Housing Affordability and Household Health. Evidence from 28 EU Countries+5

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Eloisa Norman

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Agenda

• Introduction and motivation
• Health and housing: conceptual channels of influence
• Literature
• Contribution and hypothesis
• Data and methodology: Eu-Silc cross 2005-2020 .. Not 2021
• Empirical strategy and model
• Results
• Conclusions
Introduction and motivation

• Large analysis of the health causes and differences among countries
  • With the Pandemic period, it becomes a key topic

• Why the issue is relevant?: Mental health affects to
  • Lower productivity
  • Market size as reduces the final consumption

• Health and housing have been largely analyzed
  • Based on housing quality
  • Based on housing features... mental health
  • Based on housing use ... energy poverty
  • ..... 
  • Also in housing affordability and its implications on health (but limited)

• This research deeps into the analysis of housing affordability and health.
  • Measuring the impact depending on the severe effects of non-affordable housing
  • Defining and start testing the channels through which the effect is transmitted
Health and housing: conceptual channels of influence

Several channels:
• In households. Lack of affordability produces..
  • Low consumption... with effects on the general economy!

• In households affordability
  • Pressures to cover the cost of living ... stress and depression
  • Lack of affordability reduces the amount of income to cover some
    • Lack of the consumption of basic needs...
      • no healthy food
      • No coverage of medicines or proper health care
      • Transport not available

• Covered with nonquality homes, problems of energy poverty and health issues associated with it
  • Cannot pay energy

• Fewer expenses in leisure ➔ Cultural activities disappear .... Lack of cultural life and sociability, .. mental health ... isolation and
  • Agorafobia
  • Apatia

• Lower productivity in the labor market

Were they previously ill??
Selected Literature (listed at the end)

• Health:
  • Most effects are published in medical and Health Sciences fields (not economics). Only tests technical (medical) issues
  • Economic research uses socioeconomic variables

• Focusing on channels: separating direct and indirect causes
  • Health problems as caused **directly** (immediate exposure) by:
    • Housing conditions
    • External causes (COVID, economic crisis) and housing
    • Housing (lack of) affordability and increase in cost of living
    • Energy problems: energy poverty
  • And mental health problems as **indirectly** (long-term exposure?) related to
    • Housing features
    • Housing affordability
    • ...
  • Sometimes, it is difficult to separate health from mental health

• Health vs housing satisfaction? (psychological effects on health)
Selected Literature findings. Housing and Health

- **Housing conditions**
  - **Housing type**
    - Apartments ➔ higher risk of smoking, insufficient vitamin D, cardiovascular disease, and cholesterol.
      - ➔ More social interactions, wellbeing
    - Single family/detached homes ➔ negative: highest extreme temperatures
      - ➔ Positive: Increase the quality of life, well-being and mental and physical health
  - **Size:** the larger, the better the housing satisfaction
- **Housing density**
  - Overcrowding ➔ low-life quality ➔ mental health
    - ➔ Microbial transmission indoors ➔ worst health
- **Construction materials, quality and age**
  - Less insulation associated with age and low-quality
  - ➔ low-income families ➔ high temperatures ➔ children and elderly health
    - ➔ risk during summer
    - ➔ Low thermal comfort
Selected Literature. Housing and Health

• Housing Tenancy
  • Homeownership vs rent;
    ➔ less stress and better wellbeing than tenants.
    ➔ They show higher housing satisfaction (not immediately after buying a house).
    ➔ Improve subjective wellbeing
    ➔ Homeowner would source of financial anxiety or financial burden after divorce.
    ➔ Downwards **housing trajectories** (from owner to tenant) ➔ lower life wellbeing.
    ➔ **Rental** associated with externalizing behavior among children (aggressive)
  • Housing stability (associated to ownership)
    ➔ Better housing and life satisfaction, mental health, mental wellbeing, and physical health.
    ➔ Insecure housing ➔ chronic state of stress and worse later life wellbeing
      ➔ Loose sense of community and emotional support
      ➔ people feel unhappy, and depressed, strongly affecting children
    ➔ For people with illness, housing mobility would create less safety perception and reduce wellbeing
• Lack on Housing Affordability
  ➔ for low-income families, the only option is to live in unhealthy accommodation
  ➔ Less affordable housing are associated with feeling unsafe, have community dissatisfaction and poor self-rated health (Australia)
  ➔ The perceived risk of losing the house was found to be associated with an increase in self-reported mental health
  ➔ Household’s ability to afford housing costs was found as a key determinant of their self-reported health
  ➔ Labour market conditions have significant and positive impacts on the wellbeing of residents (rather than housing conditions?)
  ➔ An increase in the price of housing
      ➔ is associated to a better physical health of homeowners.
      ➔ But negative effect on the physical and mental health of renters
  ➔ Housing value is not a determinant of housing-related wellbeing at an older age.
      ➔ Depends on their savings which determine their capacity to invest in housing conditions
Selected Literature. Health and indirect implications

- Housing satisfaction
  - Happiness + life satisfaction

- Long-term illness ➔ mental health

- Work, salaries, productivity, School results

- Physical health

- Life satisfaction

- Housing satisfaction/affordable

- Wellbeing/mental health
• Evaluating how
  • Health \( \leftarrow f(\text{housing affordability}) \),

• Several controls (type of household, income, ill before, poor or type of housing) as tested by the literature
• BUT
• Hypothesis:
  • H1: \( \Delta \text{cost of living} \rightarrow \text{difficult to make ends} \rightarrow \text{Mental health} \)
  • H2: \( \Delta \text{cost of living} \rightarrow \text{reduce consumption} \rightarrow \text{physical health} \)
  • H3: poor quality homes \( \rightarrow \text{energy poverty} \rightarrow \text{physical health} \)
  • H4: Fewer expenditure in leisure \( \rightarrow \text{isolation} \rightarrow \text{mental health} \)
• \( \rightarrow \text{lack on cultural life} \rightarrow \text{agoraphobia} \rightarrow \text{mental h.} \)
• H5: less affordable housing \( \rightarrow \text{feel unsafe} \rightarrow \text{mental h.} \)
• H6: rental apartments \( \rightarrow \text{less health?} \)
Data and Methodology

• Estimate housing affordability indicators of the 28 EU countries +5

• Main data source:
  • Life conditions survey, EU-Silc, cross 2005-2020 (2021 has several changes in the measures we need to use)
  • Micro-data
  • 28 countries +5

• Procedure:
  • Merging the data from different years
  • Variable definitions and calculation. New variables assigned
    • Income distribution measures
    • Affordability ratios (Rent to income, debt to income, housing stress. IAM)
    • Poverty line
    • Health variables
    • Combination of household data and individual information

• Exploratory analysis
• Empirical evidence
**Data and Methodology**

- **ADDED VARIABLES (by country)**
- **Poverty line**: households with income = and under 60% of median (Eurostat def)
  - Using income by consumption unit (without transfers)
  - Referred to the country

- **Three levels of housing affordability severity measures** *(2 conventions + 1)*
  1.- **Affordability ratio**: debt or rent to income
     \[
     DtI_t = \frac{H_{exp}}{Inc_t}
     \]
     where \( H_{exp} = (A + int_t) \) or rent (available in DB)
  2. - **Housing stress**: % of housing costs on income for those households falling under 40% of income distribution (Hs)
     \[
     DtI_t | inc \leq 40\% = \frac{H_{exp_t}}{Inc_t}
     \]
  3.- **Max affordability Index (IAM)**
     \[
     IAM_t = \frac{DtI_{MAX}}{DtI_t}
     \]
     - \( H_1 \): If IAM = (\( Dti_{max} \) / \( Dti \)) < 1 \( \Rightarrow \) The household falls in Housing induce Poverty (HIP).
     - \( H_2 \): If IAM = (\( Dti_{max} \) / \( Dti \)) \( \geq \) 1 \( \Rightarrow \) No HIP problems.

- **Energy poverty indicator** *(Taltavull et al, 2022)*
- **Labor market indicator**
Data and Methodology

- **Health measures (main person in the household this time):**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH010</td>
<td>General health</td>
</tr>
<tr>
<td>PH020</td>
<td>Suffer from a chronic (long-standing) illness or condition</td>
</tr>
<tr>
<td>PH030</td>
<td>Limitation in activities because of health problems</td>
</tr>
<tr>
<td>PH110</td>
<td>Body mass index (BMI) (16: bottom coding/ 40: top coding)</td>
</tr>
<tr>
<td>PH120</td>
<td>Type of physical activity when working</td>
</tr>
<tr>
<td>PH130</td>
<td>Time spent on physical activities (excluding working) in a typical week</td>
</tr>
<tr>
<td>PH140</td>
<td>Frequency of eating fruit</td>
</tr>
<tr>
<td>PH150</td>
<td>Frequency of eating vegetables or salad</td>
</tr>
</tbody>
</table>

- **2nds and children**
Empirical strategy and model

• General model: Conditional likelihood function
  • how extend health depends on housing issues?:

  \[ \Pr(\text{health}|X,Y)_i = \alpha_i + \sum_{j=1}^{J} \beta_j \text{AFFORD}_{ji} + \sum_{j=1}^{J} \delta_j X_{ji} + \sum_{m=1}^{M} \gamma_m Y_{m,i} + \Omega K_i + f e_i + \mu_i \]

• Where
  • AFFORD is the variable measuring affordability
  • Three levels of controls:
    • \( X \) is a set of housing characteristics, including tenancy,
    • \( Y \) is a set of household features
    • \( K \) is a set of other health and satisfaction control variables
  • FE..Country fixed effects
Empirical strategy and model

- Endogeneity issues: income (salaries), previous illness
- Illness levels?. Tests by level of illnesses
Data: EUSilc, 2005-2020, microdata

Empirical evidence finding: research strategy

• Exploratory analysis: previous variable calculation and description of indicators
  • Poverty and poverty line
  • Ratios: DtI or RtI, housing stress, dMta, IAM
    • Segmented by: tenure, gender, poverty
  • Energy poverty indicator

• Causal relationship:
  • Health status = f(affordability), control {housing characteristics, tenure, household type, time and income}, panel analysis
  • Heath is tested in different levels: physical and mental health

• Econometric methodology:
  • Regression in hedonic analysis, Conditional likelihood model
Exploratory analysis

**Ownership Rate in 33 European Countries**

**Housing Provided Free Rate in 33 European Countries**

(Households with a home provided free/total households)

Source: Eurostat, EU-Silc, UK and Iceland data is until 2018, Italy and Germany, until 2019
Exploratory analysis

Source: Eurostat, EU-Silc, UK and Iceland data is until 2018, Italy and Germany, until 2019
**Exploratory analysis**

### HOUSING AFFORDABILITY RATIOS BY LEVEL OF POVERTY. 33 EUROPEAN COUNTRIES

(% over disposable income)

- **debt to income_No-Poor**
- **debt to income_poor**

Source: Eurostat, EU-Silc, UK and Iceland data is until 2018, Italy and Germany, until 2019
Pr(health|X,Y)_i
= α_i + \sum_{j=1}^{j} β_j AFFORD_{ji} + \sum_{j=1}^{j} δ_j X_{ji} + \sum_{m=1}^{m} γ_m Y_{m,i} + ΩK_i + FE_i + μ_i

Where

- X is a set of housing characteristics, including
  - Tenancy type: (2 categories, omitted provided free)
  - Housing features: type (2, omitted block), size (m2)+
    - 12 housing features (accessibility, contamination, noise, natural light, neighbourhood conditions and safety, temperature at home)

- Y is a set of household features, including
  - Household type (6 categories, Others is omitted) +
  - Gender
  - Num of persons in the household

- K is a control variables matrix
  - Disposable income by household
  - Length of stay in the home

- Method: pooled OLS
<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General health</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cons</td>
<td>2.106***</td>
<td>2.106***</td>
<td>1.868***</td>
<td>1.864***</td>
<td>1.865***</td>
<td>2.1804***</td>
</tr>
<tr>
<td>debt to income ratio %</td>
<td>-0.0012***</td>
<td>-0.0016***</td>
<td>-0.00013 ***</td>
<td>-</td>
<td>-0.0016***</td>
<td>-0.00274***</td>
</tr>
<tr>
<td>Tenancy type (owner to provided free, 1..4)</td>
<td>0.0896***</td>
<td>0.0896***</td>
<td>0.0868***</td>
<td>0.0271***</td>
<td>0.029***</td>
<td>-0.000076</td>
</tr>
<tr>
<td>Housing Stress ratio %</td>
<td>-0.0012***</td>
<td>-0.003***</td>
<td>-0.00274***</td>
<td>-0.003***</td>
<td>-0.00274***</td>
<td></td>
</tr>
<tr>
<td>Sex (male-1, female-2)</td>
<td>0.01635***</td>
<td>0.0199***</td>
<td>0.026***</td>
<td>0.0552***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor household (yes,no)</td>
<td>0.291***</td>
<td>0.237***</td>
<td>0.094***</td>
<td>0.0489***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of urbanisation (1..3, dense..thinly)</td>
<td>0.291***</td>
<td>0.237***</td>
<td>0.094***</td>
<td>0.0489***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwelling Type (1-4,detached.. to apart)</td>
<td>0.0311***</td>
<td>0.017***</td>
<td>0.0381***</td>
<td>-0.010***</td>
<td>-0.0169***</td>
<td></td>
</tr>
<tr>
<td>Number of rooms available to the household (#)</td>
<td>-0.045***</td>
<td>-0.04919***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to keep home adequately warm (yes,1,no,2)</td>
<td>0.396***</td>
<td>0.2934***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall life satisfaction (0-99)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.02682***</td>
<td></td>
</tr>
<tr>
<td><strong>R- correlation</strong></td>
<td>0.039</td>
<td>0.039</td>
<td>0.092</td>
<td>0.080</td>
<td>0.162</td>
<td>0.203</td>
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<tr>
<td><strong>Adj-R2</strong></td>
<td>0.01</td>
<td>0.001497</td>
<td>0.00840854</td>
<td>0.0063663</td>
<td>0.0264</td>
<td>0.0411312</td>
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<tr>
<td><strong>F</strong></td>
<td>99528,7***</td>
<td>99528.69***</td>
<td>1238013.72***</td>
<td>52480</td>
<td>396447</td>
<td>35017.13***</td>
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<tr>
<td><strong>N</strong></td>
<td>132768761</td>
<td>583978909</td>
<td>57335751</td>
<td>117149477</td>
<td>7346800.5</td>
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</tr>
</tbody>
</table>
## Order of relevance explaining the health perception

<table>
<thead>
<tr>
<th>Factor</th>
<th>$\beta$</th>
<th>Rank</th>
<th>$\beta$</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenancy type (owner to provided free, 1..4)</td>
<td>0.011</td>
<td>8</td>
<td>0.000</td>
<td>9</td>
</tr>
<tr>
<td>Housing Stress ratio %</td>
<td>-0.075</td>
<td>2</td>
<td>-0.077</td>
<td>3</td>
</tr>
<tr>
<td>Sex (male-1, female-2)</td>
<td>0.014</td>
<td>6</td>
<td>0.031</td>
<td>6</td>
</tr>
<tr>
<td>Poor household (yes,no)</td>
<td>0.05</td>
<td>5</td>
<td>0.026</td>
<td>7</td>
</tr>
<tr>
<td>Degree of urbanisation (1..3, dense..thinly)</td>
<td>0.016</td>
<td>4</td>
<td>0.0347</td>
<td>5</td>
</tr>
<tr>
<td>Dwelling Type (1-4, detached.. to apart)</td>
<td>-0.012</td>
<td>7</td>
<td>-0.022</td>
<td>8</td>
</tr>
<tr>
<td>Number of rooms available to the household (#)</td>
<td>-0.064</td>
<td>2</td>
<td>-0.073</td>
<td>4</td>
</tr>
<tr>
<td>Ability to keep home adequately warm (yes,1,no,2)</td>
<td>0.135</td>
<td>1</td>
<td>0.0958</td>
<td>2</td>
</tr>
<tr>
<td>Overall life satisfaction (0-99)</td>
<td>-0.142</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Aggregate Model: Results

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>( \beta )</th>
<th>( \beta )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Suffer from a chronic (long-standing) illness or condition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cons</td>
<td>1.662***</td>
<td>1.7348***</td>
</tr>
<tr>
<td>debt to income ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenancy type (owner to provided free)</td>
<td>-0.02978***</td>
<td>-0.0285***</td>
</tr>
<tr>
<td>Housing Stress ratio</td>
<td>0.00190***</td>
<td>0.00188***</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td>-0.050***</td>
</tr>
<tr>
<td>Poor household</td>
<td>-0.0356***</td>
<td>-0.036***</td>
</tr>
<tr>
<td>Degree of urbanisation</td>
<td>0.01156***</td>
<td>0.01083***</td>
</tr>
<tr>
<td>Size of the dwelling in square meters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shortage of space in the dwelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwelling Type</td>
<td>0.02058***</td>
<td>0.02115***</td>
</tr>
<tr>
<td>Number of rooms available to the household</td>
<td>0.01318***</td>
<td>0.01299***</td>
</tr>
<tr>
<td>Ability to keep home adequately warm</td>
<td>-0.0886***</td>
<td>-0.0891***</td>
</tr>
<tr>
<td>Overall life satisfaction</td>
<td>0.00190***</td>
<td></td>
</tr>
<tr>
<td>R, 095a</td>
<td></td>
<td>0.104a</td>
</tr>
<tr>
<td>Adj-R2</td>
<td>0.008933028</td>
<td>0.01089631</td>
</tr>
<tr>
<td>F</td>
<td>151388.6***</td>
<td>161898.54***</td>
</tr>
<tr>
<td>N</td>
<td>117568994</td>
<td>117568994</td>
</tr>
</tbody>
</table>
### Aggregate model. Results

<table>
<thead>
<tr>
<th>Order of relevance explaining the Suffer from a chronic (long-standing) illness or condition (standardized parameters)</th>
<th>b</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenancy type (owner to provided free, 1..4)</td>
<td>-0.017</td>
<td>7</td>
</tr>
<tr>
<td>Housing Stress ratio %</td>
<td>0.086</td>
<td>1</td>
</tr>
<tr>
<td>Sex (male-1, female-2)</td>
<td>-0.044</td>
<td>2</td>
</tr>
<tr>
<td>Poor household (yes,no)</td>
<td>-0.031</td>
<td>5</td>
</tr>
<tr>
<td>Degree of urbanisation (1..3, dense..thinly)</td>
<td>0.016</td>
<td>8</td>
</tr>
<tr>
<td>Dwelling Type (1-4, detached.. to apart)</td>
<td>0.0421</td>
<td>4</td>
</tr>
<tr>
<td>Number of rooms available to the household (#)</td>
<td>0.03</td>
<td>6</td>
</tr>
<tr>
<td>Ability to keep home adequately warm (yes,1,no,2)</td>
<td>-0.049</td>
<td>3</td>
</tr>
<tr>
<td>Overall life satisfaction (0-99)</td>
<td>0.08669</td>
<td>1</td>
</tr>
</tbody>
</table>
Conclusions

• Inicial results suggest the direct and indirect channels to explain (small) reasons for illness
• Quite different situations in housing affordability by countries
  • And health
• Role of (ordered):
  • Lack of affordability
  • Housing issues
  • Tenancy does not seems to be relevant
• Specific situation by country
• Tests: energy poverty with health
  • Channels: cost of living, low quality of housing, fewer expenses over productivity and health ..
References

- Bailey, P. (2020). *Housing and health partners can work together to close the housing affordability gap*. Center on Budget and Policy Priorities.


Thank you for your attention