Dynamic properties of

energy poverty measures

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Energy poverty concept

- social (household) impact of energy policies

- access vs efficiency

- capabilities (Sen approach)

- dimension of general poverty

- absolute vs relative measures

- actual expenditure vs modelled heating costs

Overlapping applied measures

- relative measure: LIHC
  - low income (lower than 60% of median after energy costs)
  - high costs (above median)
  - (model energy costs)
  - energy efficiency and income?
- absolute measure: spending more than 10% of income on energy bills
- subjective measure: ratio of households declaring to live in too cold flats/houses

To what extend do energy poverty measures depend on the population structure, building structure, income, energy prices and the quality of housing?

What is the optimal measure of energy poverty as an objective of energy/poverty policies?

Microsimulation model

- Polish Household Budget Survey (HBS) 2013 as a base population

- statistical imputation of the insulation from energy module

- the reweighing scheme to account for changes in population and building structure

- IV model of impact of income and thermal insulation on subjective energy poverty measure

- Quadratic almost ideal demand system - QAIDS with Lewbel prices (Banks, Blundell i Lewbel, 1997; Poi, 2012)

- random selection of households for retrofit policy

❶ population projection: age, gender, residence, region

❷ structure of buildings

❸ thermal insulation of the living area

❹ household income

❺ energy prices

Ageing - central statistical office projection

Year	<16	16-64	65-74	75+
2030	13.1	63.7	11.9	11.3
2020	14.8	66.3	11.8	7.1
2015	14.9	69.3	8.8	7.0
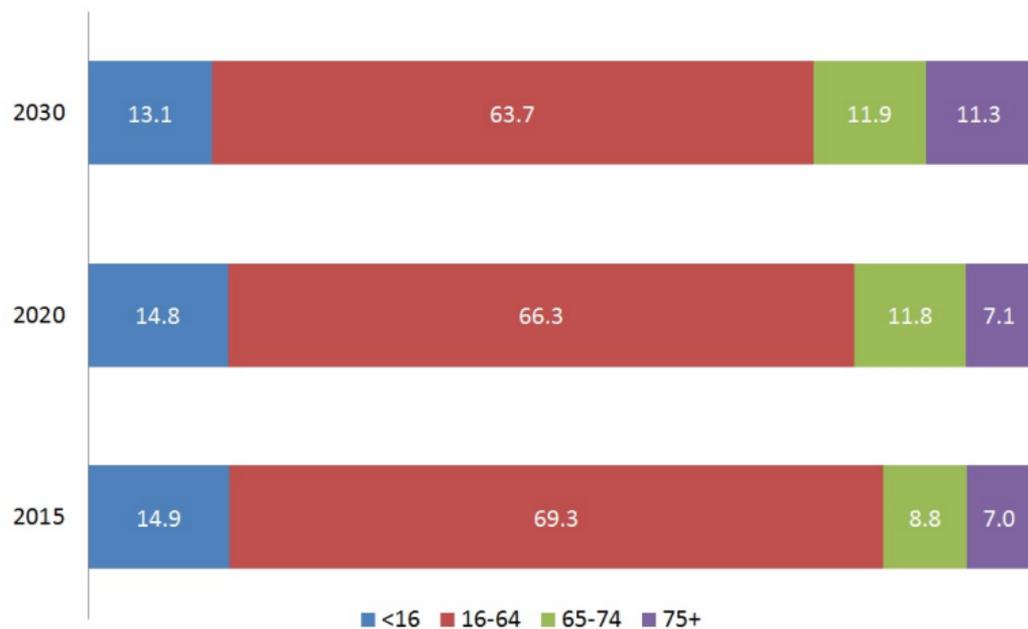
Ageing - effects on the energy poverty

year	LIHC (%)	10% model ener. exp. (%)	10% actual ener. exp. (%)	relative poverty (%)	extreme poverty (%)	subjective poverty (%)
2015	15,3	38,8	55	16	5,8	11,6
2020	15,4	39,7	55	16	5,7	11,5
2030	15,8	42,1	55	15,9	5,5	11,4

Buildings - completion year, trend forecasting
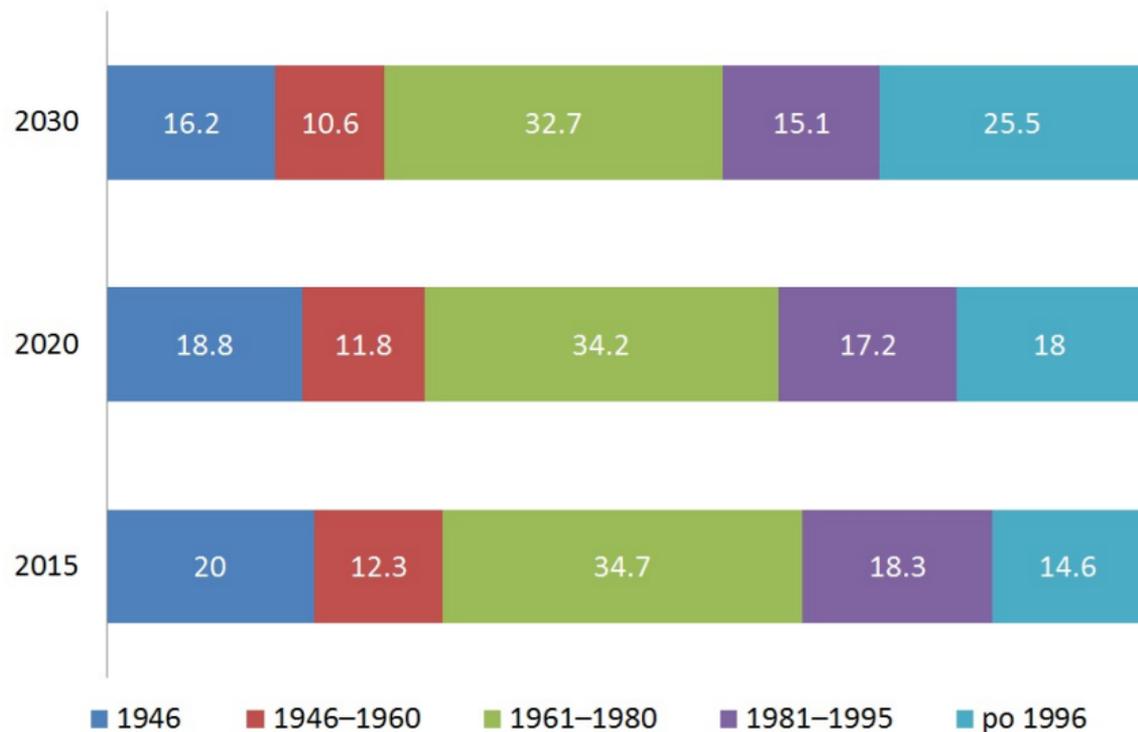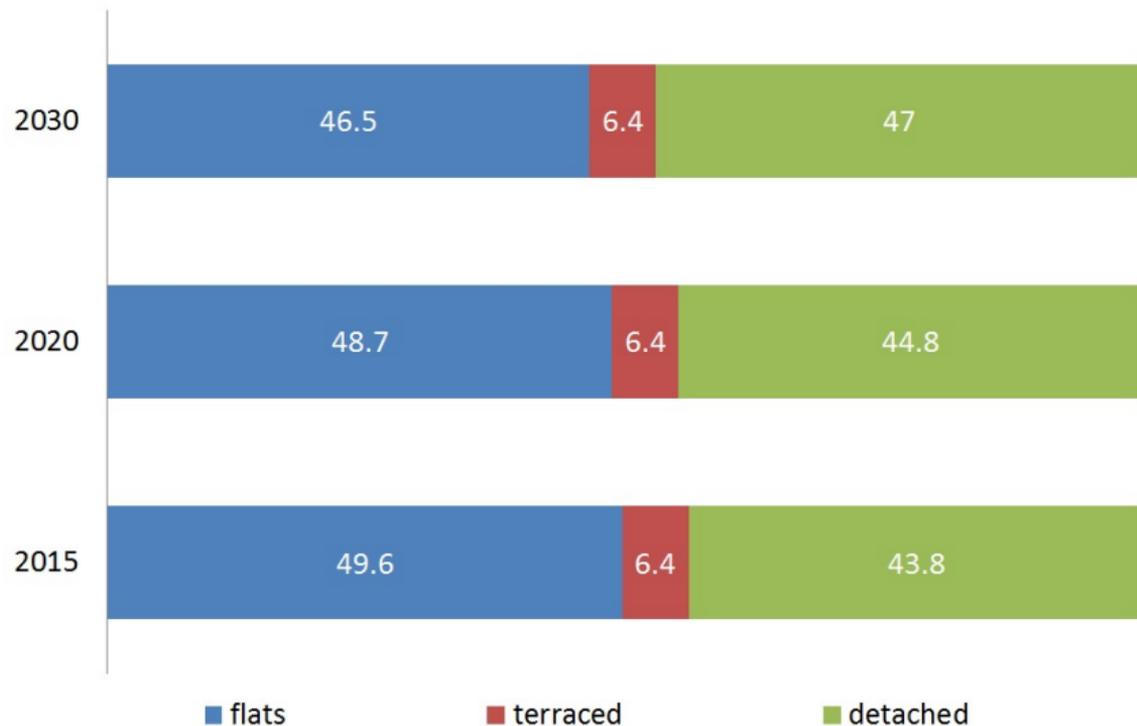
	1946	1946–1960	1961–1980	1981–1995	po 1996
2030	16.2	10.6	32.7	15.1	25.5
2020	18.8	11.8	34.2	17.2	18
2015	20	12.3	34.7	18.3	14.6

Year	>30	30-49	50-64	65-79	80-99	100-139	140-189	190+
2030	5.7	18.8	15	7.8	9.6	24.8	11.1	7.3
2020	9.6	19.9	16.7	7.6	9.6	21.6	9.2	5.9
2015	11.1	20.3	17.5	7.5	9.5	20.1	8.4	5.4
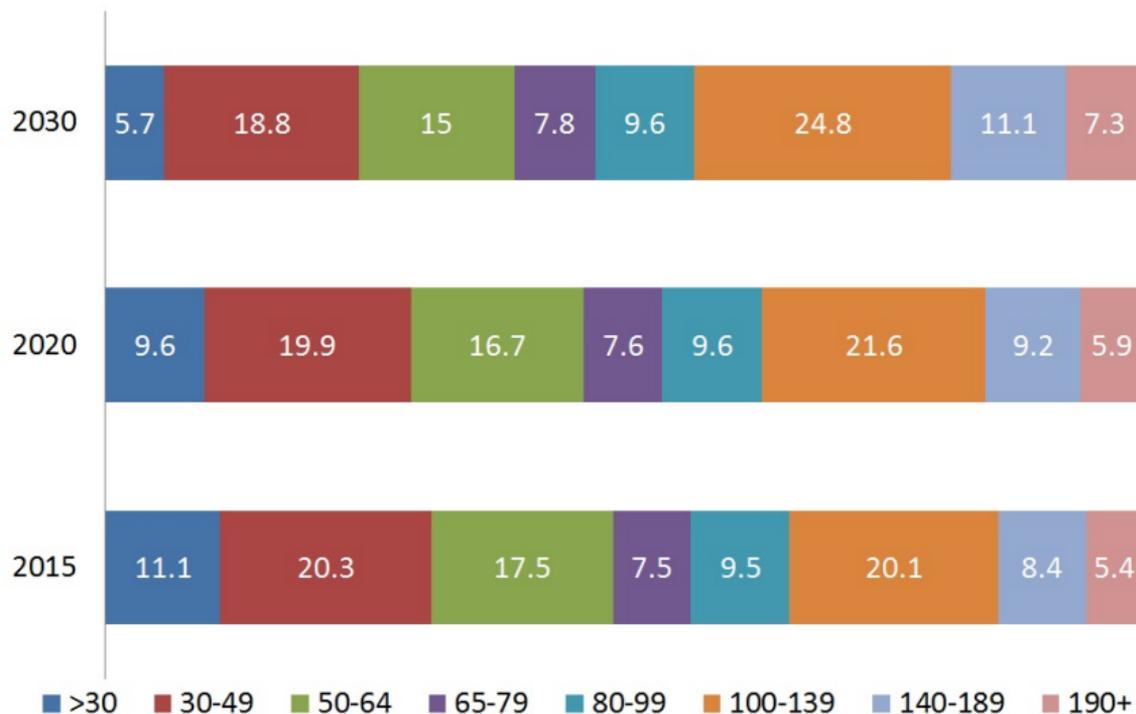
year	LIHC (%)	10% model ener. exp. (%)	10% actual ener. exp. (%)	relative poverty (%)	extreme poverty (%)	subjective poverty (%)
2015	15,3	38,8	55	16,0	5,8	11,6
2020	15,3	38,9	55	16,3	5,7	11,3
2030	15,6	39,3	55	17,2	5,5	10,6

- spending 2.5 billion PLN (0.6 billion Euro) a year on thermal insulation

- 4.4 million m^2

- there are 1 billion m^2 of living area in Poland, 44% needs improvements in insulation

year	LIHC (%)	10% model ener. exp. (%)	10% actual ener. exp. (%)	relative poverty (%)	extreme poverty (%)	subjective poverty (%)
2015	15,3	38,7	55	16,0	5,8	11,6
2020	15,1	38,1	55	16,0	5,8	11,4
2030	14,8	36,4	55	16,0	5,8	11,1

- income elasticities of energy

    - heat: 0.95

    - electricity: 0.78

- according to Social Security projections

    - labour income growth of 3.1% yearly

    - pension and social benefits growth of 1.6% yearly

Impact of income increase

year	LIHC (%)	10% model ener. exp. (%)	10% actual ener. exp. (%)	relative poverty (%)	extreme poverty (%)	subjective poverty (%)
2015	15,3	38,8	55,0	16,0	5,8	11,6
2020	14,6	34,9	55,0	15,5	3,0	11,5
2030	13,4	27,5	53,5	16,3	0,9	11,4

Impact of energy prices increase

year	LIHC (%)	10% model ener. exp. (%)	10% actual ener. exp. (%)	relative poverty (%)	extreme poverty (%)	subjective poverty (%)
2015	15,3	38,8	55,0	16,0	5,8	11,6
2020	16,0	43,4	55,0	16,0	5,8	11,6
2030	17,6	53,5	55,0	16,0	5,8	11,6

Impact of all expected changes

year	LIHC (%)	10% model ener. exp. (%)	10% actual ener. exp. (%)	relative poverty (%)	extreme poverty (%)	subjective poverty (%)
2015	15,3	38,8	55,0	16,0	5,8	11,6
2020	15,0	39,8	55,0	15,9	2,9	11,1
2030	14,9	42,9	50,0	17,1	0,9	10,0

Conclusions

- LIHC critically depends on:

    - energy prices

    - income

    - buildings' quality

- LIHC reacts weaker than income poverty measures and other energy poverty measures

- the impact of energy efficiency on LIHC very limited

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