



**UNIVERSITÉ  
DE GENÈVE**

INSTITUTE FOR  
ENVIRONMENTAL  
SCIENCES

# Energy savings calculation methods in practice

Analysis of regional utility-driven energy efficiency programme data

Thomas Guibentif, PhD candidate

Energy Evaluation Europe 2021

Virtual event, 10-16<sup>th</sup> March 2021

# Presentation layout

## Context

- “Replicability crisis”
- Case study

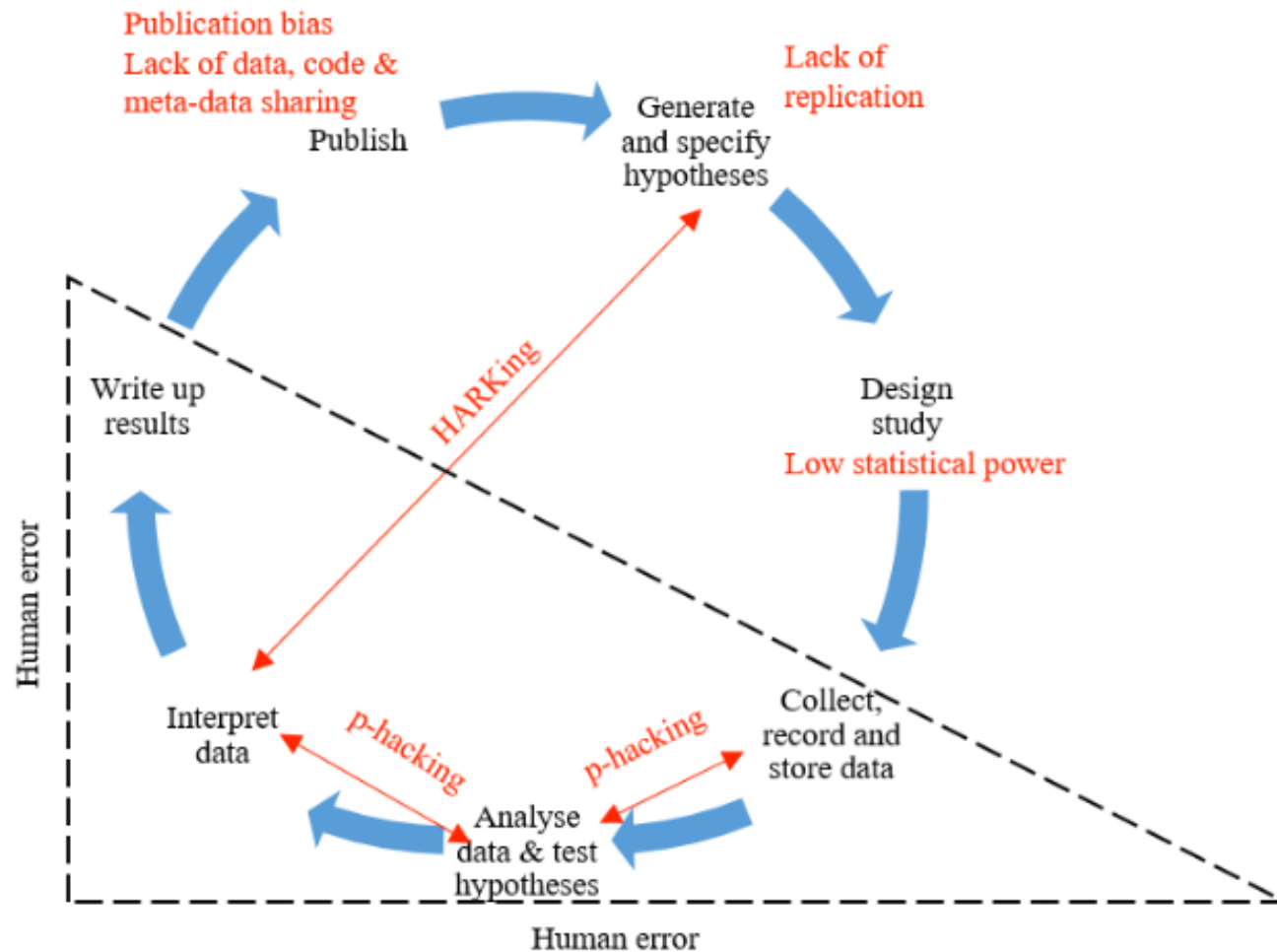
## Data and methods

- Energy efficiency measures and consumption data
- Saving estimation method assesment

## Results

- Significant gap and uncertainty
- Usability for small savings

# Replicability crisis



Source: Huebner, G. M. et al. *Are We Heading towards a Replicability Crisis in Energy Efficiency Research? A Toolkit for Improving the Quality, Transparency and Replicability of Energy Efficiency Impact Evaluations*. In *ECEEE Summer Study Proceedings*, 11. ECEEE, 2017.

# Case study

## **The energy efficiency programme**

- Utility-led EE Programme in a west-swiss canton started in 2008
- Comprehensive targeting of energy consumption and strong link with stakeholders

## **The Efficient Lighting sub-programme**

- Over 5000 technology replacement projects since in 2011 in Common Areas of Buildings and SMEs
- Largest savings volume (along with other uses in large enterprises)
  - “Low hanging fruits”
- Now mature and phasing out following new regulation on incandescent bulbs

# Data

Projet

Zone 1 : Test 1

☒ Installation 1.1 :

Installation existante		Installation optimisée	
Nom	Exemples : Spots vitrine, plafonniers, lampade		
Caractéristiques techniques			
Type de source lumineuse	---		
Nombre de luminaires			
Nombre sources par luminaire	---		
Puissance par source [W]			
Puissance totale			
Temps de fonctionnement			
Type de régulation	---	aucun	
Horaire	À 100% 0.5 h/jour	À 100%	h/jour
	Veille 0 h/jour	Veille	h/jour
Puissance en veille 0 % (pas de veille)		Puissance en veille %	
Données économiques			
Coût d'entretien annuel	CHF/an		
Commentaires	Exemple : Température de couleur 3000K max		

Résumé

ROI net

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Test

[Voir dans l'espace privé](#)

## Programme data

- Detailed description of >5000 Lighting EEM

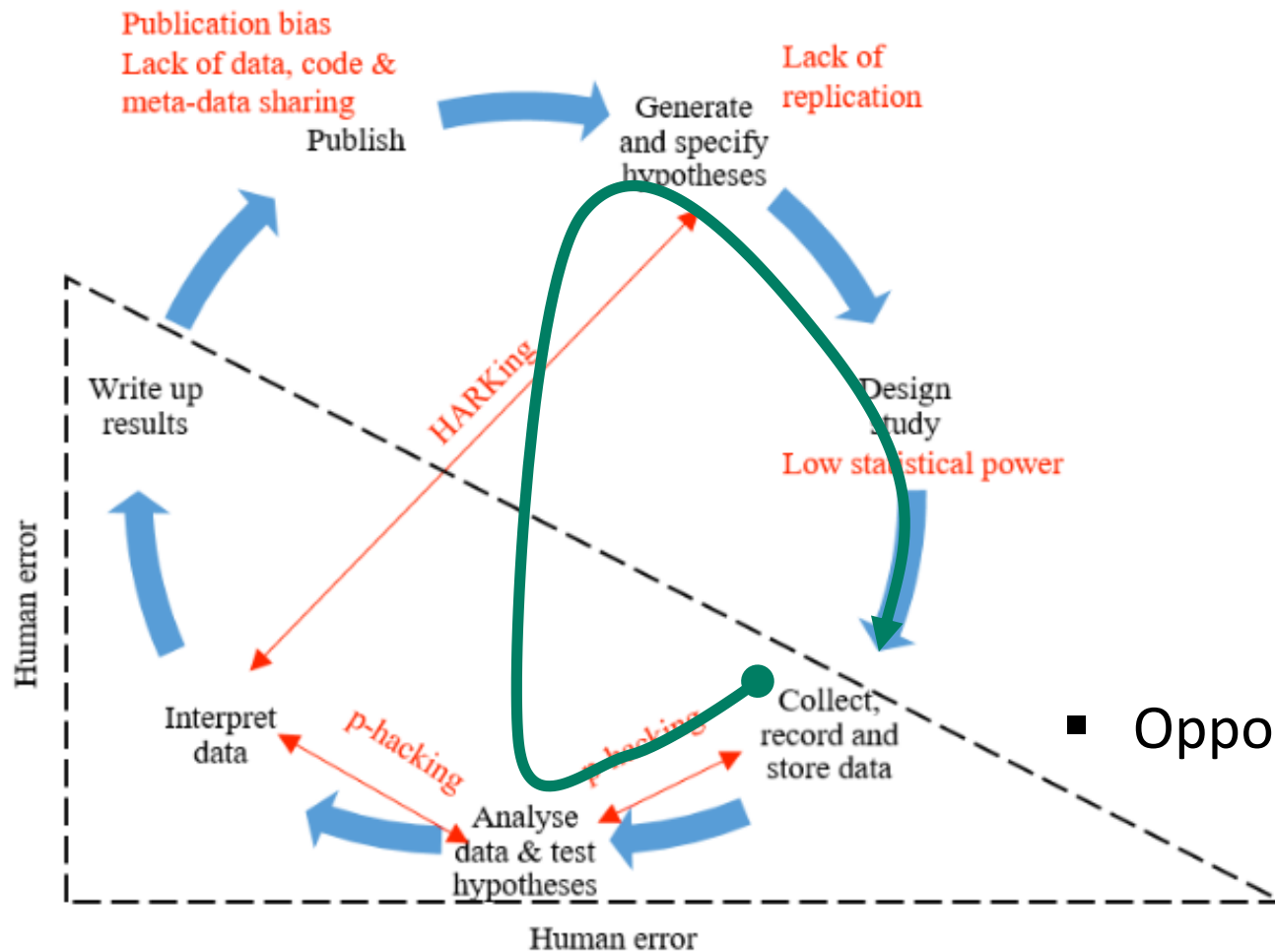
ID & time

## Utility data

- "Bill data" vs. "Meter data"



# Data

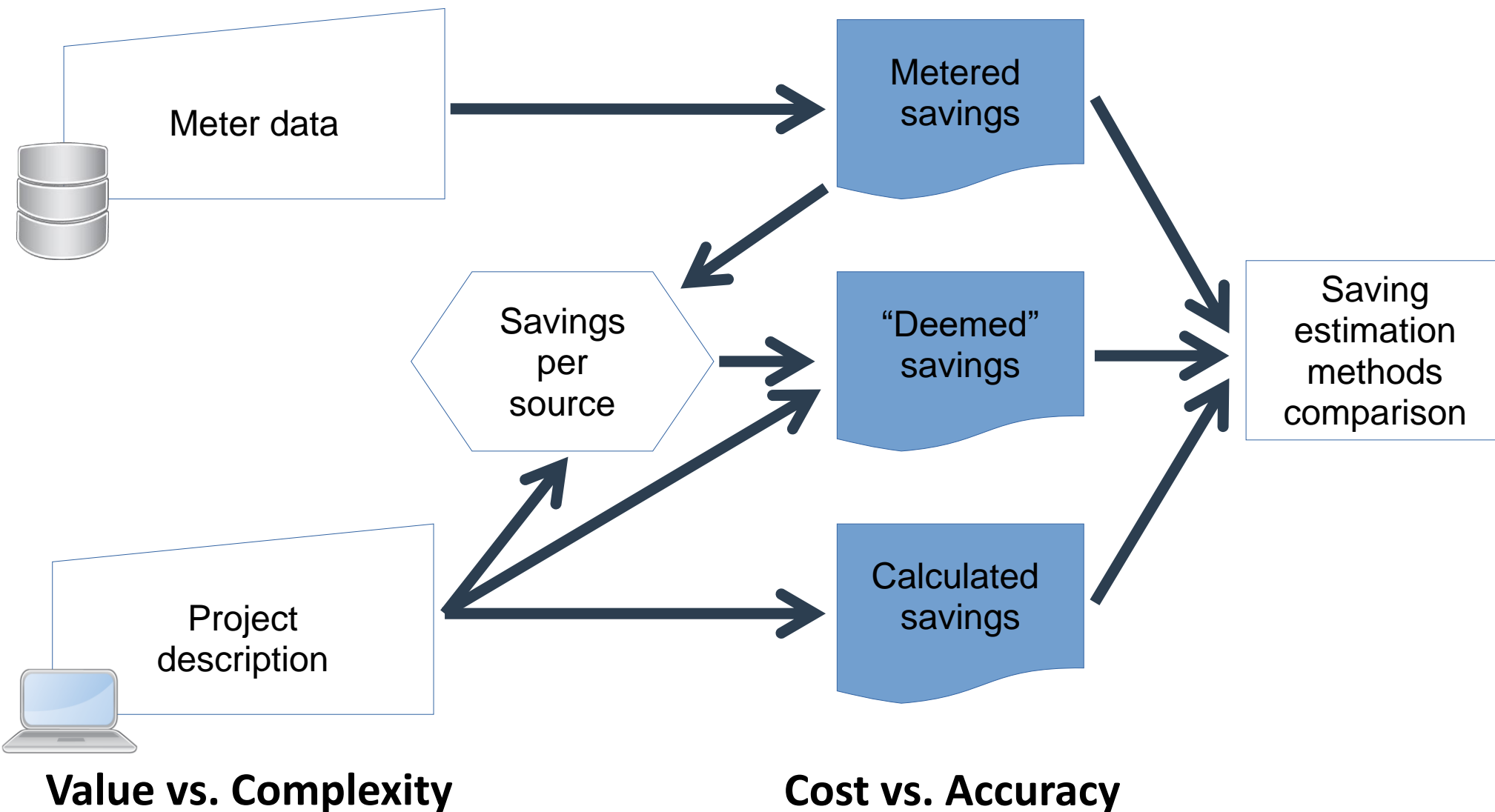


## A timeline issue

- Opportunity-based data collection
- No prior study design
- Poor data quality

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# Methods

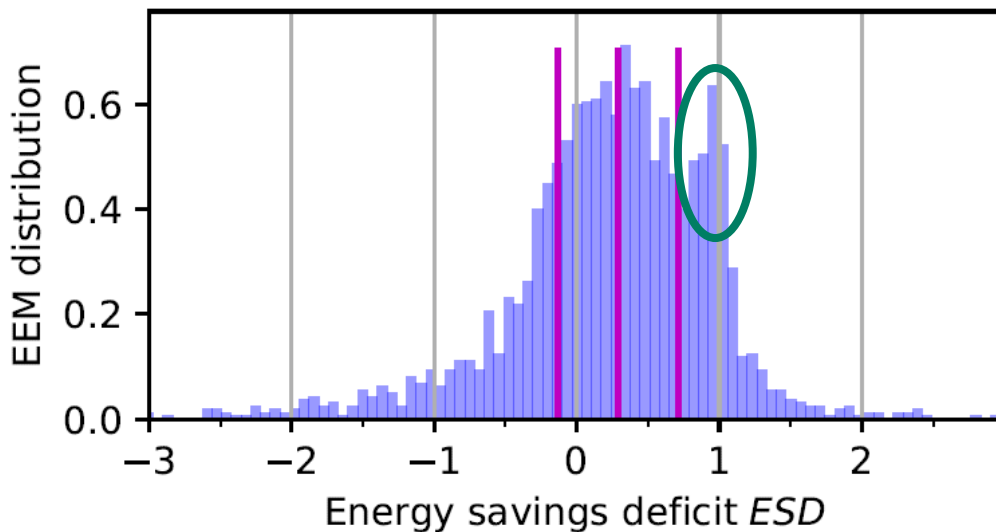


# Saving estimation methods comparison

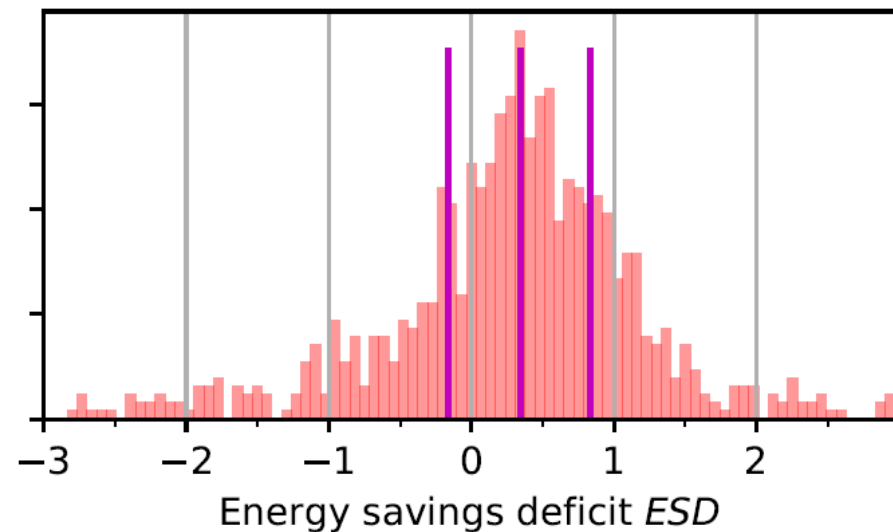
## Energy Savings Deficit

$$\text{ESD}_{r,\nu} = \frac{\Delta_r E_\nu - \Delta_m E_\nu}{\Delta_r E_\nu}$$

CAB  $N=2351$ ,  $Q2=0.29$ ,  
 $Q1=-0.13$ ,  $Q3=0.72$

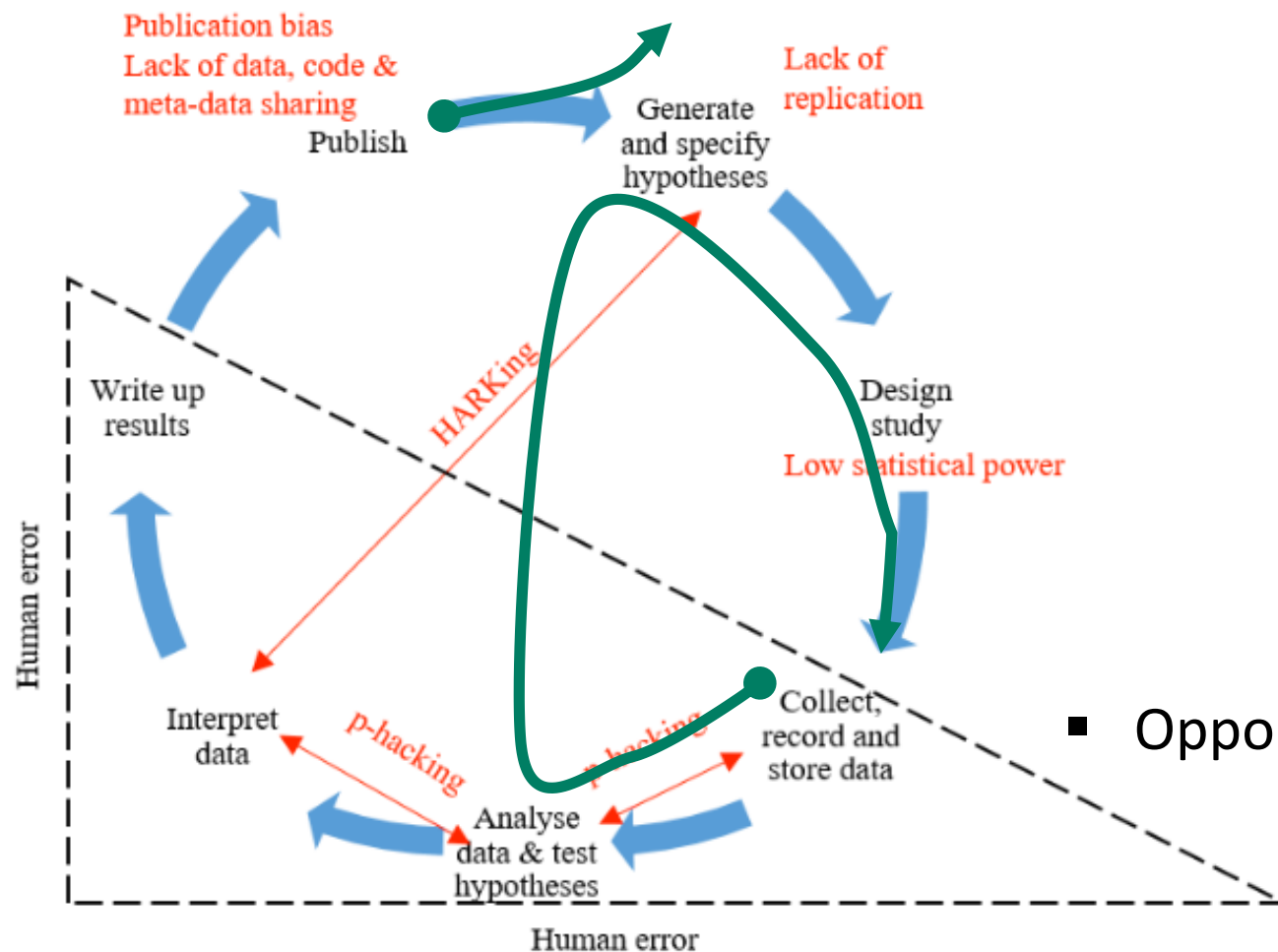


SME  $N=931$ ,  $Q2=0.35$ ,  
 $Q1=-0.17$ ,  $Q3=0.84$





# Methods



## A usability issue

- Statistical significance vs.
  - Practical significance

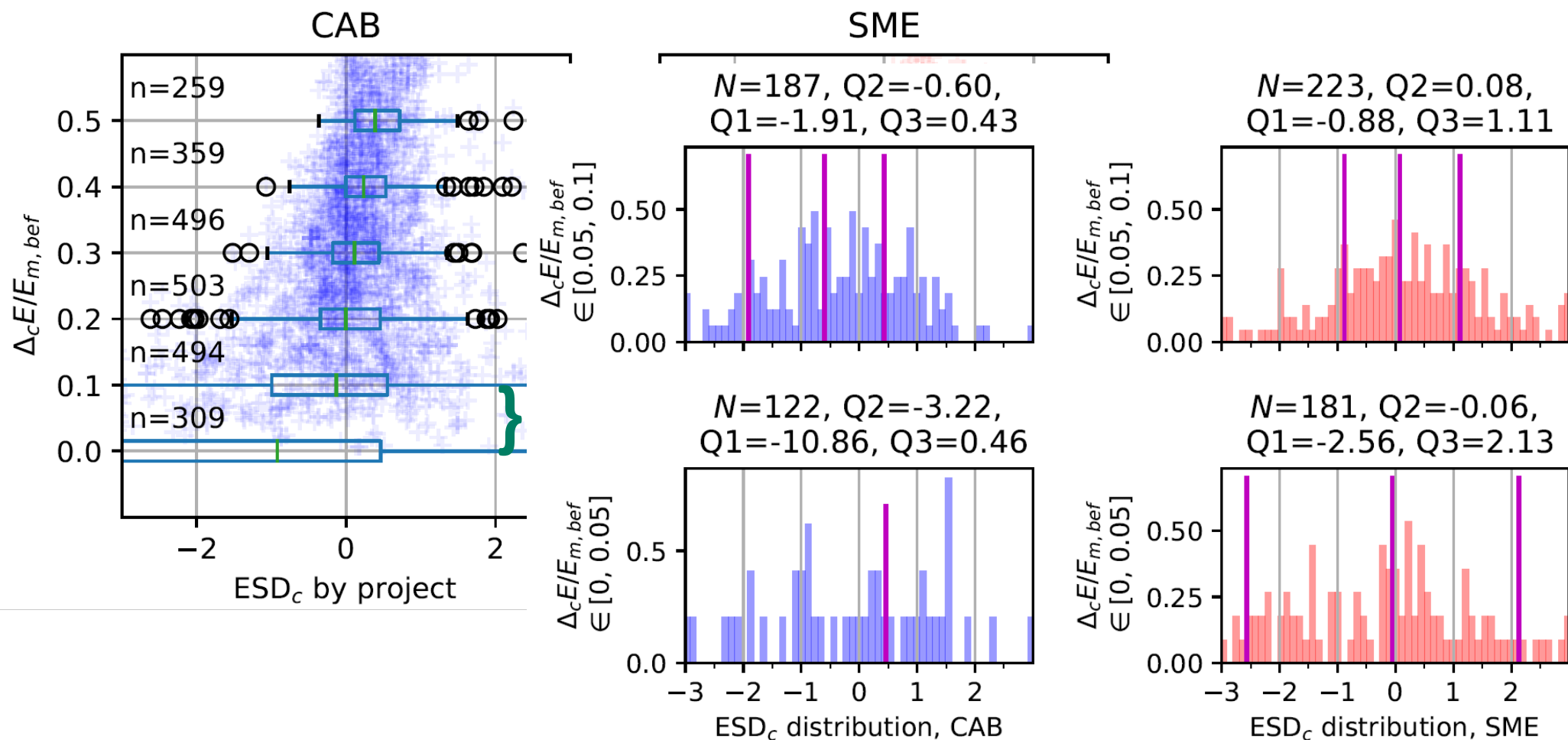
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# Sensitivity to savings magnitude

## 5% rule of thumb



# Conclusions

## **Energy research is especially subject to “real world” constraints**

- Data accessibility / quality (basic data might be missing)
- Usability of results
- Need for standards

## **The ESD distribution could be a useful tool for EEP assessment**

- Relatively low cost (computationally simple, little data)
- Visual detection of systematic errors
- Quantification of the systematic bias and variability (both large...)
- Effective for relatively small EEM (>5%) if sample size is enough

## **Further research**

- Assess other saving estimation methods to find optimal complexity
- Statistical treatment of the distributions



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# Thank you for your attention

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Special thanks to :



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