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## Smart Survey Implementation

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### Work package 1

### Coordination and integration

### Deliverable 1.2: Smart baseline stage report

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#### Prepared by:

Remco Paulussen (CBS, The Netherlands)  
Barry Schouten (CBS, The Netherlands)  
Martin van Sebille (CBS, The Netherlands)

Work package Leader:

Remco Paulussen (CBS, The Netherlands)  
e-mail address : r.paulussen@cbs.nl  
mobile phone : +31 (0)6 2123 0392

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## Part 1: Overview of the SSI Smart baseline stage

### 1. Introduction

WP1 is the overarching WP responsible for aligning both organizationally and conceptually the different smart survey design levels. In this part of this deliverable, we revisit the terminology and taxonomy of smart features and smart surveys (chapter two), evaluate the implications against the activities and conclusions of the WP's in the Smart Baseline stage (chapter three), and summarize the conclusions and recommendations from the SSI survey on smart perceptions (chapter four). The full report of this survey is given in the Annex.

## 2. A new taxonomy

In deliverable D1.1 a first proposal was made for smart survey terminology (smart features, smart tasks, smart data, smart services and smart surveys) and for a classification of smart features. During the second SSI project stage, these definitions have been somewhat rephrased. However, the taxonomy has been substantially revised and extended. Details can be found in deliverable D4.2 of WP4. Here, the main revisions in the taxonomy are highlighted.

In the taxonomy, two new criteria were added based on so-called accuracy gaps and output gaps. The accuracy gap is the distance between ideal smart data and smart data as obtained in practice. It is the counterpart to the output gap which is the distance between desired data (based on output specifications) and the ideal smart data. An output gap implies that smart data need to be supplemented. An accuracy gap means that smart data need to be adjusted, i.e. one or more smart tasks are imperative.

*Table 1.1: Tentative scores on the four criteria for examples of smart features and the survey-specific criteria for smart surveys. Between brackets are given the potential smart survey applications. SILC = Statistics on Living Conditions. EHIS = European Health Interview Survey. ICT = Information and Communication Technology survey. HBS = Household Budget Survey. TUS = Time Use Survey.*

| Feature (survey)                                | Data existent prior | Type of measurement | Accuracy gap | In-device handling | Output gap |
|---|---------------------|---------------------|--------------|--------------------|------------|
| Photos of housing conditions (ENERGY, SILC)     | NO                  | Internal sensor     | Respondent   | YES                | Q&A smart  |
| Data donation of energy meter (ENERGY)          | YES                 | External sensor     | Post-survey  | YES                | Q&A smart  |
| Indoor air quality system by NSI (ENERGY, SILC) | NO                  | External sensor     | Negligible   | NO                 | Q&A smart  |
| Step count data donation (EHIS)                 | YES                 | External sensor     | Negligible   | YES                | Q&A        |
| Physical activity tracker by NSI (EHIS)         | NO                  | External sensor     | Post-survey  | NO                 | Q&A        |
| Scans of receipts (HBS)                         | NO                  | Internal sensor     | Post-survey  | YES                | Q&A        |
| Upload of e-receipts (HBS)                      | YES                 | Internal sensor     | Negligible   | NO                 | Q&A        |
| Location tracking (TUS, Passenger Mobility)     | NO                  | Internal sensor     | Respondent   | YES                | Q&A smart  |
| Web tracking (ICT)                              | NO                  | Internal sensor     | Post-survey  | YES                | Q&A smart  |
| Product/service search (HBS)                    | NO                  | Q&A                 | Post-survey  | YES                | Negligible |
| Time use activity search (TUS)                  | NO                  | Q&A                 | Post-survey  | YES                | Negligible |

Furthermore, a distinction is made between a classification of smart features and a classification of smart surveys. The new criteria for categorizing a smart feature are:

1. Do the data exist independent of a survey? YES, NO
2. What type of measurement is performed? REGULAR Q&A, MOBILE DEVICE SENSOR, EXTERNAL SENSOR SYSTEM
3. How large is the accuracy gap of smart data? NEGLIGIBLE, CAN BE HANDLED WITHOUT RESPONDENT, RESPONDENT ASSISTANCE NEEDED
4. Is any handling/processing performed in-device? YES, NO

Detailed explanation of the criteria can be found in deliverable D4.2.

A smart survey is the combination of one or more smart features and a particular survey application. As a consequence, in general, a smart survey does not have a unique classification. Different smart features that are included may come from different types. For different survey subtopics, it may still be possible to classify. One more criteria is added corresponding to the output gap:

5. How large is the output gap of the smart data relative to the output need? NEGLIGIBLE, CAN BE HANDLED BY Q&A INDEPENDENT OF THE SMART DATA, Q&A DEPENDENT ON THE SMART DATA

In deliverable D4.2, the implications for the different smart survey design levels are sketched. In Section 2, references are made to these where relevant.

Table 1.1 shows a classification of topical smart surveys, including the three SSI case studies.

### 3. The Smart Baseline stage

The SSI work packages (WPs) have delivered separate, extensive deliverables following the objectives and activities of the Smart Baseline stage of SSI. Here, a summary is given, focussing especially on the relations and dependencies between the WPs. The main findings, conclusions and recommendations are given per WP. Subsequently, an overarching summary is presented.

During the Smart Baseline stage, the focus has been on receipt scanning for HBS and geo-tracking for TUS. The HBS also makes use of a (manual) product search service, but this feature is not explicitly studied. Table 1.1 shows the categorization of the two resulting smart surveys. In Deliverable 4.2 of WP4, the consequences of the different types of smart features on all design levels are discussed. Table 1 in Section 2 of that deliverable displays the design levels that are particularly impacted.

The use of internal sensors that have non-negligible accuracy gaps and a considerable output gap for TUS implies challenges on almost all fronts for the methodology design level.

Similarly, the properties of the internal sensors have a strong impact on IT. An active respondent component is imperative affecting both how the frontend is implemented and how the backend reacts. In addition, the partly local execution of smart tasks, puts a strong emphasis on security of both app and backend database. Focussed pen tests are required.

Excluding external sensor systems, the implications for the logistics design level in WP4 are much more modest. They exist for the instruction, training and assistance of interviewers, the monitoring, the helpdesk and the later GSBPM stages. Activities that yet have to be conducted within field tests.

Finally, the large accuracy and output gaps are very influential on thinking and considerations within the legal-ethical design level. They imply strong trade-offs between risk assessment, data minimization and data utility.

Main points per WP:

- WP2 – methodology: Recommendations are strongly founded in field tests that are under study or have yet to start.
  - Recruitment and motivation: Field test research questions have been specified per country and an analysis strategy is described and explained. Most importantly, per country field tests, randomizations have been added to learn.
  - AI-ML: The smart tasks for the two case studies have been defined and specified. Explorations started into the training underneath some of the tasks. The text extraction part for receipt scanning is advanced furthest. Specifications have been set for the services and comparability in time and within the ESS is considered. An exploration is made of the impact of the source of points-of-interest data.

- UI-UX/HCI: The user tests started with some delay, in part, because they were dependent on the development of the services and the integration into the UI of the solutions. The workflow for each smart survey was elaborated and for the receipt scanning service elaborated to all smart tasks that (may) involve respondents. User tests are on-going.
- Method effects: The sources of smart methods effects have been further studied and elaborated. Explicit research questions have been formulated for the three field tests in BE, FR and IT.
- WP3 – IT: The smart services for receipt scanning HBS and geo-tracking TUS have been split into ‘subservices’ for which extensive functional and non-functional requirements are given. All subservices are elaborated but vary in maturity. The OCR service is delivered and currently being integrated in MOTUS and CBS HBS solutions, including pen tests. The creation of a COICOP classification service has been split into a multistep strategy based on matching, pre-trained ML and manual search. The performance of pre-trained models is not yet sufficient. For now, this is a post-survey service. The geo-tracking subservice for stop-track segmentation has been prepared and made available, but the other two subservices transport mode and activity/stop purpose are (still) in research.
- WP4 – Logistics and business process: The focus has been on revisiting the maturity model and criteria, including a first benchmark for the HBS case study at NL, and on identifying building blocks in the GSBPM phases Design, Build, Collect and to a more modest extent Evaluate. Also the taxonomy and terminology has been revised. The maturity criteria benchmark at NL pointed at the need for more communication between different design levels and staff expertise.
- WP5 – Legal-ethical: Activities within WP5 have been relatively modest. The focus has been on conceptually separating the relatively objective set of risks and measures and the relatively subjective assessment of proportionality and subsidiarity. A list of principles has been formulated and a strategy to move to overarching DPIA’s is proposed.

Overarching summary: Activities have been mostly in line with the anticipated implications under deliverable 4.2.

The use of internal sensors, that have non-negligible accuracy gaps and a considerable output gap for TUS, indeed has been very noticeable in WP2 activities and preparations. Perhaps, the geo-tracking TUS case study is methodologically one of the most complex. AI-ML and UI-UX are strongly related and by themselves impact recruitment and motivation. The gaps likely (and in fact, hopefully) lead to smart method effects. The Smart Advanced stage will be crucial for optimization.

Similarly, the properties of the internal sensors have a strong impact on IT. WP3 has been very active in this project stage setting the necessary stage for the field tests that feed WP2. Hidden within WP3 is a lot of useful and crucial data science that has yet to grow to maturity.

As mentioned, the implications for the logistics design level are much more modest. WP4 focussed mostly on formalizing the business process and terminology. Doing so, it may pave the way for better understanding of concepts, building blocks and a generalization to other smart feature applications and between WP's. In the Smart Advanced stage, this has to be demonstrated.

Finally, the large accuracy and output gaps have been, and still are, very influential on thinking and considerations within the legal-ethical design level. A strategy has been proposed to deal with these, but for now a distinction need to be made between a temporary design stage and a more permanent production stage. The step from case studies to generic procedures still needs to be made. The NWM survey has provided useful insights for WP5, but also revealed clear cross-country differences. The on-going and upcoming field tests likely provide further input to converge to procedures.



## 4. The survey on perceptions about smart surveys

Here, only a summary is given of the findings and conclusions for the SSI perception survey. A full account is given in the Annex. This Annex addresses various research questions, relevant, especially, to push-to-smart data collection strategies and to legal-ethical considerations:

1. What kind of persons express hypothetical willingness to do smart tasks?
2. How does willingness depend on the type of smart task?
3. What are socio-economic/demographic characteristics of persons really going smart?
4. To what extent does hypothetical willingness predict actual willingness?
5. What are the main motives of persons to not perform a smart task?
6. To what extent can hesitations be predicted from known characteristics prior to a survey?
7. In all of the above, how does the dependence of country/NSI come in?

SSI set out to measure perceptions that the general population may have about surveys with smart features. Within SSI, the smart survey perceptions study has been conducted in Italy (IT), Slovenia (SI) and the Netherlands (NL) to investigate respondent motivations and hesitations. Field work has been performed between September 2023 and February 2024. The survey employed two questionnaires that are sequential but offered to respondents simultaneously. Population samples in NL, IT and SI were invited to fill in a paper survey first and then to proceed to an online survey. The paper survey contained questions on device ownership and usage, and perceptions and requirements towards the use of smart features of these devices in surveys. The online survey combined questions and measurements in short modules on four themes: travel, physical activity, consumption and energy.

Since cross-country comparison is perhaps the most important goal of the survey, two results are explicitly included. Table 1.2 displays the hypothetical willingness across countries on the seven tasks asked in the first paper survey. Table 1.3 confronts the hypothetical willingness with the actual willingness for the tasks included in the online survey.

*Table 1.2: Would you participate in a(n) ISTAT/CBS/SURS survey which asks you to:*

| IT   | Yes   | Maybe | No    | DK    |
|--|-------|-------|-------|-------|
| Share location                                       | 9.2%  | 15.5% | 65.5% | 9.7%  |
| Share pictures of your house                         | 7.1%  | 9.3%  | 76.5% | 7.1%  |
| Share data on energy use                             | 24.2% | 17.5% | 49.0% | 9.2%  |
| Use an air quality monitor                           | 28.8% | 15.9% | 44.9% | 10.5% |
| Give the step counts on your mobile devices          | 21.0% | 14.3% | 56.1% | 8.6%  |
| Wear an activity tracker provided by ISTAT           | 12.1% | 14.0% | 64.7% | 9.2%  |
| Take pictures of receipts or upload digital receipts | 7.6%  | 12.7% | 70.8% | 8.9%  |

| NL   | Yes   | Maybe | No    | DK   |
|--|-------|-------|-------|------|
| Share location                                       | 24.9% | 24.9% | 37.8% | 4.1% |
| Share pictures of your house                         | 11.8% | 17.9% | 58.9% | 3.1% |
| Share data on energy use                             | 40.9% | 24.8% | 28.0% | 3.8% |
| Use an air quality monitor                           | 47.4% | 19.8% | 24.7% | 5.3% |
| Give the step counts on your mobile devices          | 39.0% | 22.8% | 32.4% | 3.1% |
| Wear an activity tracker provided by CBS             | 20.2% | 20.0% | 48.3% | 3.0% |
| Take pictures of receipts or upload digital receipts | 13.8% | 19.3% | 56.0% | 2.5% |

| SI   | Yes   | Maybe | No    | DK   |
|--|-------|-------|-------|------|
| Share location                                       | 20.9% | 22.5% | 50.9% | 5.6% |
| Share pictures of your house                         | 7.4%  | 13.3% | 76.0% | 3.4% |
| Share data on energy use                             | 17.5% | 22.5% | 54.1% | 5.8% |
| Use an air quality monitor                           | 32.7% | 22.4% | 40.5% | 4.4% |
| Give the step counts on your mobile devices          | 29.7% | 21.8% | 45.0% | 3.5% |
| Wear an activity tracker provided by SURS            | 19.2% | 18.5% | 57.7% | 4.5% |
| Take pictures of receipts or upload digital receipts | 9.3%  | 14.4% | 70.7% | 5.7% |

Table 1.3: Actual willingness against hypothetical willingness for the four smart tasks included.

|                              | Performed |       |       | Could not perform |       |       | Was not willing to |       |       |
|------------------------------|-----------|-------|-------|-------------------|-------|-------|--------------------|-------|-------|
|                              | IT        | NL    | SI    | IT                | NL    | SI    | IT                 | NL    | SI    |
| <b>Share location</b>        | 24.1%     | 46.5% | 34.9% | 2.7%              | 22.3% | 18.1% | 73.2%              | 31.2% | 47.0% |
| <b>Share step count</b>      |           |       |       |                   |       |       |                    |       |       |
| <i>Has a step count</i>      | 35.5%     | 54.7% | 51.5% |                   |       |       |                    |       |       |
| <i>Invited</i>               | 90.3%     | 98.3% | 84.2% | NA                | NA    | NA    | 9.7%               | 1.7%  | 15.8% |
| <b>Share receipt</b>         |           |       |       |                   |       |       |                    |       |       |
| <i>Receipt available</i>     | 50.7%     | 48.7% | 47.6% |                   |       |       |                    |       |       |
| <i>Scanned/uploaded</i>      | 17.9%     | 51.5% | 35.4% | NA                | NA    | NA    | 82.1%              | 48.5% | 64.6% |
| <i>No receipt available</i>  | 49.3%     | 51.3% | 52.4% |                   |       |       |                    |       |       |
| <i>Hypothetical</i>          | 69.4%     | 75.6% | 85.1% | NA                | NA    | NA    | 30.6%              | 24.4% | 14.9% |
| <b>Share meter reading</b>   |           |       |       |                   |       |       |                    |       |       |
| <i>Is at home</i>            | 70.1%     | 86.3% | 72.0% |                   |       |       |                    |       |       |
| <i>Water</i>                 | 9.3%      | 36.3% | 12.7% | 38.2%             | 24.1% | 38.9% | 52.5%              | 39.6% | 48.4% |
| <i>Electricity</i>           | 9.3%      | 43.6% | 17.4% | 35.9%             | 14.7% | 34.2% | 54.8%              | 41.7% | 48.4% |
| <i>Gas</i>                   | 8.2%      | 38.8% | 20.0% | 37.6%             | 19.3% | 11.4% | 54.2%              | 41.9% | 68.6% |
| <i>Not at home</i>           | 29.9%     | 13.7% | 28.0% |                   |       |       |                    |       |       |
| <i>Hypothetical - Water</i>  | 38.6%     | 47.1% | 50.0% | NA                | NA    | NA    | 61.4%              | 52.9% | 50.0% |
| <i>Hypothetical - Electr</i> | 42.2%     | 48.2% | 53.2% | NA                | NA    | NA    | 57.8%              | 51.6% | 46.8% |
| <i>Hypothetical - Gas</i>    | 44.9%     | 50.0% | 40.0% | NA                | NA    | NA    | 55.1%              | 50.0% | 60.0% |

The main conclusions from all evaluations are:

- In all three countries, around 20% of invited samples participated in the smart survey and the vast majority performed at least one smart task;
- There are strong country differences in both hypothetical and actual willingness depending also on the smart task that is asked;
- As conjectured, less willing persons more often report weaker digital skills and more concern on data security. Privacy concerns turn up as the most prominent predictor in all three countries.

- Being able to control data that are collected is rated as important in all three countries, but by itself is not an argument against going smart. Respondents that do go smart, rate it as more important than those that do not.
- As clues for improving tactics:
  - Offer alternatives to those that perceive themselves as less digital, but also assist them in going smart;
  - Be very clear about how and where data are stored and how respondents can control their data, i.e. remove all suspicion of data being open to a wide range of users;
  - Tailor recruitment and motivation, because hesitations vary across persons and are hard to predict based on information available prior to a survey;
  - Tailor to the context and specific smart task, in particular, make sure the utility of going smart is logical and legitimate;

## Part 2: Project coordination

### 1. Introduction

Work package 1 (WP1) covers the general and financial management, coordination and administration of the Smart Survey Implementation (SSI) project, in addition to communication and dissemination. This deliverable is the smart baseline stage report for the project as a whole. The report covers both the outputs of the project so far and the inputs (resources) used in the project. For both, the grant agreement is the main reference, but where there have been changes in the deliverables and milestones foreseen, or in the associated resources, this will be specified in this report.

To manage the project there are three steering levels for monitoring issues, risks, realization of the budget and the progress of the project and the fourth level is to keep everybody informed:

- Steering level one are the operational meetings per work package organized by the project leader of the work package.
- Steering level two is the overall project management meeting, which includes the WP leaders, the project officer, and the liaison officer of Eurostat. The meeting is organized by the Project Coordinator.
- Steering level three is the core team meeting, which includes representatives from all partners, and is organized by the Project Coordinator.
- The fourth level is to keep everybody informed on what happens in the project and the work packages and is organized by the Project Coordinator.

Besides the more formal meetings, also several meetings were organised and conferences attended to promote the work of the SSI project internally and externally.

Concerning the inputs (resources) of the project used so far, the report gives information on what has been spent by each WP and organisation involved, in order to be able to assess whether this is reasonable compared to the progress made so far. The resources spent should neither be too high nor too low, given the current stage of the project.

The structure of this report is simple. The next chapter (chapter two) describes the organisation of the project. Chapter three describes the realization of the deliverables of the project so far, including changes that were deemed necessary after the start of the project. In addition to the deliverables, milestones are also briefly looked at. Chapter four describes the resources spent so far and our collaborations.

## 2. Organisation

### Project structure

The SSI project consists of five work packages:

- Work package 1: Coordination and integration
- Work package 2: Methodology
- Work package 3: Developing micro services
- Work package 4: Logistics
- Work package 5: Legal

Each work package has a work package leader, who is responsible for managing the work package. This involves managing the participants of the work package and ensuring that the products and deliverables are created and delivered on time. The goal of the operational meetings of the work package is to discuss, plan, review and manage the progress.

Work package 1 takes care of the overall coordination and is responsible for the resources, budget and the overall communication. Also the cross-national perceptions survey belongs to this work package.

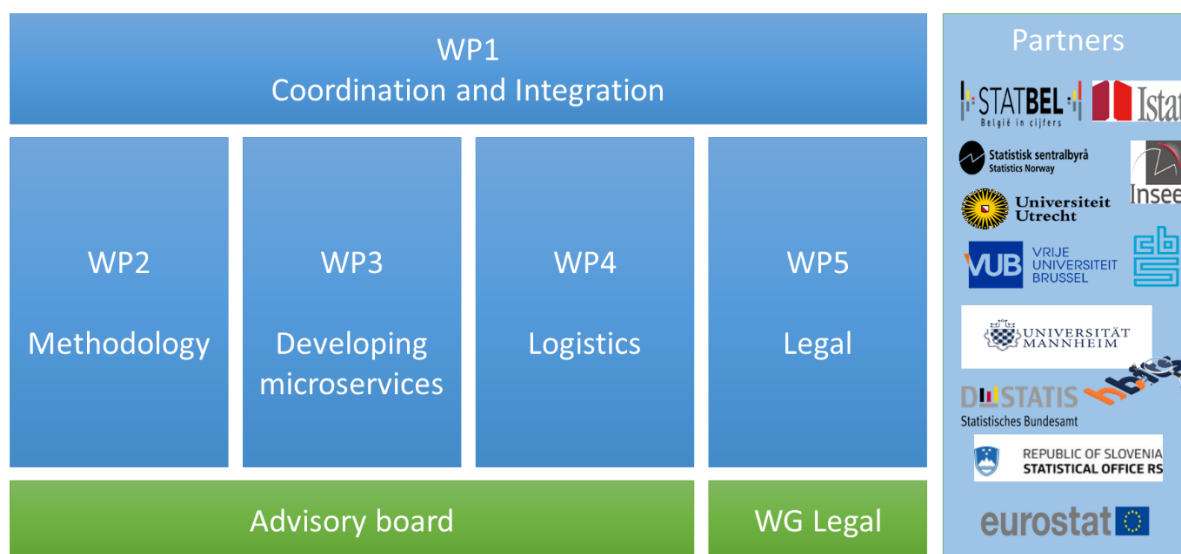


Figure 1: SSI project organisation

The project structure can be depicted as shown above. The people mentioned form together the project management team, which consists of the work package leaders, the overall smart survey expert, the overall project manager, and the project officer. Also the liaison officer of Eurostat is invited to the monthly meeting. The goal of the project management meeting is to monitor the progress of the work to check whether we are still on time (deliverables) and within budget, to monitor dependencies between the work packages and to resolve issues (risks), and detect issues that should be discussed in a broader audience or elsewhere.

Participants from eleven partners participate in the project and work packages. The core team consists of representatives of all partners and the project management team. Bi-monthly the core team meets and the goal of the meeting is to discuss and decide on issues that may affect partners, for example budget, capacity, risks, etc.

The project is supported by external advisors (see advisory board).

### Project meetings

To manage the project there are three steering levels for monitoring issues, risks, realization of the budget and the progress of the project and the fourth level is to keep everybody informed:

- Steering level one are the operational meetings per work package organized by the project leader of the work package.
- Steering level two is the overall project management meeting, which includes the WP leaders, the project officer, and the liaison officer of Eurostat. The meeting is organized by the Project Coordinator.
- Steering level three is the core team meeting, which includes representatives from all partners, and is organized by the Project Coordinator.
- The fourth level is to keep everybody informed on what happens in the project and the work packages and is organized by the Project Coordinator.

For the monthly project management meetings and the bi-monthly core team meetings minutes are created, reviewed, approved and circulated to all project members and parties interested.

At the start of the project, a kick-off meeting has been organised on May 22<sup>nd</sup> and 23<sup>rd</sup>, 2023 in Brussels with representatives from all partners and parties interested. During this meeting the objectives of the project and each work package were presented and discussed in more detail. All presentations given and the minutes of the kick-off meeting (26 pages) are available and were circulated.

Besides the more formal meetings, also several meetings were organised and conferences attended to promote the work of the SSI project internally and externally.

### Advisory board

In order to advice the work packages and review their deliverables, two independent external advisors are contracted per work package for the work packages Methodology (WP2) and Developing micro services (WP3) and three for the work package Logistics (WP4). Together they form the advisory board. Note that the work package Legal is supported by the working group Legal.

### Consortium agreement

In the Grant Agreement (GA) it is stated in the data sheet that for this project a Consortium Agreement (CA) is required. From the start of the project, it took almost nine months to create a CA that was acceptable to all parties and their legal departments. Finally, on February 13<sup>th</sup> the CA was signed by all parties.

### Project amendments

So far, no amendments were needed. Note that discussing the initial plans in more detail resulted in some small changes within and between the work packages.

At the end of this stage, we found out that the quality of the method currently used to derive the transport mode prediction is less than expected. This method is an important part of the geo-service. We are currently investigating the options and the possible impact on the planned field test. Depending on the outcome, an amendment might be needed.

### Resources and budget

Even though some activities took more effort than anticipated, the project is still within budget and has sufficient resources.

Due to unforeseen circumstances, the overall smart survey expert will be less available for the remainder of the project. He stays on board as an advisor, but will be less involved in the day-to-day operational activities. Risk has been mitigated by reshuffling the responsibilities.

### 3. Project results

#### Project deliverables

The SSI project is just over halfway done. This report describes the progress of the project so far, by summarizing the results achieved, relating these results to what was required and specified in the grant agreement. Concerning the deliverables, as a rule, the deliverables of the SSI project are sent for review to all WP leaders and applicable advisors, before they are delivered in their final form. All deliverables of the smart baseline stage have been delivered on time.

#### Project milestones

There are only five project milestones defined across the work packages for the entire project:

- Kick-off meeting in May 2023
- End of review stage in October 2023
- End of smart baseline stage in June 2024
- End of smart advance stage in April 2025
- Final closing workshop in April 2025

On May 22nd and 23rd, 2023, a kick off meeting was held in Brussels with representatives from all partners and Eurostat's liaison officer. During the meeting, the overall project planning, the project organization and each of the five work packages were presented and discussed, which gave everybody a good overview of the project. The presentations and meeting minutes were circulated and are available upon request.

#### Dissemination

During the project several meetings were organised to promote the work of the SSI project, both internally and externally. Important to mention are the informational meetings on October 20<sup>th</sup>, 2023 and March 22<sup>nd</sup>, 2024. During these sessions, presentations and demos were given to update the audience on the status of the project. Both sessions were well-visited by interested parties within and outside the consortium, including participants from Austria, Finland, Latvia, Luxembourg, Sweden and the UK.

In March, a dedicated project site was published on the new Eurostat CROS<sup>1</sup> portal. Besides general information, also the presentations and demos of the informational meetings and the final deliverables are available.

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<sup>1</sup> <https://cros.ec.europa.eu/dashboard/trusted-smart-surveys>



During the project, the SSI project results were presented at several conferences:

- LIX SIEDS (Italian Society of Economy, Demography and Statistics) Annual Scientific Meeting, 25-26 May, 2023 in Naples. One paper where the methodological and data collection issues related to smart surveys are discussed and how Istat is supporting the SSI project;
- ESRA 2023 (European Survey Research Association) conference from 17-21 July, 2023 in Milan, Italy. During this event several SSI presentations were given.
- ODISSEI conference on November 2<sup>nd</sup>, 2023 in Utrecht. A one-day large event where two papers were presented. One paper on where smart survey maturity was presented and discussed. One paper where preliminary results from the SSI perceptions survey from NL were presented.
- 2<sup>nd</sup> Workshop on Methodologies in Official Statistics, 6-7 December, 2023 in Rome. One paper on methodological issues and challenges of smart survey and the involvement of Istat in the SSI project;
- MASS 2024 workshop, March 6<sup>th</sup> and 7<sup>th</sup>, 2024 in Washington DC, USA. Mobile Apps and Sensor Surveys workshop, where the first results of the SSI perception survey were discussed.
- Q 2024 conference from 4-7 June, 2024 in Estoril, Portugal. There was a dedicated speed talk session on the SSI project. Furthermore, there was session on smart surveys, where five presentations were given by project members on the SSI project.

During the remainder of the project and after its official end (March 31<sup>st</sup>, 2025), the results will be presented at various conferences. For some conferences the proposal are already accepted, for others these are in the process of being submitted:

- 15<sup>th</sup> CNS (National Conference of Statistics), 3-5 July, 2024 in Rome. One presentation will present smart surveys, methodological issues and challenges, as well as the involvement of Istat in the SSI project. And a poster will be presented about the SSI project and some results from the Italian perception surveys.
- Online panels and mixed mode surveys workshop on October 16<sup>th</sup>, 2024 in Ljubljana, Slovenia. The SSI project and the results of the national SSI perceptions survey will be discussed.
- 13<sup>th</sup> [colloque francophone sur les sondages](#) (French-speaking conference on surveys), on 5-8 November, 2024 in Esch-Belval, Luxembourg. Our proposal has not been accepted yet.
- NTTS 2025 conference from 11-13 March, 2025 in Brussels, Belgium. Our proposal has not been submitted yet.
- ESRA 2025 conference from 14-18 July, 2025 in Utrecht, The Netherlands. Our proposal has not been submitted yet.
- ISI WSC 2025 conference on 5-9 October, 2025 in The Hague, The Netherlands. Our proposal for a dedicated session on smart surveys and results from the SSI project has been accepted.



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## Smart Survey Implementation

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### Work package 1

### Coordination and integration

### Deliverable 1.2: Smart Baseline stage report

### ANNEX: Smart perceptions survey

Version 1.1, 16-07-2024

#### Prepared by:

Ilaria Lunardelli, Janelle van den Heuvel, Barry Schouten (CBS, The Netherlands)  
Alessandra Nuccitelli, Barbara D'Amen, Barbara Lorè, Monica Perez (ISTAT, Italy)  
Mateja Zgonec (SURs, Slovenia)

Work package Leader:

Remco Paulussen (CBS, The Netherlands)  
e-mail address : r.paulussen@cbs.nl  
mobile phone : +31 (0)6 2123 0392

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## Summary

The New Ways of Measuring (NWM) or 'smart perceptions' survey has been conducted in three countries in order to find clues for improving push-to-smart fieldwork strategies, to inform legal officers and to understand country differences. The NWM consisted of a two-step approach with a questionnaire on hypothetical willingness and perceptions and a 'smart' survey including four smart tasks. The main findings are:

- In all three countries, around 20% of invited samples participated in the smart survey and the vast majority performed at least one smart task;
- There are country differences in both hypothetical and actual willingness depending also on the smart task that is asked;
- As conjectured, less willing persons more often report weaker digital skills and more concern on data security. Data security concerns – based on the concern that data collected through smart devices can be stolen or misused – turn up as the most prominent predictor in all three countries.
- Being able to control data that are collected is rated as important in all three countries, but by itself is not an argument against going smart. Respondents that do go smart, rate it as more important than those that do not.
- As clues for improving tactics, we find:
  - Offer alternatives to those that perceive themselves as less digital, but also assist them in going smart;
  - Be very clear about how and where data are stored and how respondents can control their data, i.e. remove all suspicion of data being open to a wide range of users;
  - Tailor recruitment and motivation, because hesitations vary across persons and are hard to predict based on information available prior to a survey;
  - Tailor to the context and specific smart task, in particular, make sure the utility of going smart is logical and legitimate;

## 1. Introduction

This paper is an Annex to Deliverable 1.2 of Smart Survey Implementation (SSI). Given the size and content of the paper, we present it separately. However, a summary is also available in the main deliverable.

Surveys employing smart features, so-called smart surveys, are promising for topics that are cognitively demanding or burdensome, that are non-central to respondents, and/or for which questions provide weak proxies to the concepts of interest. While promising for various applications, a prerequisite is that respondents are willing and able to perform the corresponding smart tasks. Furthermore, respondent motivations and hesitations are important in ethical and legal decisions around implementation. With these considerations in mind, SSI set out to measure perceptions that the general population may have about surveys with smart features. Within SSI, the smart survey perceptions study has been conducted in Italy (IT) by ISTAT, Slovenia (SI) by SURS and the Netherlands (NL) by CBS to investigate respondent motivations and hesitations. Field work has been performed between September 2023 and March 2024. In this document, we abbreviate the survey to NWM (short for New Ways of Measuring survey). The NWM survey has the following specific goals as given in the SSI project proposal:

- Get input for tailoring and addressing respondent concerns in smart survey data collection strategies, in particular instruction and introduction materials and interviewer training;
- Get input for addressing the need to offer alternative modes to respondents next to apps;
- Learn how respondents like to keep control over data and what minimal respondent involvement during data collection is needed;
- Inform legal-ethical officers about respondent perceptions, in particular proportionality of the smart tasks and trade-offs in data minimization;
- Learn if and in what way achieving the above goals depends on the topic;
- Learn how achieving all of the above goals depends on the country/NSI;

More specifically, we address the following research questions:

1. What kind of persons express hypothetical willingness to do smart tasks?
2. How does willingness depend on the type of smart task?
3. What are socio-economic/demographic characteristics of persons really going smart?
4. To what extent does hypothetical willingness predict actual willingness?
5. What are the main motives of persons to not perform a smart task?
6. To what extent can hesitations be predicted from known characteristics prior to a survey?
7. In all of the above, how does the dependence of country/NSI come in?

The fourth research question refers to the type of smart task. Here, we conform to the proposed taxonomy of smart tasks in SSI WP4. See Deliverable 4.2.

In this paper, we report results of NWM across the three participating countries. In Section 2, we explain the survey designs in the three countries. We then proceed to a few overarching descriptives such as unit- and item-response rates in Section 3. In Sections 4 and 5, we target the main research questions concerning hypothetical willingness to perform smart tasks and actual willingness to perform smart tasks, respectively. We discuss implications of the findings for push-to-smart strategies in Section 6. We end with a discussion of all above mentioned NWM objectives in Section 7.

The NWM invited respondents to perform in-survey smart tasks. In order to conduct the survey submissions to an ethical committee and to data protection officers were mandatory. These are not described here. We refer to WP5 deliverables of SSI and to country coordinators for more details. Details on how smart tasks were implemented can also be given on request. An English Data Protection Impact Assessment of CBS is available on request.

## 2. Design of the NWM survey

The NWM survey employs two questionnaires that are sequential but offered to respondents simultaneously. Population samples in NL, IT and SI are invited to fill in a paper survey first and then to proceed to an online survey. The paper survey contains questions on device ownership and usage, and perceptions and requirements towards the use of smart features of these devices in surveys. The online survey combines questions and measurements in short modules on four themes: travel, physical activity, consumption and energy. We will term the surveys NWM-G(eneral) and NWM-S(mart). Table 2.1 shows the main design features.

*Table 2.1: Sampling and data collection design of NWM in IT, NL and SI.*

|                    | IT   | NL   | SI   |
|--------------------|--|--|--|
| Sample size        | 4000 <sup>1</sup>  | 4000   | 2000   |
| Sampling design    | Two-stage stratified simple random sample from population register (municipality is the primary sampling unit) | Simple random sample from population register  | Stratified two-stage sample from population register 18-74   |
| Contact modes      | Advance letter F2F interviewer <sup>2</sup>  | Invitation letter  | Invitation letter F2F interviewer  |
| Incentive strategy | None   | 5 Euro unconditional Lottery 400 Euro for NWMS-S   | The first 1000 respondents will receive a gift card. Conditional gift card (5 Euro) for general perception survey.   |
| Reminder strategy  | Interviewer visit (return after 2 weeks to collect)  | Mailed letter after two weeks based on online response<br>Mailed letter after five weeks based on paper response | Mailed letter after three weeks based on paper response (including announcement of follow up with field interviewers)<br>Thank you mailed letter and a reminder in one (thank you note on completed paper questionnaire) |

<sup>1</sup> 6 municipalities, for a total of 166 individuals, have never started the fieldwork. Finally, the eligible individuals have been 3667.

<sup>2</sup> In Italy, interviewer involvement was limited to delivery and collect the self-administred paper questionnaire (NWM-G); interviewer was not required to administer the interview.

|                       |   |                     |  |
|-----------------------|---|---------------------|--|
|                       |   |                     | or interview and a reminder on online response after few weeks after completed PAP/CAPI) |
| NWMS-G administration | Paper   | Paper               | PAP, CAPI  |
| NWMS-S software       | Limesurvey with plug-in                       | Blaise with plug-in | Blaise with plug-in for web, Blaise for CAPI   |
| Fieldwork period      | Jan 22 – Mar 8 field<br>Jan 22 – Mar 30 entry | Sept 15 – Nov 15    | Sept 25 – Dec 15   |

The NWM survey, thus, has two questionnaires, one for NWM-G and one for NWM-S. In Appendices A and B, we present the English model questionnaires for, respectively, NWM-G and NWM-S. Here, we list merely the blocks and questions. See Table 2.2. The NWM-G contains four open-ended questions. The coding schemes are given in Appendix C. NWM-S has four smart tasks: location tracking, step count data donation, photo or upload of a shopping receipt, and photo(s) of electricity-gas-water meters. The order in which these are offered is randomized. NWM-S respondents that cannot or are not willing to do a smart task get an open-ended question on the reason(s). The coding scheme for the nonresponse open-ended question is given in Appendix D.

*Table 2.2: Blocks and questions in NWM-G.*

| NWM-G question                              | Type           |
|---|----------------|
| BLOCK Survey participation                  |                |
| 1 – Contact mode                            | Categorical    |
| 2 – Administration mode                     | Categorical    |
| 3 – Main reason to participate              | Categorical    |
| 4 – Main reason not to participate          | Categorical    |
| BLOCK Smart devices                         |                |
| 5 – Ownership smart devices                 | All-that-apply |
| 6 – Frequency use smartphone                | Scale          |
| 7 – Smartphone usage                        | Scale          |
| 8 – Smartphone skills                       | Scale          |
| BLOCK Participating smart survey            |                |
| 9a – Willingness location tracking          | Matrix - scale |
| 9b – Willingness photos house               | Matrix – scale |
| 9c – Willingness photos energy meters       | Matrix – scale |
| 9d – Willingness indoor air quality         | Matrix – scale |
| 9 <sup>e</sup> – Willingness step count     | Matrix – scale |
| 9f – Willingness physical activity wearable | Matrix – scale |
| 9g – Willingness scans/uploads receipts     | Matrix – scale |



|   |                |
|---|----------------|
| 10 – Concern misuse smart data others                 | Scale          |
| 11 – Concern misuse smart data through ISTAT/CBS/SURS | Scale          |
| 12a – Secure through app store apps                   | Matrix – scale |
| 12b – Secure through offline modes                    | Matrix – scale |
| 12c – Secure through interviewer                      | Matrix – scale |
| 12d – Secure through external audit report            | Matrix – scale |
| 12e – Secure through wearable of ISTAT/CBS/SURS       | Matrix – scale |
| 13 – Other security measures                          | Open-ended     |
| 14 – Importance informed consent                      | Scale          |
| 15 – Options offer informed consent                   | Open-ended     |
| 16 – Importance data control                          | Scale          |
| 17a – Data control through personal login page        | Matrix – scale |
| 17b – Data control through apps that display data     | Matrix – scale |
| 17c – Data control through retention period           | Matrix – scale |
| 18 – Other options to offer control                   | Open-ended     |
| BLOCK Online participation                            |                |
| 19 – Willingness NWM-S                                | Yes/No/DK      |
| 20 – Reason(s) against participation                  | Open-ended     |

### 3. Descriptives

We give basic background information to fieldwork in the three countries.

Table 3.1 presents numbers of respondents and response rates for the two surveys separately and crossed. A summary:

- The response rates to NWM-G vary greatly, from 23% in NL to 68% in IT. This can be explained largely by the difference in recruitment modes, self-administered in NL, self-administered plus interviewer-assisted in SI and partially interviewer-assisted in IT.
- Somewhat surprisingly, the response rates to NWM-S do not vary much, from 17% in SI to 23% in IT. In all countries, this survey was self-administered and interviewers in IT and SI had no or limited insight into respondents' participation. Still, we must conclude that the willingness to do the online smart survey was not raised by the prior involvement of interviewers.
- Break-off in NWM-S varied across countries and was between 8% for IT (74 out of 927) to 16% (136 out of 875) for NL of persons starting the survey.
- In NL, the NWM-G was self-administered and this led to incomplete questionnaires. Around 7% of respondents (70 out of 1005) returning a questionnaire had an incomplete.

*Table 3.1: Overview of persons that completed NWM-G, partially completed NWM-G, completed NWM-S and broke-off in NWM-S.*

| IT                | NWM-G complete | NWM-G incomplete | NWM-G Nonresponse | Total      |
|-------------------|----------------|------------------|-------------------|------------|
| NWM-S complete    | 833 (23%)      | 2 (0%)           | 18 (1%)           | 853 (23%)  |
| NWM-S Break-off   | 69 (2%)        | 1 (0%)           | 4 (0%)            | 74 (2%)    |
| NWM-S nonresponse | 1591 (43%)     | 31 (1%)          | 1118 (31%)        | 2740 (75%) |
| Total             | 2493 (68%)     | 34 (1%)          | 1140 (31%)        | 3667       |

| NL                | NWM-G complete | NWM-G incomplete | NWM-G Nonresponse | Total      |
|-------------------|----------------|------------------|-------------------|------------|
| NWM-S complete    | 522 (13%)      | 5 (0%)           | 212 (5%)          | 739 (18%)  |
| NWM-S Break-off   | 49 (1%)        | 3 (0%)           | 84 (2%)           | 136 (3%)   |
| NWM-S nonresponse | 364 (9%)       | 62 (2%)          | 2699 (67%)        | 3125 (78%) |
| Total             | 935 (23%)      | 70 (2%)          | 2995 (75%)        | 4000       |

| SI                | NWM-G complete | NWM-G incomplete | NWM-G Nonresponse | Total      |
|-------------------|----------------|------------------|-------------------|------------|
| NWM-S complete    | 316 (16%)      | NA               | 16 (1%)           | 332 (17%)  |
| NWM-S Break-off   | 28 (1%)        | NA               | 8 (0%)            | 36 (2%)    |
| NWM-S nonresponse | 659 (33%)      | NA               | 973 (49%)         | 1632 (82%) |
| Total             | 1003 (50%)     | NA               | 997 (50%)         | 2000       |

We evaluated the distributions of response to NWM-G and NWM-S for a number of available auxiliary variables. In Appendix E, we display the available variables plus categories. In Appendix F, we show distributions of response.

As item-nonresponse was modest or absent in IT and SI in NMW-G, we explore item-response rates in-depth only for NL. Table 3.2 contains the rates at which respondents filled in each NWM-G question. Two rates are computed, one relative to all persons that returned the paper questionnaire and one relative to those that filled in most of the questionnaire. Item-nonresponse rates were in the range 0% to 6.5% for those that filled in most of the questionnaire.

*Table 3.2: NL item-response rates for NWM-G relative to all persons that returned a questionnaire and relative to persons that submitted an almost complete questionnaire.*

| NWM-G question                                    | % item-response |           |
|---|-----------------|-----------|
|   | All             | Completes |
| BLOCK Survey participation                        |                 |           |
| 1 – Contact mode                                  | 86,7%           | 93.4%     |
| 2 – Administration mode                           | 86,8%           | 93.5%     |
| 3 – Main reason to participate                    | 89,5%           | 96.4%     |
| 4 – Main reason not to participate                | 88,3%           | 95.1%     |
| BLOCK Smart devices                               |                 |           |
| 5 – Ownership smart devices                       | 89,9%           | 96.8%     |
| 6 – Frequency use smartphone                      | 88,8%           | 95.6%     |
| 7 – Smartphone usage                              | 87,4%           | 94.1%     |
| 8 – Smartphone skills                             | 88,1%           | 94.9%     |
| BLOCK Participating smart survey                  |                 |           |
| 9a – Willingness location tracking                | 92,9%           | 100%      |
| 9b – Willingness photos house                     | 93,0%           | 100%      |
| 9c – Willingness photos energy meters             | 93,5%           | 100%      |
| 9d – Willingness indoor air quality               | 93,0%           | 100%      |
| 9 <sup>e</sup> – Willingness step count           | 92,9%           | 100%      |
| 9f – Willingness physical activity wearable       | 92,9%           | 100%      |
| 9g – Willingness scans/uploads receipts           | 92,9%           | 100%      |
| 10 – Misuse smart data others                     | 92,9%           | 100%      |
| 11 – Misuse smart data through ISTAT/CBS/SURS     | 92,9%           | 100%      |
| 12a – Secure through app store apps               | 88,1%           | 94.9%     |
| 12b – Secure through offline modes                | 88,9%           | 95.7%     |
| 12c – Secure through interviewer                  | 86,7%           | 93.4%     |
| 12d – Secure through external audit report        | 87,0%           | 93.7%     |
| 12e – Secure through wearable of ISTAT/CBS/SURS   | 86,7%           | 93.4%     |
| 14 – Informed consent                             | 91,4%           | 97.1%     |
| 16 – Data control                                 | 91,3%           | 98.3%     |
| 17a – Data control through personal login page    | 90,2%           | 97.1%     |
| 17b – Data control through apps that display data | 89,5%           | 96.4%     |
| 17c – Data control through retention period       | 89,1%           | 95.9%     |
| BLOCK Online participation                        |                 |           |
| 19 – Willingness NWM-S                            | 89,1%           | 95.9%     |

NWM-G contained four open-ended questions. The first three were optional and asked for additional suggestions. The fourth open-ended question was only meant for respondents that did not want to participate in the NWM-S. The open-ended question on informed consent was the only one not preceded by suggestions and had the highest item-response rate; more than half of the complete respondents provided an answer. We present the item-response rates to the open-ended questions separately in Table 3.3 for all countries. In almost all cases a minority provided suggestions. The question on offering more information in asking for consent probed the most suggestions. In NL, a small majority responded. We will give a detailed account of the suggestions separately.

*Table 3.3: Item-response rates for NWM-G open-ended questions relative to all persons that returned a questionnaire and relative to persons that submitted an almost complete questionnaire.*

| NWM-G open-ended question            | % item-response |       |    |           |       |       |
|--------------------------------------|-----------------|-------|----|-----------|-------|-------|
|                                      | All             |       |    | Completes |       |       |
|                                      | IT              | NL    | SI | IT        | NL    | SI*   |
| BLOCK Participating smart survey     |                 |       |    |           |       |       |
| 13 – Other security measures         | 20,1%           | 29,5% | NA | 20,3%     | 31.8% | 13.6% |
| 15 – Options offer informed consent  | 26,7%           | 52,0% | NA | 27,0%     | 56.0% | 41.0% |
| 18 – Other options to offer control  | 15,6%           | 22,2% | Na | 15,7%     | 24.0% | 9.7%  |
| BLOCK Online participation           |                 |       |    |           |       |       |
| 20 – Reason(s) against participation | 99,3%           | 33,3% | NA | 99,6%     | 35.8% | 41.3% |

\* As we also had CAPI, all questions were mandatory (except open-ended questions). The filled-out paper general questionnaires were entered into Blaise software that was designed for CAPI data collection.

The first module in NWM-G addressed preferred contact and administration modes and ownership of a range of smart devices. Appendix G presents summaries of the answers across the three countries. As an important side remark, we note that response rates for NWM-G were much higher in IT and SI. This likely leads to some confounding of selection into NWM-G and conclusions. IT shows larger preferences for contact via SMS or telephone. NL differs from IT and SI in self-administered modes as the preferred administration modes. However, we note that NL did not employ interviewers in NWM, whereas IT and SI did. Contributing to official statistics and civic duty are by far the most mentioned motivations for doing a survey in all countries. Motivations for not doing a survey are lack of time, burden and privacy, where privacy is mentioned more often in NL. Around 90% of respondents owns a mobile device but for almost all other smart devices there is a minority; with air quality and water meters being the lowest. NL shows much higher coverage rates for smart energy meters than IT and SI.

## 4. Hypothetical willingness and respondent profiles

We consider three research questions that can be answered primarily with the NWM-G response.

### 4.1 What kind of persons express hypothetical willingness to do smart tasks?

We answer this question by comparing NWM-G respondents on how many tasks they report to be willing to perform.

Table 4.1 displays the proportions of NWM-G respondents that agreed to at least one task, that agree to all tasks and that did not agree to any task for the three countries. Note that ‘maybe’ and ‘do-not-know’ answers are not counted and ‘Yes at least once’ and ‘Always no’ do not add up to 100%, therefore. We make a split also between NWM-G only respondents and NWM-G respondents that also did NWM-S. We can conclude that around half of the population was willing to do at least one task but that virtually no respondents would be willing to do all tasks. There is a sizeable subpopulation that would not agree on any task.

*Table 4.1: Summary of hypothetical willingness split also for NWM-G respondents that did the NWM-S survey and those that did not.*

|                   | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|                   | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes at least once | 33.6%    | 51.6% | 40.5% | 56.9% | 79.1% | 66.1% | 41.9% | 66.9% | 48.6% |
| Always yes        | 0.8%     | 5.8%  | 2.6%  | 2.4%  | 1.1%  | 4.4%  | 1.4%  | 3.0%  | 2.6%  |
| Always no         | 36.6%    | 22.5% | 32.8% | 20.6% | 5.3%  | 14.6% | 30.8% | 12.2% | 27.0% |

However, the subpopulations of hesitant respondents are not included in Table 4.1. Table 4.2 contains statistics on the proportions of respondents including ‘maybe’ and ‘do-not-know’. The results tell us that in all countries a large majority of respondents is hesitant about at least one task. Also the proportion of respondents hesitant about three or more tasks still is fairly large. These results point at the importance of context.

*Table 4.2: Summary of statistics on hesitant respondents split also for NWM-G respondents that did the NWM-S survey and those that did not.*

|                   | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|                   | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Maybe-DK $\geq 1$ | 51.0%    | 61.5% | 53.7% | 64.9% | 78.4% | 68.7% | 55.9% | 70.4% | 58.4% |
| Maybe-DK $\geq 3$ | 25.4%    | 21.2% | 24.2% | 27.3% | 30.5% | 34.5% | 26.0% | 25.3% | 27.4% |
| Maybe-DK $\geq 5$ | 11.9%    | 3.4%  | 6.3%  | 6.3%  | 6.4%  | 8.2%  | 9.9%  | 5.1%  | 6.9%  |
| Not No $\geq 1$   | 63.4%    | 77.5% | 67.2% | 79.4% | 95.7% | 85.4% | 69.2% | 87.8% | 73.0% |

Let us try to predict what type of respondents agree to performing at least one smart task. We do this in two steps. In the first step, we consider only background variables. In the second step, we also include NWM-G answers to perception questions and digital skills. We show the variables selected without and with NWM-G in Table 4.3. When NWM-G variables are excluded then several auxiliary variables get selected, although how many and which vary per country. Once NWM-G variables are

added as candidate explanatory variables, these variables lose importance. In Section 5.4, we explore to what NWM-G predictors themselves can be predicted.

*Table 4.3: Selected variables in logistic regression for yes/no at least one ‘yes’ on a smart task for NWM-G respondents without and with NWM-G variables as explanatory variables. Results are given per country.*

| Variable            | Without NWM-G |    |    | With NWM-G |    |    |
|---------------------|---------------|----|----|------------|----|----|
|                     | IT            | NL | SI | IT         | NL | SI |
| NWM-G               |               |    |    |            |    |    |
| Skills              | NA            | NA | NA | ++         | +  |    |
| Device use          | NA            | NA | NA |            |    | +  |
| Security            | NA            | NA | NA | ++         | +  | +  |
| Information         | NA            | NA | NA | ++         | +  |    |
| Control             | NA            | NA | NA | +          | +  |    |
| NR-privacy          |               |    |    | +          | +  | +  |
| Admin               |               |    |    |            |    |    |
| Gender              |               |    |    |            |    | ++ |
| Age                 | ++            |    |    |            | +  |    |
| Income*             | ++            | +  |    |            |    | +  |
| Origin/Nationality* | +             | +  |    |            |    |    |
| Assets              | NA            |    |    | NA         |    |    |
| House value         | NA            | +  |    | NA         |    |    |
| SES                 | NA            | +  |    | NA         |    |    |
| Education           | +             | ++ | +  |            | +  |    |
| Household           |               | +  |    |            |    |    |
| Urbanity            |               |    | +  |            |    | +  |

\* In the case of IT, the variable Income refers to Household income; the variable Country of Origin/Nationality refers to Nationality.

## 4.2 How does willingness depend on the type of smart task?

We answer this question by looking at the variety in willingness across different tasks. NWM-G included seven smart tasks. Respondents could answer each task with a ‘yes’, ‘maybe’, ‘no’ or ‘do-not-know’ (DK). Table 4.4 displays the seven tasks plus three other tasks and categorizes the tasks following the taxonomy of smart features proposed in Deliverable 4.2 of WP4. The taxonomy includes four criteria (yes/no data existent, type of measurement, size of accuracy gap between ideal smart data and smart data in practice, and yes/no in-device handling of smart data) linked to individual smart features and one criterion (size of output gap between concepts of interest and ideal smart data) that depends on the smart survey context in which a feature is included.

In Table 4.5, we show the NWM-G reported hypothetical willingness rates per task and per country. It is immediately clear that willingness depends strongly on the task with installing an air quality system being the most popular and taking pictures of housing conditions being the least popular. Based on the taxonomy, especially smart tasks that have a large accuracy gap and/or a large output gap have lower willingness rates. These are smart tasks that follow features for which data need considerable adjustment with the help of respondents or that have a large surplus of information relative to what

is needed. It is also for these features that privacy-by-design and data minimization principles in GDPR are prominent. Another conclusion, we can draw is that 20 to 25% of respondents answers ‘maybe’ or ‘do-not-know’. In other words, there is fairly large subpopulation that may be convinced to go smart, but that seems to seek more information. We come back to this finding in Section 6.

*Table 4.4: Tentative scores on the four smart feature criteria and the output gap criterion for examples of smart features. Tasks in light blue are included in NWM-G. Tasks in dark blue are included also in NWM-S. The accuracy gap labels represent large = adjustment needed with help of respondent, moderate = adjustment needed but not necessarily with respondent, small = negligible adjustment needed.*

|                                  | Smart feature criteria |                 |              |           | Output gap |
|----------------------------------|------------------------|-----------------|--------------|-----------|------------|
|                                  | Data existent          | Measurement     | Accuracy gap | In-device |            |
| Photos of housing conditions     | NO                     | Internal sensor | Large        | YES       | Large      |
| Data donation of energy meter    | YES                    | External sensor | Moderate     | YES       | Small      |
| Indoor air quality system by NSI | NO                     | External sensor | Small        | NO        | Small      |
| Step count data donation         | YES                    | External sensor | Small        | YES       | Large      |
| Physical activity tracker by NSI | NO                     | External sensor | Moderate     | NO        | Large      |
| Scans of receipts                | NO                     | Internal sensor | Moderate     | YES       | Small      |
| Upload of e-receipts             | YES                    | Internal sensor | Small        | NO        | Small      |
| Location tracking                | NO                     | Internal sensor | Large        | YES       | Large      |
| Web tracking                     | NO                     | Internal sensor | Moderate     | YES       | Large      |
| Product/service search           | NO                     | Q&A             | Moderate     | YES       | Small      |
| Time use activity search         | NO                     | Q&A             | Moderate     | YES       | Small      |

*Table 4.5: Would you participate in a(n) ISTAT/CBS/SURS survey which asks you to:*

| IT   | Yes   | Maybe | No    | DK    |
|--|-------|-------|-------|-------|
| Share location                                       | 9.2%  | 15.5% | 65.5% | 9.7%  |
| Share pictures of your house                         | 7.1%  | 9.3%  | 76.5% | 7.1%  |
| Share data on energy use                             | 24.2% | 17.5% | 49.0% | 9.2%  |
| Use an air quality monitor                           | 28.8% | 15.9% | 44.9% | 10.5% |
| Give the step counts on your mobile devices          | 21.0% | 14.3% | 56.1% | 8.6%  |
| Wear an activity tracker provided by ISTAT           | 12.1% | 14.0% | 64.7% | 9.2%  |
| Take pictures of receipts or upload digital receipts | 7.6%  | 12.7% | 70.8% | 8.9%  |

| NL                           | Yes   | Maybe | No    | DK   |
|------------------------------|-------|-------|-------|------|
| Share location               | 24.9% | 24.9% | 37.8% | 4.1% |
| Share pictures of your house | 11.8% | 17.9% | 58.9% | 3.1% |
| Share data on energy use     | 40.9% | 24.8% | 28.0% | 3.8% |
| Use an air quality monitor   | 47.4% | 19.8% | 24.7% | 5.3% |

|  |       |       |       |      |
|--|-------|-------|-------|------|
| Give the step counts on your mobile devices          | 39.0% | 22.8% | 32.4% | 3.1% |
| Wear an activity tracker provided by CBS             | 20.2% | 20.0% | 48.3% | 3.0% |
| Take pictures of receipts or upload digital receipts | 13.8% | 19.3% | 56.0% | 2.5% |

|  |       |       |       |      |
|--|-------|-------|-------|------|
| SI   | Yes   | Maybe | No    | DK   |
| Share location                                       | 20.9% | 22.5% | 50.9% | 5.6% |
| Share pictures of your house                         | 7,4%  | 13.3% | 76.0% | 3.4% |
| Share data on energy use                             | 17.5% | 22.5% | 54.1% | 5.8% |
| Use an air quality monitor                           | 32.7% | 22.4% | 40.5% | 4.4% |
| Give the step counts on your mobile devices          | 29.7% | 21.8% | 45.0% | 3.5% |
| Wear an activity tracker provided by SURS            | 19.2% | 18.5% | 57.7% | 4.5% |
| Take pictures of receipts or upload digital receipts | 9.3%  | 14.4% | 70.7% | 5.7% |

We model hypothetical willingness to each individual smart task using background variables and NWM-G perceptions and device use. Full models are given in Appendix H. In Table 4.6, we summarize the importance of the explanatory variables. Logistic regression models were fitted using an AIC-based forward-backward selection. We indicate what variables are selected. We distinguish between selected variables with p-values of odds-ratios all below 0.01 and all other selected variables. From Table 4.6, we derive that self-reported concerns about security of data collected through smart devices is the only strong predictor in all smart tasks and in all three countries. This relation is further strengthened by privacy concerns as main reason not to participate in a survey that also comes up as predictor for several tasks for NL and SI. The importance of controlling data is almost always selected in NL and SI, but with much less variation in odds ratios. In IT, it is only selected once. In IT, self-reported digital skills rating is a quite prominent predictor for several tasks, whereas in NL and SI this variable is only selected a few times. In SI, device usage is selected in all but two smart tasks. Background characteristics turn out to be weak predictors. The exception is gender in location tracking and receipt scanning in NL and SI.

*Table 4.6: Summary of selected variables per individual smart task in NWM-G in logistic regression models in IT (first row), NL (second row) and SI (third row). ‘++’ indicates odds ratios had p-values of 0.01 and lower. ‘+’ indicates other selected variables.*

| Variable    | Smart task        |               |                    |               |                     |               |               |
|-------------|-------------------|---------------|--------------------|---------------|---------------------|---------------|---------------|
|             | Location tracking | Photo house   | Air quality indoor | PA tracking   | Step count donation | Energy meter  | Receipt scan  |
| Skills      | ++<br>+           |               | ++                 |               | ++<br>+<br>+        | +             | +<br>+        |
| Device use  | +                 |               | +<br>+             | +             | +<br>+              | +<br>+        |               |
| Security    | ++<br>++<br>++    | ++<br>++<br>+ | ++<br>++<br>+      | ++<br>++<br>+ | ++<br>++<br>+       | ++<br>++<br>+ | ++<br>++<br>+ |
| Information | +                 |               | ++                 | +             | ++                  | +             |               |



|                               |         |               |         |         |         |         |         |
|-------------------------------|---------|---------------|---------|---------|---------|---------|---------|
|                               |         | ++            |         |         |         | +       |         |
| Control                       | +<br>++ | ++<br>+<br>++ | +<br>++ | +<br>++ | +<br>++ | +<br>++ | +       |
| NR: Lack of time              | ++      |               | ++<br>+ |         |         | +<br>+  |         |
| NR: privacy issues            | +       | +<br>+        | +       |         | +       | +       |         |
| NR: personal                  | +       | +             | +       |         |         | +       |         |
| Gender                        | ++<br>+ | +             |         | +<br>++ |         | +       | ++      |
| Age                           | +       |               |         | +       |         |         |         |
| Income                        |         | +             | +       |         |         |         | +       |
| Country of origin/nationality |         |               | ++      | +<br>+  | +       |         |         |
| Assets                        | NA<br>+ | NA<br>+       | NA      | NA      | NA      | NA      | NA      |
| House value                   | NA      | NA            | NA      | NA      | NA      | NA      | NA<br>+ |
| SES                           | NA      | NA<br>+       | NA      | NA<br>+ | NA      | NA<br>+ | NA      |
| Education                     | +<br>+  | +             | +<br>+  |         |         | +<br>+  |         |
| Household                     |         |               |         |         |         | +       |         |
| Urbanity                      |         |               | +       |         | +<br>+  |         | +       |

### 4.3 How does the dependence of country/NSI come in?

From the tables in the previous subsections, we conclude that country differences in self-reported willingness are huge. Overall, patterns in what smart tasks are more popular or less popular are similar, but the rate of willingness differs. We must note again that response rates in IT and SI were much higher than in NL. We can only speculate what willingness rates would be for NWM-G had interviewer modes also been included in the NWM-G for NL. We must, however, conclude that different implementations of smart features would lead to different pick-up rates across countries. Inherently, these differences will lead to smart methods effects across countries.

## 5. Actual willingness

In this section, we focus on the research questions that combine NWM-G and NWM-S.

### 5.1 What are characteristics of persons really going smart?

Here, we limit ourselves to explaining NWM-S response by variables linked from administrative data and/or sampling frame. These variables are available prior to fieldwork, possibly with a time-lag. We list the available variables in Appendix E.

Logistic regression models for the binary indicator of yes/no response to NWM-S were fitted in IT, NL and SI separately. All employed a stepwise selection of variables based on AIC. We note that some NWM-S respondents did not do any smart task. These were included nonetheless because of the experimental feel of NWM-S and because the NWM-S smart tasks were but a subset of potential smart tasks (among those for example listed in NWM-G). We come back to an evaluation of how many tasks are done in subsequent subsections.

Table 5.1 presents the auxiliary variables that were selected for prediction NWM-S response per country. Overall models tend to be relatively weak. Nagelkerke  $R^2$  is 0.12 for IT, 0.08 for NL and 0.12 for SI. In all three countries, income and educational level are predictors. Age is a stronger predictor in IT and SI, but, somewhat surprisingly, not in NL.

*Table 5.1: Summary of selected auxiliary variables for explaining yes/no NWM-S response. ‘++’ indicates odds ratios had p-values of 0.01 and lower. ‘+’ indicates other selected variables.*

| Variable           | IT | NL | SI |
|--------------------|----|----|----|
| Gender             |    |    | +  |
| Age                | ++ |    | ++ |
| Income             | ++ | +  | +  |
| Origin/nationality | ++ | +  |    |
| Assets             | NA |    |    |
| House value        | NA |    |    |
| SES                | NA |    |    |
| Education          | ++ | +  | +  |
| Household          |    | +  |    |
| Urbanity           |    |    |    |

### 5.2 To what extent does hypothetical willingness predict actual willingness?

It is conjectured in smart survey literature (e.g. Struminskaya et al 2020 and 2021, Public Opinion Quarterly) that hypothetical willingness overestimates true willingness. Despite the somewhat experimental nature of NWM, the survey does allow to investigate consistency of respondents. This consistency may be further evaluated against the type of smart task and the country/NSI context.

We report the actual smart task performance as observed in NWM-S. In doing so, we make a distinction between whether a respondent was in the position to perform the task, was in the position but did not want to do the task, was in the position and willing but experienced technical issues, and was in the position and performed the task. For the four smart tasks this meant the following:

- Location: A respondent could, despite a soft warning, do the survey on a laptop or desktop. In case such a device did not support location tracking, they would have an item missing. Some respondents also experienced issues on mobile devices.
- Step count: A respondent could not share a step count when he/she did not have an activity tracker.
- Energy meters: A respondent could not take a photo when he/she was not at home when completing the survey or when they did not own a private meter. Respondents could always stop and continue the survey at a time they were at home, but some proceeded directly.
- Receipts: A respondent could not scan a receipt or upload a receipt when they had none. They were able to continue the survey at a later time, but some proceeded directly.

In Table 5.2, we first show the actual smart task performance rates across the four tasks and three countries. We must note that we have no means of checking whether indeed a respondent was not able to do a task. The respondent could potentially hide a refusal by a not-being-able argument. On the counter side, comparisons between countries are easier for NWM-S because response rates were comparable, also with respect to relevant subpopulations. The overall higher consent rate encountered in the NWM-G in NL is confirmed. Differences are huge for all tasks. SI has consent rates in between IT and NL. A few more specific findings: Although expressing to have a receipt, only one fifth provides scans/uploads in IT and one third in SI. IT experienced far less technical issues in sharing location, which makes the low consent rate even more striking; almost three quarters would not want to share. The large differences in meter sharing rates are moderated to some extent by the low alleged coverage rates in SI. In Italy, the difference is mostly related to the often inaccessible position of meters to take photos and to respondents assuming it should be available through administrative data. Refusal rates are much more in line with each other.

Table 5.2: Smart task performance.

|                              | Performed |       |       | Could not perform |       |       | Was not willing to |       |       |
|------------------------------|-----------|-------|-------|-------------------|-------|-------|--------------------|-------|-------|
|                              | IT        | NL    | SI    | IT                | NL    | SI    | IT                 | NL    | SI    |
| <b>Share location</b>        | 24.1%     | 46.5% | 34.9% | 2.7%              | 22.3% | 18.1% | 73.2%              | 31.2% | 47.0% |
| <b>Share step count</b>      |           |       |       |                   |       |       |                    |       |       |
| <i>Has a step count</i>      | 35.5%     | 54.7% | 51.5% |                   |       |       |                    |       |       |
| <i>Invited</i>               | 90.3%     | 98.3% | 84.2% | NA                | NA    | NA    | 9.7%               | 1.7%  | 15.8% |
| <b>Share receipt</b>         |           |       |       |                   |       |       |                    |       |       |
| <i>Receipt available</i>     | 50.7%     | 48.7% | 47.6% |                   |       |       |                    |       |       |
| <i>Scanned/uploaded</i>      | 17.9%     | 51.5% | 35.4% | NA                | NA    | NA    | 82.1%              | 48.5% | 64.6% |
| <i>No receipt available</i>  | 49.3%     | 51.3% | 52.4% |                   |       |       |                    |       |       |
| <i>Hypothetical</i>          | 69.4%     | 75.6% | 85.1% | NA                | NA    | NA    | 30.6%              | 24.4% | 14.9% |
| <b>Share meter reading</b>   |           |       |       |                   |       |       |                    |       |       |
| <i>Is at home</i>            | 70.1%     | 86.3% | 72.0% |                   |       |       |                    |       |       |
| <i>Water</i>                 | 9.3%      | 36.3% | 12.7% | 38.2%             | 24.1% | 38.9% | 52.5%              | 39.6% | 48.4% |
| <i>Electricity</i>           | 9.3%      | 43.6% | 17.4% | 35.9%             | 14.7% | 34.2% | 54.8%              | 41.7% | 48.4% |
| <i>Gas</i>                   | 8.2%      | 38.8% | 20.0% | 37.6%             | 19.3% | 11.4% | 54.2%              | 41.9% | 68.6% |
| <i>Not at home</i>           | 29.9%     | 13.7% | 28.0% |                   |       |       |                    |       |       |
| <i>Hypothetical - Water</i>  | 38.6%     | 47.1% | 50.0% | NA                | NA    | NA    | 61.4%              | 52.9% | 50.0% |
| <i>Hypothetical - Electr</i> | 42.2%     | 48.2% | 53.2% | NA                | NA    | NA    | 57.8%              | 51.6% | 46.8% |
| <i>Hypothetical - Gas</i>    | 44.9%     | 50.0% | 40.0% | NA                | NA    | NA    | 55.1%              | 50.0% | 60.0% |

Table 5.3 gives a further confirmation of findings. We show the distributions of the number of tasks actually completed. More than half of NWM-S respondents would do two or more tasks in NL In SI this is around. In IT, a small majority of respondents did not do any task and only around 15% did two or more tasks. The only proportion that is comparable across countries is one task; around 30%.

*Table 5.3: Number of smart tasks performed (maximum of four)*

| Number of tasks | IT    | NL    | SI    |
|-----------------|-------|-------|-------|
| 0               | 50.2% | 11.7% | 35.5% |
| 1               | 32.8% | 28.0% | 34.0% |
| 2               | 11.8% | 29.7% | 22.0% |
| 3               | 4.8%  | 22.7% | 6.3%  |
| 4               | 0.4%  | 7.7%  | 2.1%  |

Next, we move to the consistency between NWM-G hypothetical willingness and NWM-S actual willingness. Table 5.4 crosses the two willingness variables for NWM-S respondents that also did NWM-G. In NL, a relatively large proportion of sampled persons did do only NWM-S. For NL, we, therefore, investigated whether NWM-S respondents that did NWM-G and those that did not are different. Details are given in Appendix H. Based on the investigation, we conclude that NWM-S only respondents in NL are more often migrant, younger, higher educated, more often female and perform fewer smart tasks. The difference in average number of smart tasks is relatively modest, but excluding the NWM-S only respondents does give a more positive view on consent rates in NL.

*Table 5.4: Hypothetical willingness in NWM-G against real willingness in NWM-S*

| NWM-G hypothetical  | NWM-S observed willingness |     |      |                |     |     |           |     |     |
|---------------------|----------------------------|-----|------|----------------|-----|-----|-----------|-----|-----|
|                     | Shares                     |     |      | Is not able to |     |     | Not share |     |     |
|                     | IT                         | NL  | SI   | IT             | NL  | SI  | IT        | NL  | SI  |
| Share location      |                            |     |      |                |     |     |           |     |     |
| Yes                 | 63%                        | 62% | 49%  | 23%            | 30% | 23% | 14%       | 9%  | 28% |
| Maybe               | 39%                        | 56% | 43%  | 36%            | 19% | 21% | 26%       | 24% | 36% |
| No                  | 17%                        | 28% | 20%  | 63%            | 22% | 12% | 20%       | 51% | 68% |
| Don't know          | 32%                        | 47% | 9%   | 46%            | 18% | 27% | 23%       | 35% | 64% |
| Share step count    |                            |     |      |                |     |     |           |     |     |
| Yes                 | 47%                        | 66% | 84%  | 42%            | 33% | 14% | 11%       | 1%  | 2%  |
| Maybe               | 42%                        | 58% | 85%  | 55%            | 40% | 15% | 3%        | 2%  | 0%  |
| No                  | 20%                        | 24% | 80%  | 68%            | 75% | 4%  | 13%       | 1%  | 16% |
| Don't know          | 21%                        | 29% | 100% | 67%            | 71% | 0%  | 12%       | 0%  | 0%  |
| Share receipt       |                            |     |      |                |     |     |           |     |     |
| Yes                 | 18%                        | 48% | 22%  | 63%            | 47% | 66% | 19%       | 5%  | 12% |
| Maybe               | 18%                        | 32% | 20%  | 66%            | 56% | 67% | 17%       | 12% | 13% |
| No                  | 7%                         | 16% | 13%  | 46%            | 48% | 43% | 47%       | 36% | 44% |
| Don't know          | 9%                         | 24% | 24%  | 43%            | 59% | 53% | 47%       | 18% | 24% |
| Share meter reading |                            |     |      |                |     |     |           |     |     |
| Yes                 | 15%                        | 63% | 8%   | 16%            | 8%  | 42% | 69%       | 29% | 50% |
| Maybe               | 5%                         | 42% | 12%  | 15%            | 10% | 35% | 81%       | 48% | 54% |
| No                  | 5%                         | 8%  | 4%   | 9%             | 12% | 36% | 87%       | 80% | 60% |
| Don't know          | 2%                         | 22% | 0%   | 10%            | 17% | 30% | 88%       | 61% | 70% |

In Table 5.4, as expected, we observe a positive relation between hypothetical and actual willingness. With a few exceptions, it holds that those who consented hypothetically have a much higher rate of really sharing. However, the strength of this relation varies between countries and per smart task. For NL it is true in all tasks, but only for sharing location is the pattern clear for all countries. The relations between hypothetical and actual willingness are partially blurred by respondents mentioning they are not able to do the task. For step counts, receipts and meters this can partially be explained by the lack of step count or receipts and by meters being inaccessible. However, for sharing location, rates are unrealistically high and it could be that respondents hide a refusal by a claim not being able. To provide a ‘cleaner’ view, Table 5.5 presents sharing rates for all NWM-S respondents not claiming they were unable. Only for sharing receipts and sharing step counts, the conditional consent rates have a moderating effect and countries are more aligned. For the meter readings and for locations, differences remain huge.

*Table 5.5: Sharing rates for those that claimed to be able.*

| Hypothetical        | Actual sharing |      |      |
|---------------------|----------------|------|------|
|                     | IT             | NL   | SI   |
| Share location      |                |      |      |
| Yes                 | 82%            | 87%  | 64%  |
| Maybe               | 60%            | 70%  | 54%  |
| No                  | 46%            | 35%  | 23%  |
| Don't know          | 58%            | 57%  | 12%  |
| Share step count    |                |      |      |
| Yes                 | 81%            | 99%  | 98%  |
| Maybe               | 93%            | 97%  | 100% |
| No                  | 61%            | 96%  | 83%  |
| Don't know          | 64%            | 100% | 100% |
| Share receipt       |                |      |      |
| Yes                 | 51%            | 91%  | 50%  |
| Maybe               | 62%            | 73%  | 50%  |
| No                  | 16%            | 31%  | 50%  |
| Don't know          | 21%            | 57%  | 50%  |
| Share meter reading |                |      |      |
| Yes                 | 21%            | 68%  | 14%  |
| Maybe               | 7%             | 47%  | 18%  |
| No                  | 6%             | 9%   | 7%   |
| Don't know          | 3%             | 27%  | 0%   |

### 5.3 What are the main motives of persons to (not) perform a smart task?

In previous sections we have seen that a sizeable proportion of NWM-G respondents is not willing to go smart. They either did not do the NWM-S or did the NWM-S but limited the number of tasks. Here, we start investigating how their choices may relate to opinions on smart features. This forms the bridge to improving tactics and to informing ethical and legal officers.

In Table 5.6 to 5.12, we present the NWM-G questions that we hypothesized to be predictive of smart survey participation. We split distributions for those doing only NWM-G and those doing both surveys.

Let us first look at digital/online skills and behaviour. Respondents that did not do NWM-S own fewer devices, are less active on devices and consider themselves to be less skilled. Somewhat remarkably, in IT, respondents that did NWM-S still relatively often report not being very skilled. So the hypothesis is confirmed that respondents that feel less digitally literate or comfortable less often go smart. This does not mean that this is the cause by itself as other reasons may interact with being less digital. Table 4.5 on selected variables in logistic regressions showed us that digital skills only come in as predictors for some tasks; namely, those were the camera needs to be used.

*Table 5.6: Summary of Question 5 and split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.*

|  | No NWM-S       |                |                | NWM-S          |                |                | All            |                |                |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|  | IT             | NL             | SI             | IT             | NL             | SI             | IT             | NL             | SI             |
| At least one smart device              | 83.8%<br>(0.9) | 82.2%<br>(1.6) | 90.2%<br>(1.1) | 97.9%<br>(0.5) | 97.5%<br>(1.6) | 97.5%<br>(0.9) | 88.8%<br>(0.6) | 90.6%<br>(0.9) | 92.5%<br>(0.8) |
| Phone/tablet                           | 82.1%<br>(1.0) | 78.2%<br>(1.7) | 89.2%<br>(1.2) | 97.7%<br>(0.5) | 96.5%<br>(1.6) | 97.5%<br>(0.9) | 87.7%<br>(0.7) | 88.3%<br>(1.0) | 91.8%<br>(0.9) |
| Smart device which is not phone/tablet | 33.5%<br>(1.2) | 58.1%<br>(1.8) | 28.4%<br>(1.7) | 57.1%<br>(1.6) | 78.9%<br>(1.8) | 44.9%<br>(2.8) | 42.0%<br>(1.0) | 69.6%<br>(1.5) | 33.6%<br>(1.5) |

*Table 5.7: Question 6: How often do you use a smartphone for activities other than phone calls or text messaging? split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.*

|                       | No NWM-S       |                |                | NWM-S          |                |                | All            |                |                |
|-----------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                       | IT             | NL             | SI             | IT             | NL             | SI             | IT             | NL             | SI             |
| Several times a day   | 72.5%<br>(1.2) | 72.4%<br>(1.7) | 71.2%<br>(1.8) | 87.9%<br>(1.1) | 90.1%<br>(1.7) | 83.4%<br>(2.1) | 78.6%<br>(0.9) | 82.9%<br>(1.2) | 75.3%<br>(1.4) |
| Once a day            | 8.4%<br>(0.8)  | 6.2%<br>(7.8)  | 15.5%<br>(1.5) | 5.6%<br>(0.8)  | 2.6%<br>(7.8)  | 8.1%<br>(1.6)  | 7.3%<br>(0.6)  | 4.1%<br>(0.7)  | 13.1%<br>(1.1) |
| Several times a week  | 8.6%<br>(0.8)  | 9.8%<br>(6.4)  | 5.6%<br>(0.9)  | 4.0%<br>(0.7)  | 4.1%<br>(6.3)  | 4.9%<br>(1.2)  | 6.8%<br>(0.5)  | 6.4%<br>(0.8)  | 5.3%<br>(0.7)  |
| Several times a month | 3.2%<br>(0.5)  | 3.7%<br>(11.0) | 3.6%<br>(0.8)  | 1.6%<br>(0.4)  | 0.6%<br>(11.0) | 2.3%<br>(0.9)  | 2.6%<br>(0.3)  | 1.4%<br>(0.4)  | 3.2%<br>(0.6)  |
| Once a month or less  | 7.3%<br>(0.7)  | 4.9%<br>(8.3)  | 4.1%<br>(0.8)  | 0.9%<br>(0.3)  | 0.9%<br>(7.6)  | 1.3%<br>(0.6)  | 4.8%<br>(0.5)  | 2.5%<br>(0.5)  | 3.2%<br>(0.6)  |

*Table 5.8: Question 8: Generally, how would you rate your skills of using a smartphone on a scale? and split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.*

|          | No NWM-S       |                |                | NWM-S          |                |                | All            |                |                |
|----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|          | IT             | NL             | SI             | IT             | NL             | SI             | IT             | NL             | SI             |
| Beginner | 26.6%<br>(1.2) | 12.0%<br>(1.4) | 10.3%<br>(1.2) | 6.6%<br>(0.8)  | 1.3%<br>(0.6)  | 1.0%<br>(0.6)  | 18.7%<br>(0.8) | 5.6%<br>(0.8)  | 7.2%<br>(0.9)  |
| 2        | 16.2%<br>(1.0) | 13.7%<br>(1.4) | 13.6%<br>(1.4) | 10.1%<br>(1.0) | 5.5%<br>(1.2)  | 6.8%<br>(1.4)  | 13.8%<br>(0.7) | 8.8%<br>(0.9)  | 11.3%<br>(1.0) |
| 3        | 37.0%<br>(1.3) | 44.4%<br>(2.1) | 44.7%<br>(2.0) | 44.0%<br>(1.7) | 37.8%<br>(2.5) | 45.0%<br>(2.8) | 39.8%<br>(1.0) | 40.5%<br>(1.6) | 44.8%<br>(1.6) |
| 4        | 9.6%<br>(0.8)  | 14.0%<br>(1.5) | 17.2%<br>(1.5) | 20.3%<br>(1.4) | 21.6%<br>(2.2) | 22.8%<br>(2.4) | 13.8%<br>(0.7) | 18.5%<br>(1.3) | 19.1%<br>(1.3) |
| Advanced | 10.6%<br>(0.8) | 15.9%<br>(1.5) | 14.2%<br>(1.4) | 19.0%<br>(1.3) | 33.8%<br>(2.5) | 24.4%<br>(2.5) | 13.9%<br>(0.7) | 26.6%<br>(1.4) | 17.6%<br>(1.3) |

In NWM-G, concerns about security or misused of data collected through smart devices turned out to be the strongest predictor. Indeed, respondents that did NWM-S and those that did not differ strongly on how they perceive security risks. And this is true in all countries. However, the contrast is much larger for NL than for IT and SI. In IT also those that did do NWM-S still show a small majority of quite to very concerned NWM-G respondents. Surprisingly, in NL, the concerns about security and misused of data become larger when the NSI is mentioned as smart data collector; in IT concerns are smaller and in SI there is no difference.

The third group of perceptions concerns the importance that respondents attach to being clearly informed about the context and about how they can be in control of data collection. There is a vast majority that reports it to be quite to very important to know what is collected and to be able to control. However, respondents that did NWM-S and that did not differ relatively little in how important they find it to be informed or to be able to control the smart data collection. NWM-S respondents tend to find it more important.

All in all, we can conclude that especially privacy concerns relate strongly to going smart.

*Table 5.9: Summary of Question 10: In general, how concerned are you about your data being stolen and misused by others? split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.*

|          | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|----------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|          | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Not      | 12.3%    | 24.5% | 21.4% | 15.7% | 30.6% | 25.6% | 13.5% | 28.0% | 22.7% |
| Somewhat | 25.9%    | 33.9% | 31.1% | 33.3% | 47.9% | 36.7% | 28.6% | 42.0% | 32.9% |
| Quite    | 28.7%    | 25.5% | 30.4% | 29.0% | 17.1% | 25.9% | 28.8% | 20.6% | 29.0% |
| Very     | 33.1%    | 16.1% | 17.0% | 22.0% | 4.6%  | 11.7% | 29.1% | 9.3%  | 15.4% |

*Table 5.10: Summary of Question 11: How concerned are you that data collected through smart devices by ISTAT/CBS/SURS would be stolen or misused by others than ISTAT/ CBS/SURS? split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.*

|          | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|----------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|          | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Not      | 23.5%    | 16.2% | 19.4% | 30.2% | 20.8% | 23.1% | 25.9% | 19.0% | 20.5% |
| Somewhat | 32.3%    | 33.8% | 30.3% | 38.4% | 53.4% | 35.8% | 34.5% | 44.7% | 32.0% |
| Quite    | 23.2%    | 31.0% | 33.2% | 20.4% | 21.1% | 31.0% | 22.2% | 25.4% | 32.5% |
| Very     | 21.0%    | 19.0% | 17.2% | 11.1% | 4.7%  | 10.1% | 17.4% | 10.9% | 15.0% |

*Table 5.11: Summary of Question 14: When you are invited to participate in a study that collects data through smart devices, how important would it be for you to be informed about what data will be collected? split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.*

|          | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|----------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|          | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Not      | 7.8%     | 7.2%  | 6.4%  | 5.0%  | 0.8%  | 2.2%  | 6.8%  | 3.4%  | 5.1%  |
| Somewhat | 7.8%     | 8.4%  | 7.4%  | 8.4%  | 9.1%  | 9.8%  | 8.0%  | 8.8%  | 8.2%  |
| Quite    | 22.2%    | 28.9% | 37.0% | 23.8% | 35.5% | 35.8% | 22.7% | 32.8% | 36.6% |
| Very     | 44.7%    | 55.4% | 39.9% | 58.5% | 54.5% | 50.6% | 49.7% | 54.9% | 43.3% |
| DK       | 17.5%    | -     | 9.3%  | 4.4%  | -     | 1.6%  | 12.8% | -     | 6.9%  |

Table 5.12: Summary of Question 16: How important would it be for you to be able to control what data will be collected? split also for NWM-G respondents that did the NWM-S survey and those that did not. Standard errors between brackets.

|          | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|----------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|          | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Not      | 8.1%     | 7.6%  | 7.7%  | 6.0%  | 3.8%  | 3.2%  | 7.3%  | 5.4%  | 6.3%  |
| Somewhat | 8.0%     | 7.9%  | 7.3%  | 10.1% | 11.0% | 9.8%  | 8.7%  | 9.7%  | 8.1%  |
| Quite    | 22.0%    | 32.7% | 37.7% | 26.3% | 44.8% | 45.9% | 23.5% | 39.7% | 40.3% |
| Very     | 41.1%    | 42.9% | 36.1% | 51.2% | 39.3% | 39.6% | 44.7% | 40.8% | 37.2% |
| DK       | 20.8%    | 8.9%  | 11.2% | 6.5%  | 1.1%  | 1.6%  | 15.6% | 4.4%  | 8.2%  |

#### 5.4 To what extent can hesitations be predicted from known characteristics?

The previous sections pointed at the relation between smart task performance, ability to do smart tasks and motivation to do smart tasks. Ability is reflected by self-reported digital skills and smartphone usage. Motivation is much more diverse and is in part represented by perceptions on data security, survey information, smart data control and motives to (not) participate in surveys. Neither skills nor perceptions are known prior to survey fieldwork. Furthermore, an account of all possible objections in invitation letters would most likely scare/discourage potential respondents, if such information would be read at all. It would, therefore, be relevant to know whether such characteristics can be predicted from known auxiliary information. If so, some prior tailoring of push-to-smart strategies may be feasible.

Tables 5.13 to 5.16 summarize the auxiliary variables selected in the prediction of, respectively, yes/no self-rated digital skills 1 or 2, yes/no quite or very concerned about data being stolen, yes/no quite or very important to receive information and yes/no quite or very important to control data. In case a variable is not selected in a country it is not included. The general conclusion we draw is that with the exception of self-rated digital skills, background characteristics are weak predictors of perceptions that are influential in willingness to perform smart tasks. This points at the importance of tailoring and maintaining interaction with respondents in these countries. It is only when communicating with potential respondents that we can learn about their hesitations. However, there is noticeable difference with IT, where models tend to be stronger. Hence, in IT beforehand it will be easier to predict perceptions that may affect willingness to go smart.

Table 5.13: Summary of selected auxiliary variables for explaining yes/no self-rated digital skills levels 1 or 2. ‘++’ indicates odds ratios had p-values of 0.01 and lower. ‘+’ indicates other selected variables.

| Variable           | IT | NL | SI |
|--------------------|----|----|----|
| Gender             | +  | +  | +  |
| Age                | ++ | ++ | ++ |
| Income             | ++ | +  |    |
| Origin/nationality | +  |    |    |
| Assets             | NA |    |    |
| House value        | NA |    |    |
| SES                | NA |    |    |



|           |    |   |   |
|-----------|----|---|---|
| Education | ++ | + | + |
| Household |    |   |   |
| Urbanity  |    | + | + |

Table 5.14: Summary of selected auxiliary variables for explaining yes/no quite or very concerned about smart data being stolen ‘++’ indicates odds ratios had p-values of 0.01 and lower. ‘+’ indicates other selected variables.

| Variable           | IT | NL | SI |
|--------------------|----|----|----|
| Gender             | ++ |    | +  |
| Age                | ++ | +  |    |
| Income             | +  | +  |    |
| Origin/nationality |    | +  |    |
| Assets             | NA |    |    |
| House value        | NA |    |    |
| SES                | NA |    |    |
| Education          |    |    | +  |
| Household          |    | +  |    |
| Urbanity           | +  |    | +  |

Table 5.15: Summary of selected auxiliary variables for explaining yes/no quite or very important to know what data are collected. ‘++’ indicates odds ratios had p-values of 0.01 and lower. ‘+’ indicates other selected variables.

| Variable           | IT | NL | SI |
|--------------------|----|----|----|
| Gender             | +  |    |    |
| Age                | ++ | +  |    |
| Income             | ++ |    |    |
| Origin/nationality |    |    |    |
| Assets             | NA |    |    |
| House value        | NA |    |    |
| SES                | NA |    |    |
| Education          | ++ | +  |    |
| Household          |    |    |    |
| Urbanity           |    |    |    |

Table 5.16: Summary of selected auxiliary variables for explaining yes/no quite or very important to be able to control what data are submitted. ‘++’ indicates odds ratios had p-values of 0.01 and lower. ‘+’ indicates other selected variables.

| Variable           | IT | NL | SI |
|--------------------|----|----|----|
| Gender             |    | +  |    |
| Age                | ++ | +  |    |
| Income             |    |    | +  |
| Origin/nationality |    |    |    |
| Assets             | NA | +  |    |
| House value        | NA |    |    |
| SES                | NA |    |    |

|           |    |  |  |
|-----------|----|--|--|
| Education | ++ |  |  |
| Household |    |  |  |
| Urbanity  |    |  |  |

### 5.5 How does the dependence on country/NSI come in?

The picture that we get from the actual willingness is mostly consistent with that from the hypothetical willingness. Smart task consent rates differ strongly across countries, even when ‘adjusting’ for availability/access to smart features. The relationships between perceptions and willingness seem largely the same in countries, although in NL they are more pronounced. If we can ignore the somewhat experimental nature of NWM-S, we must conclude that perceptions vary across countries, and, consequently, that the need to find effective ‘nudging’ tactics varies. In the evaluations, IT stands out more relative to NL and SI. The willingness to do smart tasks is smaller and hesitations are more distinct and predictable.

## 6 Clues for tailoring push-to-smart strategies

In order to find clues to nudge respondents to go smart, we need to identify the hesitant respondents. There are various reasons why respondents may hesitate. They may not find themselves able or competent enough to perform tasks. Their motivation or enjoyment may be outweighed by the task effort. They may feel uncomfortable or uncertain about what persons have access to their data and for what purpose. They may have strong concerns about cybercrime. And, of course, multiple reasons may play a role simultaneously.

### 6.1 How are suggestions received by respondents?

We first look at the suggestions that were made in the NWM-G questionnaire. Explicit suggestions were given for concerns about data security and for concerns about data control. For these two topics, respondents could also provide suggestions themselves. For concerns about the context of a survey only an open-ended question was included.

Tables 6.1 to 6.5 show the distributions of the questions after suggestions. We again split the distributions for those doing NWM-S and those that did not. All suggested data security improving additional measures by the NSI's (offering dedicated apps, offline alternatives, interviewer-assistance, external audit reports and provision of NSI devices) get some support from the NWM-G only respondents. Not surprisingly, the strongest support is for offline alternatives. The open-ended follow-up question also points at offering alternatives. In NL, interviewer-assistance gets little support relative to IT and SI, but this may be due to the lack of interviewer-assistance NWM-G in the first place. When it comes to offering information, there is no consistent preference for doing this online or offline. The suggestion to offer information in some form is, however, supported. As expected also information on content and timelines of sharing data are supported. When it comes to controlling data, the dedicated web page is the most preferred option. The other two suggestions (a dedicated app and a retention time period) also get support, but less prominent. The open-ended questions further support the conclusions, but in IT and SI point more at a dedicated environment and in NL more at autonomy in what is shared by respondents and what not.

*Table 6.1: Summary of Question 12: What should ISTAT/CBS/SURS do in your opinion to ensure that the security of data you share with ISTAT/CBS/SURS feels secure? split also for NWM-G respondents that did the NWM-S survey and those that did not.*

| Dedicated apps | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|----------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|                | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes            | 24.9%    | 23.9% | 29.5% | 42.1% | 49.2% | 44.9% | 31.2% | 39.0% | 34.4% |
| No             | 24.6%    | 24.2% | 22.9% | 24.5% | 14.7% | 13.6% | 24.5% | 18.5% | 19.9% |
| DK             | 50.6%    | 52.0% | 47.6% | 33.5% | 36.2% | 41.5% | 44.3% | 42.5% | 45.7% |

| Offline modes | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|---------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|               | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes           | 41.9%    | 62.5% | 47.5% | 43.4% | 64.2% | 48.1% | 42.4% | 63.5% | 47.7% |
| No            | 20.9%    | 20.6% | 25.3% | 33.1% | 21.1% | 29.7% | 25.3% | 20.9% | 26.7% |
| DK            | 36.9%    | 16.9% | 27.2% | 23.6% | 14.8% | 22.2% | 32.1% | 15.6% | 25.6% |

| Interviewer assistance | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|------------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|                        | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes                    | 32.3%    | 9.2%  | 41.2% | 23.6% | 13.8% | 19.6% | 29.1% | 11.9% | 34.4% |
| No                     | 32.7%    | 71.8% | 32.0% | 55.4% | 67.2% | 56.3% | 41.0% | 69.1% | 39.7% |
| DK                     | 33.7%    | 19.0% | 26.8% | 21.1% | 19.0% | 24.1% | 29.1% | 19.0% | 25.9% |

| External audit report | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-----------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|                       | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes                   | 29.6%    | 26.3% | 37.6% | 42.6% | 39.0% | 43.4% | 34.4% | 33.8% | 39.4% |
| No                    | 23.8%    | 34.6% | 22.7% | 26.8% | 33.0% | 16.1% | 24.9% | 33.7% | 20.6% |
| DK                    | 45.4%    | 39.1% | 39.7% | 30.1% | 28.0% | 40.5% | 39.8% | 32.5% | 40.0% |

| Devices provided by NSI | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-------------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|                         | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes                     | 21.5%    | 17.7% | 32.2% | 38.6% | 36.8% | 42.7% | 27.7% | 29.0% | 35.5% |
| No                      | 29.7%    | 38.5% | 31.6% | 27.6% | 24.0% | 22.8% | 28.9% | 29.0% | 28.8% |
| DK                      | 48.8%    | 43.8% | 36.2% | 33.8% | 39.3% | 34.5% | 43.3% | 41.1% | 35.7% |

*Table 6.2: Summary of Question 13: Is there anything else ISTAT/CBS/SURS can do to make you feel comfortable about the security of data you share with ISTAT/CBS/SURS? split also for NWM-G respondents that did the NWM-S survey and those that did not.*

|                  | No NWM-S |     |     | NWM-S |     |     | All |     |     |
|------------------|----------|-----|-----|-------|-----|-----|-----|-----|-----|
|                  | IT       | NL  | SI  | IT    | NL  | SI  | IT  | NL  | SI  |
| Behaviour        | 38%      | 23% | 34% | 46%   | 48% | 63% | 42% | 41% | 46% |
| Person           | 5%       | 38% | 18% | 5%    | 23% | 4%  | 5%  | 29% | 12% |
| Situation        | 1%       | 1%  | 1%  | 1%    | 3%  | 4%  | 1%  | 2%  | 2%  |
| Miscellaneous    | 7%       | 32% | 48% | 3%    | 26% | 30% | 5%  | 29% | 40% |
| No/Anything else | 49%      | --  | --  | 45%   | --  | --  | 47% | --  | --  |

*Table 6.3: Summary of Question 17: How could ISTAT/CBS/SURS assist you in controlling what data will be collected? split also for NWM-G respondents that did the NWM-S survey and those that did not.*

*a. Personal webpage/landing page*

|     | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-----|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|     | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes | 45.0%    | 52.8% | 46.3% | 76.8% | 84.7% | 74.4% | 56.5% | 71.1% | 55.1% |
| No  | 21.0%    | 30.9% | 22.0% | 9.2%  | 7.5%  | 7.3%  | 16.7% | 17.4% | 17.3% |
| DK  | 34.0%    | 16.4% | 31.7% | 13.9% | 7.8%  | 18.4% | 26.7% | 11.5% | 27.5% |

*b. App that shows data being collected*

|     | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-----|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|     | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes | 42.0%    | 46.1% | 46.6% | 72.3% | 78.0% | 68.7% | 53.0% | 64.7% | 53.5% |
| No  | 23.4%    | 32.2% | 22.1% | 13.3% | 12.0% | 7.6%  | 19.7% | 20.4% | 17.5% |
| DK  | 33.7%    | 21.7% | 31.3% | 15.3% | 10.0% | 23.7% | 27.0% | 14.9% | 28.9% |

c. *Retention time before respondent data are really included*

|     | No NWM-S |       |       | NWM-S |       |       | All   |       |       |
|-----|----------|-------|-------|-------|-------|-------|-------|-------|-------|
|     | IT       | NL    | SI    | IT    | NL    | SI    | IT    | NL    | SI    |
| Yes | 41.3%    | 44.3% | 51.4% | 55.0% | 52.1% | 63.0% | 46.3% | 48.8% | 55.0% |
| No  | 20.2%    | 35.2% | 21.5% | 23.4% | 28.1% | 14.9% | 21.4% | 31.2% | 19.4% |
| DK  | 37.6%    | 20.5% | 27.1% | 21.5% | 19.7% | 22.2% | 31.8% | 20.0% | 25.5% |

Table 6.4: Summary of Question 18: Is there any other way ISTAT/CBS/SURS could assist you in controlling what data will be collected? split also for NWM-G respondents that did the NWM-S survey and those that did not.

|                   | No NWM-S |     |     | NWM-S |     |     | All |     |     |
|-------------------|----------|-----|-----|-------|-----|-----|-----|-----|-----|
|                   | IT       | NL  | SI  | IT    | NL  | SI  | IT  | NL  | SI  |
| Autonomy          | 1%       | 17% | 7%  | 5%    | 41% | 29% | 3%  | 32% | 16% |
| Authorize/Channel | 38%      | 6%  | 2%  | 34%   | 12% | 2%  | 36% | 10% | 2%  |
| Information       | 35%      | 32% | 9%  | 38%   | 38% | 12% | 36% | 37% | 10% |
| Nothing           | 17%      | 45% | 14% | 19%   | 9%  | 7%  | 18% | 22% | 11% |
| Miscellaneous     | 8%       | -   | 68% | 5%    | -   | 49% | 7%  | -   | 60% |

Table 6.5: Summary of Question 15: How could ISTAT/CBS/SURS help to explain what data will be collected? split also for NWM-G respondents that did the NWM-S survey and those that did not.

|                     | No NWM-S |     |     | NWM-S |     |     | All |     |     |
|---------------------|----------|-----|-----|-------|-----|-----|-----|-----|-----|
|                     | IT       | NL  | SI  | IT    | NL  | SI  | IT  | NL  | SI  |
| Online              | 28%      | 20% | 19% | 35%   | 29% | 13% | 32% | 26% | 16% |
| Offline             | 27%      | 22% | 31% | 18%   | 13% | 15% | 22% | 16% | 24% |
| Interview           | 7%       | 2%  | 4%  | 3%    | 1%  | 2%  | 5%  | 1%  | 3%  |
| Type of information | 25%      | 25% | 30% | 32%   | 39% | 50% | 29% | 35% | 38% |
| Miscellaneous       | 13%      | 31% | 17% | 12%   | 18% | 20% | 12% | 22% | 18% |

## 6.2 What about the hesitant respondents?

In order to find clues, we need to isolate respondents that we view as hesitant, i.e. soft refusers. We label an NWM-G respondent as potentially hesitant when:

- A. Agreeing hypothetically on at least one NWM-G task but not participating in NWM-S;
- B. Agreeing hypothetically but not actually performing the specific NWM-S task;
- C. Giving multiple 'maybe' or DK answer hypothetically;
- D. Giving a 'maybe' or DK answer hypothetically but not doing the corresponding NWM-S task;
- E. Reporting digital skills level 1 or 2 on the five-point scale (with 1 = beginner and 5 = advanced);
- F. Reporting to be quite or very concerned about data being stolen or misused;

The questions we answer are:

- Do they give other/more suggestions how data can be more secure?
- Do they give other/more suggestions how they can be better informed?
- Do they give other/more suggestions how they can better control data?

We start from the NWM-S and identify respondents that refused a task (but were able to). These respondents were asked for the reason(s) not do the task. We ignore the donation of a step count because but a very small proportion refused despite having a step count. Table 6.6 categorizes the

main reason for refusing for the other three tasks into three categories: privacy (code 60 or 61 in Appendix D), respondent questions the utility of the smart data (code 62 or 63 in Appendix D), and other reasons. Other reasons are mostly technical or physical. Around a quarter of respondents refusing a task questions the utility of the data. This is a legitimate comment as the smart data collected in NWM-S are much too limited to derive meaningful statistics. For this group, the hope is thus set on the efficacy of a true request in a real smart survey setting. We investigate the NWM-S respondents that express privacy reasons.

*Table 6.6: Main reason reported by respondents not to perform an NWM-S task in IT, NL and SI.*

a) IT

| Task                    | Privacy   | Unclear utility | Other     |
|-------------------------|-----------|-----------------|-----------|
| Share location          | 336 (36%) | 40 (4%)         | 551 (59%) |
| Take picture of meter   | 272 (29%) | 46 (5%)         | 609 (66%) |
| Take picture of receipt | 200 (22%) | 29 (3%)         | 698 (75%) |

b) NL

| Task                    | Privacy   | Unclear utility | Other     |
|-------------------------|-----------|-----------------|-----------|
| Share location          | 139 (70%) | 49 (24%)        | 12 (6%)   |
| Take picture of meter   | 98 (37%)  | 67 (25%)        | 100 (38%) |
| Take picture of receipt | 120 (51%) | 51 (22%)        | 65 (27%)  |

c) SI

| Task                    | Privacy   | Unclear utility | Other    |
|-------------------------|-----------|-----------------|----------|
| Share location          | 106 (66%) | 21 (13%)        | 34 (21%) |
| Take picture of meter   | 51 (43%)  | 6 (5%)          | 63 (53%) |
| Take picture of receipt | 52 (39%)  | 5 (4%)          | 63 (57%) |

In Table 6.7, we show the distributions on NWM-G questions on data security concerns, importance of being able to control data and various measure to improve data security. We selected all NWM-S respondents that performed NWM-G and NWM-S and that expressed at least once they do not want to do a task because of privacy. We compare these to respondents that did NWM-G and NWM-S but never made such a remark. We must stress that numbers are small and conclusions need to be drawn with some caution. Table 6.7 shows that these respondents are consistent. They expressed also more concern in NWM-G. They do not differ strongly on digital skills (not shown) or importance of controlling data. A fair amount of the respondents with privacy concerns still opted for dedicated apps, devices provided by an NSI or audit reports. However, for all options they were less enthusiastic than the other respondents. The exception is offering offline options other than an interviewer. This, obviously, points at paper questionnaire.

*Table 6.7: Distributions of respondents that did both NWM-G and NWM-S mentioning at least once not to perform a NWM-S task because of privacy-related reasons against those that did not.*

a) IT

| NWM-G question                                 | NWM-S with privacy | All other NWM-S |
|--|--------------------|-----------------|
| Quite or very concerned data being stolen      | 35%                | 31%             |
| Quite or very concerned NSI data being misused | 58%                | 51%             |
| Quite or very important to control data        | 80%                | 77%             |

|                                    |     |     |
|------------------------------------|-----|-----|
| Improve security by                |     |     |
| Offering apps                      | 38% | 41% |
| Offering offline options           | 46% | 43% |
| Offering interviewer options       | 22% | 23% |
| Showing external audit certificate | 41% | 42% |
| Provide NSI devices                | 34% | 38% |

b) NL

| NWM-G question                                 | NWM-S with privacy | All other NWM-S |
|--|--------------------|-----------------|
| Quite or very concerned data being stolen      | 33%                | 16%             |
| Quite or very concerned NSI data being misused | 41%                | 19%             |
| Quite or very important to control data        | 89%                | 82%             |
| Improve security by                            |                    |                 |
| Offering apps                                  | 38%                | 65%             |
| Offering offline options                       | 64%                | 65%             |
| Offering interviewer options                   | 9%                 | 16%             |
| Showing external audit certificate             | 35%                | 41%             |
| Provide NSI devices                            | 34%                | 39%             |

c) SI

| NWM-G question                                 | NWM-S with privacy | All other NWM-S |
|--|--------------------|-----------------|
| Quite or very concerned data being stolen      | 57%                | 24%             |
| Quite or very concerned NSI data being misused | 58%                | 29%             |
| Quite or very important to control data        | 92%                | 81%             |
| Improve security by                            |                    |                 |
| Offering apps                                  | 36%                | 51%             |
| Offering offline options                       | 52%                | 45%             |
| Offering interviewer options                   | 18%                | 21%             |
| Showing external audit certificate             | 42%                | 44%             |
| Provide NSI devices                            | 41%                | 44%             |

Another view is directly from concern about smart data being misused as expressed in NWM-G. In NWM-G the concern was asked in a general setting, not related to a specific task. Table 6.8 shows the distribution of the number of smart tasks performed in NWM-S. The selection is again NWM-G respondents that also did NWM-S. The results tell us that general concern is stronger among those doing fewer tasks, but not prohibitive to doing some smart tasks.

Table 6.8: Distributions of concern about data being misused in NWM-G as a function of number of tasks performed in NWM-S for NL and SI.

a) NL

| Concerned | 0   | 1   | 2   | 3   | 4   |
|-----------|-----|-----|-----|-----|-----|
| Not       | 12% | 20% | 28% | 26% | 15% |
| Somewhat  | 24% | 36% | 24% | 12% | 5%  |
| Quite     | 14% | 27% | 28% | 25% | 7%  |
| Very      | 32% | 48% | 12% | 0%  | 8%  |

b) SI

|           |     |     |     |    |     |
|-----------|-----|-----|-----|----|-----|
| Concerned | 0   | 1   | 2   | 3  | 4   |
| Not       | 14% | 57% | 14% | 0% | 14% |
| Somewhat  | 26% | 32% | 35% | 3% | 3%  |
| Quite     | 41% | 29% | 19% | 9% | 2%  |
| Very      | 34% | 36% | 22% | 6% | 1%  |

Next, we selected NWM-G respondents that had three or more ‘maybe’ or ‘do-not-know’ answers on the seven smart tasks that were presented to them. In Table 6.9, we show their response in NWM-G on perceptions and suggestions. The results point most prominently at the need for control of what is being collected. On all three suggested options (personal webpage, app showing what is collected and retention time) there is more support. Also this group tends more towards offline options. Furthermore, they expressed strong concerns in smart data being stolen or misused

*Table 6.9: Distributions of NWM-G respondents that had  $\geq 3$  ‘maybe’ or DK answers on the hypothetical smart tasks against the overall mean in NWM-G in NL and SI.*

a) NL

| NWM-G question                                    | $\geq 3$ maybe-DK | All NWM-G |
|---|-------------------|-----------|
| Quite or very important to know what is collected | 85%               | 88%       |
| Improve information (open-ended)                  |                   |           |
| Information                                       | 34%               | 35%       |
| Interviewer                                       | 1%                | 1%        |
| Offline   | 20%               | 10%       |
| Online  | 25%               | 26%       |
| Miscellaneous                                     | 21%               | 22%       |
| Quite or very important to control data           | 87%               | 81%       |
| Improve control by (closed)                       |                   |           |
| Personal webpage                                  | 82%               | 71%       |
| App showing data                                  | 75%               | 65%       |
| Retention time                                    | 56%               | 49%       |
| Improve control by (open-ended)                   |                   |           |
| Autonomy  | 34%               | 32%       |
| Authorize   | 9%                | 10%       |
| Information                                       | 43%               | 37%       |
| Nothing   | 14%               | 22%       |
| Quite or very concerned data stolen               | 25%               | 30%       |
| Quite or very concerned data being misused        | 65%               | 36%       |
| Improve security by (closed)                      |                   |           |
| Offering apps                                     | 39%               | 39%       |
| Offering offline options                          | 72%               | 64%       |
| Offering interviewer options                      | 9%                | 12%       |
| Showing external audit certificate                | 36%               | 34%       |
| Provide NSI devices                               | 26%               | 29%       |



b) SI

| NWM-G question                                    | ≥3 maybe-DK | All NWM-G |
|---|-------------|-----------|
| Quite or very important to know what is collected | 79%         | 80%       |
| Improve information (open-ended)                  |             |           |
| Information                                       | 44%         | 38%       |
| Interviewer                                       | 2%          | 3%        |
| Offline   | 22%         | 24%       |
| Online  | 19%         | 16%       |
| Miscellaneous                                     | 13%         | 18%       |
| Quite or very important to control data           | 77%         | 78%       |
| Improve control by (closed)                       |             |           |
| Personal webpage                                  | 62%         | 55%       |
| App showing data                                  | 64%         | 54%       |
| Retention time                                    | 64%         | 55%       |
| Improve control by (open-ended)                   |             |           |
| Autonomy  | 10%         | 17%       |
| Authorize   | 7%          | 2%        |
| Information                                       | 14%         | 10%       |
| Nothing   | 3%          | 11%       |
| Miscellaneous                                     | 66%         | 60%       |
| Quite or very concerned data stolen               | 35%         | 44%       |
| Quite or very concerned data being misused        | 42%         | 48%       |
| Improve security by (closed)                      |             |           |
| Offering apps                                     | 38%         | 34%       |
| Offering offline options                          | 51%         | 48%       |
| Offering interviewer options                      | 38%         | 34%       |
| Showing external audit certificate                | 38%         | 39%       |
| Provide NSI devices                               | 40%         | 36%       |

## 7 Discussion

We set out to conduct the NWM with the following objectives:

- Get input for tailoring and addressing respondent concerns in smart survey data collection strategies, in particular instruction and introduction materials and interviewer training;
- Get input for addressing the need to offer alternative modes to respondents next to apps;
- Learn how respondents like to keep control over data and what minimal respondent involvement during data collection is needed;
- Inform legal-ethical officers about respondent perceptions, in particular proportionality of the smart tasks and trade-offs in data minimization;
- Learn if and in what way achieving the above goals depends on the topic;
- Learn how achieving all of the above goals depends on the country/NSI.

We discuss each of the objectives separately.

Tailoring and addressing respondent concerns: We conclude that there is great diversity in willingness across different smart tasks, that hesitations towards to doing smart tasks are, generally, hard to predict through auxiliary variables available at the start of a (smart) survey, and that there is evidence that context matters. These findings indicate a clear need to tailor recruitment and motivation strategies to hesitations. The findings also point at the importance of maintaining interaction with respondents, i.e. to find out what arguments/hesitations play a role for a particular person/household. The tailoring concerns the self-perceived level of digital skills, the legitimacy and logic of collecting smart data within the context of an application, and, most of all, the perceived risks of misuse or secondary (unannounced) use of smart data. We believe that such tailoring cannot be done (completely) through invitation letters. Maintaining interaction would not be possible without a form of personal contact. Interviewers/recruiters/helpdesks may act in several ways. They may show to be evidence that going smart is possible with modest prior digital skills. They can make very salient that all data collected can be controlled by respondents before submission. They can make clear that secondary use by an NSI is strictly forbidden by GDPR and subject to penalty. They can also point at choice. All of this, may be dependent on first contact. Once a person/household starts a study, the UI-UX itself may further tailor through help options and through clearly offering choice in the extent to which smart features are used. The NMW-G survey, however, also shows that hesitant persons not necessarily see interviewers as the alternative. Hence, it seems that personal contact should perhaps be implemented in a different format or through new communication channels. What this format is, is open for further research.

Alternative modes: A majority of respondents not willing to go smart suggests offline modes. This finding leads to the trade-off between inaccuracy, that comes with lower and less balanced response, and incomparability of smart data and non-smart data. Again this will be, in general, be specific to the smart task and smart data collected. The arguments for opting for offline modes are related to privacy concerns and to lower perceived skills. Convincing arguments to go smart need to come from the other suggestions such as dedicated apps, audit reports and interviewer assistance. All suggestions gained some support from those not going smart. How strong the maximal impact could be of such added features can only be speculated. Given the large proportions of respondents not going smart, it must, however, be expected that they will not suffice to convert all.

Control over data: Control over data is rated as quite to very important in all three countries by a vast majority. All suggestions, a personal webpage, a dedicated app allowing to see data that was collected, and a retention time, get clear support in all three countries. However, importantly, lack of control over data does not seem to be a main argument against doing smart tasks. In fact, persons doing smart tasks often find it more important than those that do not. Nonetheless, we recommend to consider and investigate the options in SSI case studies.

Legal-ethical conclusions: The NWM offered an unprecedented opportunity to study various open questions: Do respondents understand the risks of smart features, do they understand the content of smart data, do they seek non-smart alternatives, and to what extent do they like to control data being collected. The combination of hypothetical willingness with little context and actual willingness with more context revealed informative findings. The first is that security/privacy risks are rather overestimated than underestimated. It is the most prominent reason not to go smart. In other words, respondents are cautious and do not easily step into unknown territory. If there is a misunderstanding of risks, then it is to the careful side. The second is that a considerable proportion of respondents gave a 'maybe' or 'DK' hypothetical willingness answer, implying that they could not decide just on the little context that was given. While hypothetical willingness is a predictor of actual participation, respondents clearly seek the logic. The third is that it turned out that control over data is perceived as quite to very important to many, but not necessarily is a barrier. It is clear that such control must be implemented clearly and transparently and is expected to be so by respondents. The fourth is that alternative options are frequently suggested and going smart implies offering non-smart. Hence, smart features should be optional not mandatory.

Topic-dependence: Topic-dependence comes in two ways. The first is that smart tasks vary greatly in both hypothetical and actual up take by respondents. The second is that many respondents expressed a 'maybe' or 'DK' when asked hypothetically. This hesitation is stressed especially in NL by a relatively large number of respondents seeing little utility in doing the smart tasks in NWM-S. It must be concluded that a legitimate and logical context matters. Once a smart feature is a clear benefit both to data quality and to respondent burden, it is that offering the option is logical. The proportion of households willing to scan a paper receipt in NWM-S was relatively low, while in HBS pilots and field tests in NL and NO such proportions are considerable. It may be that only through offering the non-smart alternative that respondents see the logic of smart features.

NSI-dependence: The three countries vary in the levels of willingness with IT being the most hesitant and NL being the most willing. The relative differences between the smart tasks are, however, relatively stable. It is, foremost, the general willingness. While IT, NL and SI have different survey climates, they are not representative of the ESS as a whole. Nonetheless, it must be conjectured that variation pertains to other countries. The implication is that comparability across countries may be at stake when fully going smart. Offering offline modes may be one solution to get more comparable response rates and representation, but, as mentioned, leads to measurement incomparability. If cross-country comparability is key, then sometimes the decision may have to be made to avoid certain smart features in certain applications.

## Appendix A – Model questionnaire NWM-G

### BLOCK 0 - PARTICIPATION IN CBS/ISTAT/SURS SURVEYS IN GENERAL

#### Q0.1: How would you like to be invited for a CBS/ISTAT/SURS survey?

Choose all that apply.

- a) Invitation letter by mail
- b) Invitation sent by e-mail
- c) Invitation by SMS
- d) A phone call
- e) Other (please specify):

#### Q0.2: Which form of participating in a survey would you prefer the most?

- a) With interviewer – personal visit at home
- b) With interviewer - telephone interview
- c) With interviewer – video interview
- d) Online questionnaire
- e) Paper questionnaire
- f) Mobile application
- g) Other (please specify):

#### Q0.3: What would for you be the most important reason to participate in a CBS/ISTAT/SURS survey?

Select a single answer.

- a) To contribute to research/statistics about society
- b) Because I find the topic interesting
- c) Because I see this as a sense of duty
- d) A monetary compensation
- e) Another compensation or reward
- f) Other (please specify):
- g) Nothing

#### Q0.4: What would for you be the most important reason to not participate in a CBS/SURS/ISTAT survey?

Select a single answer.

- a) Lack of time
- b) I get too many requests for participation
- c) Lack of information about the importance of participation
- d) Length of the questionnaire
- e) Questions being too personal
- f) Privacy concerns
- g) I never participate in surveys out of principle
- h) Other (please specify):
- i) Nothing

### BLOCK 1 – SMART DEVICES

CBS/ISTAT/SURS is considering using data from smartphones and other devices to replace part of the data collection with questionnaires. This could make data collection easier and better.

#### Q1.1 a to h: Do you have or use the following smart devices?

*A smart device is a device that connects to an app, the internet, a local network or another device with wireless connection.*

*Please check all devices that apply.*

- Smartphone
- Tablet
- Activity tracker
- Smart watch
- Smart speaker
- Smart electricity meter
- Smart gas meter
- Smart water meter
- Smart indoor air quality monitor
- Other, please specify \_\_\_\_\_

If you do not have or use a smartphone please go to BLOCK 2

**Q1.2: How often do you use a smartphone for activities other than phone calls or text messaging (e.g. browsing websites or taking photos)?**

- Several times a day
- Once a day
- Several times a week
- Several times a month
- Once a month or less

**Q1.3: For which of the following activities do you use a smartphone?**

- Browsing websites
- Reading and/or writing emails
- Taking photos
- Taking videos
- Looking at content on social media
- Posting content to social media
- Making purchases
- Online banking
- Installing new apps
- Using GPS/location-aware apps (for example Google Maps, Foursquare, Yelp)
- Connecting to other electronic devices via Bluetooth (for example smart watches, fitness headphones, car)
- Playing games
- Streaming videos or music
- Other, please specify \_\_\_\_\_

**Q1.4: Generally, how would you rate your skills of using a smartphone on a scale from 1 = Beginner to 5 = Advanced?**

- o 1 Beginner
- o 2
- o 3
- o 4
- o 5 Advanced

**BLOCK 2 PARTICIPATION IN SMART SURVEYS AND SHARING DATA**

**Q2.1: Would you participate in a [CBS/ISTAT/SURS] survey which asks you to:**

YES, MAYBE, NO, DK

- a) Let your location be tracked for statistics on roads, public transport and travel behaviour
- b) Take pictures of your house for statistics on conditions of housing
- c) Share data on energy use for statistics on energy
- d) Use an air quality monitor provided by [CBS/ISTAT/SURS] for statistics on air quality
- e) Give the step counts on your mobile devices for statistics on fitness
- f) Wear a activity tracker provided by [CBS/ISTAT/SURS] for statistics on fitness
- g) Take pictures of receipts or upload digital receipts for statistics on how households spend their money

**Q2.2: Suppose you would participate in a survey by [CBS/ISTAT/SURS]. How concerned would you be about your data being stolen or misused by others?**

NOT CONCERNED, SOMEWHAT CONCERNED, QUITE CONCERNED, VERY CONCERNED

**Q2.3: How concerned are you that data collected through smart devices by [CBS/ISTAT/SURS] would be stolen or misused by others than [CBS/ISTAT/SURS]?**

NOT CONCERNED, SOMEWHAT CONCERNED, QUITE CONCERNED, VERY CONCERNED

**Q2.4 a to f: What should [CBS/ISTAT/SURS] do in your opinion to ensure that the security of data you share with [CBS/ISTAT/SURS] feels secure?**

|  | YES | NO | DK |
|--|-----|----|----|
| Develop ISTAT/CBS/SURS apps that are available in Google and Apple stores                  |     |    |    |
| Questionnaires on paper or other offline options   |     |    |    |
| Let data be collected by an interviewer (for example over the phone or at home)            |     |    |    |
| A report from an independent party that states that [CBS/ISTAT/SURS] handles data securely |     |    |    |
| Use smart devices that are provided by [CBS/ISTAT/SURS]                                    |     |    |    |

**Q2.4f: Is there anything else [CBS/ISTAT/SURS] can do to ensure that the security of data you share with [CBS/ISTAT/SURS] feels secure?**

OPEN QUESTION

**Q2.5: Suppose you are invited to a survey that collects data through smart devices. How important or unimportant would it be for you to be informed about what data will be collected?**

NOT IMPORTANT, SOMEWHAT IMPORTANT, QUITE IMPORTANT, VERY IMPORTANT, DK

**Q2.8: How should [CBS/ISTAT/SURS] help to explain what data will be collected?**

OPEN QUESTION

**Q2.6: And how important or unimportant would it be for you to be able to control what data will be collected?**

NOT IMPORTANT, SOMEWHAT IMPORTANT, QUITE IMPORTANT, VERY IMPORTANT, DK

**Q2.7: Here a number of options are mentioned that [CBS/ISTAT/SURS] could do. Would this help you in determining what data will be collected?**

|  | YES | NO | DK |
|--|-----|----|----|
| A personal login webpage where you can check your data               |     |    |    |
| A mobile app that allows you to check data before they are submitted |     |    |    |
| A retention period before your data are allowed to be used           |     |    |    |

**Q2.7d: Is there any other way [CBS/ISTAT/SURS] could help you to determine what data will be collected?**

OPEN QUESTION

### BLOCK 3 – ONLINE SURVEY

We have created an online survey to test how we can collect in new ways. This survey looks like a normal survey, but allows you to share data from your smartphone or tablet.

We would like to ask you to do the survey. On the next page it is mentioned how you can participate. If you do not like to share certain data, then you can indicate this. To thank you for participation, you can win gift cards of 400 euro or an iPad. At the end of the online survey you will be directly informed whether you have won

**Q3.1: Will you participate in the online survey?**

YES, MAYBE, NO

If NO or MAYBE to Q3.1:

**Q3.2: What are your reasons for not doing the survey?**

**Please list all the reasons, hesitations or doubts that came to your mind.**

OPEN QUESTION

IF BACKGROUND CHARACTERISTICS LIKE EDUCATION ARE ASKED THIS WOULD BE THE BEST PLACE

**Q3.3: Do you have any additional remarks? Your comments are very welcome!**

OPEN QUESTION

Thank you for participating in the survey. [Country specific: Please return this questionnaire through the attached free return envelope.]

How can you participate in the online survey?

Please first fill in this paper questionnaire. The online survey is a follow-up to this paper questionnaire. You can do the online survey on your smartphone or tablet. The survey can be found at the internet address below or by scanning the QR-code on your smartphone or tablet.

## Appendix B – Model questionnaire NWM-S

QIN.1: On what type of device are you performing this survey?

SMART PHONE, TABLET, DESKTOP COMPUTER (PC) OR LAPTOP, OTHER DEVICE

IF SCREENSIZE >1024, THEN GIVE MESSAGE

If possible, we advise you to switch to a smartphone or tablet

NB THE SURVEY IS NOT STOPPED. IT IS A SOFT WARNING.

### **BLOCK TRAVEL**

Currently, [CBS/ISTAT/SURS] uses questionnaires for research into traffic. Maybe sharing locations is easier and also better to measure persons' travel.

We would like to test whether we can use the location data from your smartphone or tablet. This is a one-time-only measurement for this survey only.

**QLO.1: Please give permission to share your current location.**

***Make sure your location is turned on on your mobile device***

Record location

I could not measure my location

I prefer not to share my current location

IF QLO.1 = I prefer not to

**QLO.2: What are your considerations for not sharing your location?**

OPEN QUESTION

(FOR ALL)

**QLO.3: Where are you right now?**

AT HOME, AT WORK, AT SCHOOL/STUDY, SHOPPING, TRAVELLING, OTHER (CATEGORIES FROM EXISTING SURVEY), prefer not to say

IF (QLO.3 <> HOME) AND (QLO.3 <> WORK AT HOME)

**QLO.4: How far is this location from your home?**

OPEN≥0, DK, REF

**QLO.5: What kind of transport modes do you use during an average week? Please check all that apply**

BY FOOT, BICYCLE, E-BIKE, CAR AS DRIVER, CAR AS PASSENGER, BUS, TRAM, TRAIN, OTHER

### **BLOCK PHYSICAL ACTIVITY**

In the Health survey of [CBS/ISTAT/SURS] there are many questions on how active people are. We investigate whether we can make this easier.

Therefore, we would like to ask you to share the number of steps you made (measured by your smartphone or activity tracker).

QPA.1: Do you have an activity tracker? Think for example about an app on your phone, a smartwatch or an activity tracker such as a Fitbit or Polar.

YES, NO

IF YES



**QPA.2: Please report your step count from yesterday.**

- \_\_\_ steps counted yesterday
- I have a step count, but not for yesterday
- I do not have any step counts
- I prefer not to report a step count

IF QPA.2 = I have a step count, but not for yesterday

**QPA.3: Please report your most recent step count**

- \_\_\_ steps counted on \_\_\_\_ date
- I prefer not to report a step count

IF QPA.1 OR QPA.2 = I PREFER NOT TO PROVIDE A STEP COUNT

**QPA.4: You prefer not to report your step count. What are your reasons?**

OPEN QUESTION

IF QPA.2 or QPA.3 = step count

**QPA.5: From what device did you use the step count?**

PERSONAL ACTIVITY TRACKER LIKE FITBIT, GARMIN OR POLAR  
SMART WATCH  
APP ON SMARTPHONE  
OTHER PLEASE SPECIFY

**QPA.6: In general, how would you rate your health?**

VERY GOOD, GOOD, MODERATE, BAD, VERY BAD

**QPA.7: How many minutes do you walk or run on an average day of the week?**

OPEN≥0, DK

**QPA.8: Do you do sports other than hiking or running for at least one hour per week?**

YES, NO, DK

**BLOCK CONSUMPTION**

For the household budget survey [CBS/ISTAT/SURS] asks people to report their expenses for a week. We would like to investigate whether this can be made easier.

We, therefore, like to ask you to share one paper receipt and one digital receipt of your groceries

If you do not have any receipts, then you can indicate this.

**QSR.1: Please take a photo of your receipt**

*Make sure the total amount and as many products as possible are on the photo*

*Make sure there is enough light*

*Check whether the photo is readable*

SCAN IMAGE

I do not have any paper receipts on groceries

I prefer not to submit receipts

**QSR.2: Please upload your digital receipt**

UPLOAD DIGITAL RECEIPT

I do not have any digital receipts on groceries

IF QSR.1/QSR.2 = " I do not have any receipts on groceries"

**QSR.3: "If you would have receipts on groceries, would you share these receipts? YES/NO.**

IF QSR.1/QSR.2 = "I prefer not to submit receipts" OR QSR.4=NO OR Tech = NO

**QSR.4: You did not share a receipt. What are your reasons for not sharing?**

OPEN QUESTION

**QSR.5: How much does your household spend on food and drinks in an average week? Please give a global estimate.**

AMOUNT≥0, DK, REF

### **BLOCK ENERGY**

For research into how people live [CBS/ISTAT/SURS] asks questions about use of energy. We investigate whether we can make this easier. Therefore, we would like to ask you to take pictures of your electricity, gas and water meter.

**QEN.1: What type of energy meters do you have? Please check all that apply**

ELECTRICITY, GAS, WATER

**QEN.2 Are you at home now?**

YES/NO

IF QEN.2=NO

**QEN.3 If you were at home, would you make a picture of the meter readings of your**

Electricity meter yes/no

Gas meter yes/no

Water meter yes/no

IF QEN.2= YES

QEN.1 ELECTRICITY = TRUE

**QEN.4: Please take a picture of the meter reading of your electricity meter.**

*Make sure there is enough light*

*Does your meter display multiple readings? One photo of one of the readings is sufficient*

*Please check whether the reading is readable on the photo*

Take picture IMAGE

I cannot access my electricity meter

I prefer not to take a picture of my electricity meter

IF QEN.1 GAS = TRUE

**QEN.5 Please take a picture of the meter reading of your gas meter.**

*Make sure there is enough light*

*Does your meter display multiple readings? One photo of one of the readings is sufficient*

*Please check whether the reading is readable on the photo*

Take picture IMAGE

I cannot access my gas meter

I prefer not to take a picture of my gas meter

IF QEN.1 WATER = TRUE

**QEN.6: Please take a picture of the meter reading of your water meter.**

*Make sure there is enough light*

*Does your meter display multiple readings? One photo of one of the readings is sufficient*

*Please check whether the reading is readable on the photo*

Take picture IMAGE

I cannot access my water meter

I prefer not to take a picture of my water meter

IF (QEN.4 OR QEN.5 OR QEN.6 OR QEN.7 = I prefer not to OR any item in QEN.2 =NO)

**QEN.7 1-3: You did not take a picture of your ELECTRICITY/GAS/WATER meter. What are your reasons for this?**

OPEN QUESTION

IF (QEN.4 OR QEN.5 OR QEN.6 OR QEN.7 = I cannot access my meter)

**QEN.8: Why are you not able to access your meter(s)?**

OPEN QUESTION

**QEN.9: What kind of dwelling do you live in?**

FREE STANDING, SEMI-FREESTANDING, BLOCK/CORNER, LOWER/UPPER, APPARTMENT, OTHER

**QEN.10: How many persons live in your household?**

**Please also include yourself and children who live only part of the time at home.**

OPEN, INTEGER $\geq$ 0

## Appendix C – Coding schemes open-ended questions NWM-G

In this document, a proposed coding scheme is provided for the following questions: 2.4F, 2.8, 2,7 and 3.2. The tables consist out of multiple (sub)codes and definitions. An example is given per subcode. An answer can be labeled with multiple subcodes.

### 1. Is there anything else [CBS/ISTAT/SURS] can do to ensure that the security of data you share with [CBS/ISTAT/SURS] feels secure? (Q2.4f)

Answer Q2.4g/e:

*Develop ISTAT/CBS/SURS apps that are available in Google and Apple stores*

*Questionnaires on paper or other offline options*

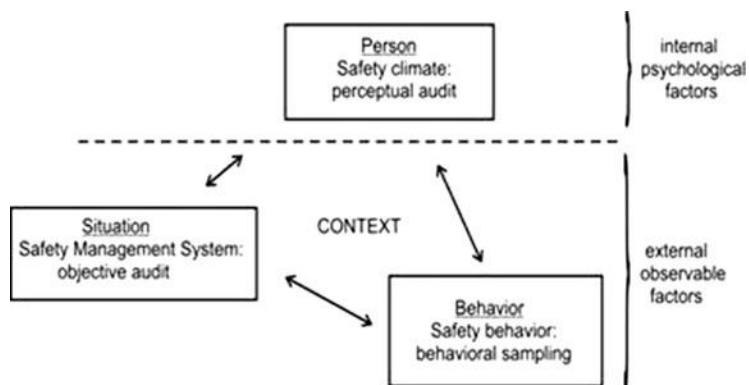
*Let data be collected by an interviewer (for example over the phone or at home)*

*A report from an independent party that states that [CBS/ISTAT/SURS] handles data securely*

*Use smart devices that are provided by [CBS/ISTAT/SURS]*

#### Conceptual framework

Reciprocal Safety Culture model (Cooper, 2000)



#### Coding scheme:

| Code                       | Definition   | Subcode   | Example  |
|----------------------------|--|---|--|
| <b>Person (Respondent)</b> | Internal psychological factors. What is the respondent willing to do him/herself to feel safe? | Choosing what to share (before joining)                   | <i>Choosing when and what to share with CBS/ISTAT/SURS</i>   |
|                            |  | Checking and adjusting data (in between or after joining) | <i>An overview in which respondent can see what is being shared and being able to adjust the setting</i>   |
|                            |  | Nothing   | <ul style="list-style-type: none"> <li>- <i>I never want to share my data</i></li> <li>- <i>CBS/ISTAT/SURS cannot do anything to convince me to share my data</i></li> </ul> |
|                            |  | Miscellaneous   |  |

|   |   |   |  |
|---|---|---|--|
| <b>Behavior (CBS/ISTAT/SURS)</b>        | External observable factors. What can CBS/ISTAT/SURS do to make the respondent feel safe?                     | Providing information                             | <i>Let the respondent know what exactly is being asked from them</i>   |
|   |   | Providing an alternative                          | <ul style="list-style-type: none"> <li>- <i>Questionnaires on paper or other offline options</i></li> <li>- <i>Let data be collected by an interviewer (for example over the phone or at home)</i></li> </ul>  |
|   |   | Device or app with a CBS/ISTAT/SURS-certification | <ul style="list-style-type: none"> <li>- <i>Develop ISTAT/CBS/SURS apps that are available in Google and Apple stores</i></li> <li>- <i>Use smart devices that are provided by [CBS/ISTAT/SURS]</i></li> </ul> |
|   |   | Miscellaneous                                     |  |
| <b>Situation (3<sup>th</sup> party)</b> | External observable factors. What can CBS/ISTAT/SURS do through a 3th party to make the respondent feel safe? | Audit (through a 3th party)                       | <i>A report from an independent party that states that [CBS/ISTAT/SURS] handles data securely</i>  |
| <b>Miscellaneous</b>                    |   |   |  |
| <b>No/Anything else</b>                 | Respondents that stated anything else is needed   |   | <ul style="list-style-type: none"> <li>- No</li> </ul> Anything else   |
| <b>Irrelevant answer or don't know</b>  | Respondents doesn't answer the question   |   | <ul style="list-style-type: none"> <li>- 0000, XYZ</li> <li>- Don't know</li> </ul>  |

## 2. How should [CBS/ISTAT/SURS] help to explain what data will be collected? (Q2.8)

| Code           | Definition                  | Subcode           | Example   |
|----------------|-----------------------------|-------------------|---|
| <b>Online</b>  | Online/digital information  | Website           | <i>Dedicated page on the CBS/ISTAT/SURS website</i>               |
|                |                             | Instruction video | <i>An instruction video providing information on the research</i> |
|                |                             | App               | <i>Information in the app self</i>                                |
|                |                             | Email             | <i>Information by email</i>                                       |
|                |                             | Miscellaneous     |   |
| <b>Offline</b> | Offline/written information | Letter            | <i>A signed letter by the respondent</i>                          |
|                |                             | Flyer             | <i>Flyer containing more information</i>                          |
|                |                             | Miscellaneous     |   |

|  |  |               |   |
|--|--|---------------|---|
| <b>Interviewer</b>                     | Interviewer/All information which is provided through an interviewer | Face-to-face  | <i>Interviewer provides more information at the respondent's door</i>               |
|  |  | Telephone     | <i>Telephone helpline</i>   |
|  |  | Miscellaneous |   |
| <b>Information</b>                     | How information is shared  | Content       | <i>Tell me what is collected<br/>Be precise about what is collected</i>             |
|  |  | Timing        | <i>Tell me beforehand what is collected</i>   |
| <b>Miscellaneous</b>                   |  |               |   |
| <b>Irrelevant answer or don't know</b> | Respondents doesn't answer the question                              |               | <ul style="list-style-type: none"> <li>- 0000, XYZ</li> <li>- Don't know</li> </ul> |

### 3. Is there any other way [CBS/ISTAT/SURS] could help you to determine what data will be collected? (Q2.7d)

#### Answer Q2.7:

A personal login webpage where you can check your data

A mobile app that allows you to check data before they are submitted

A retention period before your data are allowed to be used

| Code                     | Subcode                               | Definition   | Example  |
|--------------------------|---------------------------------------|--|--|
| <b>Autonomy</b>          | Checking and adjusting                | Respondents want more insight into what is shared and authority to adjust it   | A personal login webpage where you can check your data   |
|                          | Choosing what to share                | Respondents want to control exactly what data is shared                        | <ul style="list-style-type: none"> <li>- <i>Selection menu on what to share</i></li> <li>- A mobile app that allows you to check data before they are submitted</li> </ul> |
| <b>Share information</b> | Legislation                           | Respondent want more insights into their rights and duties                     | <ul style="list-style-type: none"> <li>- <i>Consult a legal expert</i></li> <li>- <i>I want to know how this relates to the GDPR</i></li> </ul>                            |
|                          | Provide clarification on how to share | Respondents want more insights in how sharing works or don't know how to share | <i>I don't know how to do this</i>   |

|   |   |   |  |
|---|---|---|--|
|   | Provide clarification on the use and purpose of data  | Respondents want more insight into the use of their data and for which purpose  | <ul style="list-style-type: none"> <li>- <i>I want to know why you need my data</i></li> <li>- <i>Why is my data relevant?</i></li> </ul>  |
| <b>Authorization or another way to make the respondents feel safe</b> |   | Respondents want to feel secure or safe before sharing their data or require another level of authorization                               | <ul style="list-style-type: none"> <li>- <i>Using a safe and trusted log-in platform</i></li> <li>- <i>A retention period before your data are allowed to be used</i></li> </ul> |
| <b>Changes nothing</b>  | Never share   | Under no circumstance will the respondent share data  | <ul style="list-style-type: none"> <li>- <i>I will never share my data</i></li> <li>- <i>I will never trust it</i></li> </ul>  |
|   | Positive answer   | Respondent indicates that they will share their data in the current situation. Nothing has to change. <u>NOT THE SAME AS "Don't know"</u> | <ul style="list-style-type: none"> <li>- <i>No matter what, I will always share it wit</i></li> </ul>  |
| <b>Channel</b>  | Video<br>App<br>TV<br>Website<br>Email/letter<br>Advertising<br>ContactCenter/interviewer<br>Mixed<br>Other | Respondents indicate specific channel for communicating data security   | <ul style="list-style-type: none"> <li>- <i>Would be important to have an app for ensuring data security</i></li> </ul>  |
| <b>Miscellaneous</b>  |   |   |  |
| <b>Irrelevant answer or don't know</b>                                |   | Respondents doesn't answer the question   | <ul style="list-style-type: none"> <li>- <i>0000, XYZ</i></li> <li>- <i>Don't know</i></li> </ul>  |

**4. What are your reasons for not doing the survey? Please list all the reasons, hesitations or doubts that came to your mind. (Q3.2)**

| <b>Code</b>  | <b>Definition</b>  | <b>Example</b>                             |
|--|--|--|
| <b>No time</b>   | Respondent indicates to have no time for the online survey                   | <i>It takes too much time</i>              |
| <b>No interest</b>                                     | Respondent indicates to take no interest in the online survey                | <i>One survey is enough for me</i>         |
| <b>Subject of the online survey is not interesting</b> | Respondent indicates to take no interest in the subject of the online survey | <i>I don't know what smart devices are</i> |

|  |  |   |
|--|--|---|
| <b>No equipment</b>                    | No smartphone/tablet   | <i>I have no device to take the online survey on</i>                                |
| <b>No knowledge</b>                    | Respondent thinks/has not enough skill to open the online survey or to share data from smart devices | <i>I don't know how to get to the online survey</i>                                 |
| <b>Unclear response task</b>           | Respondent doesn't understand the response task  | <i>I don't understand what I have to do</i>   |
| <b>Issue with CBS/ISTAT/SURS</b>       | Respondent has a bad image of CBS/ISTAT/SURS   | <i>CBS/ISTAT/SURS has no business doing this sort of research</i>                   |
| <b>Privacy issue (CBS/ISTAT/SURS)</b>  | Respondent doesn't trust CBS/ISTAT/SURS  | <i>I don't want to share data with CBS/ISTAT/SURS</i>                               |
| <b>Privacy issue (general)</b>         | Respondent has privacy issues in general   | <i>I don't want to share such data</i>  |
| <b>Incentive</b>                       | Respondent indicates that the provided incentive doesn't suffice                                     | <i>I want to receive more for filling in this survey</i>                            |
| <b>Break-off</b>                       | Respondent started online survey but stopped due to technical issue                                  | <i>I tried to do the survey but got stuck</i>                                       |
| <b>Miscellaneous</b>                   |  |   |
| <b>Irrelevant answer or don't know</b> | Respondents doesn't answer the question  | <ul style="list-style-type: none"> <li>- 0000, XYZ</li> <li>- Don't know</li> </ul> |



## Appendix D – Coding scheme open-ended question NWM-S

In this document, a proposed coding scheme is provided for the open questions in online questionnaire. The questions at issue are the ones that ask a reason for not completing the smart tasks. The table consists out of multiple codes and definitions. An example is given per code. An answer can be labeled with multiple codes.

### Coding scheme:

| Main    | Code                      | Subcode                           | Numerical Code | Definition   | Example  |
|---------|---------------------------|-----------------------------------|----------------|--|--|
| Refusal | Lack of trust/information | Privacy issue (general)           | 60             | Respondent indicates privacy issues in general                                   | - <i>I don't want to share such data</i>   |
|         | Lack of trust/information | Privacy issue with CBS/ISTAT/SURS | 61             | Respondent has a bad image of CBS/ISTAT/SURS                                     | - <i>I don't want to share data with CBS/ISTAT/SURS</i>  |
|         | Lack of trust/information | Unclear purpose                   | 62             | Respondent doesn't understand the purpose of carrying out the tasks              | - <i>I don't understand what you will do with this data</i>  |
|         | Lack of trust/information | Unclear relevance                 | 63             | Respondent doesn't understand the relevance of carrying out the tasks            | - <i>How can this be relevant for this survey?</i><br>- <i>What is the relevance of sharing these information?</i> |
|         | Lack of trust/information | Unclear processing                | 64             | Respondent would like more information about what will be done with his/her data | - <i>Too few information are provided about how you will store/handle my data</i>                                  |
|         | Lack of interest and time | No time                           | 65             | Respondent indicates to have no time for the                                     | - <i>It takes too much time</i><br>-   |

|                                |                                  |  |           |  |   |
|--------------------------------|----------------------------------|--|-----------|--|---|
|                                |                                  |  |           | completion of the smart task   |   |
|                                | <b>Lack of interest and time</b> | <b>Too much effort</b>                           | <b>66</b> | Respondent says it is too much effort to complete the task   | - <i>This takes too much effort</i>   |
|                                | <b>Lack of interest and time</b> | <b>No interest</b>                               | <b>67</b> | Respondents not interested   | - <i>I'm not interested in those kinds of things</i><br>- <i>I'm not interested</i>   |
|                                | <b>Lack of trust/information</b> | <b>Data known/acquired by services providers</b> | <b>68</b> | Respondents state that data are collected by services/energy providers                                 | - <i>These data are already collected by services providers</i>   |
| <b>Inability (or Not able)</b> | <b>Personal Issues</b>           | <b>No knowledge</b>                              | <b>70</b> | Respondent thinks/has not enough skill to carry out the tasks  | - <i>I don't know how to upload a photo</i>   |
|                                | <b>Personal Issues</b>           | <b>Physical problem</b>                          | <b>71</b> | Respondent states that he/she can't complete the task due to physical problems                         | - <i>Due to physical problems I can't do this</i>   |
|                                | <b>Personal Issues</b>           | <b>No permission</b>                             | <b>72</b> | Respondent states that he/she didn't receive permission from a second person to share such information | - <i>My parents don't want me to take a picture of the smart meter</i><br>- <i>I should ask my landlord before doing this</i> |
|                                | <b>Technical Issues</b>          | <b>No access</b>                                 | <b>80</b> | Respondent can't reach a   | - <i>My energy meter is in</i>  |

|                                |                          |                            |           |   |  |
|--------------------------------|--------------------------|----------------------------|-----------|---|--|
| <b>Inability (or Not able)</b> |                          |                            |           | particular room or place where the task should be carried out                                 | <i>another room and I can't go there right now</i>   |
|                                | <b>Technical Issues</b>  | <b>No equipment</b>        | <b>81</b> | No smartwatch or no features required to complete the tasks                                   | <ul style="list-style-type: none"> <li>- <i>I don't own a smartwatch</i></li> <li>- <i>My camera doesn't work</i></li> </ul> |
|                                | <b>Technical Issues</b>  | <b>No data</b>             | <b>82</b> | Respondent has no data to share   | - <i>I don't have a receipt</i>  |
|                                | <b>Technical Issues</b>  | <b>No good photo</b>       | <b>83</b> | Respondent says that the environment conditions don't allow him/her to take good pictures     | - <i>The room where the energy meter is placed is too dark</i>   |
|                                | <b>Technical Issues</b>  | <b>PC</b>                  | <b>84</b> | Respondent didn't follow the soft warning and can't perform the task                          | - <i>I can't do this because I am using a PC</i>   |
|                                | <b>Technical Issues</b>  | <b>System doesn't work</b> | <b>85</b> | Respondent tried to carry out the task but due technical problems he/she couldn't complete it | - <i>I tried but a technical problem occurred</i>  |
| <b>Other</b>                   | <b>Irrelevant answer</b> |                            | <b>98</b> | Respondents doesn't answer the question   | <ul style="list-style-type: none"> <li>- <i>XYZ, 0000</i></li> <li>- <i>Don't know</i></li> </ul>                            |
|                                | <b>Miscellaneous</b>     |                            | <b>96</b> |   | - <i>Personal motivation</i>   |

|  |           |  |    |           |                |
|--|-----------|--|----|-----------|----------------|
|  | No answer |  | 99 | No answer | - <i>Blank</i> |
|--|-----------|--|----|-----------|----------------|

## Appendix E – Available auxiliary variables

Table E.1 contains all available auxiliary variables that were linked to the country samples for NWM.

*Table E.1: Auxiliary variables linked to NWM samples*

|                 | IT   | NL   | SI  |
|-----------------|--|--|---|
| Admin variables | Age<br>Gender<br>HH composition<br>Marital status<br>Income household<br>Socio-eco status<br>(employed, unemployed, allowance, student, retired, self-employed, other)<br>House value<br>Educational level<br>Country region<br>Urbanization | Age<br>Gender<br>HH composition<br>Place HH/mar status<br>Ethnicity/migration<br>Income household<br>Socio-eco status<br>(employed, unemployed, allowance, student, retired, self-employed, other)<br>Ownership house<br>House value<br>Educational level (not for migrants)<br>Country region<br>Urbanization | Age<br>Gender<br>Personal income<br>Socio-eco status<br>Educational level<br>Urbanization |

## Appendix F – Distributions of auxiliary variables

In this appendix, we present the univariate distributions of the sample, the NWM-G response and the NWM-S response.

Table F.1 displays distributions for auxiliary variables linked to the NWM sample in IT. For all auxiliary variables, distributions test as dependent on both NWM-G and NWM-S response. The largest biases are on age and educational level. NWM-S respondents are younger and higher educated.

Table F.1: *Distributions of a range of auxiliary variables in IT for the sample and for NWM-G and NWM-S response.*

|                               | <b>NWM-S response<br/>(n=927)</b> | <b>NWM-G response<br/>(n=2527)</b> | <b>Sample<br/>(n = 3667)</b> |
|-------------------------------|-----------------------------------|------------------------------------|------------------------------|
| <b>Age</b>                    |                                   |                                    |                              |
| 18- 24                        | 9,2%                              | 7,2%                               | 7,7%                         |
| 25-34                         | 12,7%                             | 11,6%                              | 11,4%                        |
| 35-44                         | 18,6%                             | 13,1%                              | 13,5%                        |
| 45-54                         | 21,9%                             | 19,7%                              | 19,3%                        |
| 55-64                         | 21,3%                             | 19,0%                              | 19,2%                        |
| 65-74                         | 10,8%                             | 14,2%                              | 13,7%                        |
| 75 and more                   | 5,6%                              | 15,1%                              | 15,2%                        |
|                               |                                   |                                    |                              |
| <b>Gender</b>                 |                                   |                                    |                              |
| Male                          | 48,8%                             | 48,0%                              | 49,2%                        |
| Female                        | 51,2%                             | 52,0%                              | 50,8%                        |
|                               |                                   |                                    |                              |
| <b>Degree of urbanization</b> |                                   |                                    |                              |
| Strongly urbanized            | 44,3%                             | 42,2%                              | 46,9%                        |
| Moderately urbanized          | 39,6%                             | 38,8%                              | 35,6%                        |
| Hardly urbanized              | 16,1%                             | 19,0%                              | 17,5%                        |
|                               |                                   |                                    |                              |
| <b>Educational level</b>      |                                   |                                    |                              |
| No education                  | 0,5%                              | 1,7%                               | 1,9%                         |
| Primary education             | 4,1%                              | 11,1%                              | 11,5%                        |
| Lower secondary education     | 24,4%                             | 30,1%                              | 30,8%                        |
| Higher secondary education    | 47,1%                             | 38,8%                              | 37,7%                        |
| University education, PHD     | 28,5%                             | 18,4%                              | 18,1%                        |
|                               |                                   |                                    |                              |
| <b>Household income*</b>      |                                   |                                    |                              |
| 10000 Euros or more           | 4,7%                              | 4,8%                               | 4,8%                         |
| 9000 Euros                    | 1,2%                              | 1,1%                               | 1,1%                         |
| 7000 Euros                    | 1,9%                              | 0,9%                               | 0,9%                         |
| 6000 Euros                    | 2,8%                              | 1,4%                               | 1,4%                         |

|                     |       |       |       |
|---------------------|-------|-------|-------|
| 5000 Euros          | 4,3%  | 2,8%  | 2,8%  |
| 4000 Euros          | 8,8%  | 6,1%  | 6,1%  |
| 3000 Euros          | 13,8% | 9,9%  | 9,9%  |
| 2500 Euros          | 9,2%  | 7,5%  | 7,5%  |
| 2000 Euros          | 8,0%  | 7,6%  | 7,6%  |
| 1800 Euros          | 4,4%  | 4,1%  | 4,1%  |
| 1600 Euros          | 6,0%  | 5,7%  | 5,7%  |
| 1400 Euros          | 5,3%  | 7,0%  | 7,0%  |
| 1200 Euros          | 6,1%  | 6,2%  | 6,2%  |
| 1000 Euros          | 3,9%  | 5,9%  | 5,9%  |
| 800 Euros           | 1,6%  | 3,4%  | 3,4%  |
| 600 Euros           | 1,2%  | 2,2%  | 2,2%  |
| less than 600 Euros | 1,7%  | 2,8%  | 2,8%  |
| Missing             | 14,9% | 20,8% | 20,8% |

\* Household income is asked in the NWM-G questionnaire (n=2527). We don't have this information for NWM-G nonrespondents.  
The question wording is the same as in every ISTAT survey on households: "Which of the following is closest to the net monthly income of your family?"

Table F.2 displays distributions for auxiliary variables linked to the NWM sample in NL. For all auxiliary variables, distributions test as dependent on both NWM-G and NWM-S response. The most striking biases are the relatively older NWM-G response, the low response rates of migrants to both surveys, and the relatively high income and educational level of response to both surveys.

*Table F.2: Distributions of a range of auxiliary variables in NL for the sample and for NWM-G and NWM-S response.*

| NL            | NWM-S<br>response<br>(n=750) | NWM-G<br>response<br>(n=1007) | Sample<br>(n = 4000) |
|---------------|------------------------------|-------------------------------|----------------------|
| <b>Age</b>    |                              |                               |                      |
| 15 – 24       | 9.5%                         | 5.2%                          | 10.8%                |
| 25 – 34       | 19.6%                        | 12.3%                         | 16.6%                |
| 35 – 44       | 17.1%                        | 12.7%                         | 15.1%                |
| 45 – 54       | 18.0%                        | 15.0%                         | 15.9%                |
| 55 – 64       | 17.4%                        | 19.2%                         | 17.7%                |
| 65 – 74       | 13.1%                        | 20.8%                         | 13.5%                |
| 75 – 125      | 5.3%                         | 15.0%                         | 10.5%                |
|               |                              |                               |                      |
| <b>Gender</b> |                              |                               |                      |
| Male          | 51.4%                        | 48.2%                         | 49.2%                |
| Female        | 48.6%                        | 51.8%                         | 50.8%                |
|               |                              |                               |                      |
| <b>Origin</b> |                              |                               |                      |

|  |       |       |       |
|--|-------|-------|-------|
| Country of origin: The Netherlands         | 81.4% | 84.3% | 73.3% |
| Child of migrant(s)                        | 8.5%  | 6.9%  | 8.8%  |
| Migrant                                    | 10.0% | 8.8%  | 17.9% |
|  |       |       |       |
| <b>Degree of urbanisation</b>              |       |       |       |
| Extremely urbanised                        | 24.2% | 22.0% | 26.2% |
| Strongly urbanised                         | 31.4% | 29.7% | 29.6% |
| Moderately urbanised                       | 17.4% | 18.0% | 16.1% |
| Hardly urbanised                           | 21.2% | 22.6% | 21.3% |
| Not urbanised                              | 5.9%  | 7.8%  | 6.8%  |
|  |       |       |       |
| <b>Household income</b>                    |       |       |       |
| 1 – 20                                     | 8.3%  | 9.0%  | 15.0% |
| 21 – 40                                    | 10.5% | 14.3% | 16.6% |
| 41 – 60                                    | 21.6% | 19.3% | 19.0% |
| 61 – 80                                    | 25.6% | 25.2% | 21.1% |
| 81 – 100                                   | 31.6% | 30.3% | 24.1% |
| Not registered                             | 2.4%  | 1.9%  | 3.6%  |
|  |       |       |       |
| <b>Educational level</b>                   |       |       |       |
| Primary education                          | 2.4%  | 1.8%  | 4.9%  |
| Vmbo, havo, lower vwo, mbo1                | 8.1%  | 6.6%  | 9.9%  |
| Havo, vwo, mbo                             | 28.4% | 22.4% | 28.3% |
| Higher or university education bachelor    | 22.1% | 19.9% | 13.9% |
| Higher or university education master, PhD | 13.3% | 12.5% | 7.8%  |
| Not registered                             | 25.6% | 36.8% | 35.2% |

Table F.3 shows distributions for SI for NWM-G and NWM--S response against the sample. While the NWM-G response is relatively similar to the sample apart from personal income, the NWM-S response is skewed towards younger. More female, more urbanized, wealthier and higher educated subgroups.

*Table F.3: Distributions of a range of auxiliary variables in SI for the sample and for NWM-G and NWM-S response.*

|               | <b>NWM-S<br/>response<br/>(n=332)</b> | <b>NWM-G<br/>response<br/>(n=1003)</b> | <b>Sample<br/>(n=2000)</b> |
|---------------|---------------------------------------|--|----------------------------|
| <b>Age</b>    |                                       |  |                            |
| 18-24         | 13,0%                                 | 9,0%                                   | 9,1%                       |
| 25-34         | 18,1%                                 | 13,9%                                  | 15,9%                      |
| 35-44         | 19,9%                                 | 18,4%                                  | 19,0%                      |
| 45-54         | 19,9%                                 | 20,0%                                  | 20,3%                      |
| 55-64         | 20,2%                                 | 20,1%                                  | 19,3%                      |
| 65-74         | 9,0%                                  | 18,5%                                  | 16,4%                      |
| <b>Gender</b> |                                       |  |                            |



|                               |   |       |       |       |
|-------------------------------|---|-------|-------|-------|
|                               | Male  | 46,7% | 49,4% | 51,9% |
|                               | Female  | 53,3% | 50,6% | 48,2% |
| <b>Degree of urbanisation</b> |   |       |       |       |
|                               | Hardly  | 41,0% | 46,9% | 46,0% |
|                               | Moderately                                    | 38,0% | 36,1% | 35,6% |
|                               | Strongly                                      | 21,1% | 17,0% | 18,4% |
| <b>Personal income*</b>       |   |       |       |       |
|                               | 0-20  | 18,7% | 18,1% | 21,0% |
|                               | 21-40   | 11,4% | 20,9% | 20,0% |
|                               | 41-60   | 15,4% | 18,3% | 20,0% |
|                               | 61-80   | 23,2% | 21,4% | 20,0% |
|                               | 81-100  | 31,3% | 21,1% | 19,0% |
| <b>Educational level</b>      |   |       |       |       |
|                               | 1. Primary education                          | 0,0%  | 1,3%  | 1,6%  |
|                               | 2. Vmbo, havo, lower vwo, mbo1                | 6,9%  | 11,7% | 13,8% |
|                               | 3. Havo, vwo, mbo                             | 44,3% | 55,5% | 56,9% |
|                               | 4. Higher or university education bachelor    | 25,0% | 15,9% | 14,5% |
|                               | 5. Higher or university education master, PhD | 23,8% | 15,7% | 13,3% |

\* Personal income quintiles are deduced from the sample. This means they are subject to some sampling variation

## Appendix G – Preferred modes and smart device ownership

*Table G.1: Question 1: How would respondents like to be approached by ISTAT/CBS/SURS? (check all that apply). NB: Some respondents ignored instructions and ticked more options.*

|           | IT          | NL          | SI          |
|-----------|-------------|-------------|-------------|
| Email     | 45.7% (1.0) | 52.0% (1.6) | 40.0% (1.5) |
| Mail      | 37.6% (1.0) | 62.0% (1.5) | 51.1% (1.6) |
| SMS       | 13.9% (0.7) | 3.5% (0.6)  | 15.8% (1.2) |
| Telephone | 16.4% (0.7) | 2.3% (0.5)  | 9.9% (0.9)  |

Other suggestions: via whatsapp (5), via social media (2) and via governmental e-portal (2).

*Table G.2: Question 2: Which form of participating in a survey would you prefer? (check all that apply) NB: Some respondents ignored instructions and ticked more options.*

|              | IT          | NL          | SI          |
|--------------|-------------|-------------|-------------|
| Face-to-face | 20.1% (0.8) | 1.3% (0.4)  | 9.8% (0.9)  |
| Telephone    | 13.7% (0.7) | 1.9% (0.4)  | 17.4% (1.2) |
| Video        | 0.9% (0.2)  | 1.3% (0.4)  | 0.7% (0.3)  |
| Web          | 35.6% (1.0) | 50.1% (1.6) | 36.2% (1.5) |
| Paper        | 25.3% (0.9) | 44.0% (1.6) | 25.1% (1.4) |
| App          | 4.4% (0.4)  | 7.8% (0.8)  | 7.2% (0.8)  |

*Table G.3: Question 3: What would motivate you the most to participate in a ISTAT/CBS/SURS survey?*

|                                     | IT          | NL          | SI          |
|-------------------------------------|-------------|-------------|-------------|
| Contributing to official statistics | 32.4% (0.9) | 64.8% (1.5) | 34.4% (1.5) |
| Interesting topic of the survey     | 12.0% (0.7) | 10.8% (0.9) | 13.7% (1.0) |
| Sense of civic duty                 | 25.6% (0.9) | 5.6% (0.7)  | 20.2% (1.3) |
| Monetary compensation               | 12.3% (0.7) | 9.5% (0.9)  | 14.2% (1.1) |
| Another compensation or reward      | 2.0% (0.3)  | 3.3% (0.6)  | 2.9% (0.5)  |
| Nothing                             | 15.8% (0.7) | 8.8% (0.9)  | 13.2% (1.1) |

*Table G.4: Question 4: What would discourage you the most from participating in a ISTAT/CBS/SURS survey?*

|  | IT          | NL          | SI          |
|--|-------------|-------------|-------------|
| Lack of time   | 28.2% (0.9) | 21.8% (1.3) | 34.9% (1.5) |
| Too many request for participation                                 | 9.4% (0.6)  | 7.4% (0.8)  | 10.6% (1.0) |
| Lack of information about the importance of participation          | 12.2% (0.7) | 9.2% (0.9)  | 9.6% (0.9)  |
| Length of the questionnaire  | 8.1% (0.5)  | 18.3% (1.2) | 10.3% (1.0) |
| Questions being too personal                                       | 10.7% (0.6) | 7.9% (0.9)  | 7.9% (0.9)  |
| Privacy concerns   | 9.2% (0.6)  | 14.3% (1.1) | 5.9% (0.7)  |
| Due to refusal of the survey in principle, without giving a reason | 13.3% (0.7) | 4.9% (0.7)  | 8.6% (0.9)  |
| Nothing  | 8.8% (0.6)  | 18.6% (1.2) | 9.8% (0.9)  |

Table G.5: Question 5: Do you have or use the following smart devices?

|                     | IT          | NL          | SI          |
|---------------------|-------------|-------------|-------------|
| Phone               | 88.1% (0.6) | 86.1% (1.1) | 91.5% (0.9) |
| Tablet              | 41.0% (1.0) | 54.2% (1.6) | 31.3% (1.5) |
| Tracker             | 12.5% (0.7) | 9.6% (0.9)  | 6.7% (0.8)  |
| Watch               | 22.2% (0.8) | 21.8% (1.3) | 22.9% (1.3) |
| Speaker             | 23.2% (0.8) | 17.7% (1.2) | 9.4% (0.9)  |
| Electricity meter   | 12.6% (0.7) | 54.2% (1.6) | 8.4% (0.9)  |
| Gas meter           | 10.3% (0.6) | 41.4% (1.6) | 1.2% (0.3)  |
| Water meter         | 5.2% (0.4)  | 8.7% (0.9)  | 4.0% (0.6)  |
| Air quality monitor | 3.3% (0.4)  | 3.7% (0.6)  | 1.5% (0.4)  |

Other suggestions: solar panels, hubs and lamps, smart home appliances like vacuums and fridge.

## Appendix H – Investigation of NWM-S only response in NL

For NL, we build a regression model for yes/no participation in NWM-G given participation in NWM-S. The group of NWM-S only was surprisingly large. While these respondents may still be expected to be participating in smart surveys, they do not read/understand instructions or simply ignore the request to also submit a paper questionnaire. For this reason, we like to know if and how they differ from those that did the NWM-G.

Table I.1 focusses on the smart tasks. The NWM-S only respondents were slightly less active on all smart tasks. The differences are most striking for photos of energy meters; they are less often at home, less able and willing to take photos if they are at home or if they would have been at home.

*Table I.1: Smart task performance in NL split also for NWM-S respondents that did NWM-G and those that did not.*

|                            | All | No NWM-G | <u>NWM-G</u> |
|----------------------------|-----|----------|--------------|
| <b>Share location</b>      | 47% | 40%      | 49%          |
| <b>Share step count</b>    |     |          |              |
| <i>Shares step count</i>   | 55% | 51%      | 57%          |
| <b>Share receipt</b>       |     |          |              |
| <i>Has a receipt</i>       | 13% | 10%      | 14%          |
| <i>Shares receipt</i>      | 76% | 78%      | 75%          |
| <b>Share meter reading</b> |     |          |              |
| <i>Is home</i>             | 86% | 74%      | 91%          |
| <i>Water</i>               | 36% | 21%      | 40%          |
| <i>Electricity</i>         | 44% | 26%      | 49%          |
| <i>Gas</i>                 | 39% | 21%      | 44%          |
| <i>Not at home</i>         |     |          |              |
| <i>Water</i>               | 48% | 33%      | 63%          |
| <i>Electricity</i>         | 50% | 37%      | 62%          |
| <i>Gas</i>                 | 47% | 34%      | 59%          |

*Table I.2: Numbers of smart tasks performed in NL split also for NWM-S respondents that did NWM-G and those that did not.*

| Number | All | No NWM-G | NWM-G |
|--------|-----|----------|-------|
| 0      | 12% | 15%      | 11%   |
| 1      | 28% | 37%      | 25%   |
| 2      | 30% | 32%      | 29%   |
| 3      | 23% | 11%      | 27%   |
| 4      | 8%  | 5%       | 9%    |

Table I.2 shows the numbers of smart tasks. We conclude that the proportion of respondents that performed at least one smart task is relatively similar between NWM-S only and NWM-S+NWM-G. Also still around half of the NWM-S only respondents performed two or more tasks. Hence, it cannot

be concluded that NWM\_S only respondents were purely responding out of curiosity or incentive. However, NWM-S + NWM-G respondents more often do two or more tasks.

We created a logistic regression for yes/no NWM-S only with all administrative auxiliary variables and the number of smart tasks as explanatory variables. A forward-backward procedure was applied to variable selection based on significant changes in AIC. Tables I.3 and I.4 display the odds ratios for the final models, respectively, without and with number of smart tasks. We conclude that NWMS-only respondents are more often migrant, younger, higher educated, more often female and perform fewer smart tasks.

*Table I.3: Final logistic regression model for NWM-G given NWM-S in NL without number of smart tasks as predictor.*

| NWMS-S only response on background characteristics (n = 1185) |                 |                     |                  |
|---|-----------------|---------------------|------------------|
| Characteristic  | OR <sup>†</sup> | 95% CI <sup>†</sup> | p-value          |
| (Intercept)   | 1.34            | 0.47, 3.81          | 0.6              |
| <b>Age categories</b>   |                 |                     |                  |
| 15-24   | —               | —                   |                  |
| 25-34   | 0.85            | 0.46, 1.55          | 0.6              |
| 35-44   | 0.48            | 0.26, 0.90          | <b>0.021</b>     |
| 45-54   | 0.34            | 0.18, 0.64          | <b>&lt;0.001</b> |
| 55-64   | 0.19            | 0.10, 0.37          | <b>&lt;0.001</b> |
| 65-74   | 0.06            | 0.02, 0.12          | <b>&lt;0.001</b> |
| 75-125  | 0.03            | 0.01, 0.09          | <b>&lt;0.001</b> |
| <b>gender</b>   |                 |                     |                  |
| Female  | —               | —                   |                  |
| Male  | 1.45            | 1.04, 2.05          | <b>0.031</b>     |
| <b>origin</b>   |                 |                     |                  |
| 1. Country of origin: The Netherlands                         | —               | —                   |                  |
| 2. Child of migrant(s)  | 1.36            | 0.76, 2.38          | 0.3              |
| 3. Migrant  | 2.02            | 1.15, 3.49          | <b>0.013</b>     |
| <b>Education level</b>  |                 |                     |                  |
| 1. Primary education  | —               | —                   |                  |
| 2. Vmbo, havo, lower vwo, mbo1                                | 0.57            | 0.21, 1.52          | 0.3              |
| 3. Havo, vwo, mbo   | 0.43            | 0.17, 1.08          | 0.071            |
| 4. Higher or university education bachelor                    | 0.17            | 0.06, 0.44          | <b>&lt;0.001</b> |
| 5. Higher or university education master, PhD                 | 0.19            | 0.06, 0.53          | <b>0.002</b>     |
| Not registered  | 0.52            | 0.20, 1.33          | 0.2              |
| <b>HHI</b>  |                 |                     |                  |
| 1-20  | —               | —                   |                  |
| 21-40   | 1.33            | 0.68, 2.65          | 0.4              |
| 41-60   | 1.49            | 0.81, 2.77          | 0.2              |
| 61-80   | 0.90            | 0.48, 1.70          | 0.7              |
| 81-100  | 0.71            | 0.38, 1.37          | 0.3              |

<sup>†</sup> OR = Odds Ratio, CI = Confidence Interval

Table 1.4: Final logistic regression model for NWM-G given NWM-S in NL including number of smart tasks.

| NWMS-S only response on background characteristics and survey behaviour (n = 1185) |                 |                     |                  |  |
|--|-----------------|---------------------|------------------|--|
| Characteristic   | OR <sup>†</sup> | 95% CI <sup>†</sup> | p-value          |  |
| <b>(Intercept)</b>   | 1.14            | 0.40, 3.29          | 0.8              |  |
| <b>Age categories</b>  |                 |                     |                  |  |
| 15-24  | —               | —                   |                  |  |
| 25-34  | 0.80            | 0.44, 1.47          | 0.5              |  |
| 35-44  | 0.45            | 0.24, 0.85          | <b>0.013</b>     |  |
| 45-54  | 0.32            | 0.17, 0.61          | <b>&lt;0.001</b> |  |
| 55-64  | 0.20            | 0.10, 0.38          | <b>&lt;0.001</b> |  |
| 65-74  | 0.06            | 0.03, 0.13          | <b>&lt;0.001</b> |  |
| 75-125   | 0.04            | 0.01, 0.10          | <b>&lt;0.001</b> |  |
| <b>gender</b>  |                 |                     |                  |  |
| Female   | —               | —                   |                  |  |
| Male   | 1.42            | 1.01, 2.00          | <b>0.047</b>     |  |
| <b>origin</b>  |                 |                     |                  |  |
| 1. Country of origin: The Netherlands  | —               | —                   |                  |  |
| 2. Child of migrant(s)   | 1.40            | 0.78, 2.45          | 0.3              |  |
| 3. Migrant   | 2.12            | 1.20, 3.68          | <b>0.009</b>     |  |
| <b>Education level</b>   |                 |                     |                  |  |
| 1. Primary education   | —               | —                   |                  |  |
| 2. Vmbo, havo, lower vwo, mbo1   | 0.54            | 0.20, 1.47          | 0.2              |  |
| 3. Havo, vwo, mbo  | 0.39            | 0.16, 0.99          | <b>0.047</b>     |  |
| 4. Higher or university education bachelor   | 0.14            | 0.05, 0.39          | <b>&lt;0.001</b> |  |
| 5. Higher or university education master, PhD                                      | 0.16            | 0.06, 0.47          | <b>&lt;0.001</b> |  |
| Not registered   | 0.48            | 0.19, 1.25          | 0.13             |  |
| <b>HHI</b>   |                 |                     |                  |  |
| 1-20   | —               | —                   |                  |  |
| 21-40  | 1.24            | 0.63, 2.48          | 0.5              |  |
| 41-60  | 1.36            | 0.74, 2.56          | 0.3              |  |
| 61-80  | 0.83            | 0.45, 1.59          | 0.6              |  |
| 81-100   | 0.65            | 0.34, 1.26          | 0.2              |  |
| <b>Amount of smart tasks</b>   | 1.28            | 1.12, 1.47          | <b>&lt;0.001</b> |  |
| <sup>†</sup> OR = Odds Ratio, CI = Confidence Interval                             |                 |                     |                  |  |