THE PUBLIC GOOD VALUE OF FCC

6 June 2023
FCC Week 2023
Millennium Gloucester Hotel London Kensington

FCCIS – The Future Circular Collider Innovation Study. This INFRADEV Research and Innovation Action project receives funding from the European Union’s H2020 Framework Programme under grant agreement no. 951754. The information herein only reflects the views of its authors and the European Commission is not responsible for any use that may be made of the information.
The public good value in practise: three main questions

1. What do the laypeople think about CERN and its scientific research?
   - Is the public aware of CERN?

2. How much a Future Circular Collider (FCC) research programme is worth to a layperson?
   - Is society willing to give the opportunity to continue with discovery, which is uncertain and costly?

3. If a perceived value exists, what are the drivers?
   - The concept of “Willingness To financially Participate” (WTP)
• 9 countries involved
• 10,448 lay people surveyed
• 5 years of research

**Stratified sampling strategy:**
Gender, Age, Edu, Income, Occupation status, Region of residence

<table>
<thead>
<tr>
<th>N of people surveyed</th>
<th>Year of the survey</th>
<th>CERN MS</th>
<th>Cash contribution to the 2021 CERN budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>2018</td>
<td>YES, host State</td>
<td><strong>MCHF</strong> 45.97 (4.0%) 6.5 CHF</td>
</tr>
<tr>
<td>1,005</td>
<td>2017</td>
<td>YES, host State</td>
<td><strong>MCHF</strong> 162.65 (13.9%) 2.9 CHF</td>
</tr>
<tr>
<td>1,084</td>
<td>2022</td>
<td>YES</td>
<td><strong>MCHF</strong> 122.47 (10.5%) 2.3 CHF</td>
</tr>
<tr>
<td>1,027</td>
<td>2022</td>
<td>YES</td>
<td><strong>MCHF</strong> 243.98 (20.9%) 3.3 CHF</td>
</tr>
<tr>
<td>1,053</td>
<td>2022</td>
<td>YES</td>
<td><strong>MCHF</strong> 173.74 (14.9%) 3.4 CHF</td>
</tr>
<tr>
<td>1,072</td>
<td>2022</td>
<td>YES</td>
<td><strong>MCHF</strong> 33.14 (2.9%) 1.0 CHF</td>
</tr>
<tr>
<td>1,094</td>
<td>2022</td>
<td>YES</td>
<td><strong>MCHF</strong> 22.39 (1.9%) 2.7 CHF</td>
</tr>
<tr>
<td>2,048</td>
<td>2022</td>
<td>NO (Observer)</td>
<td>zero / /</td>
</tr>
<tr>
<td>1,065</td>
<td>2022</td>
<td>NO (Observer)</td>
<td>zero / /</td>
</tr>
</tbody>
</table>
4-section questionnaire

YOUR INTERESTS
General interests and opinions about the importance of scientific research

YOUR KNOWLEDGE OF CERN
Focus on CERN and its research activity

YOUR SUPPORT TO CERN
Questions to elicit respondents' WTP for future investments in particle physics research

YOUR PROFILE
Respondents’ demographics

What is CERN?
- 2-page factsheet
- 2-mins video
Attitudes towards scientific research
% of respondents interested in the listed topics

Environment: 46%
Politics and Society: 42%
Sports: 41%
Arts and culture: 38%
Medicine: 33%
Astronomy: 27%
Biology: 25%
Physics: 20%
Geology: 19%

Social media (75%) and TV (66%) are the primary sources of information.

Total N of respondents = 10,448
% of respondents who agree with the listed statements

Scientific research is important to...

- ...improve health and quality of life: 48%
- ...secure the future of next generations: 42%
- ...encourage the creation of new products and services: 36%
- ...satisfy human curiosity about the nature and origin of the Universe: 35%
- ...support economic growth and employment: 33%

Total N of respondents = 10,448
Awareness and opinion of CERN
% of respondents who are aware of CERN vs other international organisations

<table>
<thead>
<tr>
<th>Organisation</th>
<th>NCEF 2023</th>
<th>NCEF 1065</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA</td>
<td>85%</td>
<td>87%</td>
</tr>
<tr>
<td>UNESCO</td>
<td>81%</td>
<td>86%</td>
</tr>
<tr>
<td>WHO</td>
<td>80%</td>
<td>57%</td>
</tr>
<tr>
<td>CERN</td>
<td>47%</td>
<td>13%</td>
</tr>
<tr>
<td>IMF</td>
<td>42%</td>
<td>55%</td>
</tr>
<tr>
<td>ESA</td>
<td>39%</td>
<td>10%</td>
</tr>
<tr>
<td>FAO</td>
<td>34%</td>
<td>10%</td>
</tr>
<tr>
<td>ITER</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>ESRF</td>
<td>5%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Total N = 8,443 Total N = 2,048 Total N = 1,065

**IMF**: International Monetary Fund; **FAO**: Food and Agriculture Organization of the UN; **WHO**: World Health Organisation; **UNESCO**: United Nations Educational, Scientific and Cultural Organization; **ESA**: European Space Agency; **ITER**: International Thermonuclear Experimental Reactor; **ESRF**: European Synchrotron Radiation Facility; **NASA**: US National Aeronautics and Space Administration
% of respondents who are aware of CERN

Source of information

<table>
<thead>
<tr>
<th>You know CERN because of...</th>
<th>CERN MS</th>
<th>USA</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media (TV, web, and social media)</td>
<td>32%</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>Reading books and specialised magazines</td>
<td>19%</td>
<td>9%</td>
<td>4%</td>
</tr>
<tr>
<td>Films and documentaries</td>
<td>14%</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>Word of mouth</td>
<td>13%</td>
<td>7%</td>
<td>2%</td>
</tr>
<tr>
<td>During my studies</td>
<td>11%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>Visited CERN</td>
<td>2%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>During my job</td>
<td>2%</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Cultural Events</td>
<td>2%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>Not aware of CERN</td>
<td>53%</td>
<td>73%</td>
<td>87%</td>
</tr>
</tbody>
</table>

Total N of respondents aware of CERN

- N = 3,968
- N = 553
- N = 138
Communication increases knowledge and positive opinions while reducing neutral perceptions

Opinion about CERN - before /after comparison (% of respondents)

- Negative
- Neutral
- Positive

Before the exposure to the CERN info material

- 25% (Neutral)
- 73% (Positive)
- 2% (Negative)

After the exposure to the CERN info material

- 17% (Neutral)
- 80% (Positive)
- 3% (Negative)

N = 4 659
Sub-sample aware of CERN

N = 10 448
All sample

Aspects of CERN that you like

- Scientific research
- Development
- Innovation
- Possibility of a better future
- Particle accelerator

Aspects of CERN that you do not like

- Subject to complex, difficult to understand
- Excessive cost
- Low safety
- Lack of communication, information
### % of respondents who agree with the listed statements

<table>
<thead>
<tr>
<th>Statement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERN’s discoveries allow us to enrich our knowledge of the origins and evolution of the Universe</td>
<td>80%</td>
</tr>
<tr>
<td>CERN’s discoveries can lead to the creation of products that could improve the quality of life</td>
<td>77%</td>
</tr>
<tr>
<td>CERN’s education programs for students and young professionals creates value for society</td>
<td>74%</td>
</tr>
<tr>
<td>CERN develops new technologies for the diagnosis and treatment of diseases</td>
<td>68%</td>
</tr>
<tr>
<td>I am proud that my country is part of the CERN international scientific research projects</td>
<td>67%</td>
</tr>
<tr>
<td>Research activity at CERN should be intensified over the coming decades</td>
<td>66%</td>
</tr>
<tr>
<td>Research at CERN has a positive effect on my everyday life</td>
<td>51%</td>
</tr>
<tr>
<td>CERN’s research activities contribute to peace in the world</td>
<td>46%</td>
</tr>
<tr>
<td>CERN is a humanitarian aid organization</td>
<td>42%</td>
</tr>
</tbody>
</table>

Total N of respondents = 10,448

- **Scientific research at CERN is...**
  - Important for everyone: 77%
  - Important for scientists only: 25%
  - Important for people living in the surrounding area: 20%
  - Dangerous for the environment: 16%
Willingness to financially participate (WTP) in a new particle accelerator
We asked for respondents’ willingness to financially support the investment scenario A

**INVESTMENT SCENARIO**

The FCC international collaboration *decides to invest in a new particle accelerator in the next decade. It will make discoveries on phenomena that cannot be explained today.* This new accelerator will be operated for at least twenty-five years.

**NON-INVESTMENT SCENARIO**

The FCC international collaboration *decides not to invest* in a new particle accelerator. The research activity with the existing accelerator, the LHC, will gradually decrease over the next twenty years. *The possibility of finding answers to unexplained phenomena will remain limited.*
What is the maximum annual amount you would pay as a taxpayer for the investment in scenario A?

Median = 2 CHF

Median = 20 CHF

N = 965 valid WTP answers

N = 978 valid WTP answers
**WTP results**: the value of a scientific research programme based on a future circular collider perceived by respondents is higher than the actual tax amount transferred to CERN by the respective country.

<table>
<thead>
<tr>
<th>CERN member states</th>
<th>Max WTP per person per year (all sample, incl. respondents with WTP = 0)</th>
<th>Max WTP per person per year (sub-sample of respondents with WTP&gt;0)</th>
<th>Cash contribution (tax) per person in 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Median</td>
<td>Median</td>
<td>CHF</td>
</tr>
<tr>
<td>CHF</td>
<td>20</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11</td>
<td>2</td>
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<td></td>
<td>13</td>
<td>22</td>
<td>13</td>
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<td>11</td>
<td>22</td>
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<td>14</td>
<td>19</td>
<td>14</td>
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<td></td>
<td>6</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Non-member states</td>
<td>Sub-sample of respondents with WTP&gt;0</td>
<td>Respondent's aware of CERN</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>CHF</td>
<td>73%</td>
<td>81%</td>
<td></td>
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<td></td>
<td>52%</td>
<td>52%</td>
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<td></td>
<td>76%</td>
<td>65%</td>
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<td>69%</td>
<td>39%</td>
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<td>77%</td>
<td>46%</td>
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<td>77%</td>
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<td>68%</td>
<td>28%</td>
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<td></td>
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<tr>
<td></td>
<td>29%</td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>
Main reasons for being willing to participate financially (WTP > 0)

% of respondents who selected the options

- **52%** Curiosity-related motivation
  - “I feel humanity has a duty to push the frontier of knowledge ahead”
  - “Always support CERN research even if no concrete/tangible application”

- **42%** CERN improves the skills and competencies of people
  - “Competencies/skills of all people involved in the projects will grow”
  - “CERN research advances knowledge in STEM subjects”

- **20%** Industry-related impact
  - “Research enables companies to develop new products and services”

- **49%** Geographic-related impact
  - “Benefits for France and Switzerland (17%, 21%)”
  - “Benefits for Europe”
  - “Benefits for the entire world”

Total N of respondents with WTP > 0, N = 6 295
Main reasons for not wishing to participate financially (WTP = 0)

% of respondents who selected the options

- **unaffordability**
  - 37%
  - “Currently, I cannot afford this expense”

- Preferences to spend money for alternative purposes or research
  - 26%
  - “I prefer to spend my money on other things”
  - “I think my taxes contribution should be used to fund other research activities”
  - “I think my money should be used to fund research in my own country”

- Not understanding the CERN research / only stakeholders should participate
  - 25%
  - “I do not understand the purpose of CERN's scientific research”
  - “Only people who directly benefit from CERN research should pay for it”

- Protest
  - 8%
  - “I am against government-funded programs”
  - “I am against international organizations”

Total N of respondents with WTP = 0, N = 3252
WTP is a positive function of the awareness of CERN

Correlation = 20%, (p-value < 0.01); * 2021 prices, sub-sample of respondents with WTP>0
WTP is a positive function of income

Median of the stated max WTP per person per year in CHF*

Correlation = 85%, (p-value < 0.01), * purchasing power parity (PPP), 2021 prices
Drivers of the WTP

\[ \text{Prob} \ (WTP > 0) = f \ (\text{socioeconomic traits, beliefs, opinions, bid asked}) \]

- Income
- Level of education
- Being male
- Being employed (wrt unemployed, retired)
- Awareness of CERN
- Curiosity
- Having interests in science and research

- Bid asked
Main messages

1. Less than half of respondents (41%) knows what CERN and its mission are. The awareness is far below that of several other international organisations such as NASA, WHO, UNESCO with variability from country to country.

2. Society is willing to give the opportunity to continue with discovery with a positive WTP. The WTP varies by country and is driven by the socioeconomic characteristics of respondents in each country, including the level of awareness.

3. No discrepancies exist between the WTP and the contributions actually paid today and potentially being paid by future contributing states. The value of a scientific research programme based on a Future Circular Collider perceived by respondents is higher than the actual tax amount transferred to CERN by the respective countries.