Balancing distributional equity and public budget constraints in the fossil fuel phase-out

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Motivation

- Large fossil fuel dependency of European countries (60% of EU final energy consumption) \(^{(\text{EuroStat}, 2022)}\) including imports from geopolitically unstable regions
  - Heating as one driver of fossil fuel use and greenhouse gas emissions (17% of total energy related GHG emissions in EU) \(^{(\text{UNFCCC}, 2023)}\)

- Green investment needs and public budget constraints
  - Strong increase in public deficits in the EU in recent years [4.9% p.a. 2020-2022 vs. 1.0% p.a. 2014-2019] \(^{(\text{Eurostat}, 2023)}\)
  - (Underestimated) investment needs for carbon-neutral transition \(^{(\text{Kapeller et al., 2023; EC, 2020}}\)

- Policy ambition
  - Current political debate in Germany (Wärmewende) and Austria (Erneuerbare Wärme Gesätz, EWG)
In this study, we

- estimate total investment related to the fossil fuel phase-out in the residential housing sector for Austria based on micro-level household data
- estimate necessary public funds of the current subsidy program, and analyse it with respect to distributional equity
- derive net investment need across income groups (vertical equity)
- and identify determinants of horizontal equity, i.e. drivers beyond income for adversely affects household groups
Method
Overview Microsimulation

○ Starting point: every household will switch to a renewable heating system at some point during the transition phase (no endogenous investment decision)

○ Investment costs depend on
  • Living area
  • Assumed heating system (transition matrix for building type and location)
  • Required thermal renovation
Method
Overview Microsimulation

- Subsidy scheme (based on communication of the ministry (BMK, 2023))
  - Heating system
    - technology-specific flat-rate subsidies (Raus aus Öl und Gas)
    - full compensation for SFH home owner in lowest third of income distribution, up to a technology-specific threshold (Sauber Heizen für Alle, SHFA)
  - Thermal renovation: flat-rate subsidies (Sanierungsbonus)

- Database
  - Household budget survey (Konsumerhebung 2019/20 (Statistik Austria, 2022))
    - 7,139 Household observations
    - Use of economic data, dwelling data, housing tenure, urban-rural typology
  - Assumption: investment costs for tenant-occupied dwellings are covered by landlords (based on distribution of residence real estate ECB HFCS (Humer et al. 2015))
**Results**

**Investment: Total**

- Bottom-up estimate of total investment costs for heating fossil fuel phase-out (incl. necessary renovation)
  - € 67 bn over the transition period
  - Comparable range to top-down estimate
    - € 47-71 bn for total investment (public and private, renovation and heating systems, 2022-2030) (Umweltbundesamt 2022)
  - 28% of investment in tenant-occupied dwellings (importance of landlord-tenant relationships)

<table>
<thead>
<tr>
<th></th>
<th>Owner-occupied homes</th>
<th>Tenant-occupied homes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating system change</td>
<td>€ 14.5 bn</td>
<td>€ 3.6 bn</td>
</tr>
<tr>
<td>Required thermal renovation</td>
<td>€ 33.2 bn</td>
<td>€ 15.4 bn</td>
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</tbody>
</table>
Support from the current subsidy program corresponds to estimated €45.5 bn over the phase-out period.

- Strongly increased estimate, compared to Austrian WEM scenario (subsidies for renovation and heating systems 2020-2050): €13.1 bn (Umweltbundesamt 2022)

## Results

### Subsidy program: total

<table>
<thead>
<tr>
<th></th>
<th>Owner-occupied homes</th>
<th>Tenant-occupied homes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment</td>
<td>€ 47.6 bn</td>
<td>€ 18.9 bn</td>
<td>€ 66.5 bn</td>
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<tr>
<td>Subsidies</td>
<td>€ 31.4 bn</td>
<td>€ 14.1 bn</td>
<td>€ 45.5 bn</td>
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<tr>
<td>Net investment</td>
<td>€ 16.2 bn</td>
<td>€ 4.8 bn</td>
<td>€ 21.0 bn</td>
</tr>
</tbody>
</table>
Results
Investment: distribution

- If landlords have to finance the phase-out in rented dwellings, 53% of the total investment need is attributed to high-income households [V16-20] (33% to V19-20 alone).
- Investment need for tenant-occupied dwellings is much stronger distributed towards high-income households than investment need for home owners.

![Graph showing investment distribution](image-url)
Assuming that home owners and landlords finance investment and followingly receive subsidies, the subsidy scheme is progressive across income groups but high-income households [V16-20] receive 53% of government support.

Results
Subsidy program: distribution
Results

Net investment: distribution

○ progressive (vertical) distribution of net investment for home owners and especially landlords
The specific subsidy program for low-income households (SHFA) makes the subsidy scheme progressive.

However, SHFA does not address home owners in MFHs and thermal renovation investment.

The largest financial burden in terms of net investment remains on lowest-income home owners.
Summary

- Investment need of € 67 bn over the transition period, corresponding to ~2.5% annual national investment (until 2040)

- More than two thirds financed by public subsidies of € 46 bn, corresponding to 40% of pre-COVID total annual public subsidies (until 2040)

- More than halve of these subsidies go to the high-income households
The subsidy scheme is compensating for higher relative investment needs of (most) low-income households (i.e. progressive).

However it is not compensating the high relatively investment need of low-income home owners in MFHs and cooperative housing and for renovation investments in general.

A mandated phase-out with an income-based cap on subsidies for the highest income deciles could address public budget constraints without compromising equity considerations.
Thanks!

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