The hidden pitfalls in evaluating the cost-effectiveness of energy efficiency policies: a call for theoretical and quantitative rigor

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EXTENDED ABSTRACT

Introduction: The importance and pitfalls of cost-effectiveness evaluations

Cost-effectiveness is a widely adopted metric used to evaluate energy efficiency policies and programs across Europe and beyond. It plays a crucial role in determining policy viability, prioritising resource allocation, and guiding strategic investments. However, despite its centrality in energy policy assessments, cost-effectiveness analyses are frequently undermined by significant methodological inconsistencies. Evaluators often conflate distinct analytical perspectives – ranging from the individual consumer or participant viewpoint to broader societal or governmental standpoints – and employ inconsistent methods in handling multiple benefits (such as improved health outcomes), incremental costs, and transfer payments like taxes and subsidies. These methodological ambiguities affect the reliability and comparability of evaluations. In addition, they risk producing misleading outcomes, potentially misguiding policymakers and undermining stakeholder confidence.

Methodological review: Contrasting frameworks

This presentation addresses these critical challenges by advocating for greater theoretical clarity and quantitative precision in the evaluation of cost-effectiveness. It begins by systematically reviewing and contrasting key methodological frameworks: the US Environmental Protection Agency cost-effectiveness framework (U.S. EPA, 2008), the EU Better Regulation Toolbox (European Commission, 2023), and Germany's guidelines for evaluating energy efficiency policies (Schlomann et al., 2020). Each of these frameworks explicitly emphasises distinct analytical lenses and methodological guidelines. Nevertheless, evaluators often blend elements from these different approaches without clear rationales, diluting the analytical integrity (Patel et al., 2021).
This method review identified three recurring cost-effectiveness lenses for the European context: *societal* (economic analysis), *private* (financial analysis) and *state budget* (fiscal analysis) – as detailed in Table 1. In line with cost-benefit analysis (CBA) theory, each perspective should feature a different subset of cost items. For instance, the societal perspective should exclude taxes, subsidies and other public charges, since these merely redistribute funds without altering the total resource pool. This distinction of cost perspectives, among other CBA-related aspects, is detailed in the upcoming guidance titled 'A Practitioner's Guide to Capturing the EE1st Principle in Cost-Benefit Analysis' produced as part of the ongoing work of the Enefirst+ project. [1]

[1] Enefirst+. Plug Energy Efficiency First In. https://ee1st.eu/

Table 1. Recommended cost-item treatment across societal, private, and state-budget perspectives in CBA

Cost item		Perspective			Explanation
		Societal (economic analysis)	Private (financial analysis)	State-budget (fiscal analysis)	
A.1	Capital-related costs [a]	✓	✓	✗	Physical assets (equipment, installation, land, decommissioning) consume real resources, so they are a welfare cost (societal) and a cash outflow for the investor (private). They matter to the budget only if the State pays them directly, which is not the norm, hence exclusion from the pure fiscal column.
A.2	Operation-related costs [a]	✓	✓	✗	O&M and fuel are ongoing resource uses: society counts them and so does the owner who pays the bills. They do not usually flow through the Treasury, so they are absent from the fiscal view except where the State is itself the operator.
A.3	Public charges and transfers	✗	✓	✓	See **Error! Reference source not found.** Taxes, subsidies, emission-permit payments and levies shift money between actors but do not change the overall resource pool. They therefore drop out of the societal ledger, yet they alter investor cash flow (private) and the public balance sheet (fiscal).
A.4	Energy-related costs [a]	✓	✓	✗	Payments for purchased energy and network services represent real resource use (generation fuel, grid losses) and private expenditure. They are normally excluded from a strict fiscal ledger unless the State is the buyer or seller.
B.1	Transaction costs	✓	!?	✓	Time and effort spent on information search, negotiation and compliance are real resources, so society counts them. Private actors may or may not monetise these "hassle" costs. Governments should include their own administrative outlays – processing subsidy applications, inspections, reporting – because they directly affect public expenditures.
B.2	Other private non-market costs	✓	!?	✗	Comfort gains, stress reduction, and similar effects raise or lower welfare and thus enter the societal account. Private actors include them only if they perceive and monetise them; they do not affect public revenues or spending.
C.1	External costs [b]	✓	✗	✗	Climate damage, air-quality impacts, noise and land-use effects fall on society at large, so they are central to economic analysis. They are absent from private and fiscal views unless internalised through taxes or regulation (in which case they appear in A.3).

Legend: ✓ = normally included, !? = may be included, !? = normally excluded | [a] Excluding taxes, subsidies and other public transfers (A.3); [b] Excluding costs already internalised through public charges and transfers (A.3).

Quantitative illustration: A hypothetical retrofit programme

To concretely illustrate how methodological choices significantly influence evaluation outcomes, this presentation demonstrates a quantitative case study using a dedicated building sector policy model developed in the Enefirst+ project. Using plausible programme data (e.g., retrofit costs, energy savings, lifetimes, public grant contributions), the analysis systematically varies critical assumptions such as discount rates, inclusion of selected multiple benefits (air pollution, indoor temperature-related morbidity and mortality), incremental versus full investment costs, and treatment of taxes and transfer payments. The results illustrate how seemingly minor methodological differences can lead to considerably divergent conclusions on programme cost-effectiveness. For example, altering assumptions about incremental costs or societal externalities can shift benefit-cost ratios from clearly cost-effective (1.28) to marginally or even strongly cost-ineffective (0.73).

Recommendations: Ensuring methodological consistency and clarity

Based on these theoretical and quantitative explorations, this presentation argues for stronger methodological consistency and rigor in evaluating the cost-effectiveness of energy efficiency practices. It concludes by providing key recommendations to improve cost-effectiveness evaluations, emphasising:

- Clear delineation of analytical perspectives (societal, private, state budget). Evaluations should explicitly state the perspective from which cost-effectiveness is assessed to avoid confusion.
- Systematic inclusion or exclusion of multiple benefits based on explicit theoretical justifications aligned with analytical perspectives.
- Standardised treatment of fiscal elements like taxes, subsidies, and other transfer payments, ensuring comparability across evaluations.

Conclusion: Towards improved evaluations and policy decisions

Implementing these recommendations can enhance the theoretical clarity, quantitative accuracy, and practical relevance of cost-effectiveness analyses. Ultimately, this can contribute to improved evaluation credibility while supporting better-informed decision-making and more effective energy policy outcomes.

References

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