Are tenants willing to pay for energy efficiency?
Evidence from a small-scale spatial analysis in Germany

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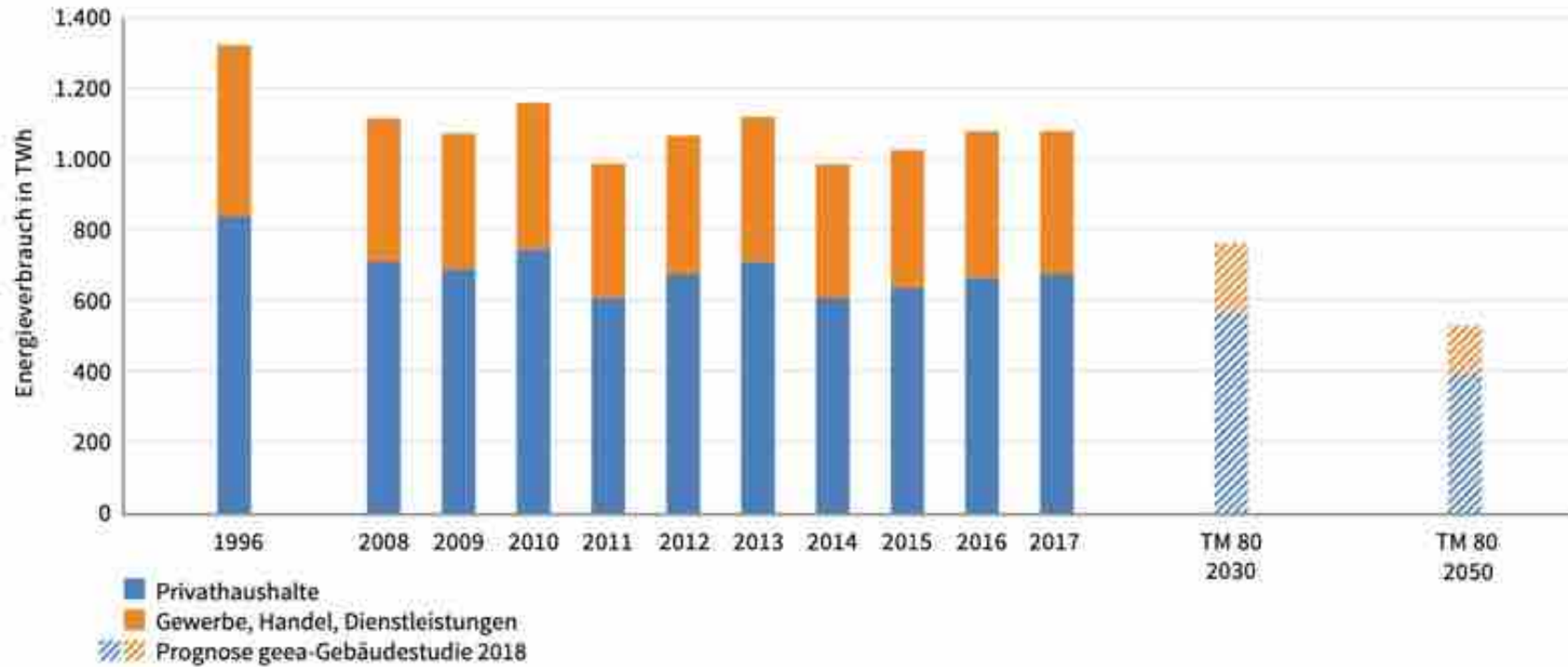
Background

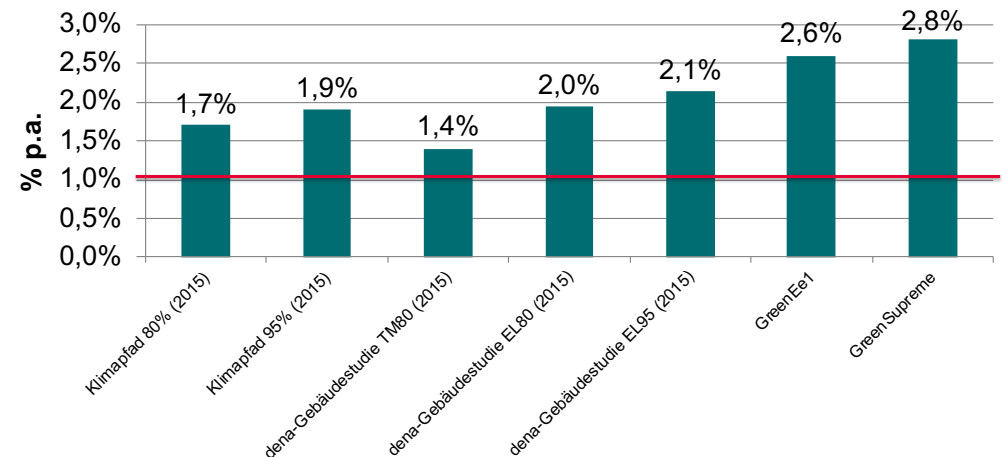**Data and Methodology**

Results

Discussion

Background

Final energy demand German building stock

Dena 2019, p 34

Refurbishment rate

Are tenants willing to pay a premium for energy efficiency?

Review of 20+ international studies on green premiums:
- Most studies identify price premiums for energy efficiency in the residential sector & larger premiums in the sales market than in the rental market
- → **Common view: energy efficiency is clearly rewarded in the market**

- **But not all studies identify price premiums**
  - Other criteria (e.g. location, neighbourhood) play a greater role
  - Large variability in estimates, even within a single geographical context
  - Many conventional hedonic modelling approaches do not account for spatial dependence

- **Spatial analyses show more differentiated picture**
  - Taltavull et al., 2017 – Bucharest:
    - Conventional hedonic analysis: predicted 3.5% premium
    - Spatial analysis: premium varied across neighbourhoods (e.g. North: 6.5%; West: 2.2%; no significant premiums identified elsewhere)
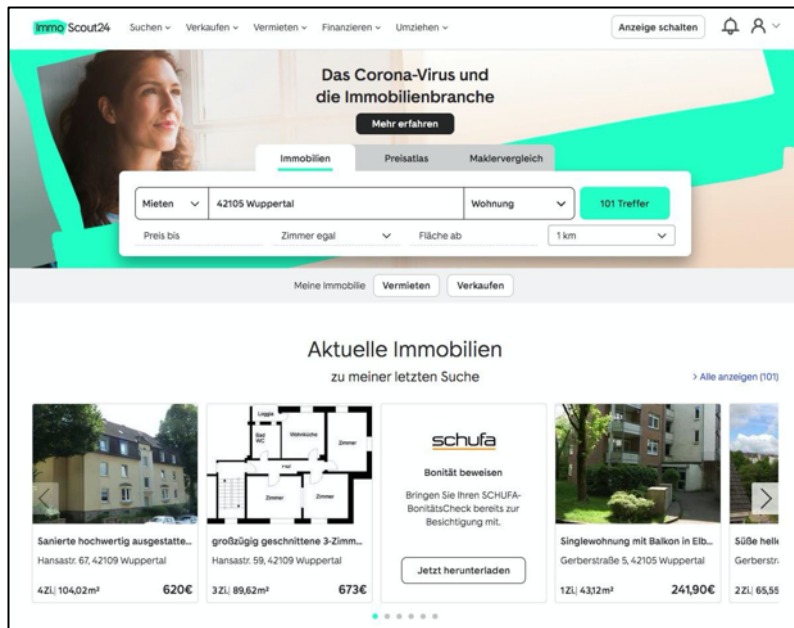
Research Gap:
- → Small-scale spatial approaches and analyses are needed
- → Present study: first city-level spatial analysis in Germany

Data and methodology

City of Wuppertal

Data

City of Wuppertal
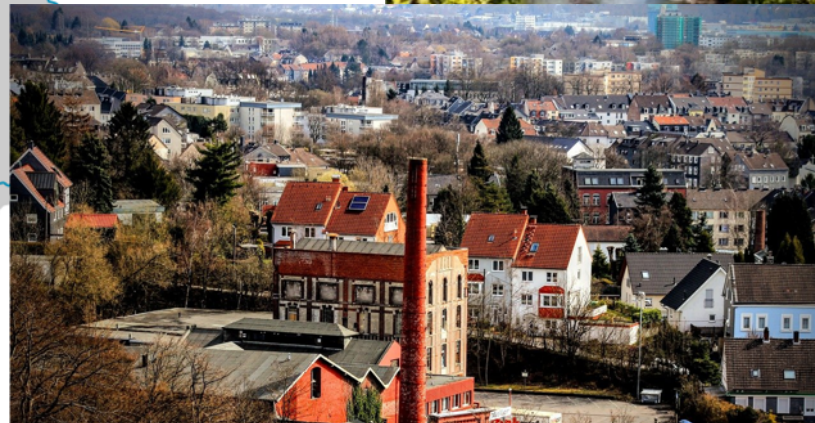
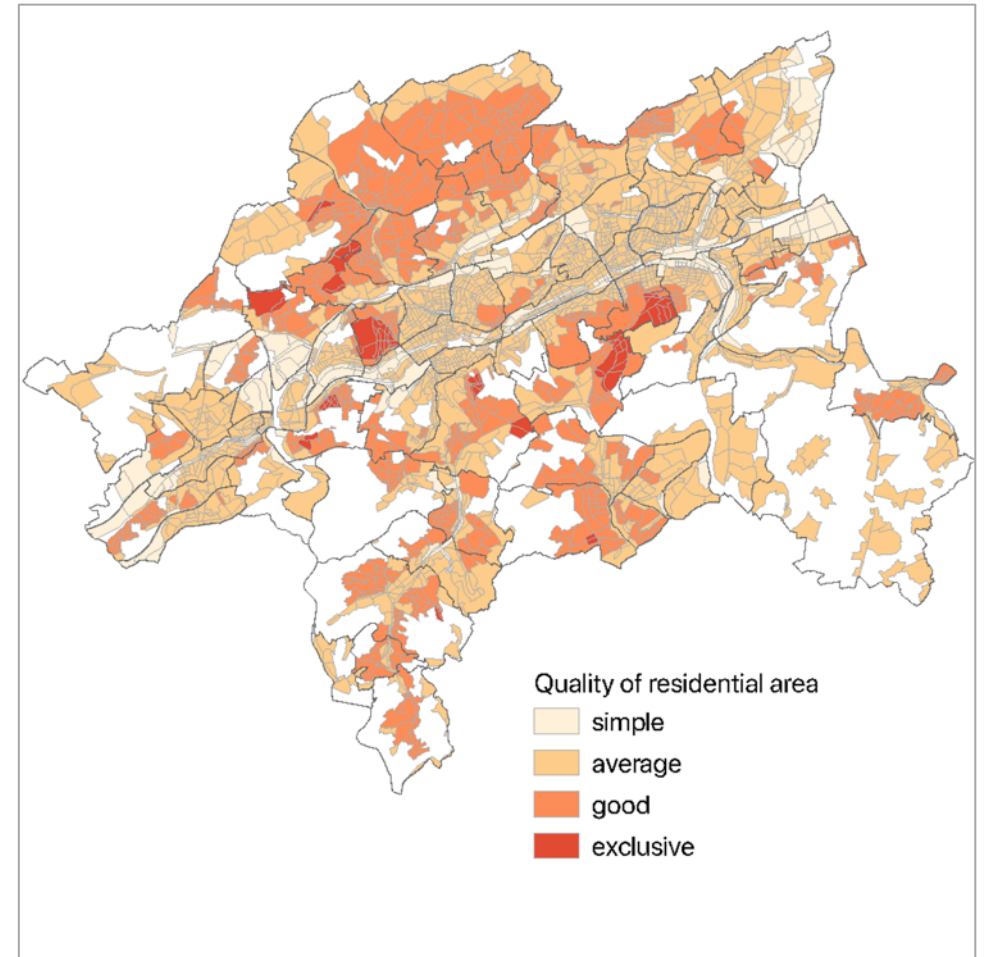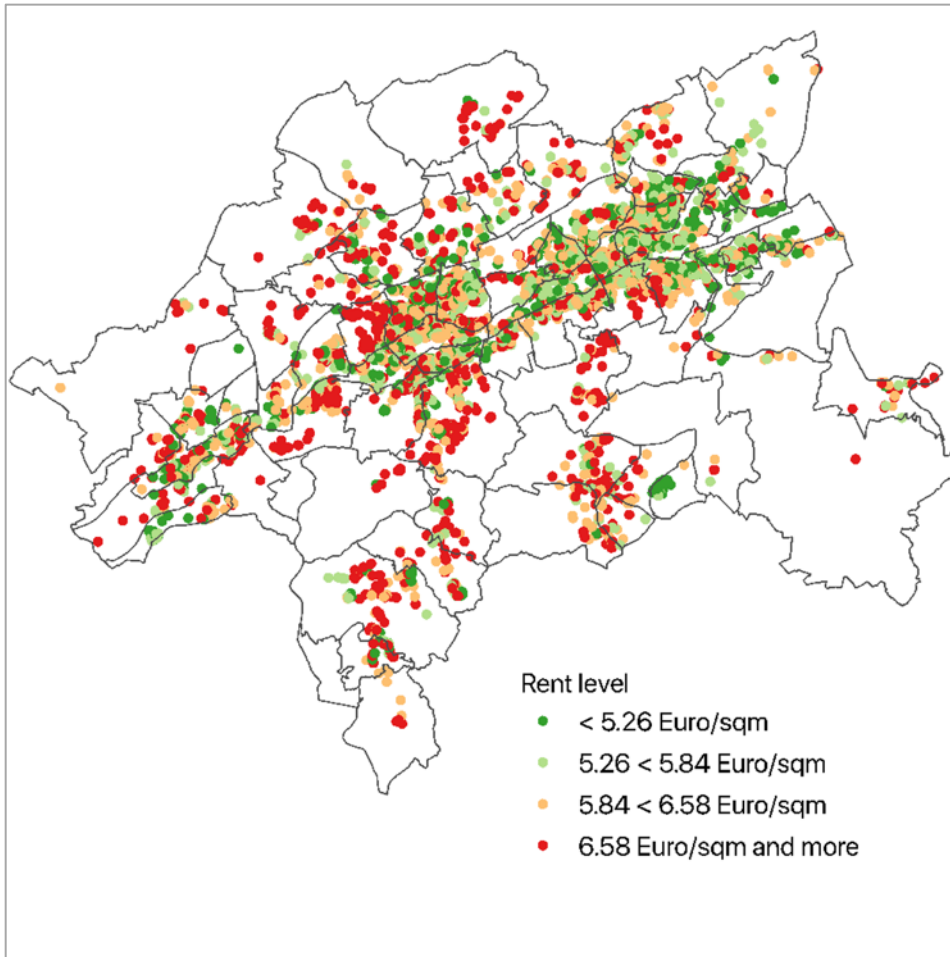**1. Hedonic apartment characteristics (Immoscout 24 database)**

- Germany's largest real estate platform
- Georeferenced data from 2012-2019
- Large set of hedonic variables, including:
    - energy efficiency performance (Energy performance certificate)
    - rental price
    - apartment characteristics, e.g. fitted kitchen, balcony, guest toilet
- Approx. 12,300 entries

2. Neighbourhood characteristics (City of Wuppertal; ALKIS property register)

- Sociodemographic + socio-economic statistics on building block level, e.g. unemployment rate, population density
- Data on the settlement structure, e.g. share of traffic area, recreational area
- Quality of residential area (simple, average, good, exclusive)

Rent level
- < 5.26 Euro/sqm
- 5.26 < 5.84 Euro/sqm
- 5.84 < 6.58 Euro/sqm
- 6.58 Euro/sqm and more

Quality of residential area
- simple
- average
- good
- exclusive

Spatial Autocorrelation and Spatial Regression

„All things are related, but nearby things are more related than distant things"

Tobler´s first law of geography

Would you pay the same rent for an identical apartment if it is situated…

$$u_i = \lambda w^i * u_j + \varepsilon_i$$

$$\ln(price_i) = \alpha + \beta EE_i + \gamma H_i + \delta N_i + \mu T_i + \boxed{u_i}$$

Time Dummy

Rental (€)
price per sqm

Constant

Energy performance of the
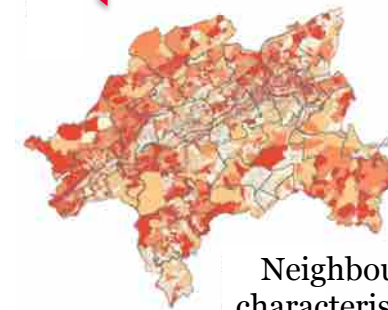apartment based on EPC
measured in kWh/sqm*a

Housing/apartment
characteristics (e.g. floor,
fitted kitchen, building
age, living space, etc.)

Neighbourhood
characteristics (e.g.
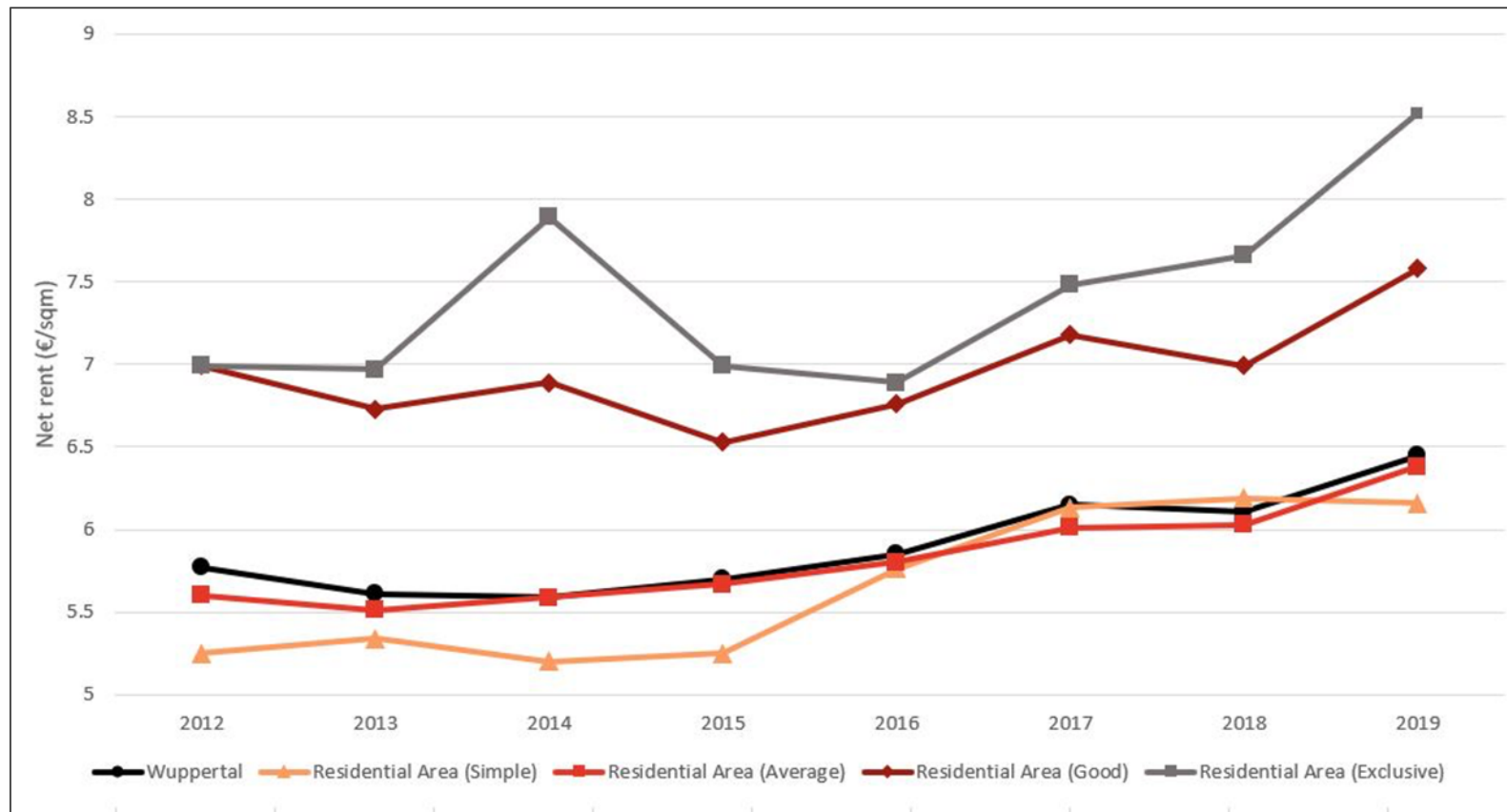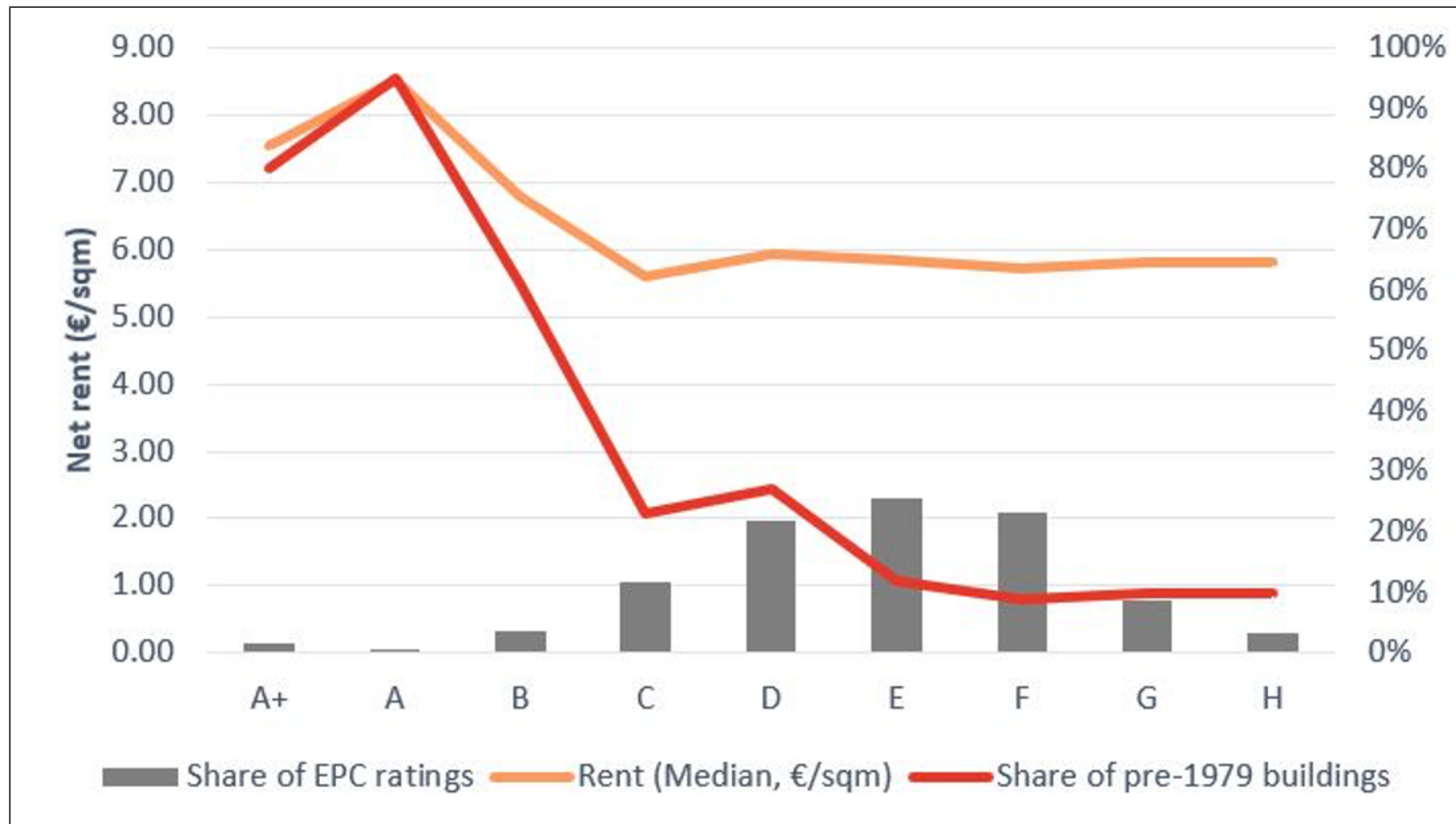population density,
unemployment rate, etc.)

Results

Results

Median rent level development 2012-2019 in Wuppertal and in different residential locations

Median rent level depending on the EPC rating

	OLS			SEM	
	Coefficient	*Standard Error*		*Coefficient*	*Standard Error*
(Intercept)	1.98468384 ***	0.097687		1.933182 ***	(0.049316)
Energy Performance	-0.00007408 ***	0.000022		-0.000166 ***	(0.000023)
N	12232			12232	
F / Likelihood Ratio (LR)	283.00 ***			3263.20 ***	
Adjusted / Pseudo R²	0.452			0.611268	
AIC	-19535			-22796.12	

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; Heteroscedasticity-consistent standard errors are shown for the OLS regression

→ **the willingness to pay increases by 0.017% for each improvement in energy efficiency of 1 kWh/sqm*a**

Key results:

- WTP among tenants exists
- WTP higher for more visible apartment features
- No evidence of easier re-letting
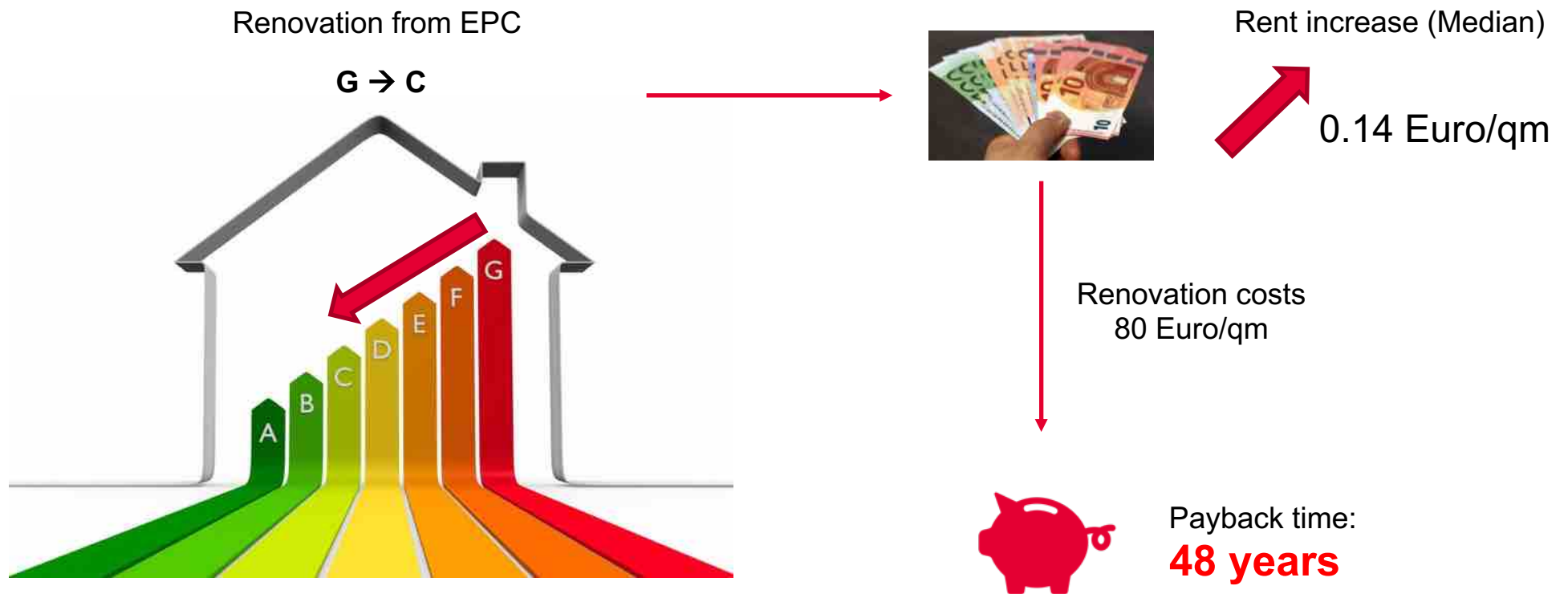
But:

→ **Energy efficiency investments barely economically viable for landlords**

Wuppertal Institut

Renovation from EPC

G → C

Rent increase (Median)

0.14 Euro/qm

Renovation costs
80 Euro/qm

Payback time:
48 years

	Simple	Average	Good	Exclusive
Energy Performance	0.00014 *	-0.00019 ***	-0.00029 ***	-0.00026
	(0.00006)	(0.00003)	(0.00008)	(0.00023)
Apartment characteristics	✓	✓	✓	✓
Neighbourhood characteristics	✓	✓	✓	✓
Time	✓	✓	✓	✓
Lambda	0.58003 ***	0.67856 ***	0.56532 ***	0.33045 ***
	(0.02869)	(0.01068)	(0.02267)	(0.08422)
N	1545	9260	1260	155
(Pseudo) R2	0.61411	0.57407	0.68705	0.67343
AIC	-2954.57772	-18031.03925	-2243.33783	-255.43674

*** p < 0.001; ** p < 0.01; * p < 0.05.

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5. Increasing rental prices due to dynamic market developments → suggests rent increases to refinance energy efficiency investments are possible…

6. … but need to be considered within the context of urban development policy to avoid energy-related gentrification and social segregation

Thank you
for your attention

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