V)$, module C $\text{ICC}_C(y, c, V)$, module D $\text{ICC}_D(y, c, V)$ and module E $\text{ICC}_E(y, c, V)$ separately. For each module, we obtain a specific number of ICCs:

- Module B: 1170 $\text{ICC}_B(y, c, V)$ (26 items × 15 countries × 3 interview types)
- Module C: 360 $\text{ICC}_C(y, c, V)$ (8 items × 15 countries × 3 interview types)
- Module D: 675 $\text{ICC}_D(y, c, V)$ (15 items × 15 countries × 3 interview types)
- Module E: 255 $\text{ICC}_E(y, c, V)$ (5 items × 15 countries × 3 interview types)

This procedure also implies that for one particular item we obtain 45 ICCs clustered into the interview types and countries (15 countries × 3 interview types). This clustering is taken into account in the model specified in the next section.

7 Link between interview speed and interviewer effects

7.1 The general picture

To understand the impact of interview speed on interviewer effects, for each module we study a cross-classified, multilevel model, for which the intra-interviewer correlation coefficients are the dependent variables (clustered into target variables and countries), with a random intercept and with the interview type (fast and slow compared with moderate) as a random effect, varying between countries. The random intercept can vary between countries and target variables. This model (Model 3) can be described as follows, for $M = B, C, D$ or E:

$$\begin{aligned} \text{ICC}_M(y, c, V) &= \beta_{0,c,y} + \beta_{1,c}\text{Fast} + \beta_{2,c}\text{Slow} + \epsilon_{c,y,v} \\ \beta_{0,c,y} &= \gamma_{000} + u_{0,c} + v_{0,y} \\ \beta_{1,c} &= \gamma_{10} + u_{1,c} \\ \beta_{2,c} &= \gamma_{20} + u_{2,c} \end{aligned}$$

with the random component distributed as $\epsilon_{c,y,V}\, N(0, \sigma_w^2)$, $u_{0,c}\, N(0, \sigma_c^2)$, $v_{0,y}\, N(0, \sigma_y^2)$, $u_{1,c}\, N$¿) and $u_{2,c}\, N$¿).

The results of this model for the modules B, C, D and E are shown in Table 2. To avoid excessively small numbers, we multiplied the ICC by 100.

Hungary shows unusually large interviewer effects for some variables. To check the robustness of our analysis, the model was also run with Hungary excluded. The results differ slightly: a lower fixed effect in general, and no random country intercepts (see Appendix A1).

The most important result apparent in Table 2 is that over all items and all countries, interviewer effects among fast interviews and slow interviews are larger than among moderate interviews (positive fixed effects). This addresses our main research goal. The results suggest that deviation from a "normal" or moderate interview speed is linked to larger interviewer effects, and hence, lower data quality.

In module D and module E, the effect of fast interviews (statistically significant) compared with moderate interviews is larger than the effect of slow interviews. Depending on the module, the effect of fast interviews ranges from 2.55 per cent in module C (2.68 when excluding Hungary) to 6.79 in module D (6.91), whilst the effect of slow interviews ranges from 1.14 per cent (1.78) in module E to 3.55 per cent (3.23) in module C. Moreover, even though the interviewer effects for moderate interviews (intercepts) are larger in modules D and E, the effect of fast interviews is also greater for these two modules.

Lastly, the variance of the country random intercepts is significant (except in module D where it could not be included), and the variance of the variable random intercepts is only significant in modules B and C. Consequently, there are some differences in interviewer effects between countries and target variables, as might be expected. The variance between countries is larger than the variance between target variables, although when including Hungary, the model with a random intercept for countries did not converge. Moreover, in modules B and D, there are differences in the influence of fast and slow interviews on interviewer effects depending on the country.

Hence, it seems that deviations from a moderate interview speed when relevant respondent characteristics are controlled

[2] Whenever available, information about (geographical) primary sample units was included in a cross-classified model (PSU and interviewer) and taken into account when calculating the intra-interviewer correlation coefficient. The results were unchanged.

Table 2
Parameter estimates of Model 3

	Coefficient			Variance			
				Intercept		Fast	Slow
		Fast	Slow	(country)	(variable)	(country)	(country)
	γ_{000}	γ_{10}	γ_{20}	σ^2_c	σ^2_y	σ^2_1	σ^2_1
B	3.61^{***}	2.99^{**}	3.49^{**}	2.00^{*}	0.92	8.95^{***}	8.97^{**}
C	3.55^{**}	2.55^{**}	3.55^{**}	7.77^{***}	2.17^{*}	0.02	5.53
D	4.24^{***}	6.79^{***}	1.46		0.75	27.40^{***}	9.00^{**}
E	4.99^{***}	4.54^{***}	1.14	13.9^{***}	0.00	4.68	8.99

$^{*}\ p < 0.05$ $^{**}\ p < 0.01$ $^{***}\ p < 0.001$

for may be an indication of poor data quality. More specifically, too fast and too slow interviews seem to be linked to higher interviewer effects in substantive variables.

7.2 Country-level results

To further understand the differences between countries in the effects of slow and fast interviews compared with moderate interviews, Figure **??** displays for each country, over the target variables in each module, the "mean" of the expected ICCs for slow, moderate and fast interviews. These expected ICCs are calculated based on Model 3. Hence, the "mean" expected ICC for country c is calculated as:

- $\gamma_{000} + u_{0,c}$ for moderate interviews
- $\gamma_{000} + u_{0,c} + \gamma_{10} + u_{1,c}$ for fast interviews
- $\gamma_{000} + u_{0,c} + \gamma_{20} + u_{2,c}$ for slow interviews

For almost all country-module combinations, the graphs are U-shaped, signifying that the expected mean ICCs are larger among slow and fast interviews than among moderate interviews. The size of the effect is, however, country dependent. The only exceptions to this pattern are found in modules D and E, which are thought to be more cognitively demanding and for which slow interviews have lower interviewer effects in some countries (module D: Finland, Germany, Norway and the Netherlands; module E: Austria, Estonia and Hungary). For these cases, slower interviews can probably be assumed to be due to the cognitive effort made by respondents.

Lastly, we compare Figure **??**, which represents the model-based expected mean interviewer effects, with Figure **??**, which displays the mean ICC over the variables in each module and country for fast, slow and moderate interviews. This can be considered as an assessment of the fit of our model, as we compare the expected values in Figure **??** with the observed values in Figure **??**.

In general, the patterns in Figure **??** are very similar to those in Figure **??**, with fast and slow interviews having larger mean interviewer effects than moderate interviews. Most of the exceptions can again be found in modules D and E (module D: Denmark, Germany, Hungary, Ireland and Slovenia; module E: Estonia, Hungary and Sweden). In addition, the mean ICCs for slow interviews are lower than for moderate interviews in module B in Ireland and Norway, and module C in Belgium and Finland, although the differences are very small. Moreover, the mean ICCs for fast interviews are lower in module B in Ireland and Sweden, and module C in Finland, again with only small differences. There is large variability between the variables concerning the differences in ICCs between slow and moderate interviews and the differences in ICCs between fast and moderate interviews as displayed in the boxplots in Appendix D.

8 Discussion and conclusion

The aim of this paper was to establish whether interview speed (in particular too fast and too slow interviews) is linked to greater interviewer effects on substantive variables.

Working with data from countries that used CAPI in round 7 of the European Social Survey, we operationalized too fast and too slow interviews as ones for which the residual speed deviates by more than one standard deviation from 0 (mean of residuals) after controlling for relevant respondent characteristics at the country and module level. By doing this, we assume that the deviation in interview speed is due to unacceptable or undesirable circumstances—such as respondent or interviewer satisficing, influential behaviour from the interviewer or usability/understandability problems—rather than "acceptable" issues such as cognitive abilities or language. The intra-class correlation coefficients were then calculated within each interview type for each variable and each country.

The results show that too fast and too slow interviews are generally linked to higher intra-interviewer correlation coefficients, and hence larger interviewer effects on target variables. This supports the idea that after controlling for acceptable effects, interview speed can be used as an indicator of deviations from the normal flow of the respondent-interviewer interaction during an interview. Although the

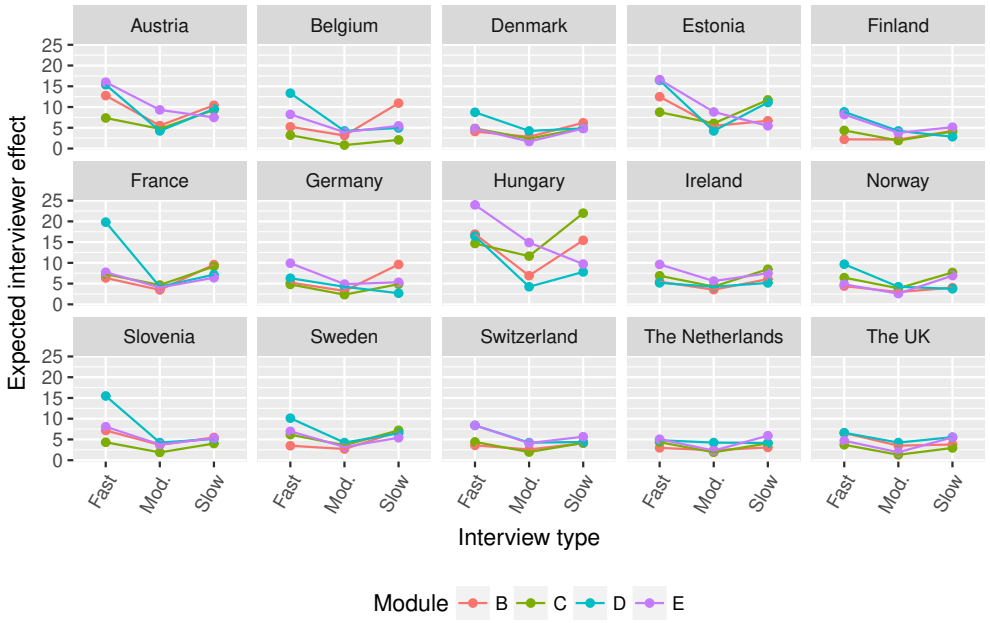

Figure 1. Expected ICCs (on 100 scale) for slow, moderate and fast interviews in each considered country

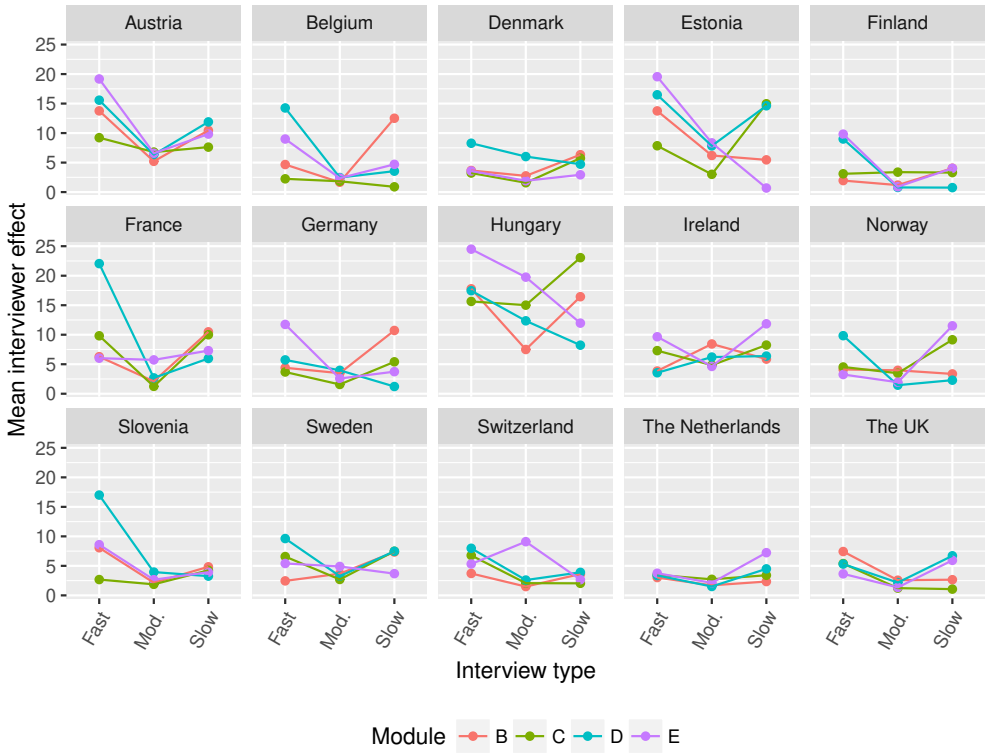

Figure 2. Mean ICCs (on 100 scale) for slow, moderate and fast interviews in each considered country

data does not allow us to identify the reasons for these deviations, we can hypothesize that on the one hand, fast interviews could be the result of interviewer satisficing (e.g., not properly probing), respondent satisficing (e.g., not going through the full cognitive process needed to give an answer and "forcing" the interviewer to guess the answer) or both. Indeed, interviewer satisficing can reduce respondent motivation and cause respondent satisficing, and the other way round, increasing the speed of the interview process. On the other hand, too long interviews could also be caused by (cognitive) difficulties experienced by respondents, too much probing from the interviewer or long breaks caused by some unwanted interactions.

This study does not allow us to identify whether some variables suffer to a larger extent than others from this speed effect. Given that the variance between target variables in some cases is statistically different from 0, knowing which variables are more speed sensitive might give some indications of weaknesses in the questionnaire. Moreover, it would be interesting to study whether the effects of too slow or too fast interviews on interviewer effects depend on the mean interview speed in a country and the variance of the speed in that country. The results also do not allow us to discern the reason for an interview being too slow or too fast. In particular we cannot distinguish whether the respondent, the interviewer, external factors or any combinations of these are responsible for deviations in speed, or which specific characteristics of the interaction lead to these deviations. In this regard, researchers could use data from audio recordings of interviews (if available) that are found to be too fast or too slow in order to investigate the reason for the deviation in speed and possible greater interviewer effects.

To conclude, controlling for relevant characteristics, this paper points to a link between interview speed, or at least its "purified" version, and a data quality indicator: interviewer effects. Therefore, using residual values from interview speeds in a fieldwork monitoring context seems relevant and might allow for early detection of interviewers with undesirable interviewing behaviour.

References

Beullens, K. & Loosveldt, G. (2014). Interviewer effects on latent constructs in survey research. *Journal of Survey Statistics and Methodology*, *2(4)*, 433–458.

Beullens, K., Vandenplas, C., & Loosveldt, G. (2018). Interviewer effects among older respondents in the European Social Survey. *International Journal of Public Opinion Research*, *31*, 1–17. doi:10.1093/ijpor/edy031

Bohme, M. & Stohr, T. (2014). Household interview duration analysis in CAPI survey management. *Field Methods*, *26(4)*, 390–405. doi:10.1177/1525822X14528450

Brunton-Smith, I., Sturgis, P., & Leckie, G. (2016). Detecting and understanding interviewer effects on survey data by using a cross-classified mixed effects location-scale model. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *181(2)*, 551–568. doi:10.1111/rssa.12205

Conrad, F. G., Tourangeau, R., Couper, M. P., & Zhang, C. (2011). Interactive interventions in web surveys can increase response accuracy. Annual Conference of the American Association for Public Opinion Research, Phoenix, Arizona. Retrieved from http : / / www . aapor . org / AAPOR _ Main / media / AnnualMeetingProceedings / 2011 / 05 - 13 - 11 _ 1D _ Conrad.pdf

Couper, M. P. & Kreuter, F. (2013). Using paradata to explore item level response times in surveys. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *176(1)*, 271–286.

Crawford, S. D. & Lamias, M. J. (2001). Web surveys perception of burden. *Social Science Computer Review*, *19(2)*, 146–162. doi:10.1177/089443930101900202

Durrant, G. B., Groves, R. M., Staetsky, L., & Steele, F. (2010). Effects of interviewer attitudes and behaviors on refusal in household surveys. *Public Opinion Quarterly*, *74(1)*, 1–36. doi:10.1093/poq/nfp098

ESS. (2014). European Social Survey Round 7 Data. Data File Edition 2.1.

Fowler, F. J. & Mangione, T. W. (1990). *Standardized survey interviewing: Minimizing interviewer-related error*. London: Sage.

Grant, J. T., Mockabee, S. T., & Monson, J. Q. (2010). Campaign effects on the accessibility of party identification. *Political Research Quarterly*, *63(4)*, 811–821. doi:10.1177/1065912909336269

Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2009). *Survey methodology*. Hoboken, New Jersey: John Wiley & Sons.

Groves, R. M. & Magilavy, L. J. (1986). Measuring and explaining interviewer effects in centralized telephone. *Public Opinion Quarterly*, *50(2)*, 251–266.

Gutierrez, C., Wells, T., Rao, K., & Kurzynski, K. (2011). Catch them when you can: Speeders and their role in online data quality. Midwest Association for Public Opinion Research Annual Conference, Chicago, IL.

Heerwegh, D. (2003). Explaining response latencies and changing answers using client-side paradata from a web survey. *Social Science Computer Review*, *21(3)*, 360–373. doi:10.1177/0894439303253985

Himelein, K. (2015). Interviewer effects in subjective survey questions: Evidence from timor-leste. *International Journal of Public Opinion Research*, *28(4)*, 511–533. doi:10.1093/ijpor/edv031

Hox, J. J. (1994). Hierarchical regression models for interviewer and respondent effects. *Sociological Methods & Research*, *22(3)*, 300–318. doi:10 . 1177 / 0049124194022003002

Japec, L. (2006). Quality issues in interview surveys: Some contributions. *Bulletin of sociological methodology/ Bulletin de méthodologie sociologique*, *90(1)*, 26–42.

Johnson, M. (2004). Timepieces: Components of survey question response latencies. *Political Psychology*, *25(5)*, 679–702.

Johnson, T. P., Parker, V., & Clements, C. (2001). Detection and prevention of data falsification in survey research. *Survey Research*, *32 (3)*, 1–16.

Kirchner, A. & Olson, K. (2017). Examining changes of interview length over the course of the field period. *Journal of Survey Statistics and Methodology*, *5(1)*, 84–108. doi:10.1093/jssam/smw031

Loosveldt, G. (2008). Face-to-face interviews. In E. D. De Leeuw, J. J. Hox, & D. A. Dillman (Eds.), *International handbook of survey methodology* (pp. 201–220). New York: Taylor & Francis Group.

Loosveldt, G. & Beullens, K. (2013a). How long will it take? an analysis of interview length in the fifth round of the European Social Survey. *Survey Research Methods*, *7(2)*, 69–78. doi:http://dx.doi.org/10.18148/srm/2013.v7i2.5086

Loosveldt, G. & Beullens, K. (2013b). The impact of respondents and interviewers on interview speed in face-to-face interviews. *Social Science Research*, *42(6)*, 1422–1430. doi:10.1016/j.ssresearch.2013.06.005

Malhotra, N. (2008). Completion time and response order effects in web surveys. *Public Opinion Quarterly*, *72(5)*, 914–934. doi:10.1093/poq/nfn050

Mangione, T. W., Fowler, F. J., & Louis, T. A. (1992). Question characteristics and interviewer effects. *Journal of Official Statistics*, *8*, 293–293.

McClamroch, K. J. (2011). Evaluating the usability of personal digital assistants to collect behavioral data on adolescents with paradata. *Field Methods*, *23(3)*, 219–242. doi:10.1177/1525822X11405826

O'Muircheartaigh, C. & Campanelli, P. (1998). The relative impact of interviewer effects and sample design effects on survey precision. *Journal of the Royal Statistical Society. Series A (Statistics in Society)*, *161(1)*, 63–77. doi:10.1111/1467-985X.00090

O'Muircheartaigh, C. & Campanelli, P. (1999). A multilevel exploration of the role of interviewers in survey nonresponse. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *162(3)*, 437–446.

Olson, K. & Bilgen, I. (2011). The role of interviewer experience on acquiescence. *Public Opinion Quarterly*, *75(1)*, 99–114. doi:10.1093/poq/nfq067

Olson, K. & Peytchev, A. (2007). Effect of interviewer experience on interview pace and interviewer attitudes. *Public Opinion Quarterly*, *71(2)*, 273–286. doi:10 . 1093/poq/nfm007

Olson, K. & Smyth, J. D. (2015). The effect of CATI questions, respondents, and interviewers on response time. *Journal of Survey Statistics and Methodology*, *3(3)*, 361–396.

Penne, M. A., Snodgrass, J., & Barker, P. (2002). Analyzing audit trails in the National Survey on Drug Use and Health (NSDUH): Means for maintaining and improving data quality. International Conference on Questionnaire Development, Evaluation, and Testing Methods (QDET), Charleston, 2002. Retrieved from http://www.blaiseusers.org/2003/papers/Analyzing_audit_trails.pdf

Pickery, J. & Loosveldt, G. (2004). A simultaneous analysis of interviewer effects on various data quality indicators with identification of exceptional interviewers. *Journal of Official Statistics*, *20(1)*, 77.

Revilla, M. & Ochoa, C. (2015). What are the links in a web survey among response time, quality, and auto-evaluation of the efforts done? *Social Science Computer Review*, *33(1)*, 97–114. doi:10 . 1177 / 0894439314531214

Roßmann, J. (2010). Data quality in web surveys of the German longitudinal election study 2009. 3rd ECPR Graduate Conference, Dublin.

Schaeffer, N. C., Dykema, J., & Maynard, D. W. (2010). Interviewers and interviewing. In P. V. Marsden & J. D. Wright (Eds.), *Handbook of Survey Research* (Vol. 2). Bingley, UK: Emerald Group Publishing Limited.

Schnell, R. & Kreuter, F. (2005). Separating interviewer and sampling point effects. *Journal of Official Statistics*, *21(3)*, 389–410.

Stieger, S. & Reips, U. D. (2010). What are participants doing while filling in an online questionnaire: A paradata collection tool and an empirical study. *Computers in Human Behavior*, *26(6)*, 1488–1495.

Vandenplas, C., Loosveldt, G., Beullens, K., & Denies, K. (2017). Are interviewer effects on interview speed related to interviewer effects on straight-lining tendency in the European Social Survey? an interviewer-related analysis. *Journal of Survey Statistics and Methodology,* smx034. doi:10.1093/jssam/smx034

Vassallo, R., Durrant, G., & Smith, P. (2016). Separating interviewer and area effects by using a cross-classified multilevel logistic model: Simulation findings and implications for survey designs. *Journal of the Royal Statistical Society. Series A: Statistics in Society*, *180 (2)*, 531–550. doi:10.1111/rssa.12206

Wells, T., Rao, K., Link, M., & Pierce, C. (2012). Flagging speeders in a multi-mode (mobile and online) sur-

vey. Annual meeting of the Midwest Chapter of the American Association for Public Opinion Research. Chicago, IL.

West, B. T. & Blom, A. G. (2017). Explaining interviewer effects: A research synthesis. *Journal of Survey Statistics and Methodology*, *5(2)*, 175–211. doi:10.1093/jssam/smw024

West, B. T. & Olson, K. (2010). How much of interviewer variance is really nonresponse error variance? *Public Opinion Quarterly*, *74(5)*, 1004–1026.

Wuyts, C., Vandenplas, C., & Loosveldt, G. (2017). An interviewer-oriented analysis of interview speed: Experience, burden, or both? European Survey Research Conference, Lisbon 2017. Retrieved from https://lirias.kuleuven.be/bitstream/123456789/589472/1/Wuyts%2C+C.%2C+Vandenplas%2C+C.%2C+Loosveldt%2C+%20G.+%282017%29.%20+An+interviewer-oriented+analysis+%20of+interview+speed+Experience%2C+burde%2C+or+both.%20+ESRA.+Lisbon%2C+17-21+July+2017.pdf

Zhang, C. & Conrad, F. G. (2014). Speeding in web surveys: The tendency to answer very fast and its association with straightlining. *Survey Research Methods*, *8(2)*, 127–135. doi:http://dx.doi.org/10.18148/srm/2014.v8i2.5453

Appendix A
Tables

Table A1
Parameter estimates of model 3 excluding Hungary

	Fixed effects			Variance of Random effects			
				Intercept			
Module	Intercept	Fast	Slow	Countries	Target	Fast	Slow
B[a]	3.18*	3.07*	3.58*	-	0.48*	13.86*	11.82
C	2.54*	3.47*	2.83*	0.34	0.76	4.99	9.46*
D[a]	3.57*	7.55*	2.12	-	0.29	59.05*	11.29*
E	3.84*	4.20*	1.86	1.62	2.14*	5.47	13.08*

[a] Model with random intercept for countries did not converge
* $p < 0.05$

Table A2
Considered variables for the intra-interviewer coefficient

Module	Variable	Scale	Label
B	Psppsgv	0–10	Political system allows people to have influence on politics
	Actrolg	0–10	Able to take active role in political group
	Psppipl	0–10	Political system allows people to have influence on politics
	Cptppol	0–10	Confident in own ability to participate in politics
	Ptcpplt	0–10	Politicians care what people think
	Etapapl	0–10	Easy to take part in politics
	Trstprl	0–10	Trust in country's parliament
	Trstlgl	0–10	Trust in the legal system
	Trstplc	0–10	Trust in the police
	Trstplt	0–10	Trust in politicians
	Trstprt	0–10	Trust in political parties
	Trstep	0–10	Trust in the European Parliament
	Trstun	0–10	Trust in the United Nations
	Lrscale	0–10	Placement on left right scale
	Stflife	0–10	How satisfied with life as a whole
	Stfeco	0–10	How satisfied with present state of economy in country
	Stfgov	0–10	How satisfied with the national government
	Stfdem	0–10	How satisfied with the way democracy works in country
	Stfedu	0–10	State of education in country nowadays
	Stfhlth	0–10	State of health services in country nowadays
	Gincdif	1–5	Government should reduce differences in income levels
	Freehms	1–5	Gays and lesbians free to live life as they wish
	Euftf	0–10	European Union: European unification go further or gone too far
	Imbgeco	0–10	Immigration bad or good for country's economy
	Imueclt	0–10	Country's cultural life undermined or enriched by immigrants
	imwbcnt	0–10	Immigrants make country worse or better place to live
C	Happy	0–10	How happy are you
	sclmeet	1–7	How often socially meets with friend, relatives or colleagues
	inprdsc	0–6	How many people with whom you can discuss intimate and personal matters
	sclact	1–5	Take part in activities compare to others of the same age
	health	1–5	Subjective general health
	rlgdgr	0–10	How religious are you?
	rlgatnd	1– 6	How often attend religious service apart from special occasions
	pray	1– 6	how often pray apart from religious services
D	qfimedu	0–10	Qualification for immigration: good educational qualifications
	qfimlng	0–10	Qualification for immigration: speak country's official language
	qfimchr	0–10	Qualification for immigration: Christian background
	qfimwht	0–10	Qualification for immigration: be white
	qfimwsk	0–10	Qualification for immigration: work skills needed in country
	qfimcmt	0–10	Qualification for immigration: committed to way of life in country
	imtcjob	0–10	Immigrants take jobs away in country or create new jobs
	imbleco	0–10	Taxes and services: immigrants take out more than they put in or less
	imwbcrm	0–10	Immigrants make country's crime problems worse or better
	pplstrd	1–5	Better for a country if almost everyone shares customs and traditions
	lwdscwp	0–10	Law against ethnic discrimination in workplace good/bad for a country
	gvrfgap	1–5	Government should be generous judging applications for refugee status
	gvtrimg	1–5	Compared to yourself government treats new immigrants better or worse
	rlgueim	0–10	Religious beliefs and practices undermined or enriched by immigrants
	dfegcon	1–7	Different race or ethnic group: contact, how often
	dfeghbg	0–10	Different race or ethnic group: contact, how bad or good
E	etfruit	1 – 7	How often eat fruit, excluding drinking juice
	eatveg	1–7	How often eat vegetables or salad, excluding potatoes
	dosprt	1–7	Do sports or other physical activity, how many of last 7 days
	alcfreq	1–7	How often drink alcohol
	alcbnge	1–5	Frequency of binge drinking for men and women, last 12 months

Table A3
Number of respondents and interviewers in each country, in each subset of interview type

Module	Typ		AT	BE	CH	DE	DK	EE	FI	FR	GB	HU	IE	NL	NO	SE	SI
B	Slow	Respondents	215	130	194	326	163	219	208	182	180	180	310	170	163	199	111
		Interviewers	42	26	29	61	33	41	52	41	42	28	48	32	31	37	21
	Moderate	Respondents	1198	1241	1064	2002	1042	1323	1506	1323	1434	1132	1632	1240	927	1288	836
		Interviewers	85	129	62	200	87	122	135	127	177	115	111	100	63	89	59
	Fast	Respondents	187	135	204	316	143	244	189	164	185	185	310	170	160	166	137
		Interviewers	33	25	28	56	28	34	46	34	42	29	53	31	29	30	21
C	Slow	Respondents	223	142	203	304	159	214	208	165	172	154	326	193	137	298	117
		Interviewers	47	31	33	53	29	39	46	39	44	27	54	38	25	40	25
	Moderate	Respondents	1240	1218	1051	2035	1020	1354	1512	1341	1458	1199	1657	1227	976	1260	821
		Interviewers	86	127	62	200	86	120	135	127	180	118	112	103	62	85	59
	Fast	Respondents	180	141	196	321	180	235	197	163	182	141	284	158	123	207	147
		Interviewers	40	25	24	55	32	37	44	36	42	22	47	29	23	38	24
D	Slow	Respondents	202	172	196	349	173	235	167	194	181	166	303	209	150	195	139
		Interviewers	43	39	29	64	37	41	44	44	45	29	50	40	31	37	28
	Moderate	Respondents	1197	1174	1059	1944	1057	1316	1628	1312	1465	1129	1709	1220	951	1277	844
		Interviewers	86	128	60	197	85	120	136	128	176	119	112	103	63	86	59
	Fast	Respondents	227	155	198	312	144	260	113	176	177	198	257	159	139	171	123
		Interviewers	39	30	29	56	26	37	28	38	44	31	48	27	28	31	19
E	Slow	Respondents	198	143	196	291	168	223	214	210	178	169	288	185	166	189	143
		Interviewers	41	30	30	50	35	36	46	47	42	30	55	33	29	33	26
	Moderate	Respondents	1211	1212	1066	2016	1020	1343	1467	1304	1430	1121	1652	1208	928	1247	816
		Interviewers	85	128	61	194	86	124	133	127	178	114	112	103	63	86	59
	Fast	Respondents	208	1350	201	332	200	225	198	195	222	186	333	207	155	217	154
		Interviewers	41	29	26	60	34	32	45	40	47	31	58	32	26	35	22

Appendix B
Figures

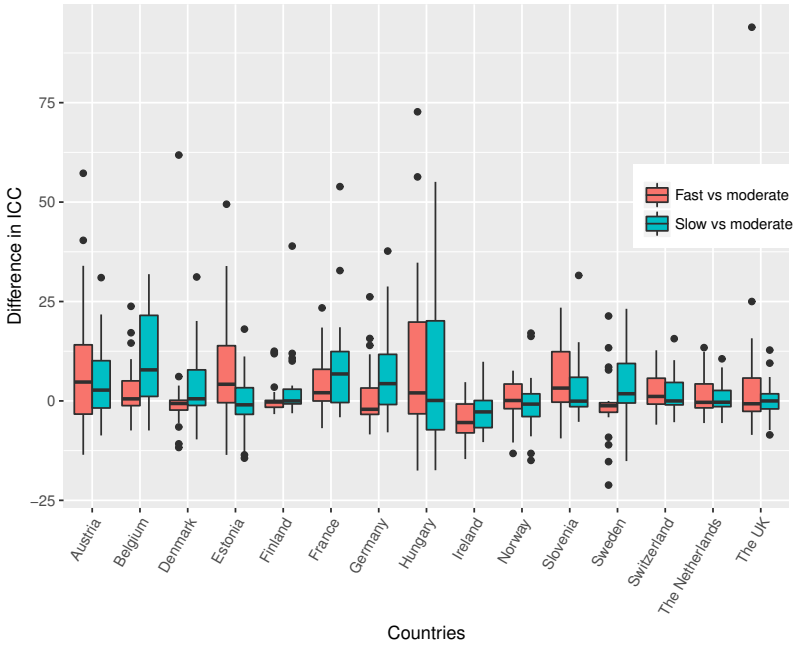

Figure B1. Boxplots per country for the differences between ICCs of the variables in module B: fast versus moderate and slow versus moderate.

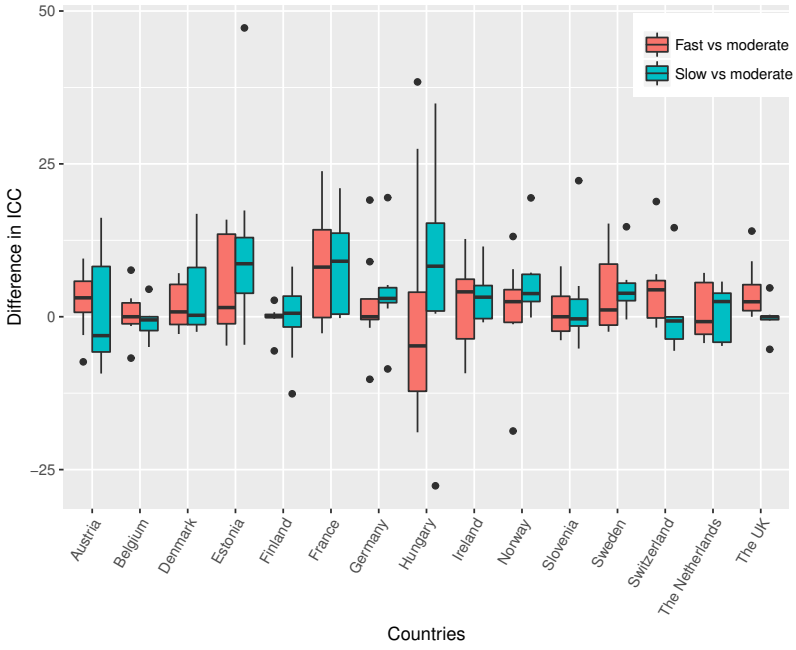

Figure B2. Boxplots per country for the differences between ICCs of the variables in module C: fast versus moderate and slow versus moderate.

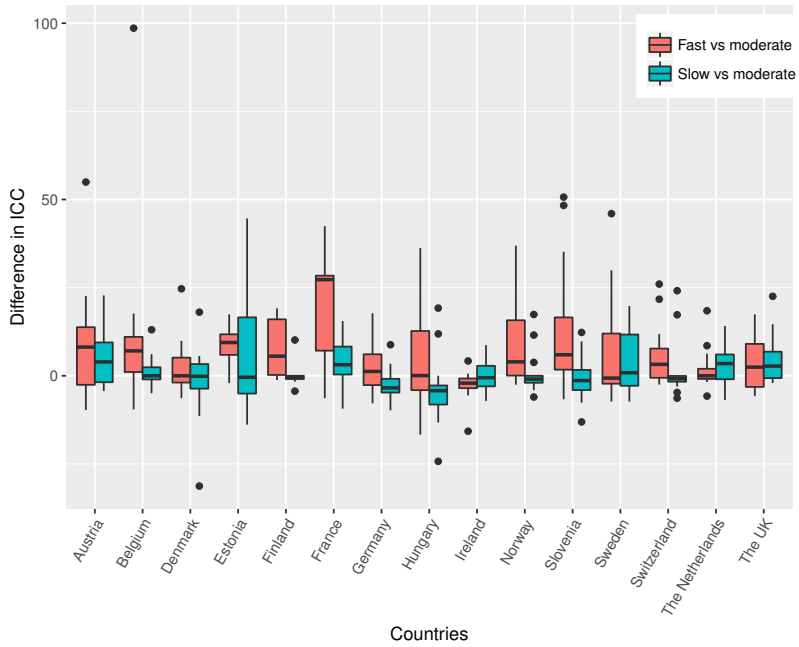

Figure B3. Boxplots per country for the differences between ICCs of the variables in module C: fast versus moderate and slow versus moderate.

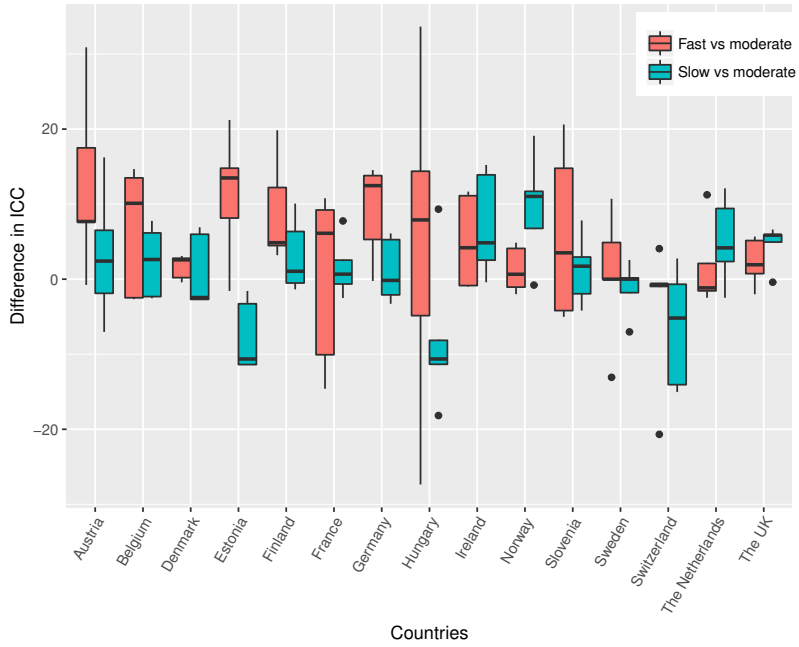

Figure B4. Boxplots per country for the differences between ICCs of the variables in module E: fast versus moderate and slow versus moderate.