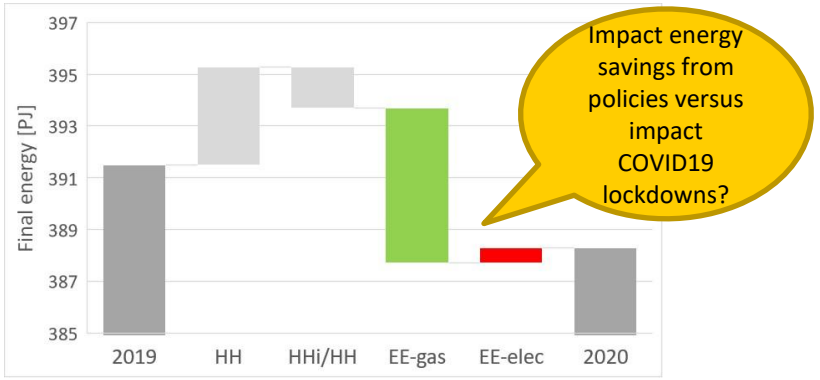
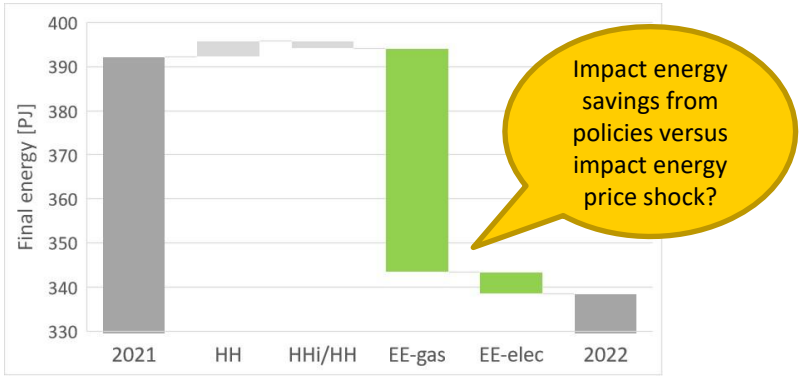
Understanding the development of Dutch residential energy use in the context of the Energy Efficiency Directive: combining top-down and bottom-up analysis

Robert Harmsen, r.harmsen@uu.nl
Copernicus Institute of Sustainable Development

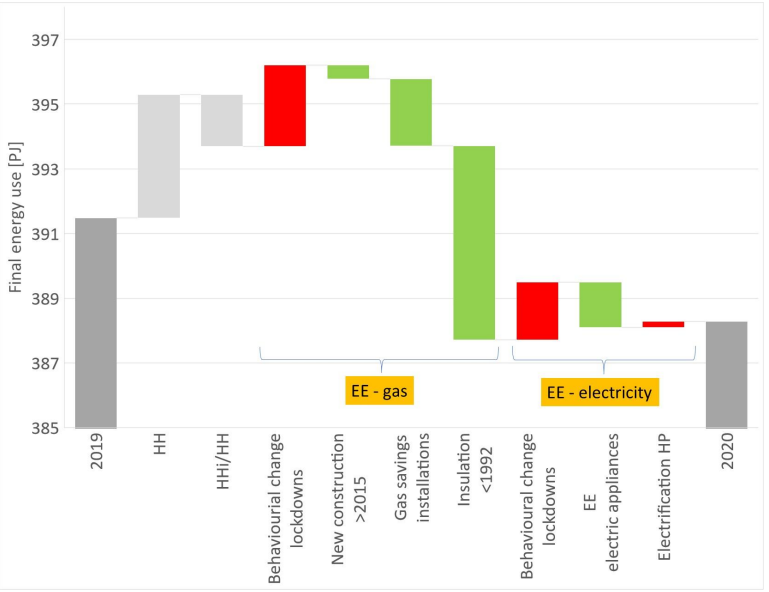


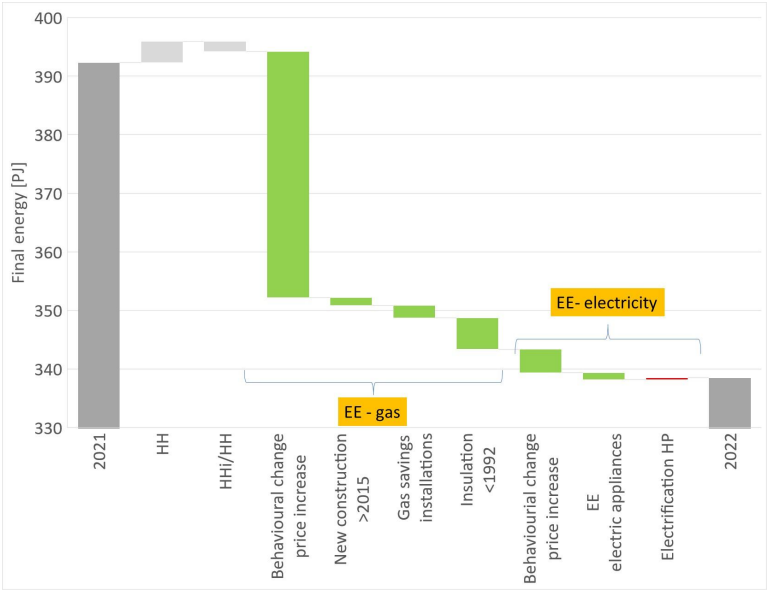


+

	2020	2022
Re-insulation existing stock [PJ]	6.0	5.3
Heating systems existing stock [PJ]	1.9	1.8
Savings electric appliances [PJ]	1.4	1.2
Total bottom-up savings [PJ]	**9.3**	**7.3**

=





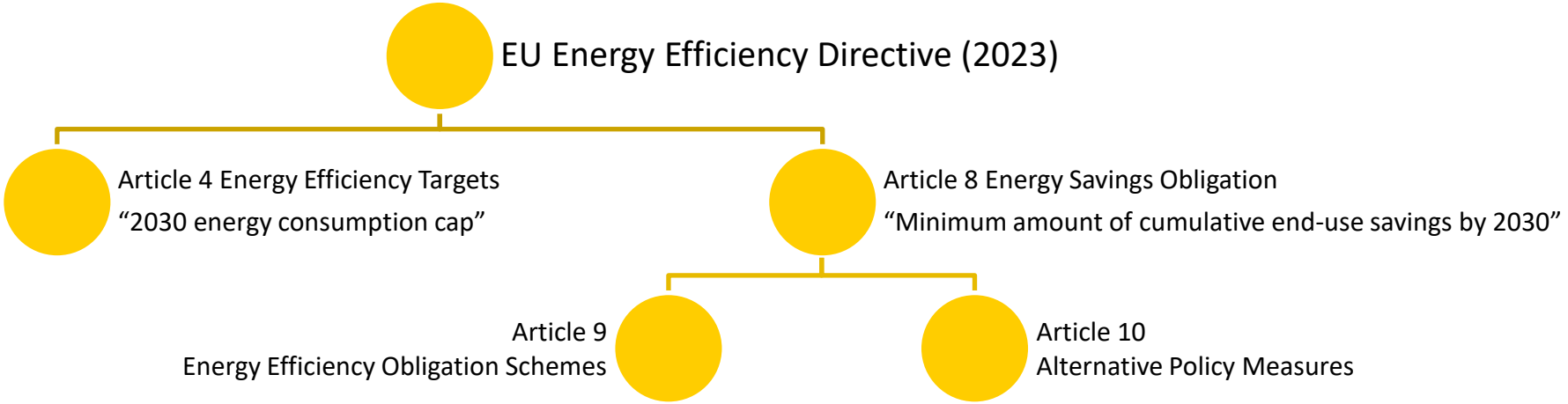
Top-down analysis (decomposition)

+

Bottom-up analysis

=

More insight



Although Article 4 & Article 8 work towards the same goal, their alignment is not always evident.
E.g., for the Netherlands, the Article 4 2020 target proved challenging for a long time, whereas meeting the Article 8 2020 target (using Article 10) seemed easy right from the start.

Whereas Article 4 & Article 8 are two sides of the same coin, they’re hardly analysed in tandem. Article 8 reporting to the EC often feels like a compliance check-box, esp. for member states that don’t use Article 9 exclusively.

Commission Recommendation (EU)2024/1590

1) Monitor the trends in final energy consumption (Article 4) and reported energy savings (Article 8) to see if they are consistent […]
2) Explain the changes or gaps observed […]

Objective:
Assess the alignment of the efficiency target (Article 4) and the savings obligation (Article 8) by analysing final energy use of the Dutch residential sector

Research questions:
1) To what extent are the policy induced energy savings reported under Article 8 of the EED consistent with the trend in final energy consumption (Article 4)?
2) If not consistent: What explains the differences?
3) Can insight in the differences be used to assess the accuracy of savings estimates under Article 8?

Analysis period:

2020 & 2021: COVID19 lockdowns

2022 & 2023: spiking energy prices

Approach:

- Chained decomposition analysis
- Refining the *Energy Efficiency Effect* from the decomposition with bottom-up insights

Decomposition equation:

Δ final energy (PJ)

=

Δ number of households (PJ)

+

Δ share of construction periods (Σ PJ)

+

Δ share of dwellings (single or multi-family) in a construction period (Σ PJ)

+

Δ final energy (gas or electricity) in a dwelling (single or multi-family) in a construction period (Σ PJ)

Δ number of households (#)
=
Δ share of one-person and multi-person households (#)
+
Δ number of people per multi-person household (#)

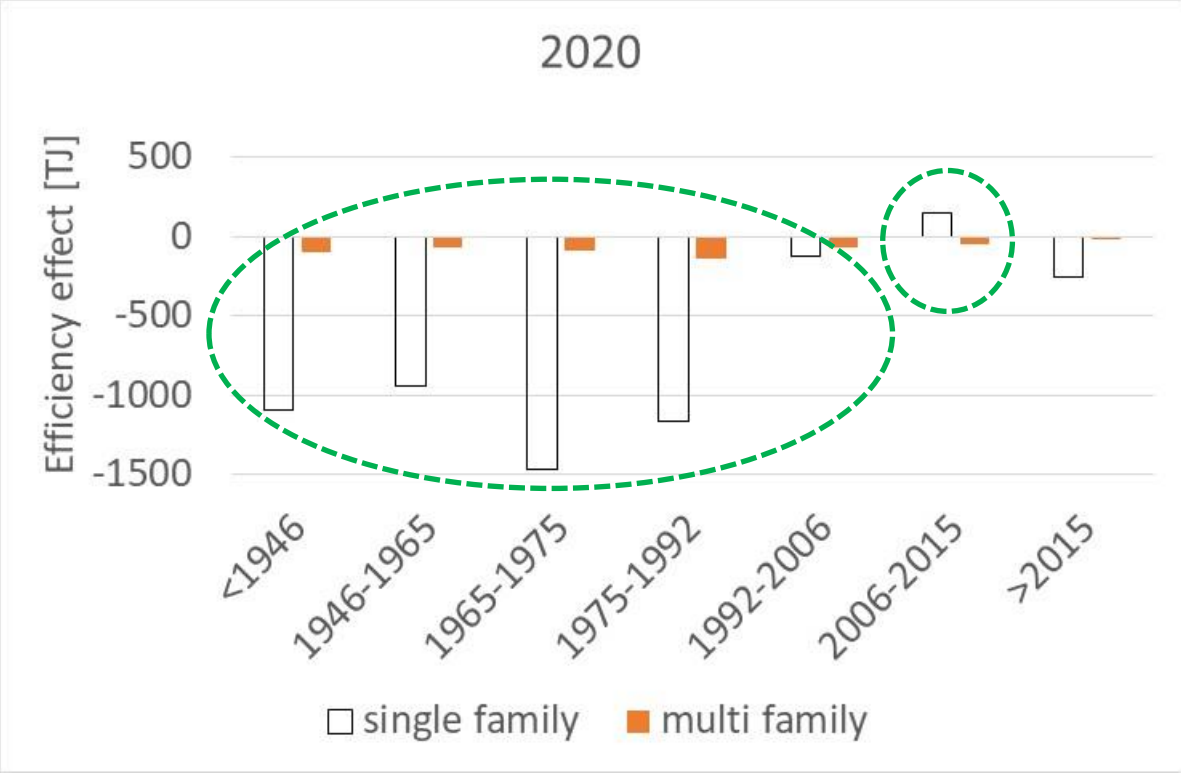
< 1946
1946-1965
1965-1975
1975-1992
1992-2006
2006-2015
> 2015

NL:
64% single family homes
36% multi-family homes

Final energy consumption for space heating normalized for heating degree days

Top-down efficiency effect in more detail:

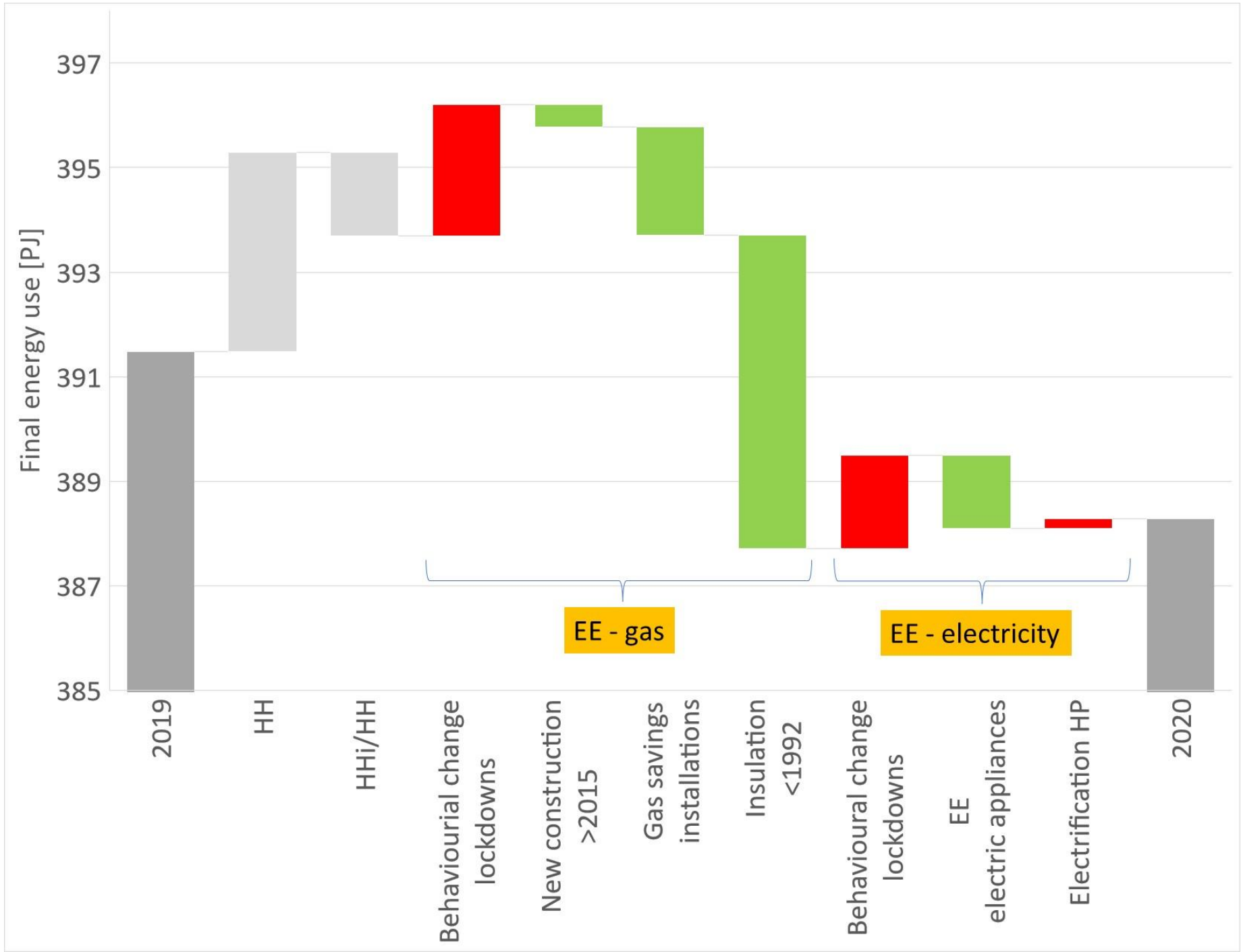
SCALE!!



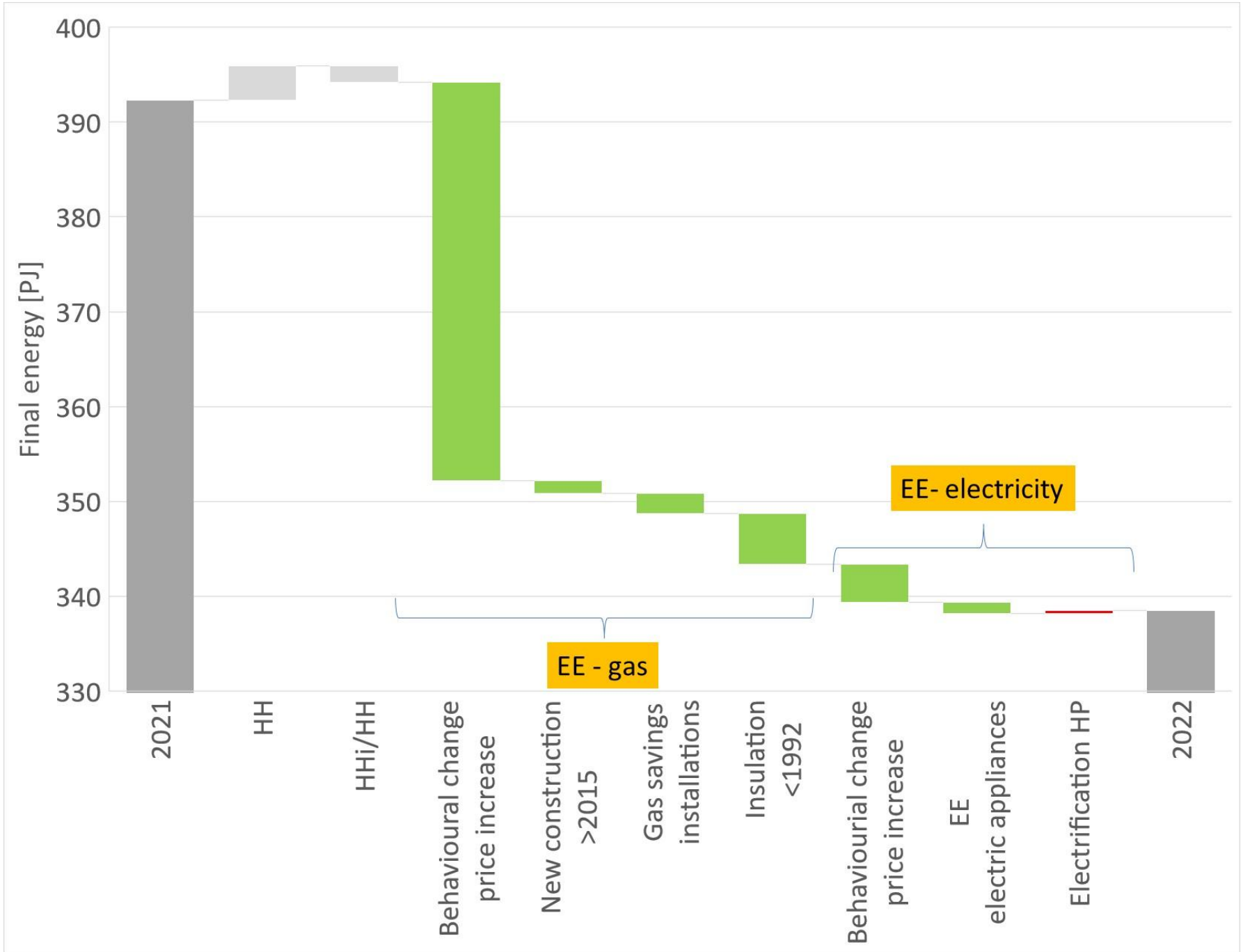
Significant more efficiency effect in single family homes and older construction periods
Positive efficiency effect (more final energy use) 2006-2015 homes: visible lockdown effect?

Negative efficiency effect 2006-2015 homes primarily explained by behavioural change (price shock effect)?

Utrecht University



Utrecht University



Utrecht University

Concluding remarks:

Our findings show that bottom-up and top-down evaluations can complement each other:

Bottom-up analysis helps disentangling efficiency effects in top-down evaluations

Top-down analysis contextualizes bottom-up policy impacts and can potentially be used for consistency checks

Combining these approaches can provide a clearer assessment of the contribution of (combined) energy efficiency policies to energy security and climate goals

However, although encouraged by the European Commission, monitoring of the consistency between the efficiency target and the savings obligation is not (yet) a given

Thank you for your attention!

Questions?

Utrecht University

Sharing science,
shaping tomorrow