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Federal Office of Topography swisstopo
Swiss Geological Survey

wissen wohin
savoir où
sapere dove
knowing where

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The economic value of a national geological 3D model

A cost/benefit analysis from Switzerland

GSEU Workshop – Towards a 3D Geomodel of Europe

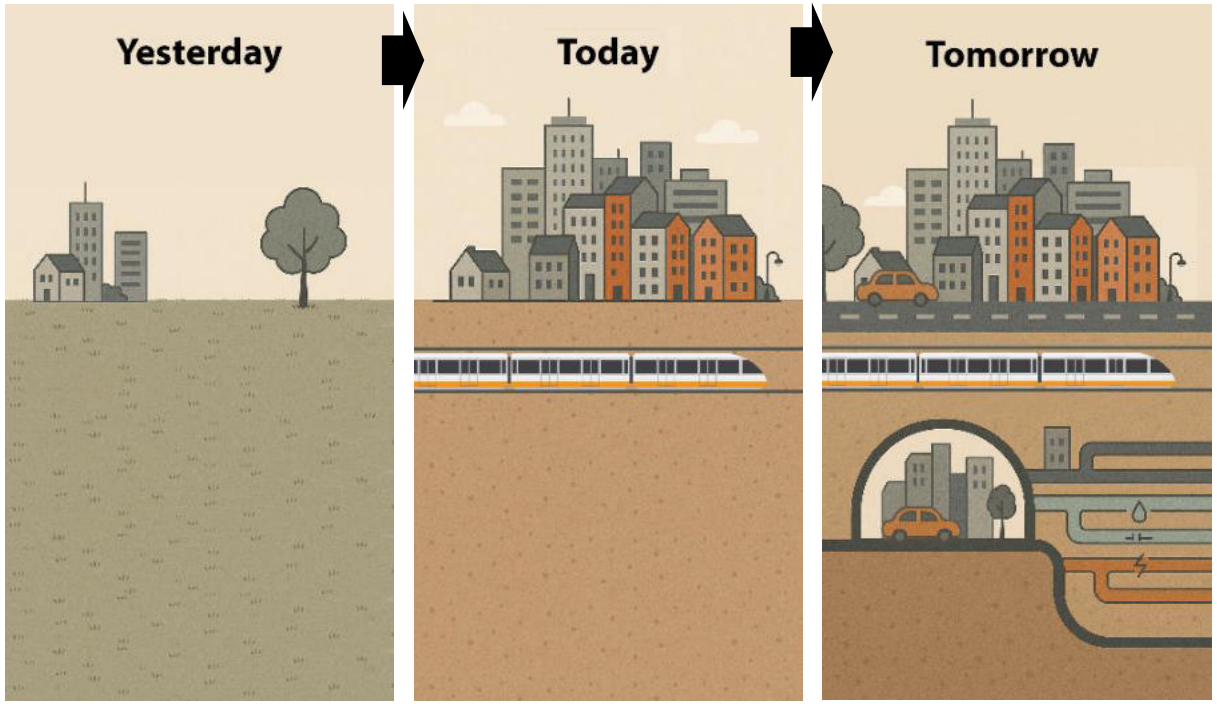
Dr. Roland Baumberger

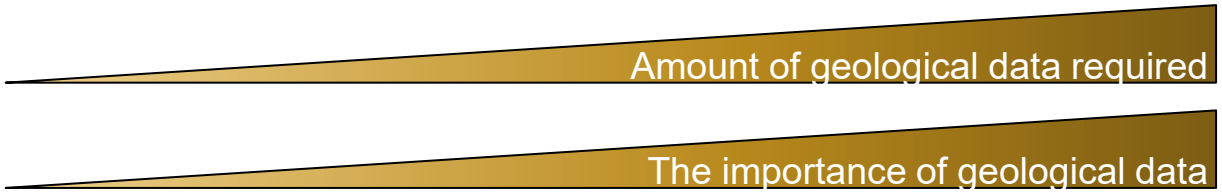
What is the value of a geological data set?



CHF 30? – CHF 1.1 million? – or many times that amount?

Problem statement





Data collection in the subsurface
- is resource-intensive and
- has a definable **acquisition cost**

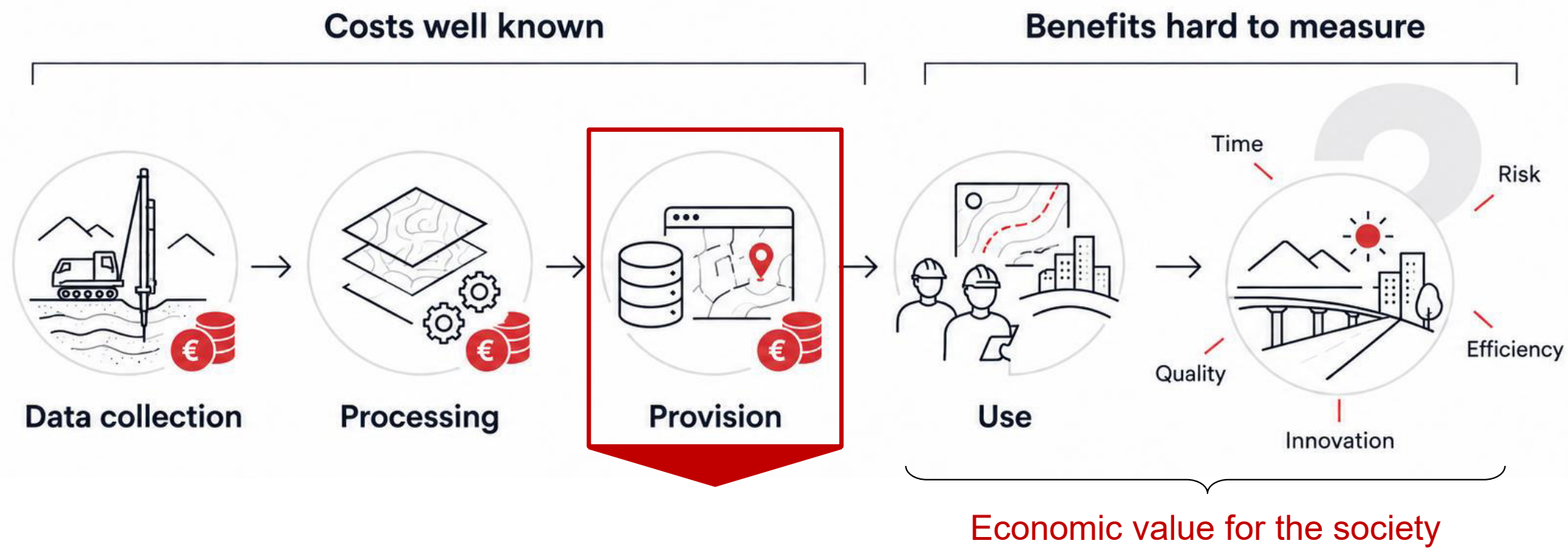
Multiple uses are possible/necessary

Unavailability of existing data = inefficient + duplication of efforts

Little or no loss of **value** over time

What value is attributed to this data?

We know the costs – but hardly the benefits



Main Research Question

→ What economic value does the public availability of federal geological data create?

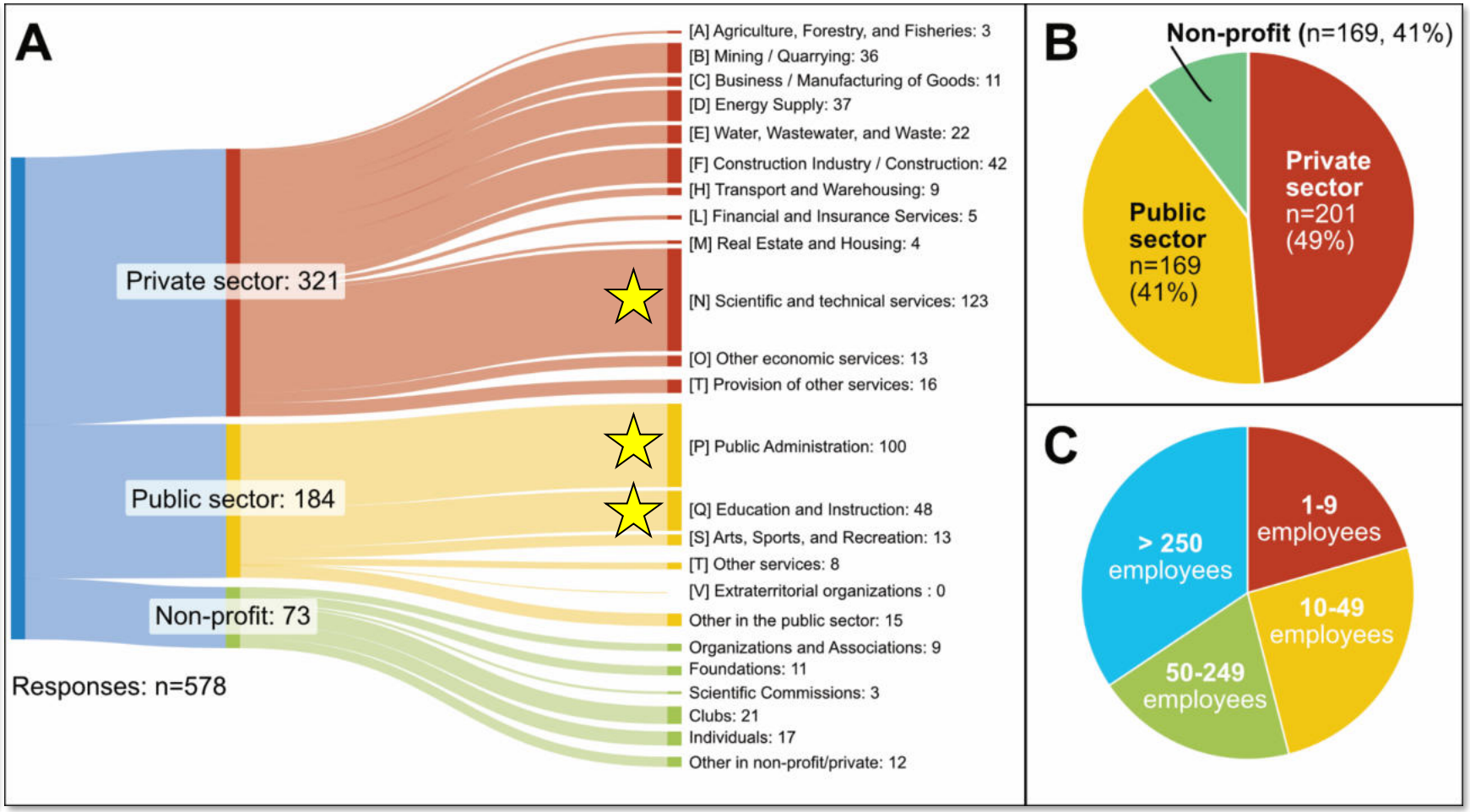
Survey design

Online survey
413 complete responses

Scope
24 economic sectors

Objectives
Costs + time + usage + willingness to pay

Study period
2007–2024



Baumberger (2026)

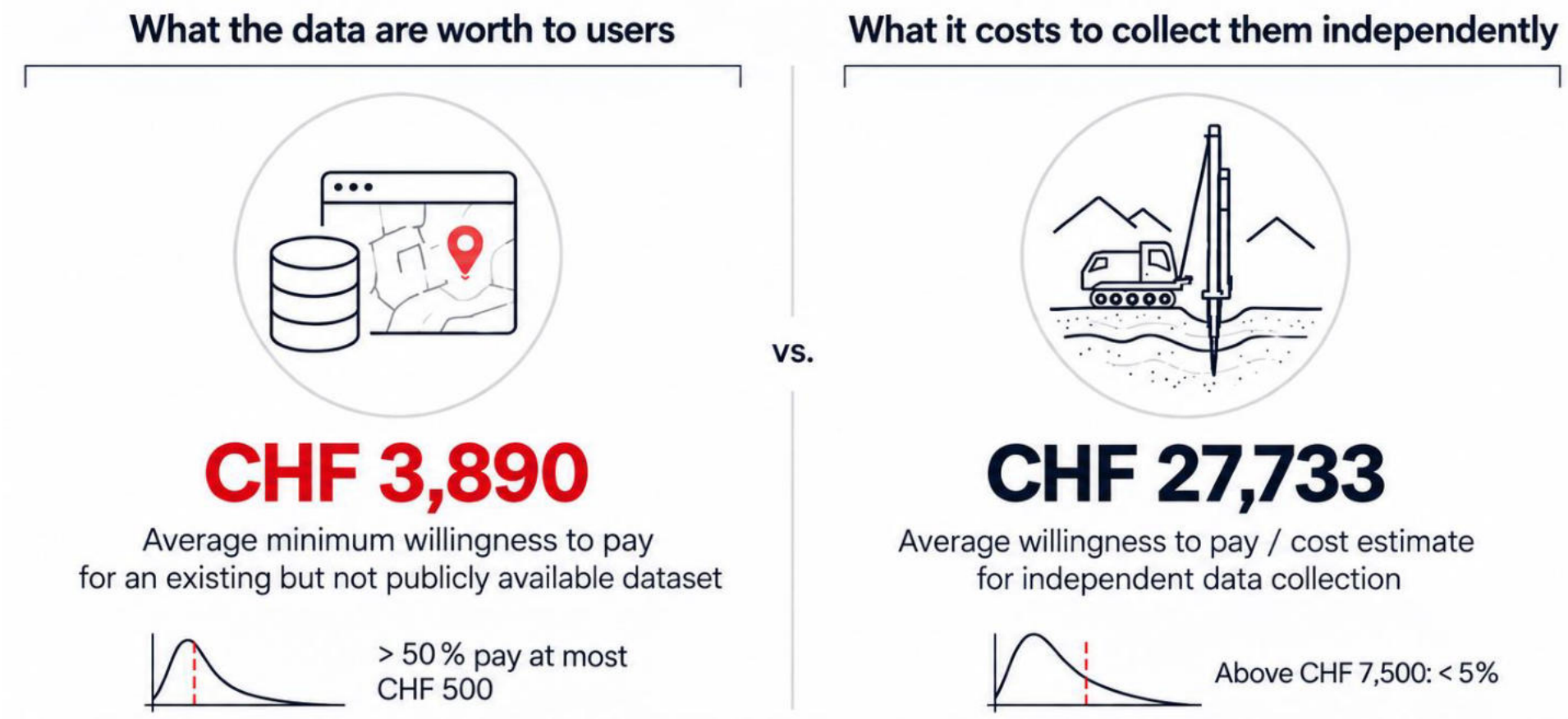
Context / Other Studies

- Focus on federal geological data
- Geological knowledge as a public good (no exclusivity or rivalry in use)
  → Geological data benefits society → the state makes it available as a public good

Country	Author	Year	Cost/Benefit ratio	Remarks
U.S.	div.	1980 – 2020	1:2 to 1:137	
Spain	Garcia-Cortes et al.	2005	1:18	Project based evaluation
Switzerland	Beer et al.	2005	1:6–8	Estimates on input data
Australia	div.	2019/2020	1:15 to 1:157	Project based evaluation
UK	Callahan	2025	1:5 to 1:40	National Geological Repository
U.S.	Berg & Faulds	2025	1:7–10 to 1:35	Survey based
Switzerland	Baumberger	2026	1:20 to 1:87	Survey based

Result 1: The willingness to pay for geological data

User estimates



→ Users need the data – but the market price cannot cover the cost of providing it.

Source: Baumberger (2026)

Example: Geological Atlas of Switzerland 1:25'000

"Economic Theory"

CHF 1.1 Mio. ÷ 200 = CHF 5'500

- Production Cost per Sheet (full costs; 210 km2)
- Print Run
- Price (**NO** public good)

But who would pay CHF 5'500 for a single geological map sheet?

Reality Check (current numbers)

CHF 1.1 Mio. ÷ CHF 30 = 36'666

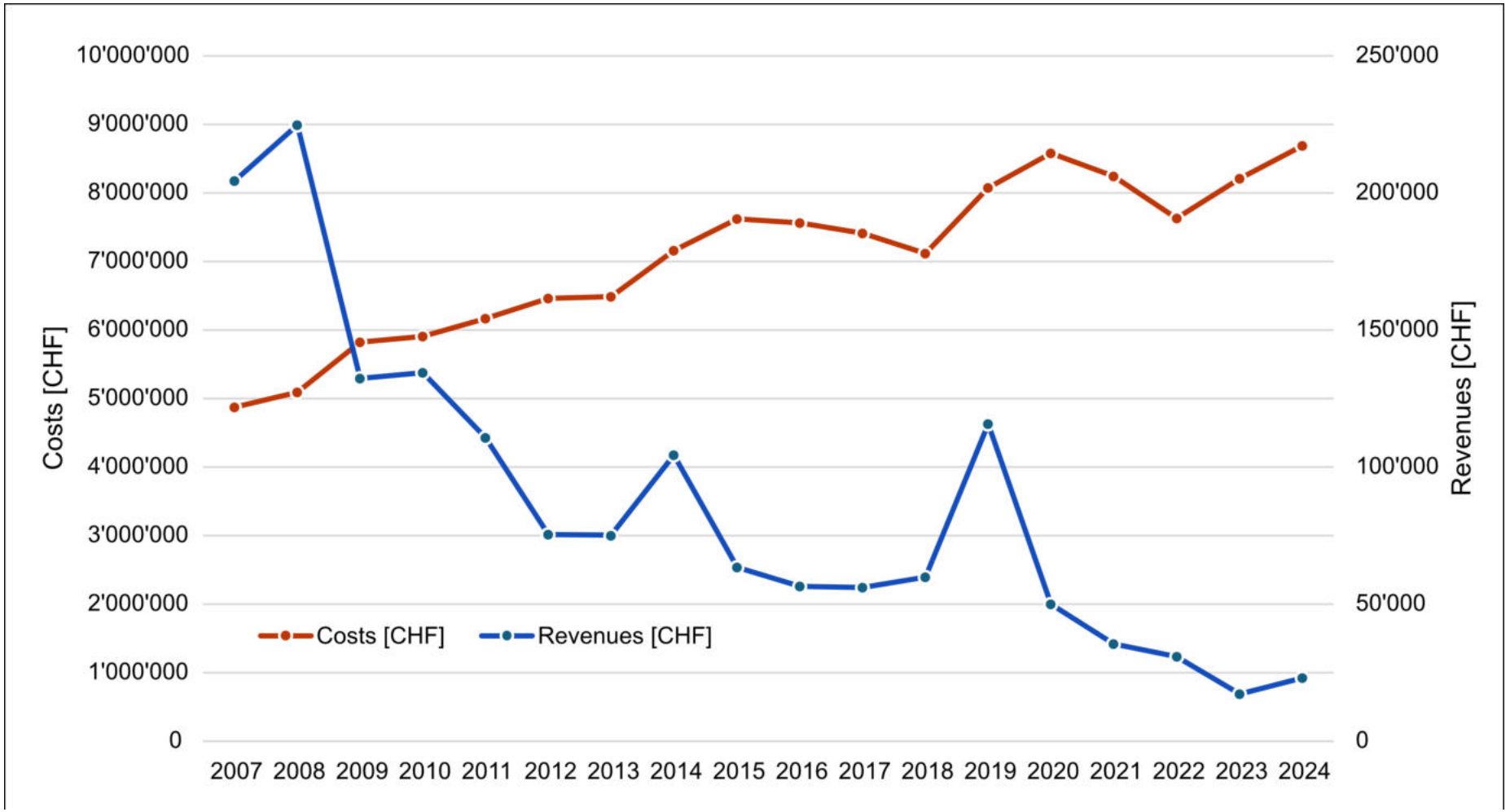
- Production Cost per Sheet (full costs; 210 km^2)
- Price (public good)
- Print Run

But who would buy 36,666 copies of a geological map sheet?

→Therefore, the value of a geological map / data set cannot be meaningfully determined by its selling price.

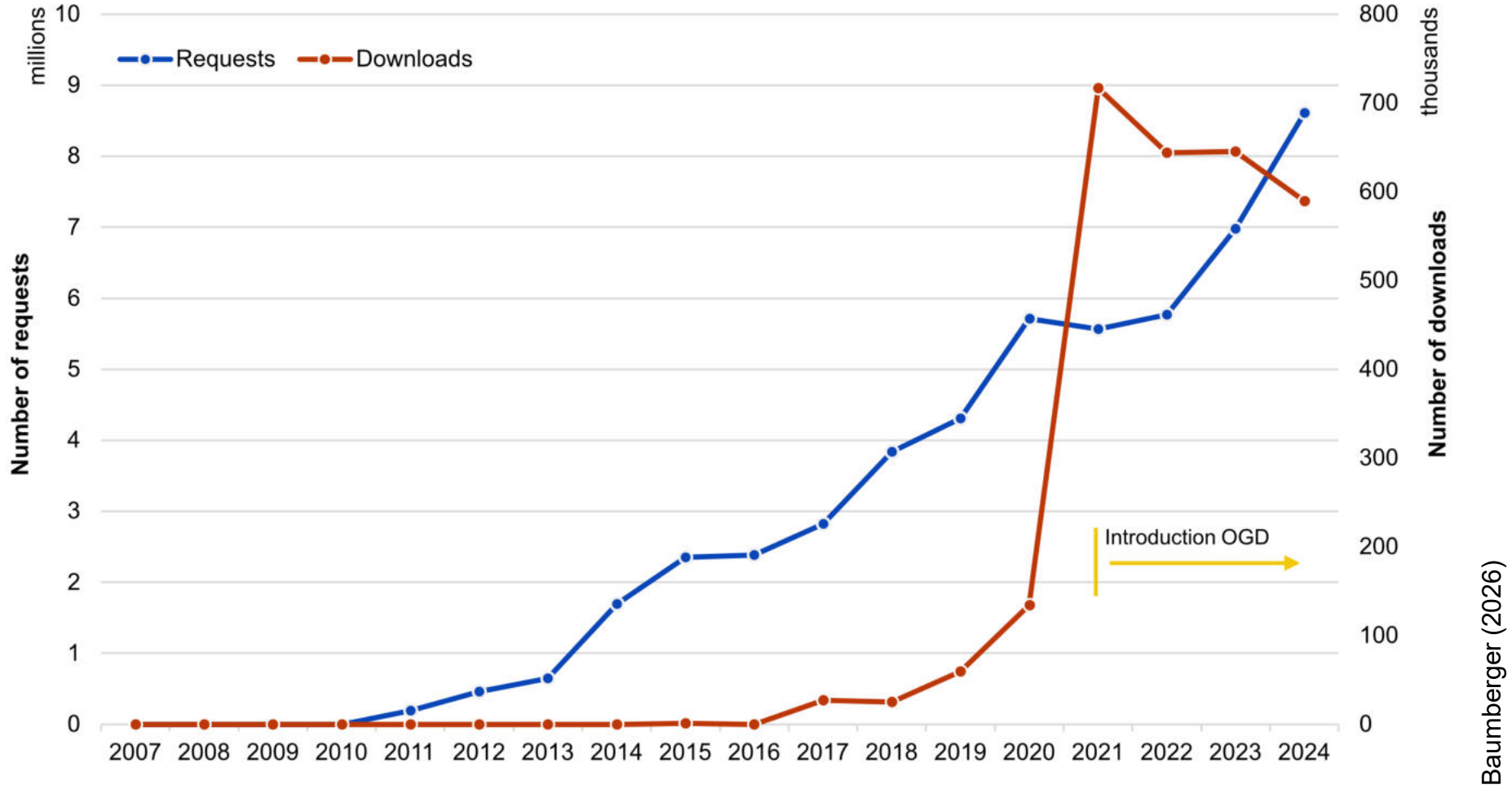
Costs and revenues to produce geological data

Models, maps, other datasets



Geological data sets on the federal geodata portal

https://map.geo.admin.ch



Result 2: The Cost/Benefit ratio



1 CHF invested → at least 20 CHF in social benefits – if data is open!

→ Publicly available geological data generate at least 20 times the value of the resources invested in them.
→ Probable estimate: 1:59;
→ Maximum estimate: 1:87.

Source: Baumberger (2026)

The numbers behind

Economic Benefit

WTP x Sales = Benefit

CHF 3,980 x 685,865 = CHF 2,66 Bn.

Minimum WTP estimation	Products + Downloads	Minimum value

Cost/Benefit ratio

Costs : Benefit = C/B ratio

CHF 133 Mio. : CHF 2,66 Bn. = **1:20**

Production costs 2010 – 2024 (excl. input data)	Minimum economic benefit	Minimum C/B ratio

Example: GeoMol + National Geological Model

GeoMol (2011 – 2017)

Interreg IV (DE, CH, F, I, A, SLO)



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Production costs: CHF 4 Mio.

Economic benefit:t CHF 80 Mio.

Minimum estimate

National Geological Model (2022 – 2032)



Talk by Eva Kurmann
today @ 14:05 – 14:25

© swisstopo

Production costs: CHF 27 Mio.

Economic benefit: CHF 540 Mio.

Minimum estimate

Example: Do not forget the value of the input data!

In many projects, existing data is reused.

Beer et al. (2005; Switzerland)

*"The economic value of a geological map is **6** to 8 times greater than the value of the data used to create it."*

Input data used in GeoMol and NGM

Data type	Value [kCHF]
Seismic data	300,000
Wells (incl. logs, etc.)	200,000
Maps	200,000
Boreholes	100,000
Total	**800,000**

Benefit calculation Swiss 3D Models

Type of benefit	Amount [kCHF]
Beer et al. (2005)	4,800,000
Baumberger (2026)	620,000
Total	**5,420,000**

Result 3 – Savings in Cost and Time

Additional study results

Question
Does the use of federal geological data in projects result in cost and time savings?

- **Potential Savings**
  Total reported costs of the projects described: CHF 47.9 billion over the past 5 years

- **Additional Costs**
  Expected additional costs in the event of unavailability of geological data

When data is publicly available

Potential savings in projects

Type	Amount
Time [%]	≥ 20
Costs [%]	≥ 10
Costs [kCHF; 5 years]	4,790,000

Source: Baumberger (2026)

When data is **not** publicly available

Additional Costs

Type	Amount
Costs [%]	5
Costs [kCHF; 5 years]	2,440

Source: Baumberger (2026)

What can we take away from this?

1. **Geological data is infrastructure.**
   Its value comes from use, not from sale.

2. **Open Data generates economic benefits.**
   Investment of 1 CHF → at least 20 CHF in benefits.

3. **Geological data is an economic factor.**
   Geological data serve as a catalyst for larger projects

→ **The crucial question is NOT:**
What can we charge for the data?

→ **The crucial question is RATHER:**
What impact can we generate with this data?

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Economic benefits of publicly available geological data: A willingness-to-pay and cost-benefit analysis from Switzerland (2007–2024)

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ABSTRACT

Geological data plays a crucial role in minimizing planning and investment risks for underground activities and, therefore, enables safe and efficient use of the subsurface. Collecting, processing, archiving and publishing this data is complex and expensive. However, the actual price of doing so is well documented. The often lack of subsurface data leads to inefficiencies, costly duplicate surveys, and the loss of investment in the subsurface. However, the economic value of processed geological data provided by government institutions in the form of maps and models for a modest fee or free of charge, can no longer be easily determined.

This study clearly demonstrates the economic added value and macroeconomic benefits of making the Swiss federal government's geological data available to the public (period 2007-2024, IQR trimmed values): the minimum willingness to pay (CHF 3,990) for geological data that is existing, but not publicly available is significantly lower than the costs (CHF 27,733) that stakeholders would be willing to pay for their own data collection, if data exists and available against for a small fee. The conservatively calculated cost-benefit ratio (1:20), based on user's estimations, is clearly positive. This means that the production and provision costs (CHF 141.8 million) are considerably lower than the benefits generated (CHF 2.79 billion).

Significant efficiency gains can be achieved through the public provision of geological data, which is relevant for the economy, society and thus politics. The proven low willingness to pay, combined with a high cost-benefit ratio, demonstrates the need for continued public access and tax-financed production of this data.

1. Introduction

Pressure on the available space on the earth's surface is growing. Population growth and social welfare lead to an increasing need for space for infrastructure construction. The subsurface offers space to relocate infrastructure (e.g., traffic, energy, shopping centers) below the earth's surface, store heat and cold, or store materials (e.g., CO_2, radioactive waste). It is used as habitat as well as a source of georesources (e.g. drinking water, mineral raw materials, renewable energies). Detailed and time-consuming planning and large investments are necessary to realize underground uses. Geological data play an important role in this, including minimizing risk and securing investments already made in the subsurface. Collecting and processing these data are complex, time-consuming, and expensive (e.g., Bernkopf et al., 1995). The ability to use existing own data as well as additional publicly available geological data can therefore be an important building block for the efficient use of the finite resource that is the subsurface.

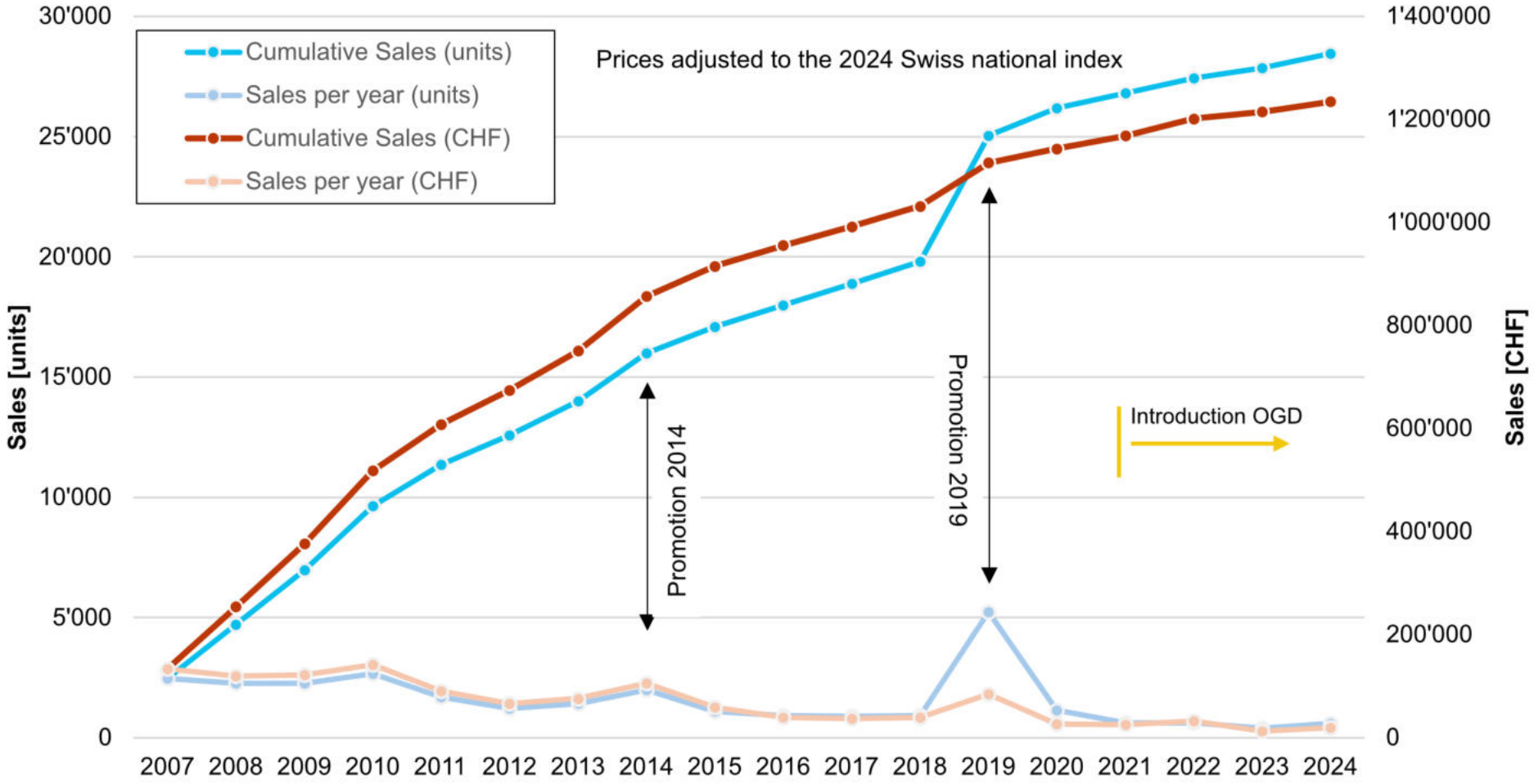
Due to often lacking knowledge on the existence or availability of geological data at certain locations, project planners often struggle to work on supra-regional and national projects. Consequently, this situation leads to expensive duplicate surveys and inefficiencies. Publicly available geological data produced and distributed by government agencies can alleviate this problem. They enable third parties to use existing data sets for their own projects, eliminating redundant data collection in many cases. The personnel and financial resources saved in this way can be used elsewhere. This minimizes the planning risk underground and increases investment security (e.g., quality assurance in planning projects, interpretation of data). The quality of forecasts increases when they are based on as much up-to-date data as possible. While a clear price can be assigned to geological data during collection, this is no longer possible after processing, editing, and interpretation, as these process steps rely, among other things, on the implicit and explicit knowledge of the staff members and other data. The economic benefits of publicly accessible geological data increase with succeeding processing steps but are therefore no longer easy to determine.

This study distinguishes three categories of geological data: (1) Geological information products include synthesized outputs such as geological maps at various scales (e.g., 1:25,000 and 1:500,000) and

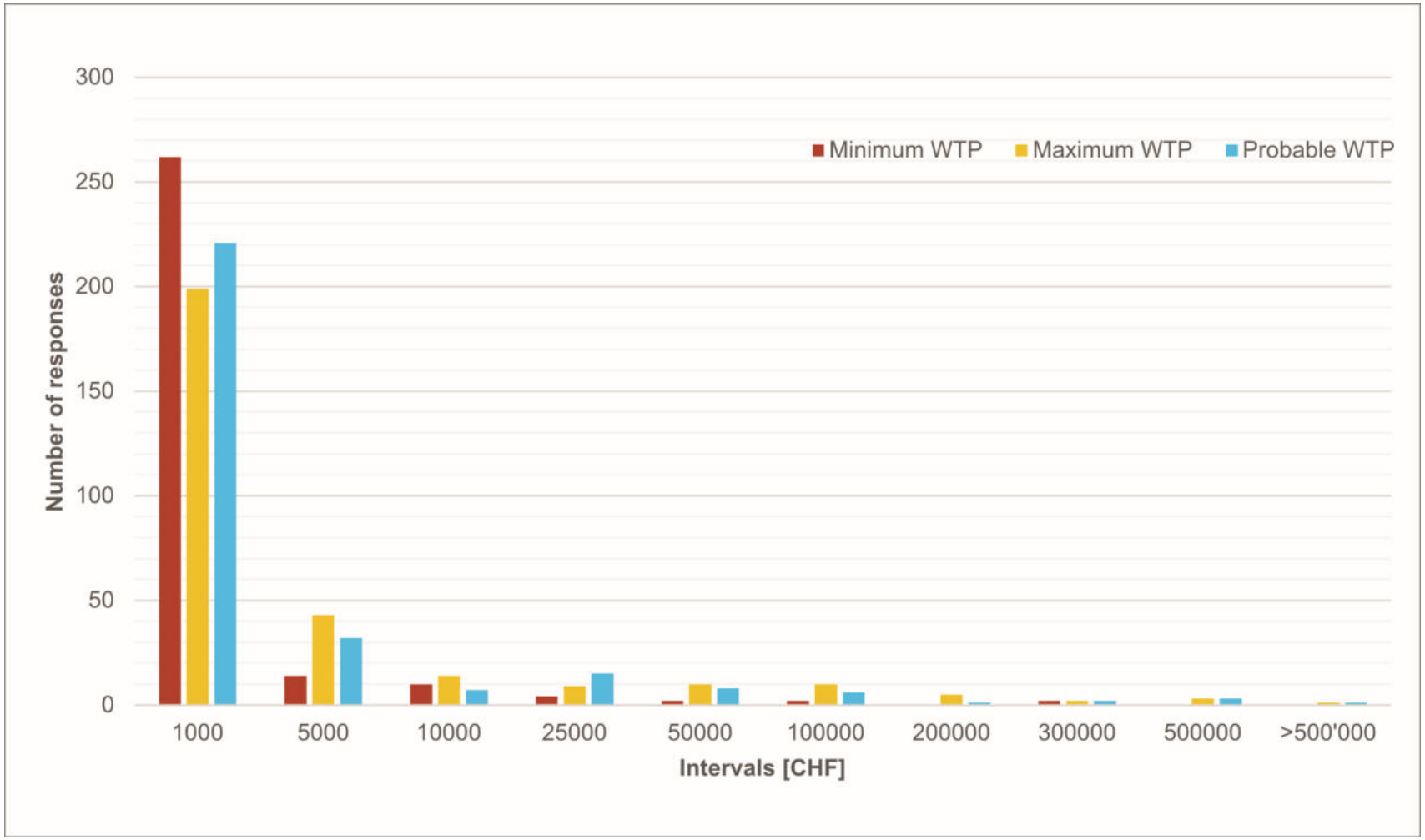
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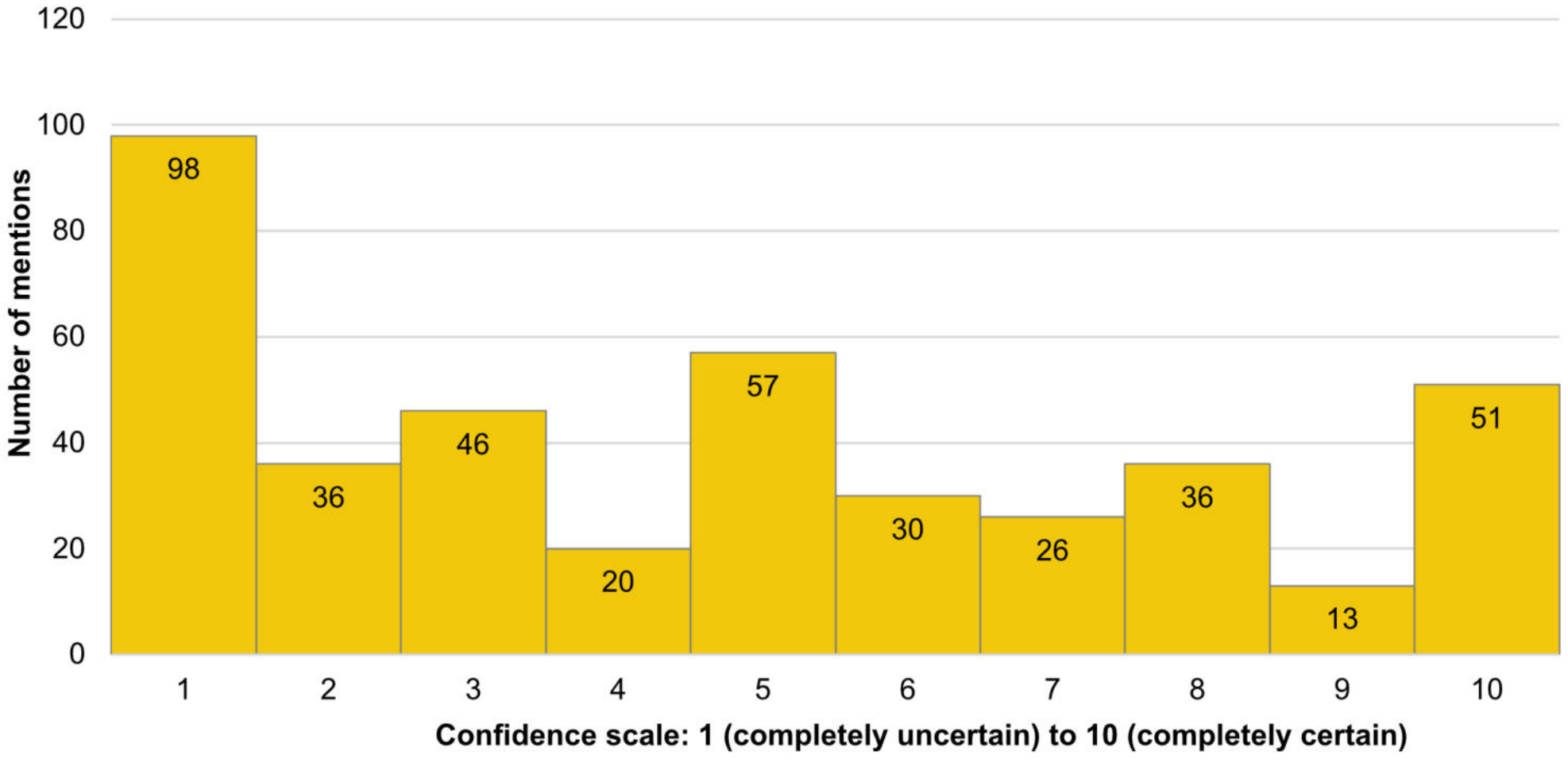
Sales figures 2007 – 2024



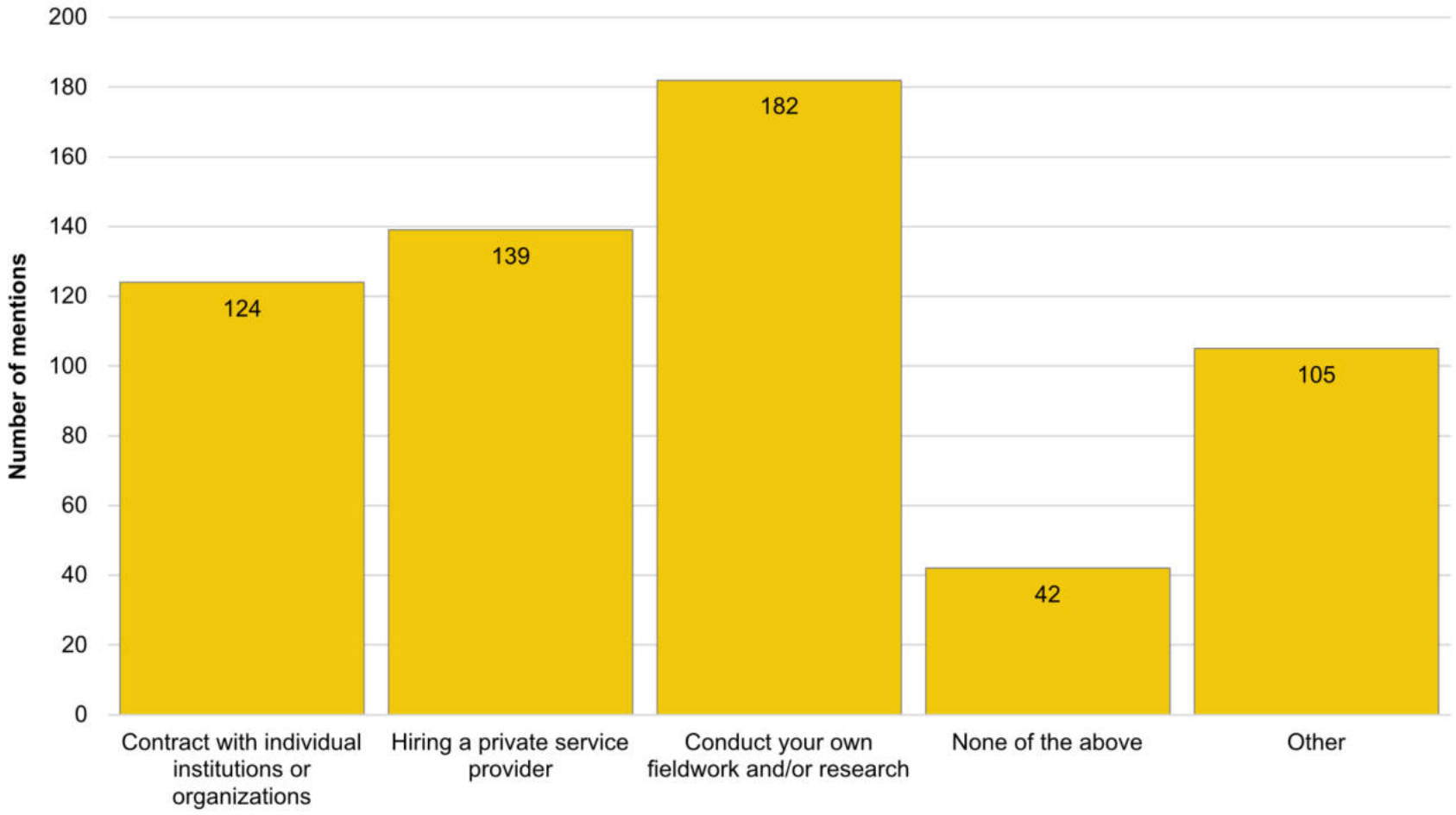
Willingness to pay



Confidence in WTP estimation



When data is not available, then…



Graphical abstract

