

## Survey of a small space sector: Experiences in data collection and analysis using the example of Austria

Conducted on behalf of the  
Austrian Federal Ministry for Climate Protection,  
Environment, Energy, Mobility, Innovation and  
Technology

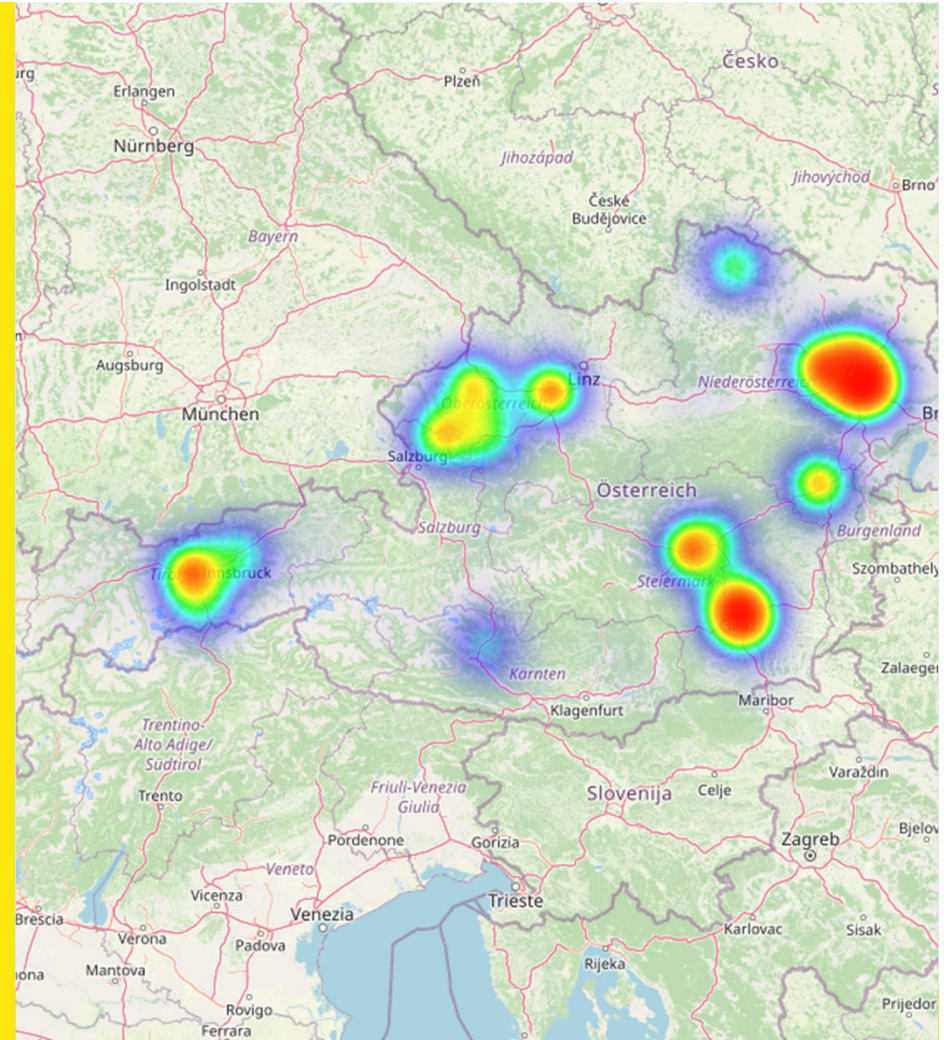
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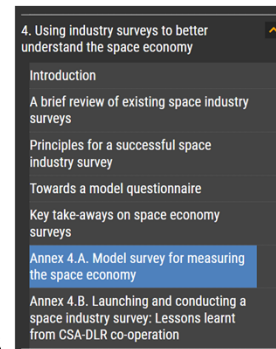


# Content

1. Questionnaire creation and testing
2. Population and crawling
3. Questionnaire mailout and survey management
4. Data preparation and evaluation
5. Selected results

# 1. Questionnaire design and testing (1/2)

- Basis: OECD sample questionnaire (2022)
- "**Tailored design**": adaptation to the language and needs of the target group: → **three questionnaires**
  - (1) Business enterprises
  - (2) Education and research institutions
  - (3) Administrative facilities and others
- 8 **cognitive test interviews** with respondents from all target groups



## Annex 4.A. Model survey for measuring the space economy

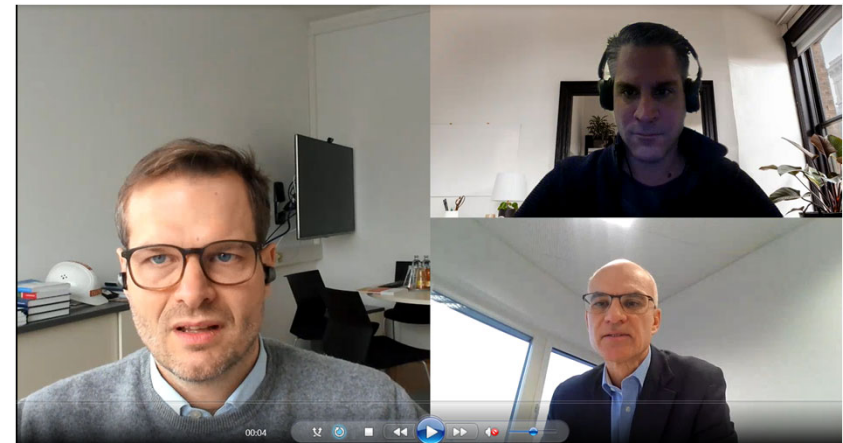
As discussed in this chapter, all surveys need to be based on specific objectives that are context specific. Despite this, a model survey with some generic sections and questions is proposed here in order to encourage the use of particular generic questions. The questions should be adapted to local context with more or less detail added as required. The questions are largely inspired by existing questionnaires and the lessons learnt shared during OECD Space Forum meetings (Fischer et al., 2021[3]). To facilitate follow-up analysis, the proposed questions presented here should be arranged in matrix format using spreadsheet programmes (e.g. MS Excel and alternatives) and ideally use online solutions.

### Respondent information

Contact information for the survey

Name:

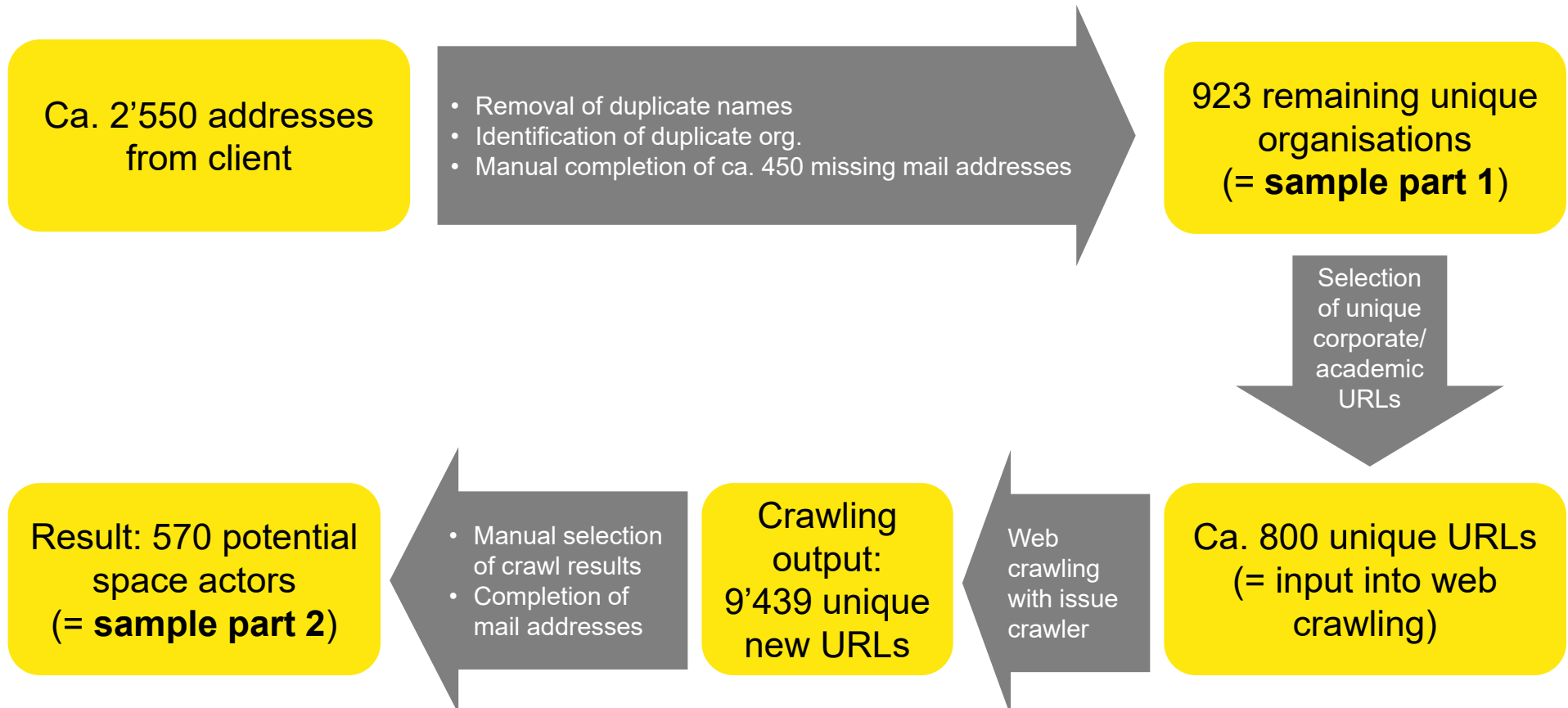
Division/Department:



# 1. Questionnaire design and testing (2/2)

- Proprietary tool **Tivian** was used as the survey tool
- Reasons:
  - ✓ **Ease of use**: user-friendly interface, simple navigation, no extensive technical knowledge required and quick to learn,
  - ✓ **Flexibility in survey creation**: customisable, variety of question options (multiple choice, free text, rating scales and more), multilingual
  - ✓ **Multi-channel distribution**: web browser, mobile, print possible (but not user-friendly),
  - ✓ **Data analysis and reporting**: Data analysis and reporting possible, but not very comfortable, but: diverse data export
  - ✓ **Data protection and security** provided (encryption technologies), server in Europe, anonymisation of survey participants possible,
  - ✓ **Relatively low licence costs**

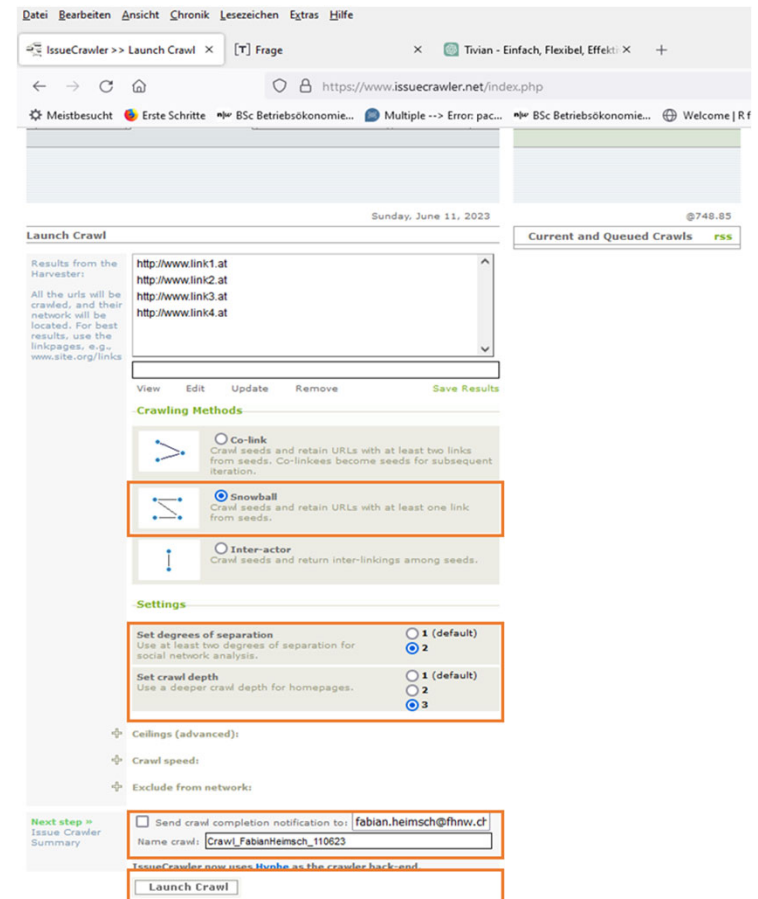
## 2. Population and crawling (1/3)



## 2. Population and crawling (2/3)

### Process:

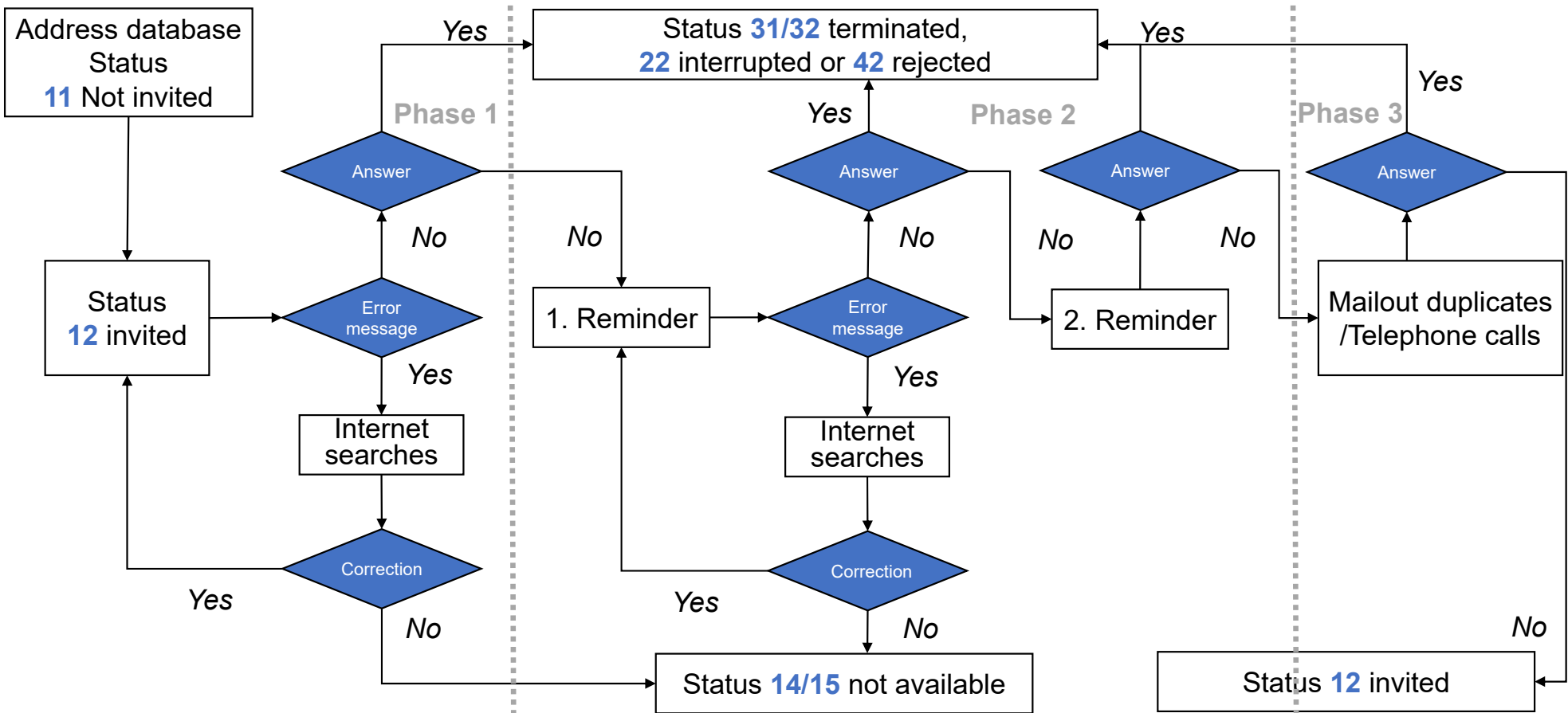
1. Obtained user account at <https://www.issuecrawler.net/> (waiting time 2-3 days, check spam folder!)
2. Copied URLs into Issue Crawler, selected the option "Snowballing" with the parameters "Degrees of separation 2" and "Depth 3", launched 4 crawls (batch size max. 250, results available in 0.5 - 3 days)
3. Input of 810 URLs generated ca. 9'400 hits (unique URLs) as output
4. Transferred results to Excel for manual reviews and plausibility checks
  - New to sample, country, type of org.
  - Time-consuming: >250h of work for 571 potential new space actors (including manual searches for mail addresses/contact persons)



## 2. Population and crawling (3/3)

	Lists from client		Crawling		Total	
	N	In %	N	In %	N	In %
Companies	528	57%	372	65%	900	60%
Academic institutes	150	16%	95	17%	245	16%
Administration units, NPOs	245	27%	103	18%	348	23%
<b>Total</b>	<b>923</b>	<b>100%</b>	<b>570</b>	<b>100%</b>	<b>1493</b>	<b>100%</b>

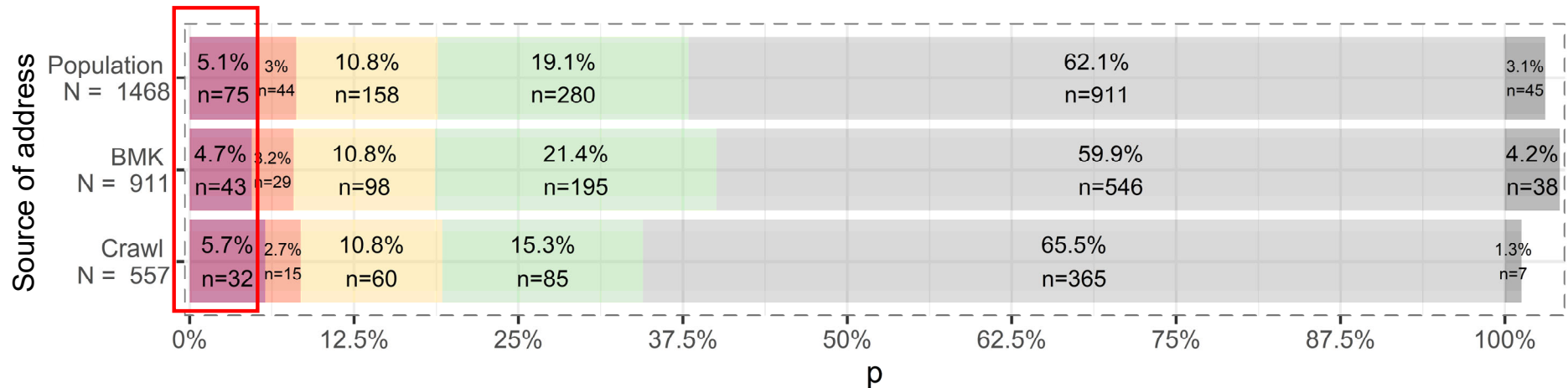
### 3. Questionnaire mailout and survey management - flowchart (1/2)





### 3. Questionnaire mailout and survey management (2/2)

#### Net population by source and response type



Explicit feedback, usually by e-mail, other org. without space activities in the responses

Status quo responses

- Not active in space
- Participation rejected
- Survey drop-out
- Survey terminated
- Non-response
- Unreachable

## 4. Data preparation and evaluation (1/3)

- Goal: identification of response errors and replacement of missing values
- Steps:
  1. Merging of different questionnaire branches
  2. Plausibility checks and corrections/imputations
    - Review of responses
    - Partially email/phone enquiries
  3. Production of synthetic variables (sums, ratios etc.)

<b>Variable</b>
1) Total turnover $\geq$ Space turnover
2) Total employees $\geq$ Space employees
3) Total employees $\geq$ female employees
4) Total employees $\geq$ R&D employees
5) Space employees $\geq$ female space employees
6) Space employees $\geq$ Space employees in R&D
7) Total employees $\in$ Employee size class

## 4. Data preparation and evaluation (2/3)

- Quantitative measures such as space revenue or full-time equivalents in the space sector often have many zero values and some strong outliers at the right end of the distribution → *Right skewed distributions*
- Example: 10 hypothetical values of FTE in the space sector:  

```
x <- c(0,0,1,1,2,2,4,8,66,150)
```
- The *arithmetic mean* of 23.4 is not a good representation of the distribution, as 8 out of 10 units have fewer than 10 FTEs and only two units show larger values  
→ *Robust statistics* necessary

## 4. Data preparation and evaluation (3/3)

```
x <- c(0,0,1,1,2,2,4,8,66,150)
```

### Robust statistics

1. **Median** (in the example 2): The median is the central measure of distribution: It is robust against outliers, but only uses the ranking of the data for calculation (inefficient).
2. **Trimmed 10% mean** (in the example 10.5): Cuts 10% of the values at the top and bottom of the distribution and estimates the arithmetic mean at the remaining 80% of the values - less robust against outliers than the median, but more efficient.
3. **Huber-M mean** (in the example 3.3): The Huber-M mean uses an iterative algorithm to obtain more robust estimates of the mean. It takes outliers into account, but weights them less.

Advantages are high robustness and efficiency, but the measure is less suitable if there are many zero values. The trimmed mean is more suitable in such cases.

# Selected results (1/7)

## Employees in the Austrian space sector

<b>All employees in full time equivalents (FTE)</b>							
Variable	Quantity > 0	Sum	Mean value	Trimmed mean (10%)	Median	Huber-M Mean	Variance
Employees	134	26'166	195.0	33.3	15.0	23.2	893
Female employees	131	6'975	53.2	7.6	4.0	6.0	210
R&D staff	130	5'941	45.7	11.3	6.4	8.9	176
<b>in space activities</b>							
Employees	133	1'172*	8.8	4.3	2.0	3.1	21.3
Female employees	127	266	2.1	1.0	0.5	0.8	4.9
R&D employees	125	732	5.9	3.1	2.0	2.7	13.6

\* Answers provided after the survey was closed indicate that the space sector in Austria employs more than 1'300 FTEs.

- On average 10-15% of FTEs work in space
- Space is predominantly male and R&D-intensive (above all the smaller space organisations)

## Selected results (2/7)

### Revenues/budgets in the space sector (in m€)

Variable	Quantity > 0	Total	Mean value	Trimmed mean (10%)	Median	Huber-M Mean	Variance
Total revenues (m€)	141	10'752	76.3	3.31	1.31	2.11	471.7
Space revenues (m€)	142	184.2*	1.3	0.38	0.10	0.18	3.95
Space revenues abroad (e.g., exports, foreign grants) (m€)	125	141.5	1.1	0.24	0.04	0.07	4.05

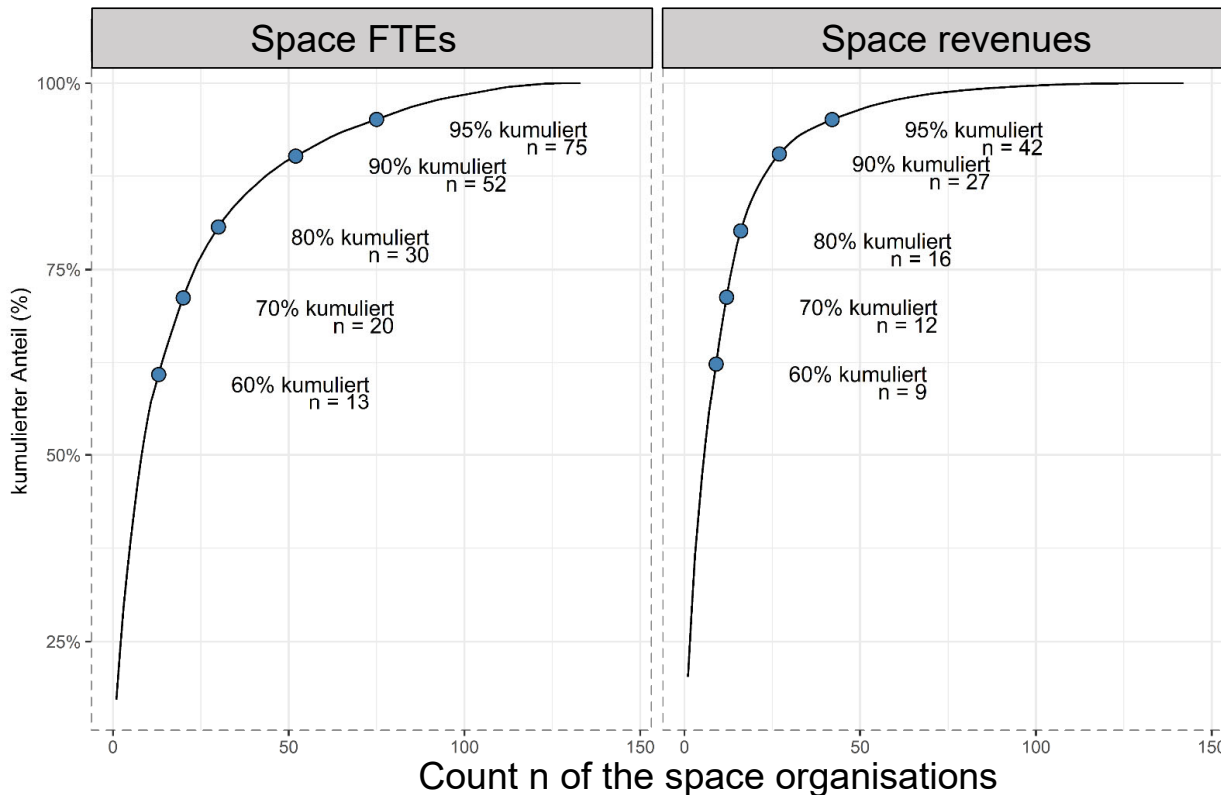
\* Answers provided after the survey was closed indicate that the space sector in Austria generates more than 209 m€ revenues.

→ 209 m€ of space revenues in total.

→ On average 180'000 € of space revenues (8.5% of total revenues) per space organization.

## Selected results (3/7)

# Cumulative space revenues and FTEs

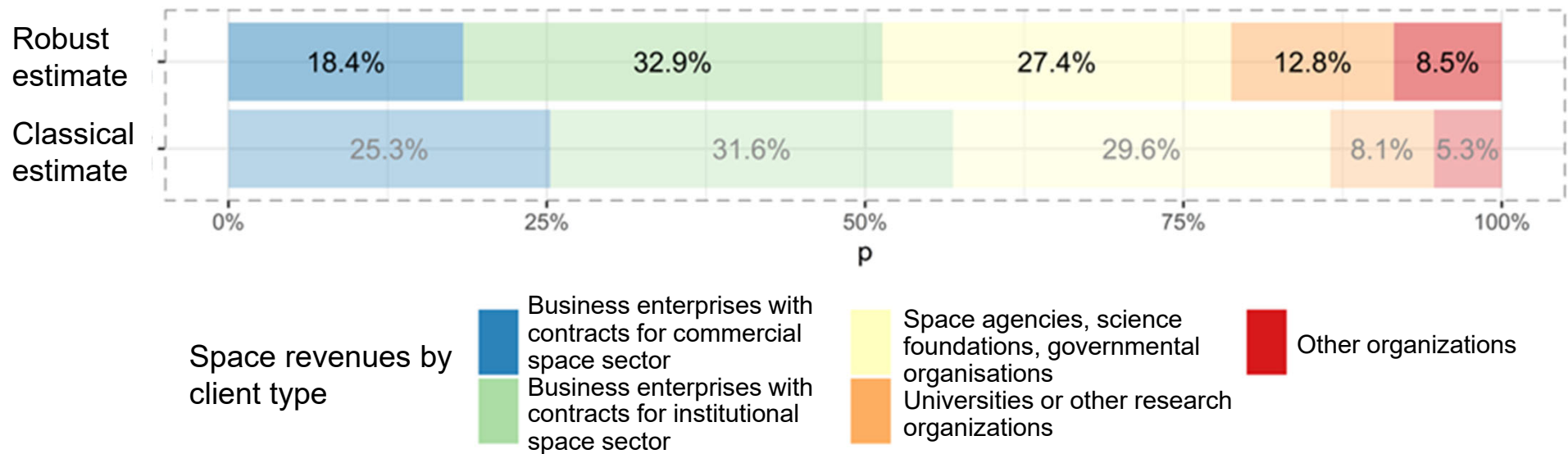


### Highly skewed distributions

- The 52 largest units employ 90% of the full-time equivalents in space
- The 27 largest units generate 90% of space revenues

## Selected results (4/7)

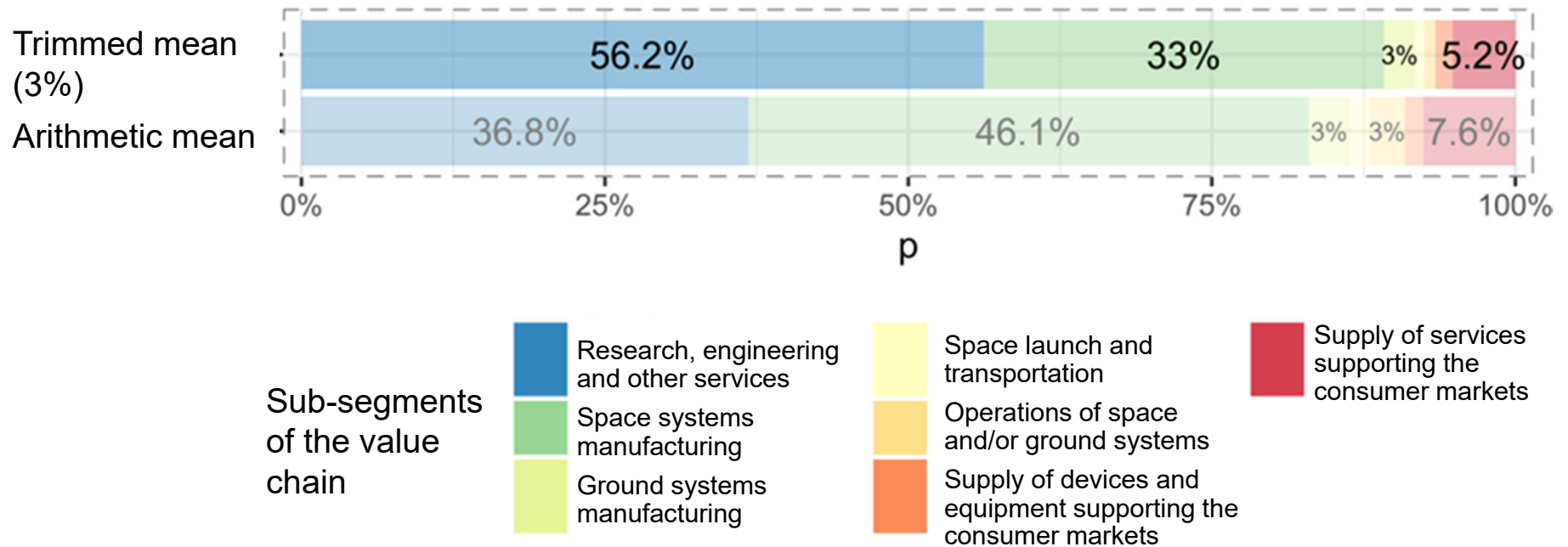
### Revenues/budgets in the space sector by client type





## Selected results (5/7)

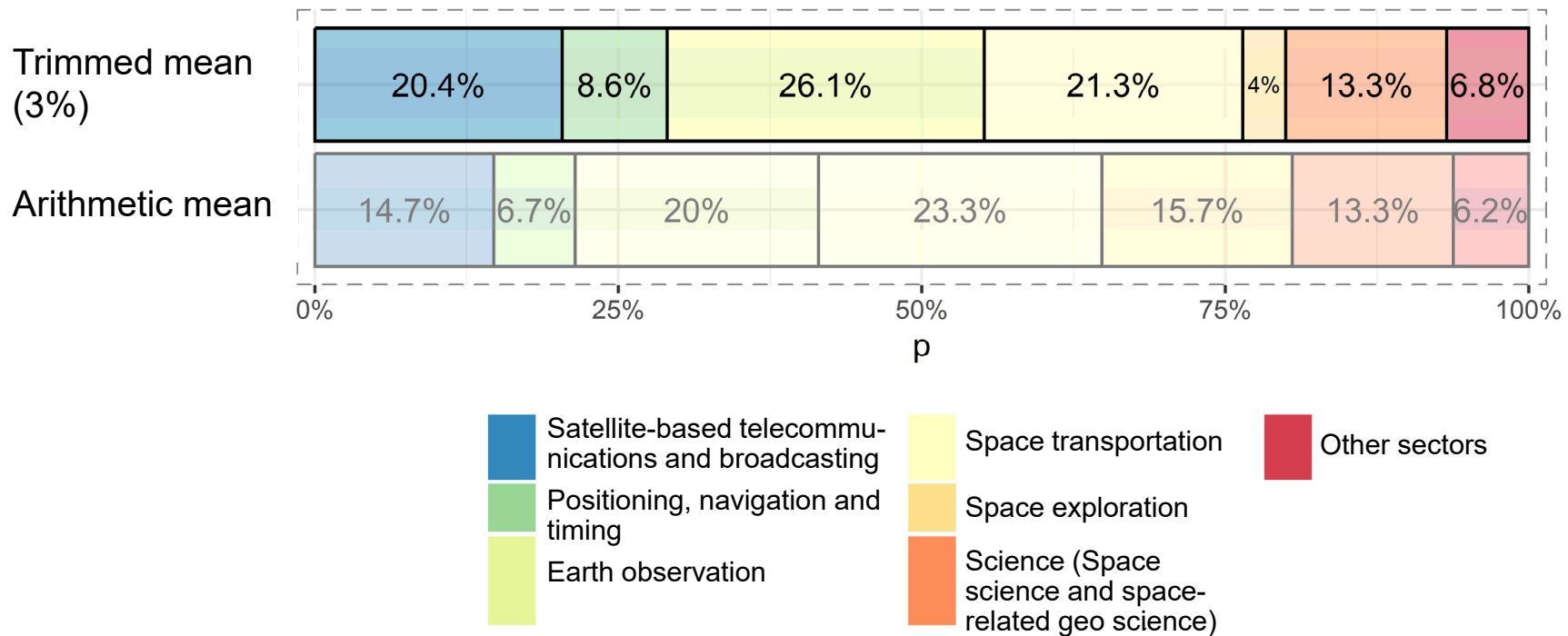
### Percentage distribution of space revenues by sub-segments of the value chain



Only sub-segments with at least 5 values > 0 are shown.

## Selected results (6/7)

### Percentage distribution of space revenues by sub-sector

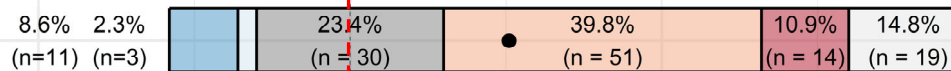


Only sectors with at least 5 values > 0 are shown.

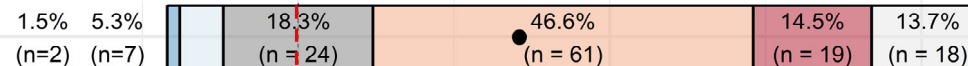
## Selected results (7/7)

Assessment of the **past** and **future** business performance in the space sector of the organisational units active in this sector over 3 years

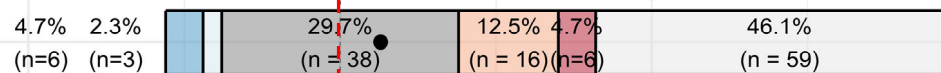
Revenues compared to 3 years ago



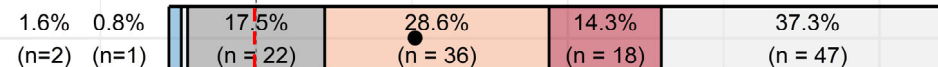
Revenues in 3 years



Exports compared to 3 years ago



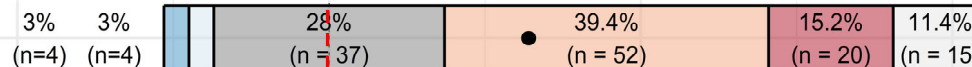
Exports in 3 years



Employment compared to 3 years ago



Employment in 3 years



→ Future expectations are positive for all measures: 55-60% of the companies each expect increases in portfolio, revenues, employment, R&D, future export assessment also fundamentally optimistic



# Thank you for your attention!

If you have further questions, please get in touch:  
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