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Summary

In this report we establish the baseline for studying panellists' response behaviour in the CROss-National Online Survey (CRONOS) panel using the CRONOS welcome survey. This survey was launched to welcome respondents to the panel before the actual bi-monthly data collection started in February 2017. The welcome survey was conducted between December 2016 and April 2017 in the three participating countries: Estonia, Great Britain, and Slovenia. In order to establish the quality baseline, we analyse item nonresponse, non-differentiation, completion time, and the evaluation of the survey experience. We also include some variables which could explain the variation in the quality indicators.

Contents

1. Introduction

Measurement accuracy in survey estimates relies on respondents paying attention to questions and tasks, and making an effort to provide accurate answers. However, respondent motivation during the survey response process can differ across individuals and situations, thus leading to suboptimal responding behaviours (Cannell, Miller, and Oksenberg 1981; J. A. Krosnick 1991), also known as 'satisficing' (Krosnick, 1991). On the advent of web surveys, it was soon recognised that certain aspects and features of web data collection may damage motivation and thus trigger satisficing behaviours. Survey methodologists have been searching for strategies to identify and reduce this kind of behaviour among online respondents, but studies tend to suffer from low effect sizes and research has been limited to a small set of western countries. The present deliverable describes a quality assessment of the first data collection of the CROss-National Online Survey (CRONOS) panel. This quality assessment is intended to establish a data quality baseline to assess panellists' response behaviour in later waves. To establish the data quality baseline, we evaluated a number of indicators related to how respondents completed the 'welcome survey' of the CRONOS panel. This assessment does not allow evaluating the quality of the observed answers as good or bad but only to describe it and serve for comparison.

2. Measurement error in web surveys

A substantial proportion of today's research in a range of fields (including the social sciences, psychological and educational testing, public health and market research) is based on survey data. Analyses of these data can be used to inform public policy and other important decision-making processes. However, survey estimates are subject to different error sources that can affect data quality, such as coverage, sampling, non-response, measurement and processing errors (Groves 1989; Groves et al. 2009). Survey methodologists devote resources and effort to measure and reduce these error sources.

Our study focuses on reducing measurement error in web surveys. Measurement error refers to the difference between a recorded response and the actual value of the variable of interest (Groves 1989). This difference can be rooted in various aspects of the measurement context, including the mode of administration, the questionnaire, and the respondent. As researchers, we have little to no control over the characteristics of those respondents who participate in the study, but we can try to use methodological approaches to maximise respondent engagement in the survey responding process. A number of theoretical models have been proposed to explain respondent-related measurement error (Tourangeau, Rips and Rasinski, 2000), leading to different approaches to reduce it. In web surveys, the main strategies have focused on improving respondent's motivation and engagement by using interactive features, providing feedback when respondents answer too fast or presenting messages that highlight the importance of answering accurately.

Compared to opt-in online panels, probability-based online panels have shown relatively high levels of data quality (Blom, Gathmann, and Krieger 2015; Callegaro 2010; Disogra, Callegaro, and Hendarwan 2009; Leenheer and Scherpenzeel 2013; M. Revilla et al. 2015, 2016; M. A. Revilla 2013; Scherpenzeel, A. C. Betlehem 2011;

Scherpenzeel 2008). However, this research has been carried out in a limited set of countries, and largely before smartphones became a popular device for web survey completion. Our goal is to investigate whether data quality is similarly high across the three CRONOS countries, and to examine whether completion device has an impact on data quality. To do this, we assessed the quality of the data from the CRONOS 'welcome survey'; a survey launched in December 2016 in the three participating countries, Estonia, Slovenia and Great Britain.

3. Method and data

3.1 The CRONOS panel

The CRONOS panel was set up in Estonia, Great Britain and Slovenia with the goals of 1) evaluating the feasibility of conducting web surveys on probability samples of the general population in a cross-national context, 2) establishing the foundations for building efficient cross-national infrastructures for web survey data collection, and 3) developing a blueprint for comparative web surveys using probability samples.

Respondents were invited to become panel members after they participated in the European Social Survey (ESS) Round 8 face-to-face interview, which took place between September 2016 and February 2017. After the 'welcome survey' was launched, data collection was conducted bi-monthly for 12 months, starting in February 2017. Panel members received an unconditional incentive with their invitation to each wave of the survey.[1] To allow for their participation, the project provided internet-enabled tablets to 182 panel members who did not have internet access for personal use. Recruitment rates, calculated as the proportion of individuals in the gross ESS sample who initially agreed to join CRONOS (including hesitant respondents), ranged from around 30% in Great Britain to around 40% in Estonia and Slovenia.

3.2 The welcome survey

The recruited panel members were first invited to complete the 'welcome survey' which was designed to maintain contact with panel members, as well as to familiarise them with the project and the nature of the surveys they would be receiving. The welcome survey was launched in December 2016 and was open until April 2017 to enable participation by the few panellists who were recruited late in the process.

A total of 1,850 panel members participated in the welcome survey, amounting to a participation rate of 20% of the gross ESS sample. The participation rate was highest in Slovenia (34% of the gross sample) and lowest in Great Britain (13% of the gross sample). In terms of electronic devices, most respondents (69%) participated in the survey using a computer, 19% used a smartphone and 13% a tablet. A majority (60%) of respondents who used tablets were panel members who previously did not have Internet access and were provided with CRONOS tablets.

[1] The way in which incentives were distributed varied between countries. See Villar and Sommer (2017).

3.3 Questionnaire

The welcome survey questionnaire was somewhat shorter than questionnaires in the later waves, comprising 51 questions about societal wellbeing, attitudes towards science, and personality traits. Country-specific questions about household and accommodation, taken from large national surveys, were added to allow comparisons of the CRONOS sample to external benchmarks.

In line with the main objectives of the CRONOS panel, data quality assessment was an important component of each data collection wave. Questions at the end of each wave asked respondents to evaluate the survey completion process. Other questions were included to help understand data quality, such as computer literacy, internet use, attitudes towards the internet, past participation in surveys. Paradata describing the response process (such as response latencies) were also collected. Questionnaires also included methodological experiments to investigate the performance of various approaches to design questions and other questionnaire-related factors that may influence data quality.

For each wave, the source questionnaire was translated from English into three other languages, namely Estonian, Russian and Slovenian. When designing the CRONOS panel, the aim was to minimise questionnaire-related measurement error by paying close attention to question wording and to the visual design of questions across devices, following web questionnaire design guidelines as far as possible.

The welcome survey contained two experiments related to questionnaire design. While the analysis of these experiments is outside the scope of this deliverable, the experimental treatments were included in some of the models presented here to control for their potential impact on the response quality indicators.

Experiment 1 manipulated the format of a set of four questions on societal wellbeing. For a random half of respondents (n = 458), the response options included seven scale points gradually going from extremely positive to extremely negative evaluations of society (questions w0q1b1 to w0q4b3). For the other random half (n = 454), the same question was presented in a branching format, starting with only three response options (positive, negative or neutral), followed up by a question about the strength of their opinion if respondents had selected a positive or negative answer at the first question (questions w0q1b1 to w0q4b3).

Experiment 2 manipulated the verbal labels describing moderate positions on 5-point scales (questions w0q8, w0q10-w0Q15 and w0Q17-w0Q34). For a random half of respondents (n = 439), the response scale showed strong adverbs on the endpoints (i.e., strongly agree, very accurate) and no adverbs on the moderate scale points (agree, accurate). In contrast, for the other half of respondents (n = 402), the endpoints were the same as in group 1 but the moderate scale points were modified by an adverb (somewhat agree, somewhat accurate).

3.4. Data quality indicators

Operationalisation of data quality

Various indicators can be used to operationalise data quality, but none can cover the concept adequately if used in isolation. For variables that can be externally observed, such as behaviours (e.g., number of visits to the hospital) and certain facts (e.g., marital status), record data may be available that can be compared to the observed survey value as an estimate of measurement error. For attitudinal questions, however, such external checks are not possible. Instead, a combination of indicators is typically used including item-nonresponse, response latency, non-differentiation, and length and quality of answers to open-ended questions.

Data quality indicators of attitudinal variables do have limitations, which relate to their level of precision and accuracy (their own measurement error), the ease of implementation and the ease of interpretation. For example, non-differentiation (see definition below) requires the inclusion of questions formulated in 'opposite' directions, so that giving the exact same answer to all questions would be incompatible. Response latencies are sometimes difficult to analyse, due to missing timing information related to recording problems as well as extreme values related to respondent multitasking. Interpretation is also challenging: short response times can indicate that a question is easy or the topic very salient for the respondent, but it may in turn indicate that respondents are not engaging sufficiently in the response process, perhaps not reading the full question. Revilla and Ochoa (2015) found a significant positive correlation between response latency and other indicators of data quality, but the correlation was not large at .30 in absolute value. Moreover, some indictors can only be computed for certain types of questions, which may not be available in a specific questionnaire. Due to these limitations, in the present study we evaluated as many different data quality indicators as possible to provide a baseline against which to monitor CRONOS respondents' behaviour.

Data quality indicators

Item nonresponse

Item nonresponse occurs when respondents do not answer the question. This may occur for various reasons such as inability or unwillingness to provide an answer, failure to adequately comprehend the question or to form an appropriate response, lack of knowledge, or lack of motivation to devote sufficient effort to the response process. In such cases, respondents may not answer the question at all or select a specific non-substantive answer, such as 'Don't know' or 'Prefer not to answer'. A special case of item nonresponse occurs when respondents 'break off'; that is, stop completing the survey before the end of the questionnaire due to motivational, technical or other reasons.

A high incidence of item nonresponse – including break-offs – can indicate excessive burden of survey participation, high sensitivity or complexity of questions, or lack of motivation (amongst other things). To investigate these aspects of survey data quality we analysed the incidence of survey breakoffs, missing data due to unanswered

questions and non-substantive answers (item nonresponse). For each respondent, we calculated the proportion of items with missing data relative to the number of all items applicable to the respondent; that is, items that were presented to the respondent with a request to provide an answer. Depending on the frequency of missing data, we modelled and evaluated the factors that influenced their occurrence.

Non-differentiation

Non-differentiation occurs when a respondent, offered a similar response scale across a set of questions, chooses the same answer (or a small range of answers) for each of them. In its extreme form, where the respondent selects the same answer repeatedly, this pattern is also referred to as 'straight-lining'. These two indicators have often been used as indicators of satisficing (Jon A. Krosnick 1991).

As mentioned before, there are difficulties in operationalising non-differentiation in a way that is meaningful as an indicator of data quality. If all questions are strongly related in topic and are expressed in the 'same direction' (where a given scale point represents one direction of the attitude for all questions) observing low variance in answers may not mean that the respondent is not putting effort into the survey process, and may instead be a sign of coherence across answers and good data quality. For low response variance across questions to really indicate low data quality, it is important to include items that one would expect to be negatively correlated. In this study, we computed the variance across sets of questions that met the following criteria: a) the same scale was used at least 5 times in a row b) the items were not all in the same direction or did not measure the same concept. This variance was our measure of non-differentiation.

Completion time

In this study, we considered completion times to be indicators of data quality. Due to limitations of the paradata provided by the web survey provider, analysis of response times was limited to respondents who had completed the full survey in one go. We handled the presence of outliers by following the truncation procedure used by Yan and Tourangeau (2008), where we replaced observations beyond the lower and upper one percentile with the lower and upper one percentile values respectively. However, before doing so, we identified respondents which answered the survey too quickly. The expected completing time for respondents was 10 minutes, so we consider respondent that take less than 8 minutes (20% of the expected value) as too quick which indicates that they are not making enough effort to answer the survey attentive.

Survey evaluation

Respondents' perception of their experience answering the survey is also an indicator of respondent behaviour often studied in the literature. This is particularly important in a panel, because low satisfaction with the process may affect the likelihood of participation in subsequent surveys. In the 'welcome survey', three questions were included almost at the end of the survey to evaluate: a) how difficult the respondents found it to understand and answer the questions in the survey, b) how much they worked at providing the most accurate answers they could, and c) how much they

enjoyed answering the survey. All three questions used a unipolar 5-point fully labelled scale. The full text of these questions is provided in Table 1.

Table 1: Survey evaluation questions

Question	Response scale
How difficult was it for you to understand and answer the questions in this survey? (w0q44)	Not at all difficult Slightly difficult Moderately difficult Very difficult Extremely difficult (Don't know) (Prefer not to answer)
And how much did you work at providing the most accurate answers you can to the questions in this survey? (w0q45)	Not at all A little A moderate amount A lot A great deal (Don't know) (Prefer not to answer)
How much did you enjoy answering this survey? (w0q46)	Not at all A little A moderate amount A lot A great deal (Don't know) (Prefer not to answer)

3.5 Analyses

Analyses were done using Stata 14. We first conducted descriptive analyses for each of the quality indicators described in section 3.4 (for the panel as a whole and by country). We then carried out regression analyses[2] to study the links between the different quality indicators and different explanatory variables. These explanatory variables included those describing the survey context and experience.

Explanatory variables

- *'Not at home'*: dummy variable taking the value 0 if the survey was completed entirely at home and 1 if elsewhere (all those who reported any other location, whether or not they also selected 'home').
- *'People nearby'*: dummy variable taking the value 1 if there were other persons present nearby during the completion of the survey and 0 if otherwise.
- *'Multitasking':* dummy variable taking the value 1 if the respondents declared that they completed any kind of other tasks during the survey completion and 0 if otherwise.

[2] Ordinary least squares was used for continuous variables, and ordered logistic regression for ordinal variables.

- *'Number of surveys completed previously'*: dummy, being 1 is the respondent had completed more than the average of 3 surveys (mean=3.3) and 0 if 3 or less surveys had been completed previously.
- *'Feeling comfortable using a computer'*: ordinal variable measuring how comfortable the respondents feel with using computers, going from '1- Not comfortable at all' to '5- Extremely comfortable'.
- *Device used: 'Smartphone'* and *'Tablet'*: dummy variables taking the value 1 respectively if the device used by the respondent to complete the survey is a smartphone or a tablet, the reference category being PC (laptop or desktop).
- *Experiments: 'Branched questions' and 'Modified answer categories':* two dummy variables which indicate the experimental group (control or treatment) in which the respondents were for the two experiments, in which the labels of some of the scale points were varied.

In addition, we also used a series of background variables as explanatory variables:

- *Country: 'Slovenia'* and *'Estonia'* dummy variables taking the value 1 if the country in which the data was collected is respectively Slovenia and Estonia, and 0 otherwise. The reference category is then Great Britain.
- *'Female'*: dummy variable taking the value 1 if the gender of the respondent is female and 0 if it is male.
- 'Age': variable coded in 8 groups from youngest to oldest age: 18-25, 26-30, 31-35, 41-50, 51-60, 61-70, and older than 70. It was treated as continuous.
- *Education: 'Low education'* and *'High education'*: dummy variables taking the value 1 if the education level of the respondent is respectively low (ISCED 229 or lower) and high (ISCED 510 or higher), the reference category being 'middle level of education'.

Finally, we included two attitudinal variables as moderators that have been used to understand differences across respondents in level of satisficing:

- *'Need_cognition'* (w0q29 to w0q31). Measure of individual tendencies to engage in cognitively demanding tasks. The expectation is that respondents who like to engage in such cognitive efforts will be intrinsically motivated to complete the survey carefully and conscientiously. The answers to the three questions are summed up and the higher the value the greater the tendency to engage in cognitively demanding tasks.
- *Need_evaluate'* (w0q32 to w0q34). Measure of individual tendencies to voice their own opinion, and self-reported strength of opinions in general. The answers to the three questions are summed up and the higher the value the greater the tendencies to voice own opinion.

4. Findings

4.1 Description of the sample

Of 1,850 panel members who participated in the welcome survey, 44% were male and 56% female. The age structure of respondents is presented in Figure 1. Fourteen

percent of respondents reported a lower level of education, 43% moderate, and another 43% higher education.

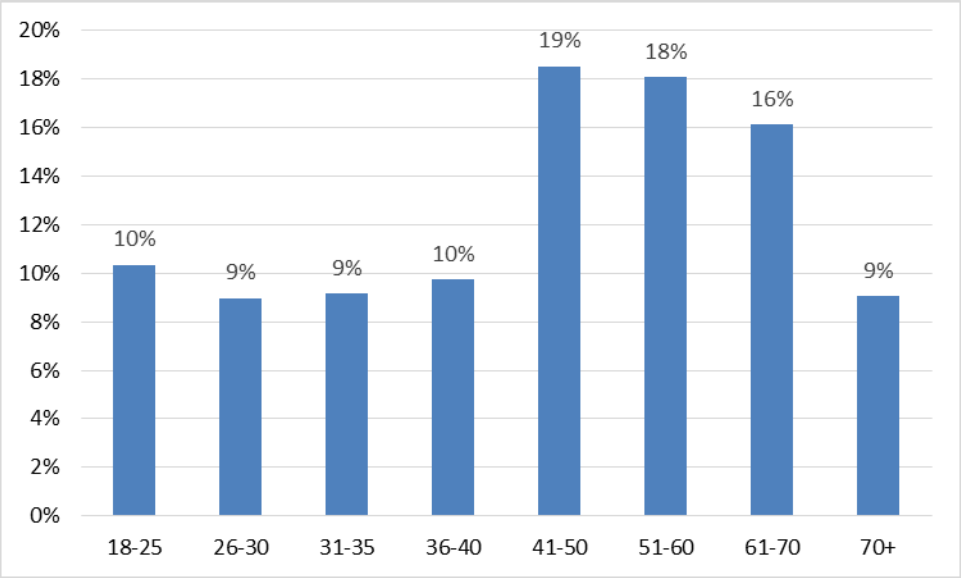


Figure 1: Age structure of respondents (n = 1,748)

Respondents generally reported being relatively comfortable using computers; 59% of them reported being very or extremely comfortable and 6% reported being not comfortable at all. The mean rated comfort using computers on a five-point scale from 1 to 5 was 3.6. Most respondents also had prior web survey experience; 54% of them indicated that they have already participated in a web survey in the past. The number of previously completed web surveys among these respondents varied substantially, with a mean number of seven, a standard deviation of 15, and a median of four web surveys.

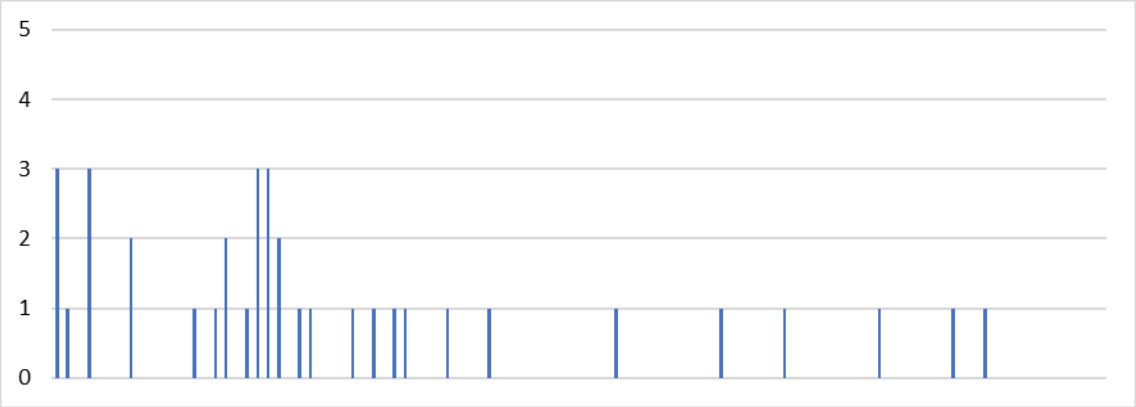
4.2 Descriptive statistics for the different indicators of data quality available in the welcome survey

4.2.1 Item nonresponse

Of 1,753 respondents who started the welcome survey, 1,692 (97%) completed the questionnaire in one session whilst a further four percent of respondents completed the survey after a break. This suggests that a vast majority of respondents did not perceive the questionnaire as being too burdensome to complete in one session (see section 4.2.4 for data on survey completion time).

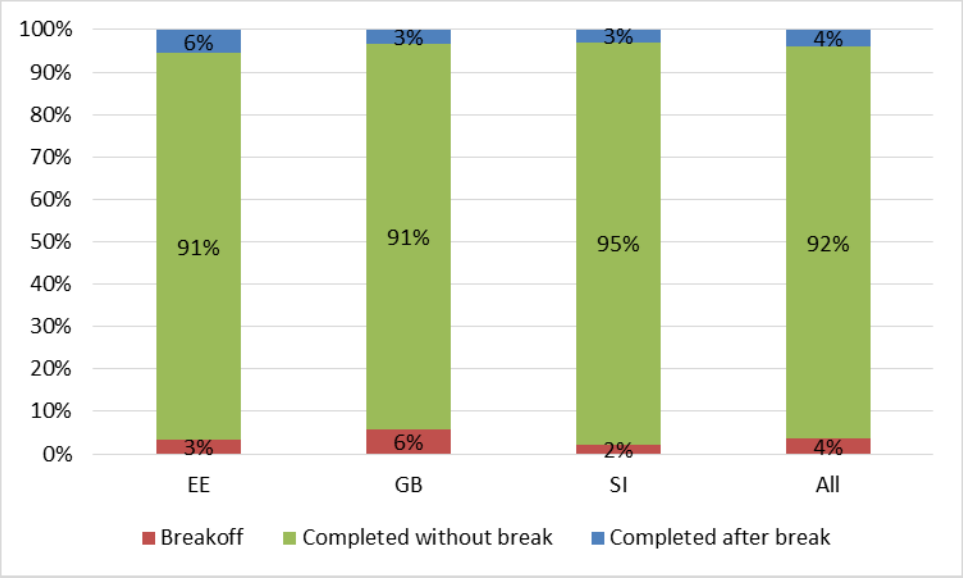
There was a very small proportion of break-offs to the welcome survey. Of 61 respondents (four per cent of total starters) who terminated the survey participation early, 24 left the questionnaire at the welcome page and did therefore not even start answering the survey questions. The remaining breakoffs occurred throughout the questionnaire relatively uniformly, although the tendency to terminate the participation was somewhat higher in the first half of the questionnaire, as presented in Figure 2. However, no questions exhibited specifically high breakoff rate that would indicate potential problems due to question complexity or sensitivity.

Figure 2: Number of breakoffs through the questionnaire



There were statistically significant differences in the proportion of completed surveys and breakoffs across countries, although the differences were not large, as illustrated in Figure 3. The proportion of breakoffs among the British respondents was two percentage points higher compared to the Estonian respondents and three percentage points higher compared to the Slovenian respondents. Slovenia and Estonia had very similar number of completed survey (98% and 97%, respectively), but Estonian respondents were somewhat more likely to complete the survey after a break.

Figure 3: Proportions of completed surveys and breakoffs by country



$\chi^2 = 15.33, p < 0.01$

Missing data due to non-substantive answers or item non-response were generally infrequent in the welcome survey. The proportion of missing data exceeded 1% only for nine items, and 2% for the following three items:

- Numeric entry of the number of cars or vans available to the household (w0q37gb, question specific to GB): 33% missing answers. Note that this item was applicable only to 12 respondents who indicated four or more cars available to the household. Four of 12 respondents did not provide numeric entry, resulting in relatively high item non-response rate.

- Number of rooms available to the households (w0q36gb, question specific to GB): 7% missing answers.
- Number of rooms available to the households (w0q36si, question specific to Slovenia): 2% missing answers.

Overall, 9% of respondents who completed the survey selected a non-substantive answer (i.e. 'don't know' or 'prefer not to answer'), or left unanswered, at least one item applicable to them. The average proportion of missing data among the respondents who completed the survey is correspondingly low, amounting to 0.4% of applicable items, as shown in Table 2. Relatively speaking, the most frequent causes of missing data were 'don't know' answers (on average 0.2% of applicable items), followed by item non-response and refusals ('Prefer not to answer', 0.1%).

Respondents with a substantial number of missing data were scarce: 5% of individuals who completed the survey had missing data on more than 2% of items applicable to them and 1% on more than 8% of items.

The incidence of specific types of missing data as the percentage of all items applicable to the respondents

Missing data type	Mean	Std. dev.	95% percentile	99% percentile	Min-Max
Don't know	0.15	0.97	0.00	3.92	0.00-21.57
Refusal	0.10	1.06	0.00	2.08	0.00-34.00
Item non-response	0.12	0.97	0.00	2.08	0.00-30.61
All missing data	0.37	1.99	2.00	8.16	0.00-34.00

Data presented for respondents who completed the survey (*n* = 1,692)

In sum, the low incidence of missing data suggests that survey breakoffs, item non-response and non-substantive answers were not a likely threat to data quality in the welcome survey. Because of their low frequency and dispersion across various questions, it is also not feasible to perform further statistical modelling for identification of factors influencing the occurrence of individual types of missing data. However, the incidence and patterns of missing data will be closely monitored throughout all panel waves and further analyses will be performed as needed.

4.2.2 Non-differentiation

In the welcome survey, we could identify three different sets for which the same scale was used at least five times in a row and the items were not all in the same direction or all items did not measure the same concept (see Appendix 1 for the question wording):

- Set 1: six questions about how the respondents see science and technology (w0q10-w0q15), all asked using the following scale: 1=Strongly agree, 2=(Somewhat) Agree, 3=Neither agree nor disagree, 4=(Somewhat) Disagree, 5=Strongly Disagree. The respondents were also able to say 'don't know' or not answer.

- Set 2: twelve questions about respondents' personality following the International Personality Item Pool (IPIP) (w0q17-w0q28), all asked using the following scale: 1=Very inaccurate, 2=(Moderately) Inaccurate 3=Neither inaccurate nor accurate, 4=(Moderately) Accurate, 5=Very accurate. The respondents were also able to say 'don't know' or 'prefer not to answer'.
- Set 3: six questions about how the respondent characterises him/herself regarding own opinions and problem-solving capacities (w0q29-w0q34), all asked using the following scale: 1=Strongly agree, 2=(Somewhat) Agree, 3=Neither agree nor disagree, 4=(Somewhat) Disagree, 5=Strongly disagree. The respondents were also able to say 'don't know' or 'prefer not to answer'.

For each of these three sets, in order to measure the level of non-differentiation, we computed the variance of answers of each respondent, focusing on respondents who provided substantive responses, i.e. excluding 'don't know' and 'prefer not to answer'. Table 2 presents the mean, standard deviation (Std. dev.), minimum (Min) and maximum (Max), for all three countries together and per country, for each set of questions.

Table 2: Variance of answers per set of questions and country

	Country (*N*)	**Mean**	**Std. dev.**	**Min**	**Max**
Set 1	All (*1,675*)	1.21	.98	0	4.80
	Estonia (*617*)	1.18	1.02	0	4.80
	GB (*474*)	1.29	1.01	0	4.80
	Slovenia (*584*)	1.18	.91	0	4.80
Set 2	All (*1,675*)	1.15	.65	0	4.08
	Estonia (*624*)	1.16	.64	.083	3.36
	GB (*468*)	1.18	.64	0	4.08
	Slovenia (*583*)	1.12	.67	0	3.88
Set 3	All (*1,683*)	.72	.64	0	4.27
	Estonia (*625*)	.77	.66	0	4.17
	GB (*473*)	.69	.59	0	4.27
	Slovenia (*585*)	.70	.65	0	4.17

While the minimum is most of the time 0 (no variance at all, meaning pure straight-lining: the respondent selects always exactly the same answer), the maximum varies from 3.36 to 4.80 (on a 5-point scale). The mean and standard deviation are overall larger for set 1, then for set 2, and finally for set 3, which is as expected since only in set 1 we have items that are really in opposite directions. Comparing within each set, differences across countries are usually quite small and there is no pattern of one country having always a higher or lower variance of answer than the others. Overall, there are only some respondents who are pure straight-lining, i.e. do not differentiate between their answers and thus give contradictory answers, but most respondents show some variation. Table 3 presents the absolute number of respondents that straight-line, ranging from 0 for set 1 in Estonia (0%) to 26 for set 3 in Slovenia (4.44%). In sum, only few respondents seem not to differentiate between their answers

Table 3: Absolute number of pure straight-liners

	Country	Total number of respondents	Absolute number of pure straight-liners	Percentage of pure straight-liners
Set 1	Estonia	617	11	1.78%
	GB	474	5	1.05%
	Slovenia	584	9	1.54%
Set 2	Estonia	624	0	0.00%
	GB	468	3	0.64%
	Slovenia	583	3	0.51%
Set 3	Estonia	625	23	3.68%
	GB	473	17	3.59%
	Slovenia	585	26	4.44%

4.2.3 Completion time

After applying the truncation procedure used by Yan and Tourangeau (2008), which consists in replacing observations beyond the lower and upper one percentile with the lower and upper one percentile values respectively, the completing time, considering all countries together, ranges from 5.3 minutes to 49.8 minutes with a mean completing time of 15.3 minutes and a standard deviation of 8 minutes. Figure 4 shows the distribution of these completion times for all countries together and Figure 5 for each country separately.

Due to the truncation procedure the minimal and maximal time for completion remains the same when we consider the countries separately. The country means and standard deviations are somewhat different, but these differences are not significant (Estonia: 16.7 minutes with a standard deviation of 9.1, Great Britain (GB): 13.6 minutes with a standard deviation of 6.4, and Slovenia: 15.0 minutes with a standard deviation of 7.6). The expected survey duration was about 10 minutes, so we find that overall respondents took longer. Taking the expected 10 minutes as criteria, we can consider those answering in less than 8 minutes as too quick which can be interpreted as not paying attention. In total 174 respondents (11%) answered in less than 8 minutes, 47 (8%) in Estonia, 58 (13%) in GB and 69 (12%) in Slovenia. The maximal time varies also but cannot be interpreted as lack of attention or an improved effect as respondents might have done something else in between but then returned (with or without attention) to the survey. In any case, as mentioned initially, the analyses of the 'welcome survey' shall serve as baseline to evaluate the following waves in the CRONOS panel.

Figure 4: Total completion time – all countries together

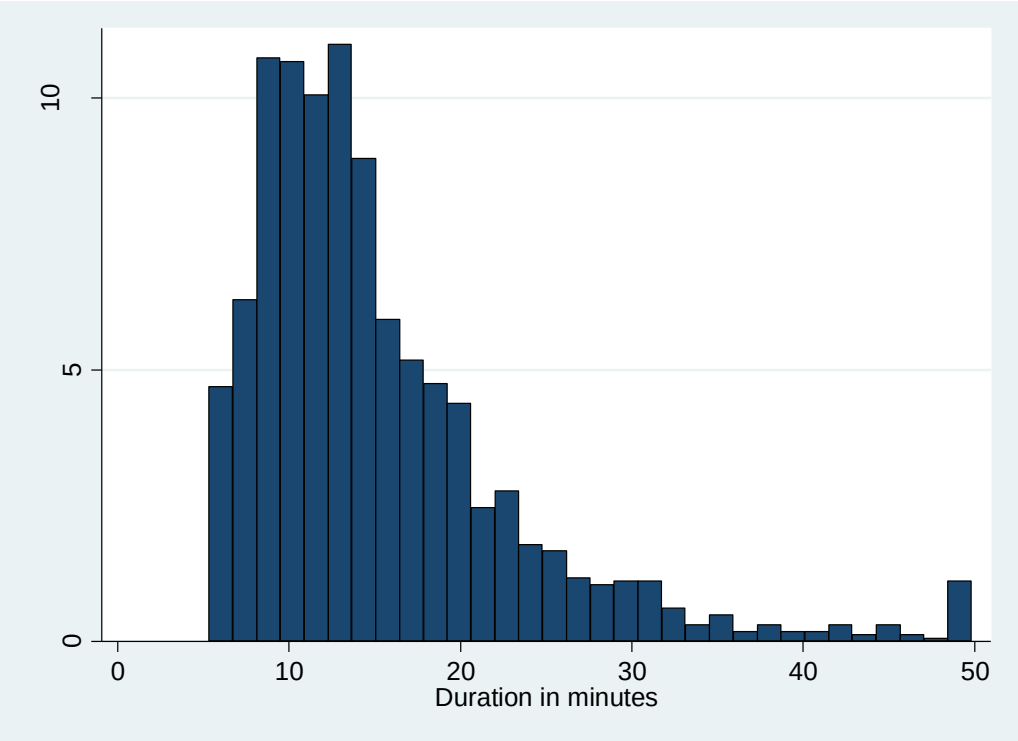
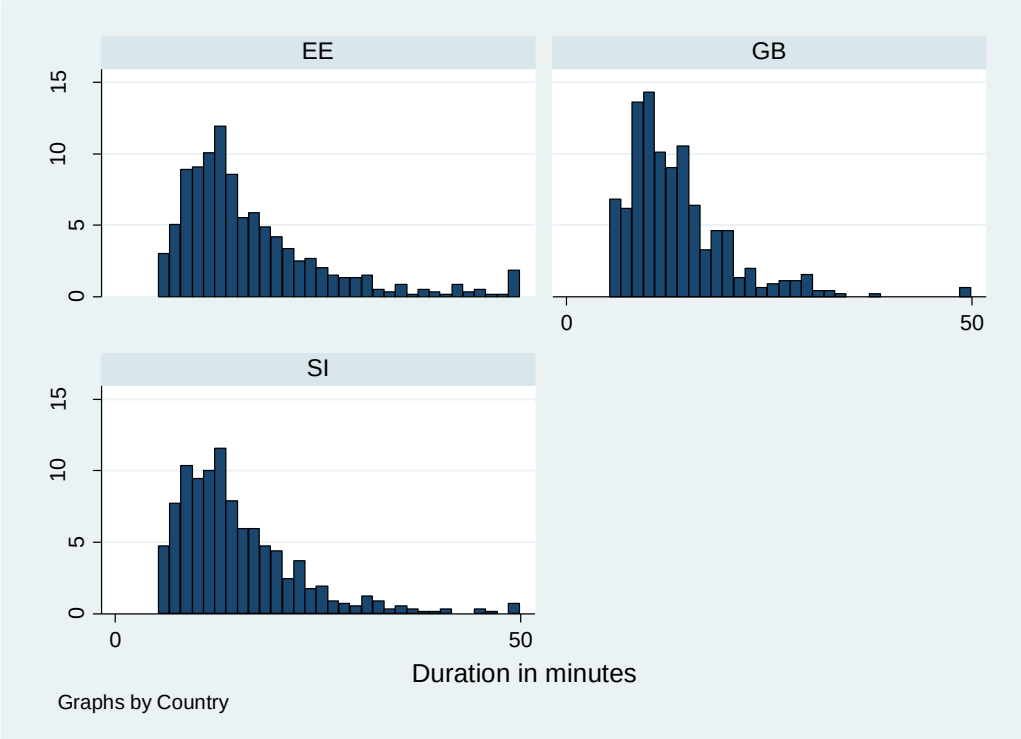


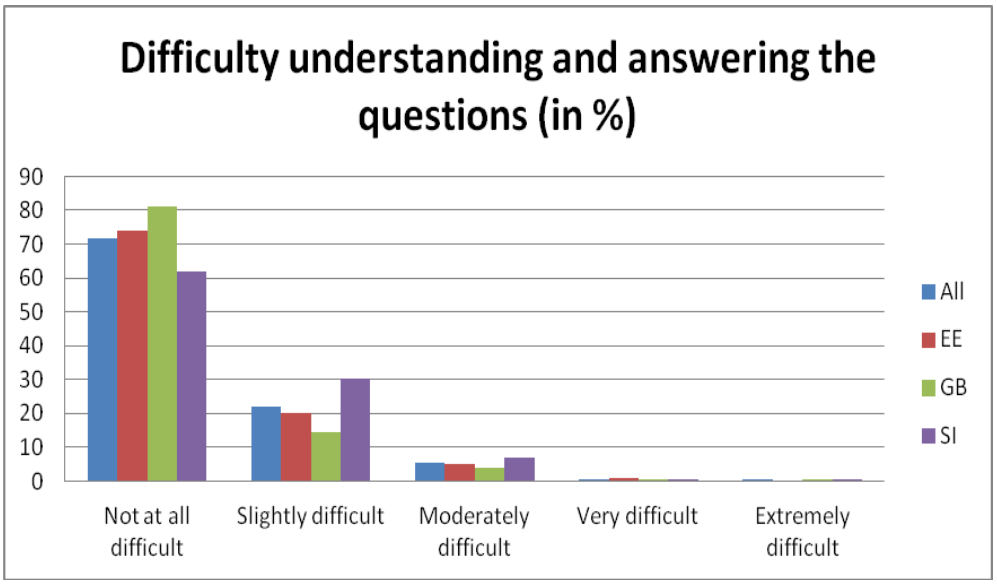
Figure 5: Total completion time per country

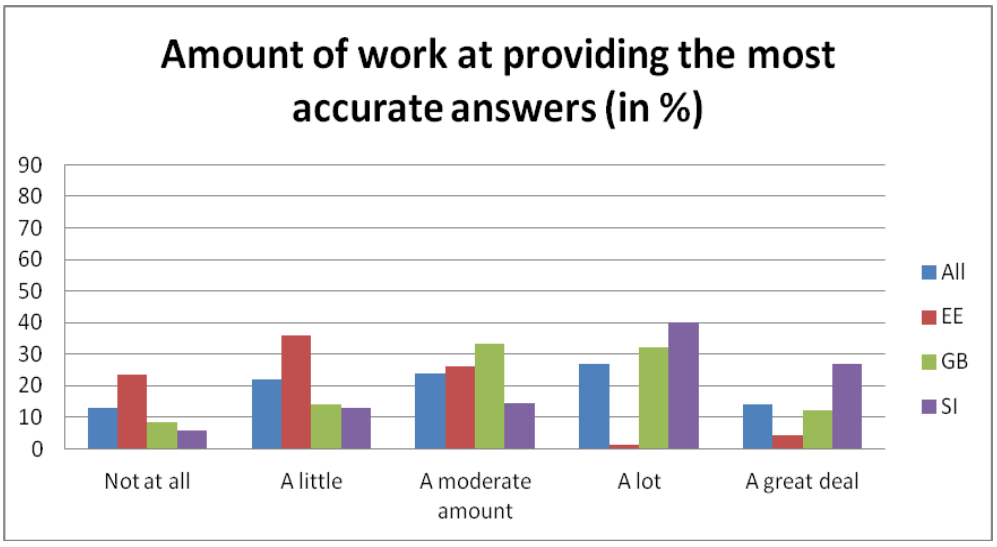


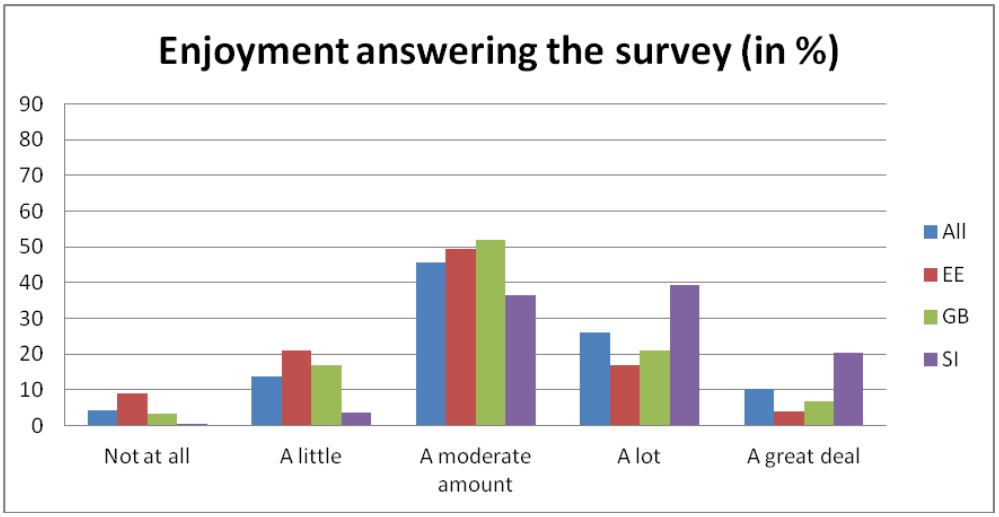
4.2.4 Survey evaluation

The three graphs in Figure 7 present the distributions of answers (excluding missing values) for the three questions related to survey evaluation, across all respondents (*N*=1,688-1,691 depending on the question) and per country (*N*=630-632 for Estonia, *N*=470-471 for Great Britain and *N*=588 for Slovenia).

Figure 6: Questions on survey evaluation







Overall, the respondents did not find the survey difficult, even if there are some differences across countries. In particular, in Slovenia, a lower percentage of respondents found the survey 'not at all difficult' and a higher percentage found it 'slightly difficult' than in Estonia and Great Britain. In terms of the amount of work respondents put into answering the survey, the distribution for the whole sample is more uniform with quite similar proportions of respondents selecting the different categories. However, once again, there are differences across countries: The majority of respondents in Estonia (83%) reported working 'not at all', 'a little' or a 'moderate amount' to provide the most accurate answer, whereas the majority of respondents in Slovenia (68%) reported working 'a lot' or 'a great deal'.

Finally, in terms of enjoyment, respondents were most likely to report having enjoyed the survey 'a moderate amount'. In Great Britain and Slovenia a higher proportion of respondents answered on the more positive side ('a lot'/'a great deal') than on the less positive side ('not at all'/'a little'). Again, differences across countries are present, with Slovenia being the country where most respondents enjoyed the survey. Overall the results about the survey experience of the participants are quite positive. Respondents found the survey mainly not difficult and enjoyable which also explains why they only need to put a moderate amount of effort for answering it.

4.3 Regression analyses

The following section presents the results of regression analyses to further explore factors explaining variation in the level of non-differentiation, survey completion time and survey evaluations across respondents.

4.3.1 Non-differentiation

Table 4: OLS Regression of non-differentiation (Set 1 to 3) (Dependent variable = variation in response set)

	Set 1	**Set 2**	**Set 3**
	coefficient (std. error)	coefficient (std. error)	coefficient (std. error)
Experiments			
Given branched questions	-0.042	-0.017	0.034
	(0.04)	(0.03)	(0.04)
Modified answer categories	**0.250*** **	**0.247*** **	**0.332*** **
	(0.04)	**(0.03)**	**(0.04)**
During survey completion			
Not at home	-0.019	0.003	-0.075
	(0.05)	(0.04)	(0.05)
People nearby	0.016	0.002	0.106*
	(0.05)	(0.03)	(0.04)
Multitasking	-0.035	-0.001	0.005
	(0.04)	(0.03)	(0.04)
Web survey experience			
Number of surveys completed previously	0.037	0.075*	-0.019
	(0.05)	(0.03)	(0.04)
Feeling comfortable using a computer	**0.149*** **	**0.067*** **	0.005
	(0.02)	**(0.02)**	(0.02)
Device used (reference category: PC)			
Smartphone	-0.049	-0.014	0.004
	(0.06)	(0.04)	(0.05)
Tablet	0.087	**0.109***	-0.005
	(0.07)	**(0.06)**	(0.06)
Country (reference: GB)			
Slovenia	-0.021	**-0.136** **	0.061
	(0.06)	**(0.04)**	(0.05)
Estonia	-0.068	-0.063	**0.114***
	(0.05)	(0.04)	**(0.05)**
Female	**-0.162*** **	0.008	-0.011
	(0.04)	(0.03)	(0.04)
Age group	0.014	-0.014	0.012
	(0.01)	(0.01)	(0.01)
Education			
Low level	0.101	0.042	0.036
	(0.07)	(0.05)	(0.06)
High level	**0.177*** **	0.022	-0.023
	(0.05)	(0.03)	(0.04)
need_cognition	0.000	**0.019***	**-0.033** **
	(0.01)	**(0.01)**	**(0.01)**
need_evaluate	**0.024***	**0.017***	**-0.083*** **

	(0.01)	**(0.01)**	**(0.01)**
constant	-1.022***	-0.642***	0.253
	(0.17)	(0.13)	(0.16)
Model fit			
R^2	0.099	0.094	0.136
Adjusted R^2	0.089	0.084	0.127
N	1,598	1,616	1,558

* p<0.05, ** p<0.01, *** p<0.001

All three models are significant (p <.01) but explain only around one tenth of the variance in the dependent variable (adjusted R^2): 8.9% for set 1, 8.4% for set 2, and 12.7% for set 3[3].

Regarding the question wording experiments conducted in the welcome survey, we find the modification of the response scale has a significant effect. In all three sets of questions, respondents exposed to scales labelled strongly agree, *somewhat* agree, neither agree nor disagree, *somewhat* disagree, strongly disagree (compared to the scale not using the term *somewhat*) were more likely to display non-differentiation.

Feeling comfortable using a computer also increases non-differentiation, but only for question sets 1 and 2. Regarding question set 1 about science and technology, we find that women's answers are less non-differentiated than men's, while respondents with a higher level of education exhibited more non-differentiation compared to those with a moderate level of education. Regarding question set 2 measuring personality, we find that respondents in Slovenia chose significantly more differentiated response options than those in the UK, and that answering on a tablet increases non-differentiation compared to answering on a PC. Finally, regarding question set 3 (respondent characteristics and problem-solving capacities), we find that respondents in Estonia show evidence of greater non-differentiation than those in the UK.

4.3.2 Completion time

Because the dependent variable (survey completion time) is skewed to the left as illustrated in Figure 4 above), with a mean of 15 minutes but the fastest completion time of 5.5 minutes and the longest of 50 minutes we transform the variable logarithmically in order to run a linear regression.

Table 5: OLS regression of (log) completion time (in minutes)

	Completion time
	Coefficient (SE)
Experiments	
Given branched questions	**0.04* (0.02)**

[3] The assumption of non-collinearity between the predictors holds: the variance inflation factor is lower than 2 for all three models. The assumption of homogeneity of the variance of the residuals does not hold for set 1 and set 3, even after the logarithmic transformation of the skewed dependent variables. We therefore present the robust standard errors.

Modified answer categories	**0.05** (0.02)**
During survey completion	
Not at home	**-0.08** (0.02)**
People nearby	**0.12*** (0.02)**
Multitasking	**0.06** (0.02)**
Web survey experience	
Number of surveys completed previously	**-0.06** (0.02)**
Feeling comfortable using a computer	**-0.08*** (0.01)**
Device used (reference category: PC)	
Smartphone	0.00 (0.03)
Tablet	0.06 (0.03)
Country (reference GB)	
Slovenia	**0.15***(0.03)**
Estonia	**0.26***(0.03)**
Female	-0.01 (0.02)
Age group	**0.07***(0.01)
Education (reference category: middle level)	
Low education	0.06 (0.03)
High education	**-0.06* (0.02)**
need_cognition	0.00 (0.00)
need_evaluate	-0.00 (0.00)
constant	2.34***(0.08)
Model fit	
R^2	0.31
Adjusted R^2	0.31
N	1,556

* p<0.05, ** p<0.01, *** p<0.001

The model explaining survey completion time is significant (p-value <.01) and explains 31% of the variance (adjusted R^2)[4].

We find that being exposed either to the branching version of the questions (experiment 1) or the amended response scale containing additional modifiers (experiment 2) increases the completion time. This is to be expected as experiment one involves asking two questions rather than one and experiment two adds words to the response scale which affects the reading time. We also find that people answering the survey while other people are close by or whilst they are multitasking take longer, whereas people who are outside their home are faster. Respondents with more web survey experience and a higher level of education are also faster, as would be expected. Finally, we find that respondents in both Slovenia and Estonia take longer than those in GB.

[4] We tested the assumptions of homoscedasticity of the residuals and non-collinearity between the predictors and both are not violated (p-value=.0 for the Breusch-Pagan test and the variance inflation factor is <2 for all three models).

4.3.3 Survey evaluation

As the three questions assessing respondents' survey evaluation showed a skewed distribution, where some answer categories were only chosen by few respondents, we transformed the dependent variables into dummy variables, and consequently we ran logistic regressions for these variables.

Table 6: Regression of survey evaluation (Questions 1 to 3)

	Coefficient (SE)		
	Difficulty understanding and answering questions (0 "not at all difficult"; 1 "slightly or more difficult")	Amount of work providing most accurate answers (0 "not, little or moderate amount"; 1 "a lot or great deal of work")	Enjoying answering the survey (0 "not, little or moderate amount"; 1 "a lot or great deal of enjoyment")
Experiments			
Given branched questions	0.14 (0.12)	0.25* (0.12)	-0.11 (0.11)
Modified answer categories	-0.09 (0.12)	-0.01 (0.12)	-0.05 (0.11)
During survey completion			
Not at home	-0.08 (0.15)	-0.081 (0.15)	-0.21 (0.15)
People nearby	0.11 (0.13)	-0.00 (0.13)	-0.01 (0.13)
Multitasking	0.01 (0.13)	-0.20 (0.13)	-0.05 (0.13)
Web survey experience			
Surveys previously completed	-0.21 (0.14)	0.089 (0.14)	0.01 (0.13)
Feeling comfortable using a computer	**-0.26*** (0.06)**	0.016 (0.06)	**0.19** (0.06)**
Device used (reference category: PC)			
Smartphone	**-0.36* (0.17)**	0.129 (0.16)	-0.09 (0.16)
Tablet	**0.56** (0.19)**	0.40* (0.19)	**0.68*** (0.19)**
Demographics			
Country (reference UK)			
Slovenia	**1.26*** (0.18)**	**0.688*** (0.15)**	1.423***(0.16)
Estonia	**0.56** (0.18)**	**-1.879*** (0.17)**	-0.251 (0.16)
Female	0.03 (0.12)	-0.053 (0.12)	0.187 (0.12)
Age group	-0.03 (0.03)	**-0.252*** (0.03)**	-0.026 (0.03)
Education (reference category: middle level)			
Low education	0.25 (0.19)	-0.018 (0.19)	**0.578** (0.19)**
High education	-0.21 (0.14)	-0.027 (0.14)	**-0.264* (0.13)**
Need for cognition	**-0.08* (0.03)**	0.033 (0.03)	**0.075* (0.03)**
Need to evaluate	**-0.09** (0.03)**	0.001 (0.03)	0.038 (0.03)
constant	**1.11* (0.50)**	0.69 (0.49)	**-2.78*** (0.50)**
Model fit			
McKelvey & Zavoina R^2	.154	.321	.200
p-value of Hosmer–Lemeshow goodness-of-fit test	.12	.42	.31
N	1,633	1,633	1,633

* p<0.05, ** p<0.01, *** p<0.001

Table 5 presents the results of the separately run logistic regressions of the three survey evaluation questions on the same predictor variables. The model explains 15% of the variance of the difficulty understanding and answering questions, 32% of the variance in the amount of work respondents invested in the accuracy of their answers, and 20% of the variance in enjoyment while answering the survey. The p-value of Hosmer–Lemeshow goodness-of-fit test shows that the model fits the data well in all three cases.

We find that the evaluation of completing the survey is related to how comfortable respondents feel using a computer: the more they are comfortable with a computer, the less difficulties they have in understanding and answering the questions and the more they enjoy answering the survey. We also find that those using a smartphone have less difficulty than those using a PC, but those using a tablet have more difficulty that those responding on a PC. However, respondents answering the survey on a tablet also put in more work to give accurate answers and enjoy answering the survey more. Bearing in mind that 81% of those answering on a tablet were given a tablet specifically to answer this survey, both findings are not surprising[5]. Being given a new tablet for free is a higher incentive than for the other respondents which seem to explain their greater effort and joy while answering the survey Taking this results as the baseline for the future waves, we will then be able to observe whether this changes over time as they get used to the tablet. Compared to respondents in GB, respondents in Slovenia and Estonia had more difficulty understanding and answering the survey, those in Slovenia worked harder to give accurate answers, while those in Estonia put in less effort than respondents in GB, and finally respondents in Slovenia enjoyed answering the survey more than those in GB. The level of education only affects the enjoyment of answering the survey: Compared to respondents with a moderate level of education, we find that those with a lower level enjoyed answering the survey more, whereas those with a higher level of education enjoyed it less.

5. Discussion and Conclusions

The main goal of this study was to establish a baseline of data quality - in terms of behavioural and measurement indicators - in the welcome wave of the CRONOS panel. The quality indicators stated in this report cannot be used to evaluate respondents' behaviour as such as either good or bad. However, this baseline can be used to compare respondents' behaviour in the following waves as their experience as a CRONOS panellist increases. For now, we can compare respondents' behaviour across the three participating countries.

We find for all three countries that item nonresponse and break-offs to the welcome survey are low. British respondents were a little bit more likely to break-off, while Estonian and Slovenian respondents are comparable with the only difference that Estonian respondents were more likely to complete the survey after a break. Respondents also seem to answer carefully across countries: they vary their answers even if they are given the same response scale for a set of similar questions.

[5] 37/53 in Estonia, 55/55 in the UK, and 39/54 in Slovenia.

Overall, the time respondents took to complete the survey is longer than anticipated but this cannot necessarily be interpreted as the result of significant effort since respondents might have done something else in between but then returned to the survey. However, we do find that 13% in Great Britain, 12% in Slovenia, and 8% in Estonia answered the survey much quicker than expected (i.e. in less than 8 minutes). This might suggest that they were not paying enough attention to answer carefully but they may as well be more experienced respondents.

Asking respondents about their survey experience, we find that, overall, they did not find the survey difficult to answer, though Slovenians found it more difficult than respondents from GB and Estonia. Slovenians also reported to have invested more work in providing most accurate answers, while respondents from Estonia reported least efforts. Finally, Slovenians enjoyed answering the survey most. Overall the results about the survey experience of the participants are quite positive: respondents found the survey mainly not difficult and enjoyable which also explains why they reported only needing to put a moderate amount of effort for answering it.

These positive findings are not surprising as respondents not only decided voluntarily to participate in the CRONOS panel but already previously in the European Social Survey face-to-face interview. Moreover, the welcome survey was the first survey, relatively easy and also shorter than those of the following waves. We would therefore expect that respondents over time get less motivated and that the quality indicators compared to the baseline established in this report would show less positive results.

We also included some regressions analyses to try to explain the variation in the quality indicators. These models explain between 15-30% of the respective quality indicator. Regarding the time it takes to complete the survey the following variables have found to have a significant influence: having other people around or multitasking while answering increases the completion time, while being outside of home, having more experience in answering web surveys and higher levels of education make respondents faster. Considering non-differentiation, we find that the variables explaining this response behaviour depend on the topic of the questions in this study. Women were more varying in their answers to the questions about science and technology than men. The same was found for the more educated respondents. Measuring characteristics and problem-solving capacities, we find that respondents in Estonia do not differentiate their answers as much as respondents in GB, while measuring personality, respondents in GB are the ones that do not differentiate as much as respondents in Slovenia while there is no difference with respondents in Estonia. For the personality measures, we find that answering on a tablet increases non-differentiation compared to answering on a PC.

The enjoyment of answering the survey was greater for people answering on a tablet, who feel more comfortable using a computer, and for people with lower levels of education. Respondents feeling less comfortable using a computer, answering on a tablet (compared to PC) and in Slovenia and Estonia (compared to GB) have more difficulties in answering the survey. We also find a difference between respondents of the three countries regarding the amount of work they put in to answer most accurate: compared to GB, respondents in Slovenia provided more effort, while respondents in

Estonia less. While these finding are interesting by themselves, as in the case of the quality indicators, the models tested here can also serve as a baseline to be compared to repetition of these analyses with data from the following waves.

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Appendix

Appendix 1. Questions where non-differentiation was found.

Set 1: A few questions about how you see science and technology

Question number	Question wording
w0q10	How much do you agree or disagree with this statement: Science and technology are making our lives healthier, easier, and more comfortable.
w0q11	How much do you agree or disagree with this statement: Because of science and technology, there will be more opportunities for the next generation
w0q12	How much do you agree or disagree with this statement: We depend too much on science and not enough on faith
w0q13	How much do you agree or disagree with this statement: Scientists adjust their findings to get the answers they want
w0q14	How much do you agree or disagree with this statement: In general, scientists want to make life better for the average person
w0q15	How much do you agree or disagree with this statement: Rules will not stop scientists doing what they want behind closed doors

Response scale:	Response scale for experiment 2 for experimental group 2:
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree (Don't know) (Prefer not to answer)	Strongly agree Somewhat agree Neither agree nor disagree Somewhat disagree Strongly disagree (Don't know) (Prefer not to answer)

Set 2: Few questions about the way you are

	Question wording
w0q17	How accurate or inaccurate is this statement about you: I sympathise with other people's feelings
w0q18	How accurate or inaccurate is this statement about you: I get chores done right away
w0q19	How accurate or inaccurate is this statement about you: I get upset easily

w0q20	How accurate or inaccurate is this statement about you: I talk to a lot of different people at parties
w0q21	How accurate or inaccurate is this statement about you: I like order
w0q22	How accurate or inaccurate is this statement about you: I am quick to understand things
w0q23	How accurate or inaccurate is this statement about you: I have frequent mood swings
w0q24	How accurate or inaccurate is this statement about you: I follow a schedule
w0q25	How accurate or inaccurate is this statement about you: I have difficulty understanding abstract ideas
w0q26	How accurate or inaccurate is this statement about you: I am quiet around strangers
w0q27	How accurate or inaccurate is this statement about you: I make people feel at ease
w0q28	How accurate or inaccurate is this statement about you: I am full of ideas

Response scale	**Response scale Experiment 2 for experimental group 2**
Very inaccurate Inaccurate Neither inaccurate nor accurate Accurate Very accurate (Don't know) (Prefer not to answer)	Very inaccurate Moderately inaccurate Neither inaccurate nor accurate Moderately accurate Very accurate (Don't know) (Prefer not to answer)

Set 3: how the respondent characterises him/herself regarding own opinions and problem-solving capacities

	Question wording
w0q29	How much do you agree or disagree with this statement: It is very important to me to hold strong opinions
w0q30	How much do you agree or disagree with this statement: I have many more opinions than the average person
w0q31	How much do you agree or disagree with this statement: I have strong opinions even when I am not personally involved
w0q32	How much do you agree or disagree with this statement: I would prefer complex to simple problems
w0q33	How much do you agree or disagree with this statement: I like to have the responsibility of handling a situation that requires a lot of thinking
w0q34	How much do you agree or disagree with this statement: I really enjoy a task that involves coming up with new solutions to problems

Response scale:	**Response scale for experiment 2 for experimental group 2:**
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree (Don't know) (Prefer not to answer)	Strongly agree Somewhat agree Neither agree nor disagree Somewhat disagree Strongly disagree (Don't know) (Prefer not to answer)