

INTERNATIONAL MONETARY FUND

# The (Many) Consequences of the Housing Affordability Problem in the EU

## A Machine-Learning Empirical Analysis

Jean-Jacques Hallaert and Iglia Vassileva

WP/26/124

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WORKING PAPER

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**The (Many) Consequences of the Housing Affordability Problem in the EU:  
A Machine-Learning Empirical Analysis**

**Prepared by Jean-Jacques Hallaert and Iglia Vassileva \***

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**ABSTRACT:** Housing affordability is high on the economic, social, and political agenda in Europe. While the economic literature has mostly analyzed the drivers of housing unaffordability, this paper focuses on its consequences, quantifying, at the EU level, its impact on individuals' well-being as well as its economic and demographic impact. We find that the impact of an increase in housing cost burden is large on housing adequacy as well as on poverty and health. It is somewhat smaller on fertility and labor force participation.

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Author's E-Mail Address:	<a href="mailto:jjhallaert@imf.org">jjhallaert@imf.org</a> , <a href="mailto:ivassileva@imf.org">ivassileva@imf.org</a>

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WORKING PAPERS

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# Contents

<b>Executive Summary .....</b>	<b>4</b>
<b>Introduction .....</b>	<b>5</b>
<b>The Housing Affordability Malaise .....</b>	<b>5</b>
1. Housing: a growing concern.....	5
2. ...that is hard to find in data .....	8
3. Possible reasons for the gap between perceptions and data .....	14
<b>The Consequences of Housing Affordability: A Conceptual Framework.....</b>	<b>15</b>
1. Housing affordability problems reduce housing adequacy .....	15
2. Lost opportunities due to housing affordability problems: impact on poverty, labor force participation, and spatial allocation of labor.....	16
3. Housing affordability problems constrain non-housing consumption.....	17
<b>Estimating the Consequences of Housing Affordability.....</b>	<b>19</b>
1. Econometric approach and estimation method.....	19
2. Data .....	23
3. Results .....	23
A. Impact on housing adequacy.....	24
B. Impact on labor force participation .....	27
C. Impact on poverty.....	29
D. Impact on fertility .....	31
E. Impact on health.....	34
<b>Conclusions.....</b>	<b>36</b>
<b>Annex I. Definition and Description of Housing Costs.....</b>	<b>37</b>
1. Housing costs .....	37
2. Housing cost overburden rate.....	37
3. Housing cost in disposable household income .....	38
<b>Annex II. Disconnect Between Perception of a Housing Affordability Problems and Various Measures of Housing Affordability.....</b>	<b>39</b>
<b>Annex III. The Double Machine Learning with Instrumental Variables, Instrument Validity, and Diagnostic Checks .....</b>	<b>46</b>
<b>Annex IV. Specifications .....</b>	<b>51</b>
<b>References.....</b>	<b>53</b>

**FIGURES**

1. Perception of Housing as a Major Issue .....	6
2. Perception of Housing as a Major Issue by Country .....	6
3. Concerns About Finding or Maintaining Adequate Housing .....	8
4. EU27: Housing Insecurity by Tenure .....	8
5. Housing Costs, Housing Prices, and Income since the COVID-19 Pandemic .....	9
6. Housing Costs Components .....	9
7. Standardized House-Price-to-Income Ratio .....	10
8. Homeownership Rate .....	11
9. Housing Cost Burden .....	12
10. Housing-Related Arrears .....	13
11. Housing Adequacy .....	13
12. Fertility Rate .....	19
13. Overview of the Estimation Method and Validation Process .....	21
14. Confidence Interval of Estimates of the Impact of Housing Cost in Disposable Income .....	24
15. Evolution over Time of the Impact of Housing Costs on Housing Adequacy .....	26
16. Geographical Difference in the Impact of Housing Costs on Housing Adequacy .....	27
17. Evolution over Time of the Impact of Housing Costs on Labor Force Participation .....	28
18. Geographical Difference in the Impact of Housing Costs on Labor Force Participation .....	29
19. Geographical Difference in the Impact of Housing Costs on the At-risk-of-poverty Rate .....	31
20. Evolution over Time of the Impact of Housing Costs on the At-risk-of-poverty Rate .....	31
23. Geographical Difference in the Impact of Housing Costs on Fertility .....	33
24. The Impact of Housing Cost on Fertility over Time .....	33
25. Geographical Difference in the Impact of Housing Costs on Health .....	35
26. Evolution over Time of the Impact of Housing Costs on Health .....	35

**TABLES**

1. Housing-Related Protests are Mostly About Affordability .....	7
2. Impact of Housing Affordability on Housing Adequacy .....	25
3. Impact of Housing Affordability on Labor Force Participation .....	28
4. Impact of Housing Affordability on Poverty .....	30
5. Impact of Housing Affordability on Fertility .....	32
6. Impact of Housing Affordability on Health .....	35

## Executive Summary

**Housing affordability has become a prominent social, political, and economic issue throughout the European Union.** Protests across Europe and surveys underscore widespread concerns about housing. These concerns have reached a point where housing affordability is now perceived as undermining social cohesion and has become a major topic in several local elections. This development has prompted numerous national policy initiatives, which are now complemented by an EU-level plan.

**While most of the economic literature has focused on the drivers of housing affordability, we focus on the consequences of housing affordability.** The consequences are both multifaceted and significant, reducing aggregate productivity growth and potential economic growth but also exacerbating other social and economic issues. This suggests synergies between housing policies and broader social policies.

**Specifically, we examine three channels through which housing affordability problems have negative consequences.**

1. ***Loss of opportunities: poverty and labor market consequences.*** Individuals may turn down job offers or learning / training opportunities due to the inability to find or afford housing near their prospective workplace. This loss of opportunities may lead to an increase in overall poverty rate and lower labor force participation, contributing to lower labor mobility and spatial misallocation of labor.
2. ***Adequacy of housing: overcrowding and severe housing deprivation.*** When households cannot afford adequate housing, they may live in inadequate accommodation in terms of size, quality, and/or location. Therefore, we expect that an increase in housing costs will worsen housing overcrowding rate and severe housing deprivation, which in turn have negative implications notably for health.
3. ***Reduction in essential non-housing consumption: the fertility and health consequences.*** Low-income households may cut non-housing consumption when housing costs are high, affecting health, education, nutrition, and health.

**Our econometric results show that housing affordability issues have far-reaching implications.** Using a double machine learning framework with instrumental variables, we show all mechanisms are at play in the EU. We find that the impact of an increase in housing cost burden is large on housing adequacy, poverty, and health. It is somewhat smaller on fertility and labor force participation, and small on the average age at which children leave parental house and on age at which women have their first child. Therefore, housing affordability problems exacerbate social and economic issues that other public policies seek to address. This suggests that there are synergies between housing policies and broader social policies.

**The impact of housing affordability varies across countries and over time.** Our estimates suggest that, as expected, the impact of housing cost differs across countries reflecting differences in policies and structural features. It also changed over time. For all indicators, the impact increased pre-pandemic but declined afterwards. Further research is needed to identify the reasons for this reversal, but the development of remote work may have played a role.

# Introduction

**Housing affordability has become a prominent issue on the social, political, and economic agenda throughout the European Union (EU).** Protests and surveys underscore widespread concerns about housing that have reached a point where housing affordability is now perceived as undermining social cohesion and has become a major topic in several local elections. This development has prompted numerous national policy initiatives, which are now complemented by EU-level initiatives.

**While the economic literature has mostly focused on the drivers of housing affordability, we focus on its consequences.** To the best of our knowledge, this paper is the first attempt to estimate various impacts of housing affordability problems for the same area (the EU) over the same period (2010-2024). While we cover the main consequences highlighted in economic, medical, public health, demographic, urban sciences, and sociology literature as well as the various channels through which housing affordability is expected to affect the population, many more indicators could be considered in future research.

**Our econometric results show that housing costs play a crucial role and have far-reaching implications.** We show that the housing cost burden (our metrics for housing affordability) has implications for individuals' well-being, demographic outcomes, and economic performance. Therefore, housing affordability problems exacerbate social and economic issues that other public policies seek to address. This suggests that there are synergies between housing policies and broader social policies. Moreover, these findings support the idea that housing affordability problems affect not only individuals but also reduce aggregate productivity growth and potential economic growth.

**The paper is organized as follows.** The first section documents the growing concern with housing and developments in housing affordability. The second section describes three mechanisms through which housing affordability is expected to have economic, demographic, and well-being implications. The third section provides estimates of the consequences of housing affordability problems. We find that the impact of an increase in housing cost burden is large on housing adequacy, poverty, and health. It is somewhat smaller on fertility and labor force participation, and small on the average age at which children leave parental house and on age at which women have their first child.

## The Housing Affordability Malaise

### 1. Housing: a growing concern...

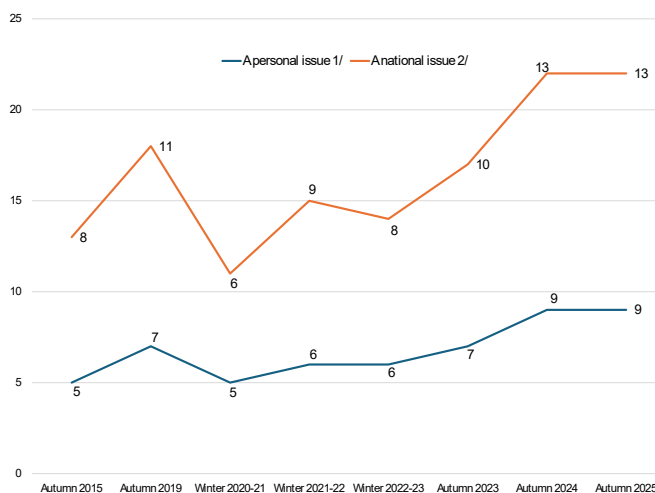
**Housing has become an important and rising concern.** According to Eurobarometer, the share of Europeans that perceive housing as one of the two main issues they face increased by 80 percent between 2015 and 2025, while the share of those that perceive housing as one of the two main issues their country is facing increased by 63 percent.<sup>1</sup> The magnitude of the change in concerns differs across countries. The increase was particularly strong in Ireland, Luxembourg, The Netherlands, and Spain where it reached

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<sup>1</sup> "Eurobarometer is the polling instrument used by the European Commission, the European Parliament and other EU institutions and agencies to monitor regularly the state of public opinion in Europe on issues related to the European Union as well as attitudes on subjects of political or social nature." For more detail see <https://europa.eu/eurobarometer/about/eurobarometer>.

remarkably elevated levels. Importantly, the increase was particularly strong from 2022 to 2024, before stabilizing (Figures 1 and 2).

Figure 1. EU27: Perception of Housing as a Major Issue (2015-25, Percent)



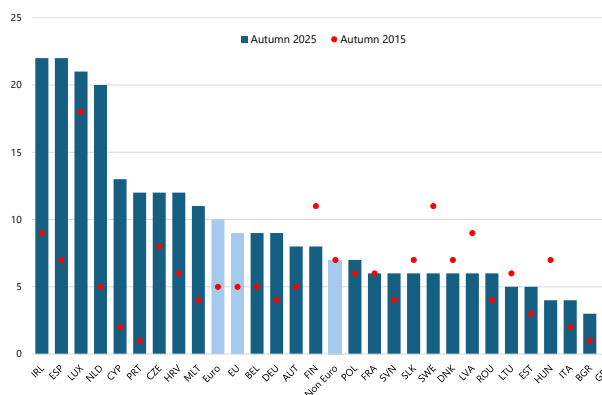
Source: Eurobarometer.

1/ Share of respondents answering "housing" to the question "Personally, what are the two most important issues you are facing at the moment?"

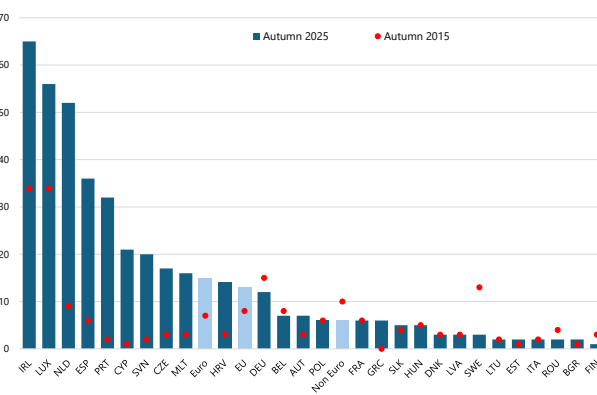
2/ Share of respondents answering "housing" to the question "What do you think are the two most important issues facing (Our Country) at the moment?"

Figure 2. EU27: Perception of Housing as a Major Issue by Country (Percent)

Personal Issue 1/



National Issue 2/



Source: Eurobarometer.

1/ Share of respondents answering "housing" to the question "Personally, what are the two most important issues you are facing at the moment?"

2/ Share of respondents answering "housing" to the question "What do you think are the two most important issues facing (Our Country) at the moment?"

**Affordability is a particular source of concern.** Housing concerns highlighted in the Eurobarometer do not provide any insight into its drivers: Is the problem with affordability, adequacy, availability, quantity, or any other dimension? Table 1 shows that when housing concerns are substantial enough to trigger protests, it was

mostly housing affordability that is emphasized. To get a better sense of the importance of affordability in European concerns about housing, we turn to the insight from other surveys.

**Table 1. EU27: Housing-Related Protests are Mostly about Affordability (2021-2025) 1/**

Year	Country	City / Area	Main Topic
2021	The Netherlands	Amsterdam, Rotterdam	Housing shortage; demand for action
2022	The Netherlands	Nationwide	Ongoing housing crisis
2023	France	Paris	Housing affordability; speculation; rent and energy price
2024	Portugal	Various	Housing affordability; cost-of-living
2024	Ireland	Various	Housing affordability
2024	The Netherlands	Various	Housing affordability
2024	Germany	Various	Housing affordability
2024	Spain	Madrid, Seville, Valencia	Housing affordability; discrimination
2024	Spain	Barcelona	Housing affordability; urgent reform
2025	Spain	40 Cities	Housing affordability; speculation; rent level
2025	The Netherlands	Utrecht	Housing affordability; rent level

Source: Authors.  
1/ The table is not exhaustive. It reports the main protests.

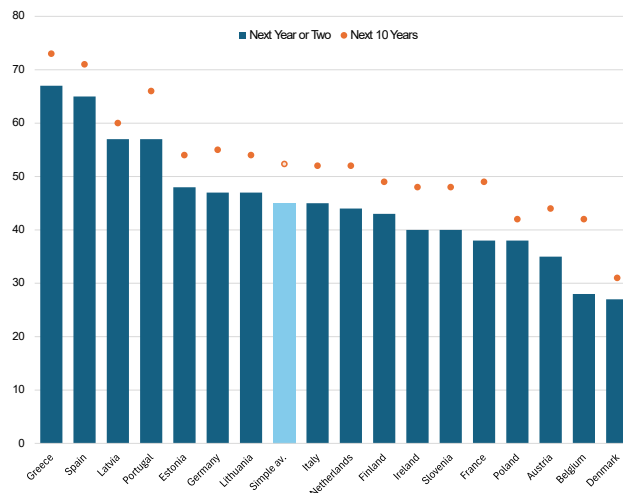
**The OECD’s Risk That Matters survey shows that “finding or maintaining adequate housing” is a concern for about half of the population.** Finding or maintaining adequate housing in the next year or two is a concern for 45 percent of the population of the 17 EU countries surveyed. This share rises to 52 percent for the next 10 years (OECD, 2025; Figure 3). The concern is more pronounced for the young. In 2022, over 59 percent of the respondents aged 18 to 29 expressed concerns about not being able to find or maintain adequate housing in the next year or two. This was 12 percentage points (ppts) higher than for respondents aged 30 to 49 and 23 ppts higher than for respondents aged 50 to 64 (OECD, 2023).

**Eurofound’s survey shows a large and growing concern about short-term consequences of housing affordability.** The share of the population declaring that it is likely that they will have to leave their home in the next 2 to 3 months because they cannot afford it increased by 43 percent since 2021 to reach 7.6 percent in 2025 (Figure 4). The recent increase in concerns about affordability is consistent with the results of the Gallup World poll that reports a sharp decline in satisfaction with housing affordability in recent years in the OECD: the decline was limited between 2017 (50 percent) and 2020 (49 percent) but was afterwards rapid to reach 40 percent in 2023 and 43 percent in 2024 (Vigers and Reimnitz, 2025). All three surveys point out that the concern increased post-pandemic.

**Finally, a recent survey conducted in France suggests that housing costs are an important component of affordability concerns.** In September 2025, 57 percent of respondents pointed to inflation and purchasing power as their main concern. 78 percent highlighted that housing is what weighs the most on their purchasing power because, for 87 percent of them, housing was the consumption item whose price increased the most in the past 10 to 15 years (Odoxa, 2025).

**Figure 3. EU: Concerns About Finding or Maintaining Adequate Housing**

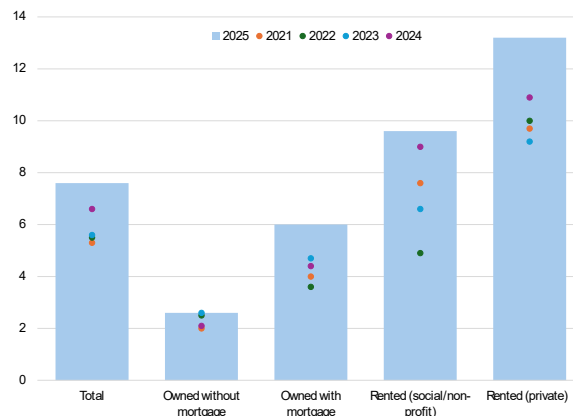
(2024, Percent of respondents) 1/



Sources: OECD (2025) and authors' calculations.

1/ Share of respondents who are "somewhat" or "very concerned" about finding / maintaining adequate housing.

**Figure 4. EU27: Housing Insecurity by Tenure (Percent of respondents) 1/**



Source: Eurofound.

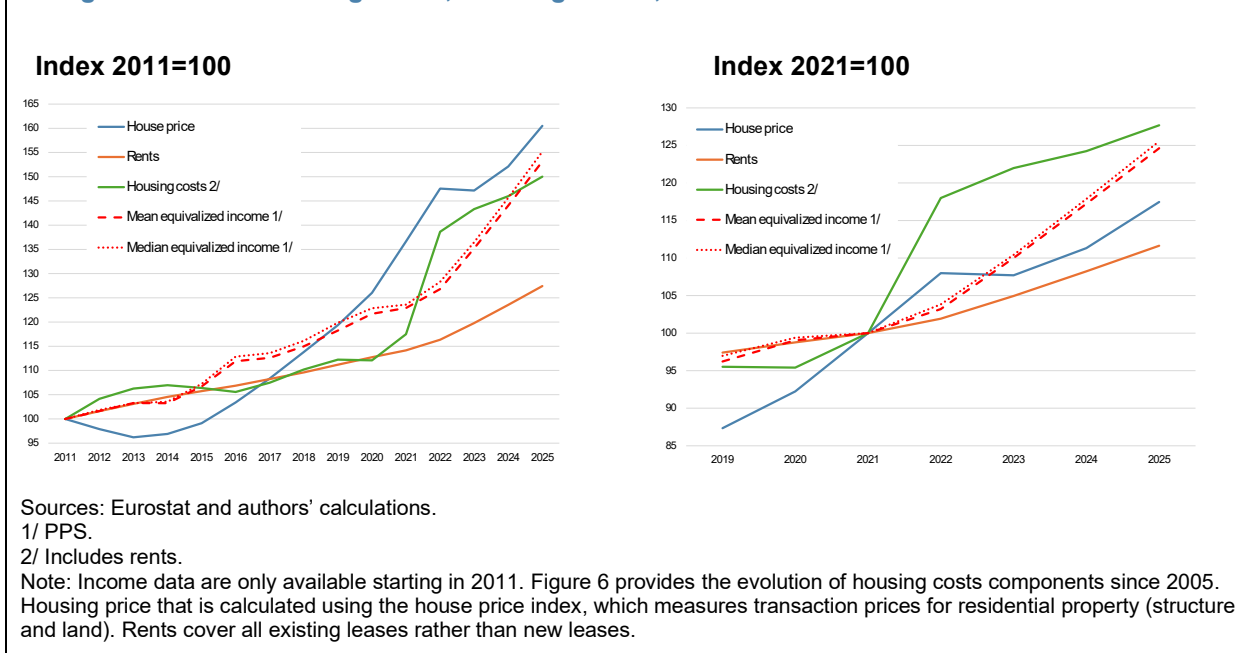
1/ Housing insecurity is measured as the proportion of respondents who said it is likely they will have to leave their home in the next few months [2-3 months] because they can no longer afford it.

## 2. ...that is hard to find in data

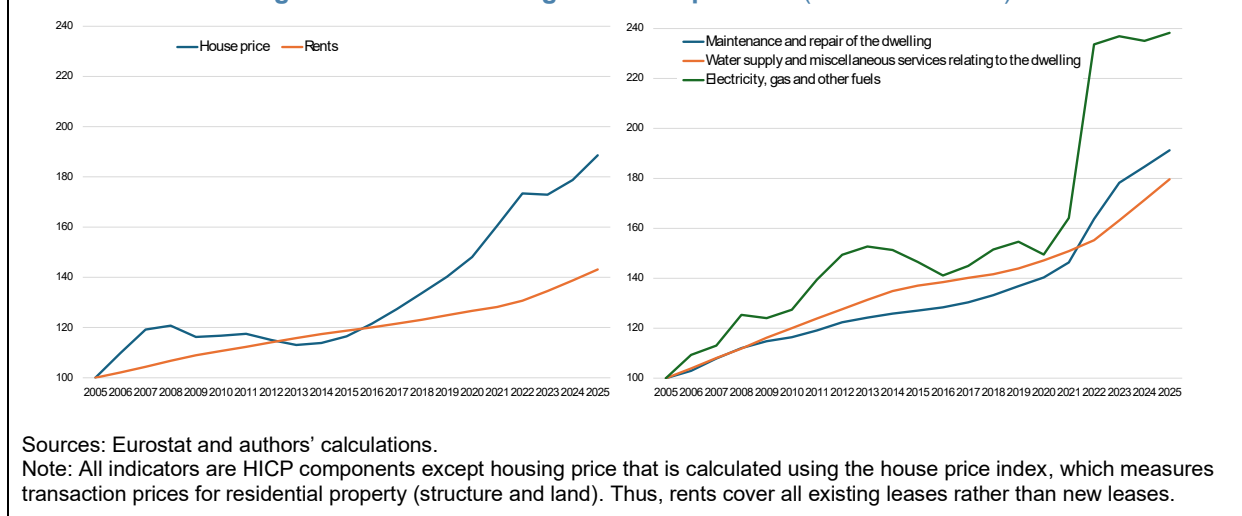
**The recent increase in public concerns coincides with a sharp post-pandemic increase in housing costs.** In the aftermath of the sovereign debt crisis, housing costs and rents increased less than income, while housing prices increased much faster. During the COVID-19 pandemic, the increase in real house price (deflated by the HICP) accelerated markedly and housing price growth outpaced income growth contributing making home purchase less affordable. In contrast, after the pandemic, housing prices and rents grew less than income, but housing costs shot up driven by energy prices (Figures 5 and 6). This contributed to a sharp

increase in the share of population unable to keep their home adequately warm from 6.9 percent in 2019 and 2021 to 10.6 percent in 2023; a level never reached since 2012 (Eurostat, 2025).

**Figure 5. EU27: Housing Costs, Housing Prices, and Income since the COVID-19 Pandemic**



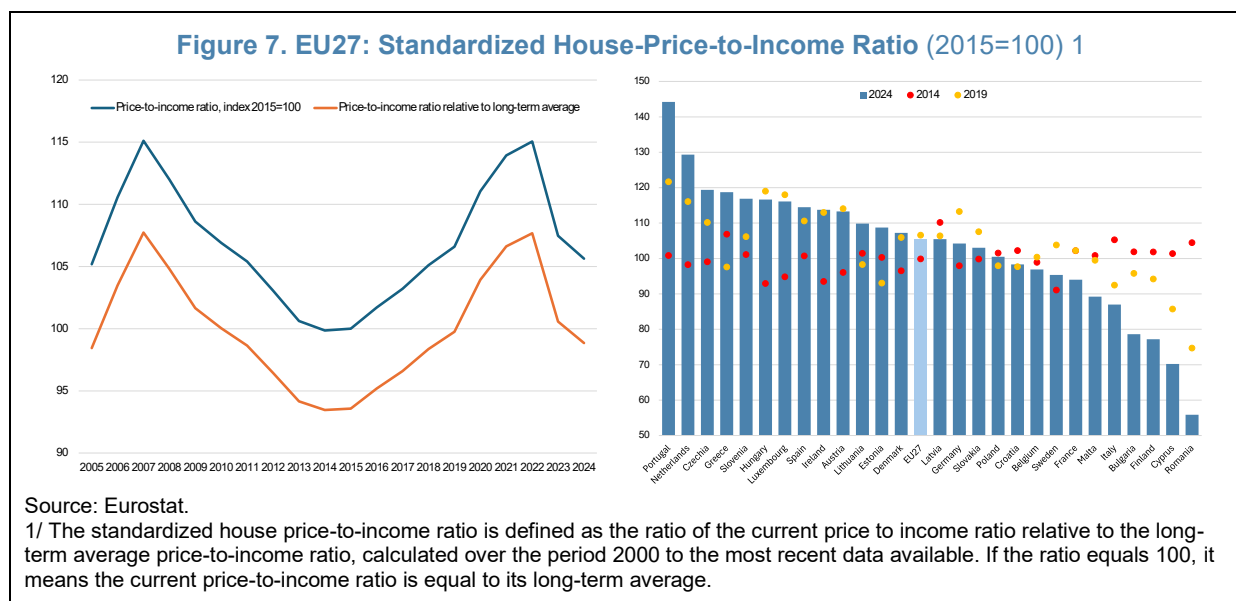
**Figure 6. EU27: Housing Cost Components (Index 2005=100)**



**However, the sharp increase in housing costs was short-lived and statistics do not point to an obvious deterioration in housing affordability over a longer horizon.** After a sharp increase due to the war in Ukraine, energy prices stabilized in 2023 and 2025. The share of people unable to keep their home adequately warm declined starting in 2024. Income caught up with housing costs. And while concerns remain elevated most surveys point that concerns stopped increasing. Overall, housing costs have risen at broadly the same

rate as income over the period 2011-25 (Figure 5).<sup>2</sup> Considering a range of indicators, this section shows that it is hard to find a deterioration in housing affordability in data in the past 10 to 15 years and Annex II documents the disconnect between the change in perceptions of housing as a problem and the change in various affordability measures.<sup>3</sup>

**First, although the house-price-to-income ratio has exhibited volatility over the past two decades, there is no sustained deterioration.** The ratio, which had decreased after the burst of the real estate bubble, started to increase in 2015 to peak in 2022 (when it was 15 percent higher than in 2015). Since then, it declined rapidly in part due to the monetary policy tightening. By 2024, it was below its long-term average. The evolution of the price-to-income ratio differs across EU members, but as detailed in Annex II, the magnitude of its change is only weakly correlated with the change in the perception of housing as an issue (Figure 7). Harmonized data on rent-to income ratio is not available but for renters, the share of the rent in disposable income has declined from its peak of 24.5 in 2013-15 to 22.5 percent in 2025. The increase during the pandemic was limited and quickly reversed.



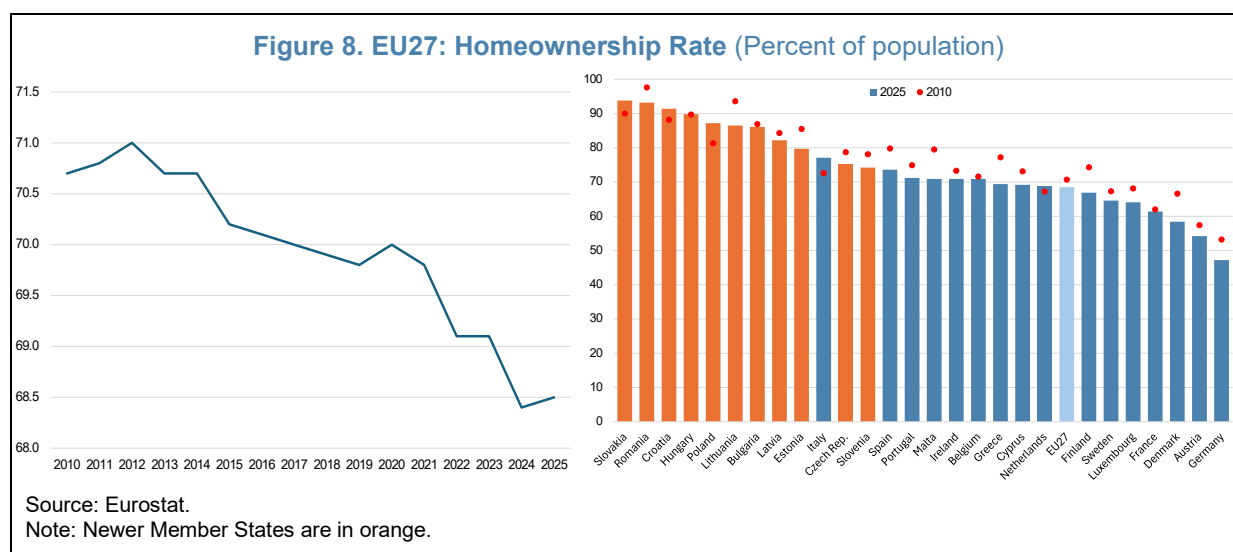
**Homeownership has nonetheless declined.** Homeownership rate varies significantly in the EU and is particularly large among newer Member States. It has declined in most countries since 2010. At the EU27 level, the homeownership rate declined marginally from 2012 (71 percent) to 2020 (70 percent). The decline then accelerated with the rate falling to 68.5 percent in 2025 (Figure 8). This period of faster decline coincides with

<sup>2</sup> For the euro area, Kouvas and Rusinova (2024) conclude “since 2022 growth in household nominal income has largely offset the rise in housing costs, and the ratio of housing costs to income has therefore remained relatively stable.” Similarly, Eurofound (2025) concludes “That housing affordability is a problem across the EU is widely acknowledged, including at the highest levels. [...] This crisis of housing affordability is not borne out by official statistics, however.” Hick and others (2025) point out that “while house prices have risen in most parts of Europe since around 2013 (Hick and others, 2022), there has not been a deterioration in housing affordability as it relates to ongoing costs and household incomes at the aggregate level.”

<sup>3</sup> There is debate on the adequate definition and measurement of housing affordability (Haffner and Hulse, 2021). Our approach which is to consider housing costs (as defined in Annex I) in income is consistent with a large part of literature as well as government and private sector approach of housing affordability (Peperini, 2023; Newman and Holupka, 2014). It is also adequate in the EU context where the recent rise in housing concerns coincided with the increase in housing costs.

the increase in population concerns about housing but as detailed in Annex II, there is no link when one considers country data suggesting that this is not a strong driver of perceptions.

**Monetary and financial developments may have contributed to the drop in homeownership rates.** A household's capacity to purchase a home is not limited to the price-to-income ratio. It also depends on its capacity to borrow. In the aftermath of the Global Financial Crisis (GFC), monetary policy and macro-prudential regulation affected differently the capacity to borrow. On the one hand, from the GFC to the pandemic, interest rates were low. Low interest rates made borrowing to purchase an accommodation easier. On the other hand, macro-prudential measures, such as the borrower-based measures, implemented to strengthen the financial sector's stability, also reduced access to home loans for part of the population and thus their capacity to purchase a home (Biljanovska and others, 2023).<sup>4,5,6</sup> Moreover, in a context of abundant liquidity and low interest rates, institutional investors, notably pension funds and insurance companies, sought investment opportunities with higher yields. They invested in real estate. "Overall, data from the ECB shows that the proportion of non-resident investors in the EU's housing market increased from 10.4% in 2010 to 14.1% in 2020, coinciding with a reduction in home ownership" (EC, 2025a). Although some of these investments led to an increase in the supply of housing, this is not frequently the case in stressed areas, where high demand for housing is attractive for institutional investors, but construction opportunities are limited. Therefore, increased financialization diminished the pool of available housing available for individual buyers, contributed to an increase in housing price and rents in some regions and may have delayed transition to first-time ownership (EC, 2025a and c; Haffner and Hulse; 2021; Hick and others, 2025).

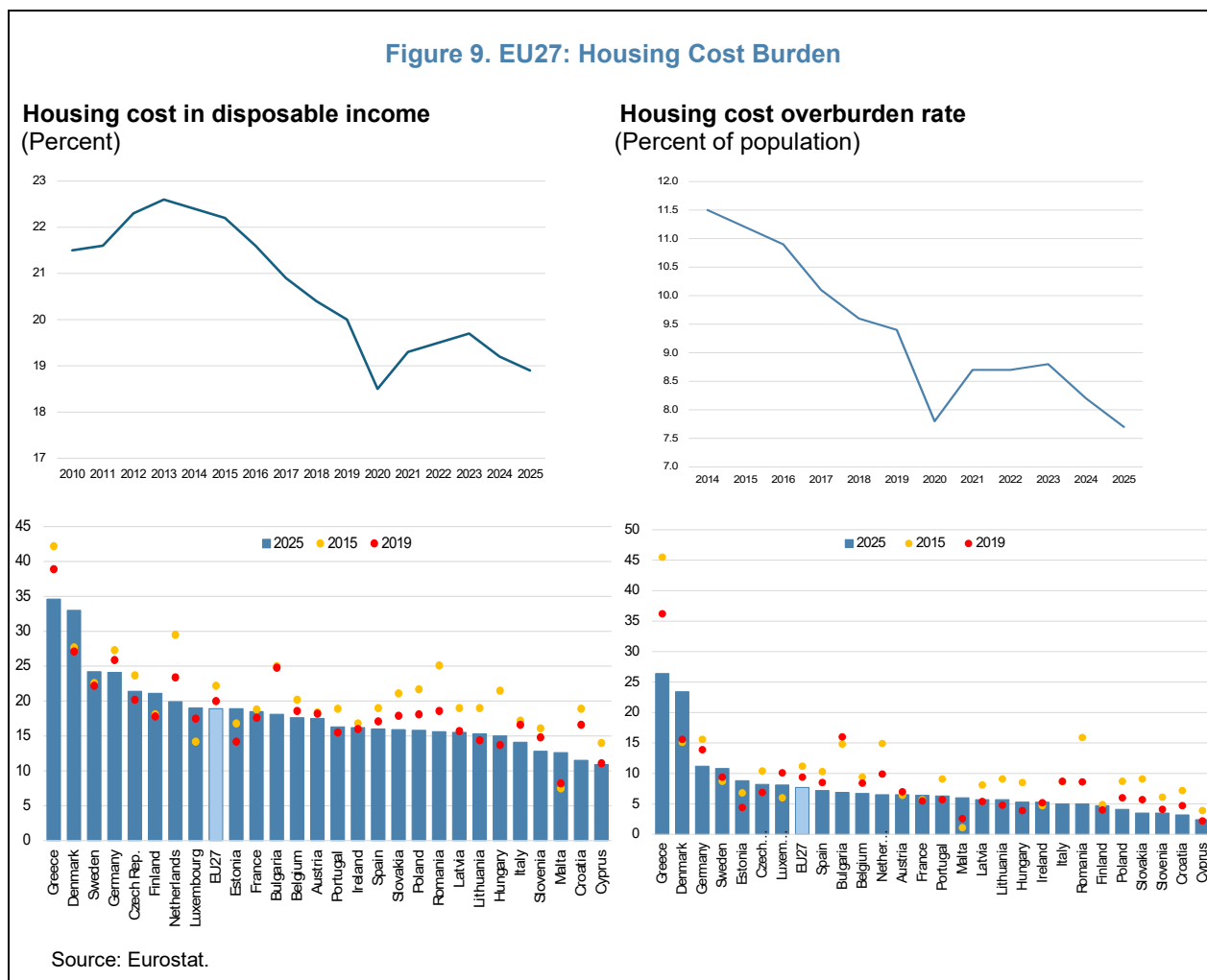


<sup>4</sup> Macroprudential policies increased the resilience in credit markets and reduced risks. In part due to macroprudential policies, the tightening in monetary policy after the start of the war in Ukraine did not lead to a sharp increase in mortgage defaults.

<sup>5</sup> The young were particularly affected because they generally have lower incomes relative to other age groups and a higher prevalence of fixed-term employment contracts, which reduce their income predictability (Chocron, 2026; Chen and others, 2018; EC, 2025a).<sup>5</sup> At the Euro area level, the ECB's Household Finance and Consumption Surveys report a decline in the population aged 16 to 34 owning their main residence from 31.8 percent in 2010 to 27.2 percent in 2017 followed by an increase to 29 percent in 2021. This may indicate that the transition to first-time owner has been delayed.

<sup>6</sup> Evidence of the impact of macro-prudential policies on homeownership remains scarce. Bäckman (2025) in a panel of 28 European countries during 2003–17 does not find any evidence that they reduce homeownership rates in aggregate or for select groups, either at the time of implementation or up to five years after. It should be noted that during the period considered the homeownership did not change much and declined markedly in the 2020s when many macro-prudential measures became more widespread in the EU (Figure 8).

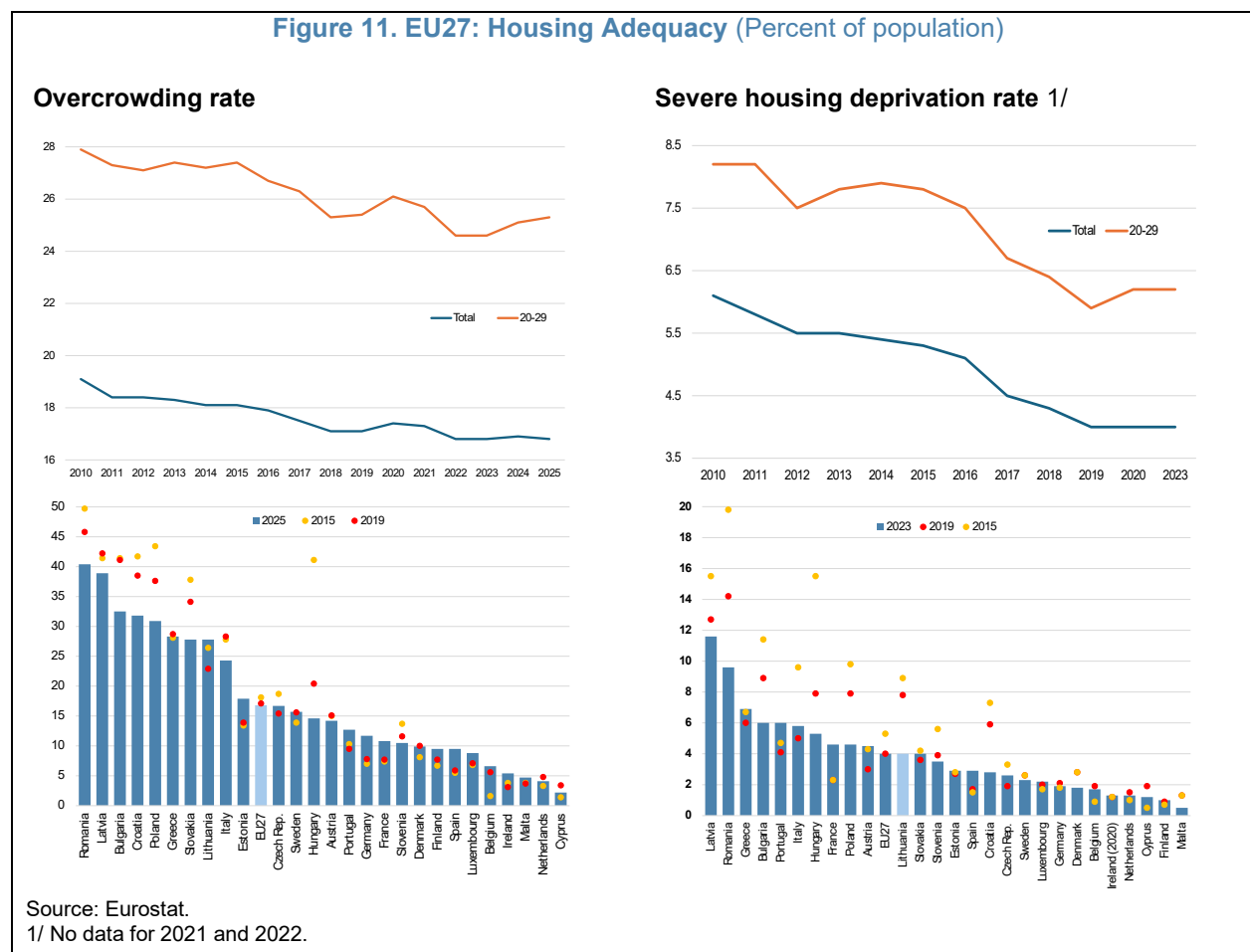
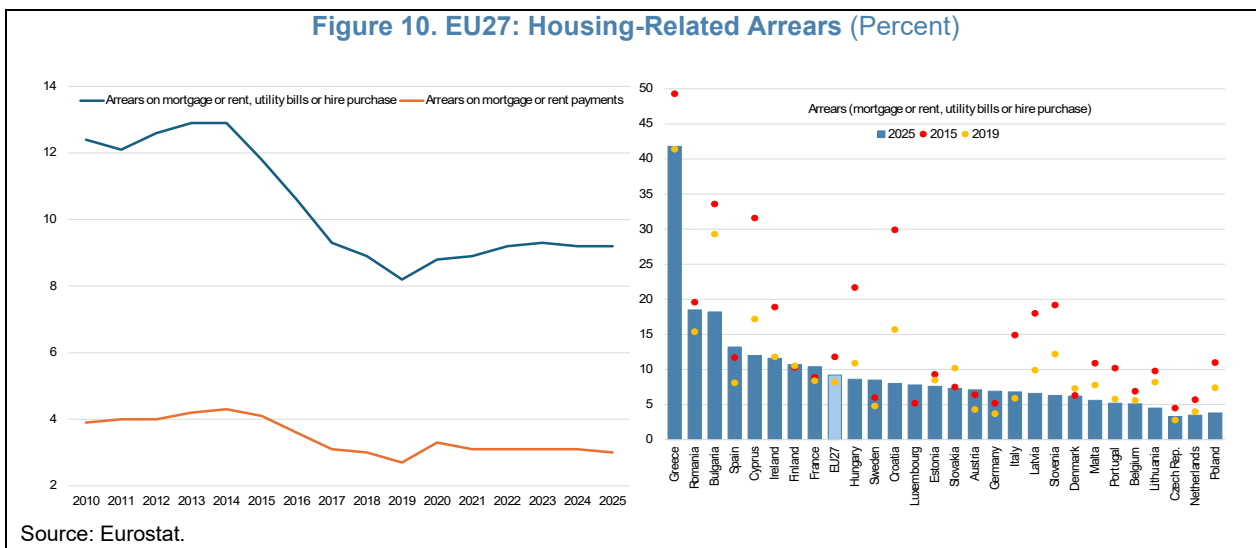
**Second, housing-cost burden indicators have declined since the GFC.** The share of housing cost in disposable income and the share of population facing housing cost overburden are now much lower than they were in the early 2010s (see Annex I for details on these two indicators). The rebound post-pandemic has been limited and short-lived with the two ratios declining in 2024-25 (Figure 9). Housing-related arrears are also lower than they were in the early 2010s, but they remain higher than in 2019 as the decline in 2024-25 was limited (Figure 10). Again, the change in these three indicators is not correlated with change in perceptions of housing as an issue (Annex II).



**Finally, the perception of housing affordability issues does not reflect a deterioration in housing adequacy.** When households cannot afford adequate housing, they may opt (i) for a smaller dwelling or to share a dwelling resulting in overcrowding or (ii) for a dwelling of poor quality. The overcrowding rate captures the first dimension, while the severe housing deprivation captures both dimensions.<sup>7</sup> At the EU level, housing

<sup>7</sup> For details on the calculation of the overcrowding rate See [Eurostat - Glossary: Overcrowding rate](#). “Severe housing deprivation rate is defined as the percentage of population living in the dwelling, which is considered as overcrowded, while also exhibiting at least one of the housing deprivation measures. Housing deprivation is a measure of poor amenities and is calculated by referring to those households with a leaking roof, no bath/shower and no indoor toilet, or a dwelling considered too dark” ([Eurostat - Glossary: Severe Housing Deprivation](#)).

adequacy has improved over time. However, for the young, the improvement is eroded post-pandemic (Figure 11). There is a positive but weak link between change in housing adequacy and change in perception of housing as an issue across EU members (Annex II).



### 3. Possible reasons for the gap between perceptions and data

**Overall aggregate data does not point to affordability issues that are as concerning as often claimed in public debate.** Homeownership declined, buying a house became more difficult in the second half of the 2010s and during the pandemic, but overall housing affordability has improved since the GFC and the short-lived deterioration during the pandemic has been since corrected. Three main reasons may contribute to the gap between perceptions of a housing affordability crisis and data.

**First, data may underestimate housing affordability problems.** In data, housing affordability is measured at the household level. This may bias downward the calculated housing costs burden. For example, if a young worker cannot afford a dwelling, he/she may decide to stay longer with his/her parents or share the housing to reduce the cost (Rhone, 2024). In that case, the household's income increases, reducing the measured housing cost burden. In other terms, data overlooked that housing cost burden did not increase much because of individual's response to housing affordability problems. Another measurement issue is that housing costs are incomplete. They include rents and interest payments on home loans but not principal payments that are considered an investment / a financial transaction and not a consumption item (Annex I). Similarly, the HICP covers consumption and therefore only includes rents but none of the costs for households to live in their own home (OOH).<sup>8,9</sup> This may again underestimate the extent of the housing affordability. The Catalan government has recently produced an adjusted consumer price index that includes the cost of buying a house. It found that the average gross salary increased more than inflation during 2014 and 2023, but the inflation adjusted to incorporate the OOH increased more than the average gross salary. Therefore, when comparing wage growth to inflation, there is a purchasing power gain but when comparing it to an indicator that includes the cost of buying a house, there is a purchasing power loss (CE Noticias Financieras, 2026a).<sup>10</sup>

**Second, housing affordability is not a generalized issue but is an issue only for some groups or countries.** Due to the difficulty finding data evidence of a generalized housing affordability problem, the literature has emphasized that housing affordability problems are concentrated on particular groups such as the young, lower income households, urban population, and tenants. Moreover, the EU average masks that housing affordability has evolved differently across the EU and can be more a problem in some countries than in others (Figures 11–17).

**Finally, affordability concerns may not be limited to financial affordability.** Concerns about housing affordability may not be limited to housing costs and prices but are likely to cover other dimensions such as availability and adequacy of housing, access to housing loans, homeownership prospects, housing and wealth inequalities, etc. As volatility in housing costs has been significant in recent years it may also be a source of concern particularly if an increase in housing costs has significant consequences. Indeed, the rest of this paper shows that the consequences of higher housing costs are numerous and significant.

<sup>8</sup> The European Central Bank has emphasized that the inclusion of OOH in the coverage of the HICP is important for monetary policymaking. In 2021, it addressed new recommendations to the European Statistical System. For details, see ECB (2022) and Eurostat (2023).

<sup>9</sup> The rents component of the HICP covers all existing rents rather than new rents. This dampens measured rents inflation compared to current market dynamics and can contribute to the data – perception gap.

<sup>10</sup> This may partly explain why the French population indicates that housing costs weighs the most on their purchasing power concern (Odoxa, 2025).

# The Consequences of Housing Affordability: A Conceptual Framework

**We investigate three mechanisms through which housing affordability problems can have consequences.**<sup>11</sup> Housing costs may (1) affect housing adequacy, (2) result in lost opportunities and reduced mobility, and (3) force low-income households to cut non-housing consumption. These three mechanisms can interact. For example, housing affordability can affect health because inadequate housing exposes individuals to health hazards (first mechanism) but also because it leaves less resources to spend on healthcare (third mechanism).

## 1. Housing affordability problems reduce housing adequacy

**Being unable to afford the housing they need may lead some households to live in an inadequate dwelling.** Housing inadequacy may take several forms: homelessness, inadequate location, inadequate housing size, inadequate quality of housing.

- **Homelessness.** Homelessness has been on the rise in the EU (EC, 2025b and c; Eurofound, 2023; European Economic and Social Committee, 2024). The European Affordability Plan, announced in the December 2025, recognizes that homelessness is “closely linked to unaffordability of housing” (EC, 2025c). This assessment is backed by a large body of evidence (for a review see Desmond 2016; EC, 2025 a and c). Therefore, the European Affordability Plan contains actions to address homelessness including the EU Anti-Poverty Strategy to be adopted in 2026 and measures to increase the availability of social housing. The decline in the stock of social housing since 2010, in part due to a lower investment and to the sale to tenants, may have contributed to an increase in homelessness and affected housing adequacy. Social housing is estimated to 6-7 percent of the housing stock by the EC and to 8 percent by the OECD but differs massively across EU countries and may not match the needs of the population (Burns, 2018; CE Noticias Financieras, 2026c; EC, 2025a and b; Eurofound, 2023; European Economic and Social Committee, 2024, OECD, 2024).
- **Inadequate location.** Affordable housing may not be available close to an individual’s main activity (work, school, etc.). Affordability problems therefore can increase the distance between employment / education location and housing location with associated commute cost and time. The neighborhood of the dwelling may also be inadequate either because of a reduced access to infrastructure or because of inadequate security and poor built-in environment.<sup>12</sup> There is evidence that this affects individuals’ health, well-being and happiness as well as children’s development (Amerio and others, 2017; ESS, 2025; Hallaert and others, 2023; Otodom, 2021; and Rautio and others, 2017).

<sup>11</sup> This section reviews the channels underpinning for the empirical analysis. As such, though it covers all the main channels, it is not meant to be an exhaustive discussion.

<sup>12</sup> “Built environment includes human-made physical elements of the environment such as streets, open spaces, infrastructure, houses, and buildings” (Amerio and others, 2017).

- **Inadequate housing size.** Unable to afford housing of adequate size, households may also opt for a smaller housing, leading to overcrowding.<sup>13</sup> The overcrowding rate is frequently used as a proxy for inadequate housing. Highlighting the link with housing affordability, is the fact that low-income households and the young are the most affected by overcrowding (EC, 2025b - Figure 11). In France 25 percent of the population aged 18 to 34 reports living in a housing that is inadequate in size compared to 15 percent for the population above 35 (Odoxa, 2026). We will estimate the impact of housing affordability on both the overcrowding rate and the age at which children leave parental house.
- **Inadequate quality.** Unable to afford adequate housing, households may also live in a housing of poor quality. We will assess this impact via the severe housing deprivation rate (an EU Social Scoreboard indicator). The severe housing deprivation rate affects more severely the rural population and the young. In France, where the share of population suffering from severe housing deprivation has increase significantly in recent years, 69 percent of the young report living in a housing that is too small, too noisy, too damp, facing heating issue, or too dark (Figure 11). This is 14 ppts more than for the population aged 35 or more (Odoxa, 2026; Eurofound 2023).

**Therefore, housing affordability impacts individuals' well-being through housing adequacy.** Living in a housing that is too small or unfit directly affects individuals' material well-being. Moreover, housing being a crucial element of social status, inadequate housing can contribute to a sense of demotion, economic and financial insecurity, and subjective poverty (Duvoux and Papuchon, 2018). Living in a too small or unfit housing also affects individuals' well-being indirectly because, as discussed below, inadequate housing has a negative impact on physical and mental health, reducing productivity, labor participation (including through higher absenteeism) and income and has fiscal costs (EC, 2025c). Inadequate housing is particularly damaging for children's development and tends to reinforce the persistence of intergenerational inequality (Hallaert and others, 2023). The impact of housing affordability on housing adequacy can also become entrenched if, as in Spain, the size of new apartments is declining in response to affordability constraints (CE Noticias Financieras, 2026b).

## 2. Lost opportunities due to housing affordability problems: impact on poverty, labor force participation, and spatial allocation of labor

**Housing affordability problems can reduce mobility and limit the capacity of individuals to seize opportunities.** Housing costs may prevent individuals from relocating to areas where there is a job or a training opportunity. In some cases, individuals may not accept opportunities that do not require a relocation but longer commute because "higher housing costs for those with low incomes are known to affect the household's ability to meet other essential needs, for example, [...] pay for transport costs (which may limit participation in employment and education)" (Bentley and others, 2011; Haffner and Hulse, 2021). Surveys suggest that this is an important mechanism. For example, in France, 30 percent of the young (aged 18-34) report that due to "housing problem" they could not accept a job (Odoxa, 2026). We focus on the impact of housing costs, but it is worth noting that it is not the only dimension of housing problem that can affect mobility.

<sup>13</sup> To some extent, "adequate size" is subjective and reflects social norms. A housing may not be considered overcrowded from a statistical point of view because it has enough rooms (for the definition see [Eurostat - Glossary: Overcrowding rate](#)), but individuals may consider the rooms too small and thus the housing inadequate in size.

Access to housing is another one.<sup>14</sup> In France, more than 80 percent of new hiring are fixed-term contracts or temporary assignments. This can be an obstacle for access to housing (notably for the young entering the job market) as landlords are increasingly requiring potential tenants to show income stability (as banks do before providing a home loan) and, thus, prefer workers with open-ended contracts (Chocron, 2026). Therefore, even if a new job makes a prospective dwelling affordable, an individual may not be able to find one.

**Lost opportunities can increase poverty and reduce labor mobility.** Turning down a job opportunity or a training opportunity can reduce an individual's current and future income and, thus, increase the risk of falling into poverty. Therefore, "poverty is [like homelessness] closely linked to unaffordability of housing" (EC, 2025b) and "housing is implicated in the creation of poverty" (Desmond, 2016). The fact that a high housing cost burden is not merely a manifestation of poverty but also creates poverty, suggests that housing affordability problems adversely affect productivity and weaken social cohesion. Moreover, the inability to accept a job due to high housing costs may result in unemployment or dropping from the labor force further dampening productivity and potential growth.<sup>15</sup> The housing affordability problems may also entrench poverty and inequality possibly over generations.

**By reducing mobility, housing affordability problems contribute to spatial misallocation of labor.** There is evidence that due to housing costs, low-income households leave high-cost metropolitan areas (Gabriel and Painter, 2020; Haffner and Hulse, 2021). This contributes to shortages of essential services workers (such as teachers, childcare professionals, and police officers) in these areas (EC, 2025a and b). Moreover, housing affordability may prevent some workers from moving to the high housing cost areas. This can contribute to the sometimes-large differences in unemployment rates across regions even in geographically small countries. The economic literature has documented this mechanism in various countries<sup>16</sup> and that this hampers productivity growth and, ultimately, economic growth. The Swedish Productivity Commission also pointed out that housing and rental market are a barrier to labor mobility which is identified as a reason for the slowdown in productivity (IMF, 2025).

### 3. Housing affordability problems constrain non-housing consumption

**Housing costs may reduce non-housing consumption.** Medical, public health, and economic literature provides evidence that for households facing a tight budget constraint and with little saving capacity, higher housing costs reduce resources available for other spending including essential consumption such as food, healthcare, education, and energy (e.g., Bentley and others, 2011; Kirkpatrick and Tarasuk, 2007 and 2011; Newman and Holupka, 2014). In this paper we will investigate this mechanism for fertility and health. Surveys highlight its importance. In 2021, 26 percent of Poles indicated making the decision to have a child conditional on housing stability (Eurofound, 2023). In 2024, 87 percent of respondents from 17 EU countries to a survey identified housing conditions as barriers to childbearing (OECD, 2025).<sup>17</sup> In 2025, 82 percent of the French

<sup>14</sup> The decline in the stock of affordable social housing may worsen the access to housing for low-income households and the young. The share of the population that are tenants at reduced price (or free) declined from 11.1 percent in 2010 to 9.5 percent in 2019. It increased steadily to reach 10.7 percent in 2025.

<sup>15</sup> We will estimate the impact of housing affordability for the entire population and for women. Indeed, housing costs provides incentives to have both members of a couple to work instead of one in order to increase the household income.

<sup>16</sup> The United States (Glaeser and Gyorko, 2018; Hsieh and Moretti 2019; Anthony, 2023), Spain (Nguyen and others, 2026), and Sweden (Eliasson and Westerlund, 2024).

<sup>17</sup> Simple average of the responses from the 17 EU countries where the survey was conducted.

aged 18 to 34 reported that, due to housing problem they had to constrain other type of spending and saving. 29 percent have given up on medical care and 21 percent said that they gave up on the idea of having a child (or one more child) due to housing (Odoxa, 2026).<sup>18</sup>

**The decline in fertility is accelerating in the EU.** The fertility rate declined from 1.57 in 2010 to 1.34 in 2024. The decline was particularly rapid post-pandemic (Figure 12). The mean age of women at the birth of their first child also increased by one year in a decade (from 28.8 in 2013 to 29.8 in 2024). Moreover, the number of births in the EU was 22.8 percent lower in 2024 than in 2010. There are many reasons for this demographic evolution and their relative importance changes over time (Doepke and others, 2022; Kearny and Levine, 2025; Skirbekk, 2022).

**Economic literature suggests that housing affordability plays a role.** According to the neo-classical models initiated by Becker (1960), if children are “normal goods,” a reduction in disposable income (after accounting for housing costs) will reduce the demand for children and thus fertility. Life-cycle models highlight that a postponement of births (due, for example, to housing costs) will reduce children a woman have during her lifetime (Hotz and others, 1997). The impact of housing of fertility is supported by empirical literature:

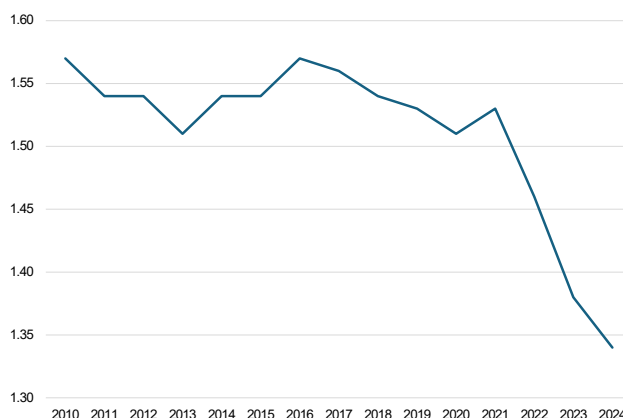
- **Rising house prices decrease fertility among tenants but, due to a wealth effect, raise it for homeowners.** This has been observed in the United States (Lovenheim and Mumford, 2013; Dettling and Kearney, 2014), Canada (Clark and Ferrer, 2019), England (Aksoy, 2016) and in Australia (Atalay and others, 2021). Van Wijk and Feijten (2025) find that, in The Netherlands, higher house prices contributed to a decline in overall fertility because the positive impact on homeowners was outweighed by the negative effect on tenants.
- **Access to housing affects fertility.** Van Doornik and others (2024) show that, in Brazil, early access to homeownership significantly boosts the fertility rate. Brauner-Otto (2023) finds that, for a panel of 39 low-fertility countries, housing access affects the age at first birth for both renters and homeowners. She also finds that the wealth effect is limited to the former communist countries of the sample perhaps due to their high homeownership rate (Figure 8).
- **Home loans and their terms influence fertility.** Cumming and Dettling (2024) find that the sharp decline in interest rates during the GFC in the United Kingdom and the United States increased birth rates among households with adjustable-rate loans. For a panel of 18 OECD countries, Malmberg and Ghilagaber (2026) find that lending growth has a positive impact on fertility: “while house prices matter, it is the growth in household lending that consistently facilitates transition to parenthood.”

**The impact of housing affordability on health is also well documented.** Medical and public health literature provides abundant evidence that housing affects physical and mental health. An important reason is related to inadequate housing which affects physical health due to (1) exposure to toxins (chemicals and microbiological agents such as mold); (2) poor insulation or dampness; (3) poor living environment which exposes to higher injury risks and favors asthma, skin infections, hypertension, arthritis, etc. and. Housing costs can also affect physical health if they reduce the capacity to afford medical visits, preventive care (including for children) as well as healthcare and prescription recommendations but also if housing results in a cut in food purchase resulting in adequate and insufficient diet (Bentley and others, 2011; Botha and others, 2024; Eurofound, 2023;

<sup>18</sup> The National Economic and Social Council also pointed out that housing problems is playing a role in declining fertility rates in Ireland (NESC, 2025).

Kirkpatrick and Tarasuk, 2007; Pollack and others, 2010, and WHO, 2018).<sup>19</sup> Housing affordability problems may also affect mental health. First, financial strain due to housing costs results in stress and there is evidence that housing affordability affects mental health over and above general financial hardship, possibly due to the social and psychological importance of housing (Arundel and others, 2024; Bentley and others 2011; Chung and others, 2020; Singh and others, 2020; Taylor and others, 2007). Parental stress can in turn increase children’s stress affecting their own health and development (Hallaert and others, 2023). Second, housing quality and its environment are associated with depressive symptoms (Amerio and others, 2020; Rautio and others, 2017). A survey conducted in Poland also suggests that neighborhood influences the sense of happiness (Otodom, 2021). Finally, housing insecurity (including if housing affordability leads to a relocation in a less favorable neighborhood or homelessness and for children to a loss of friends and change in school) affects self-perception and mental health and has been linked to increases in suicide (Desmond, 2016; Eurofound, 2023; Fowler and others, 2015).

Figure 12. EU27: Fertility Rate



Source: Eurostat.

## Estimating the Consequences of Housing Affordability

**We now estimate the consequences of housing affordability in the EU over the past 15 years.** We assess the impact of all the channels discussed in the previous section through 15 different estimates. Before presenting the results, we discuss the econometric approach and the estimation method as well as data and validity of the estimates.

### 1. Econometric approach and estimation method

**Estimating the effects of housing affordability requires an approach that avoids restrictive parametric assumptions that may be poorly suited to the complexity of the underlying economic relationships.**

<sup>19</sup> Reduced healthcare spending may also occur when housing affordability results in moving to a location with more difficult access to quality healthcare.

From an econometric perspective, the analysis is complicated by (i) considerable number of potentially relevant confounders and (ii) endogeneity concerns. Housing affordability co-moves with income, credit conditions, and policy interventions and, together with the outcome variables, is influenced by a broad set of structural and cyclical factors, many of which are difficult to model parsimoniously.

**Although the standard two-stage least square (2SLS) framework provides a useful benchmark for addressing endogeneity, its practical applicability in the current context is limited.** 2SLS relies on strong linearity assumptions, a parsimonious set of controls, and a prespecified functional form, which may be poorly suited to settings characterized by rich covariate information, nonlinear interactions, and heterogeneous treatment effects. These limitations are especially salient in cross-country panel data applications, where the number of potentially relevant confounders is large relative to the available sample size and the risk of misspecification is non-negligible. In such environments, conventional instrumental variable estimators may suffer from finite-sample bias as well as reduced efficiency and robustness. Moreover, restricting the conditioning set to a small number of controls presents the risk of omitted variable bias, while expanding it may exacerbate overfitting and weaken first-stage relationships.

**To address these limitations, we adopt a double machine learning framework with instrumental variables (DML-IV).** This approach is designed for settings with endogenous treatments and high-dimensional controls. Developed by Chernozhukov and others (2018), the DML-IV separates the estimation of the causal parameter of interest from the estimation of nuisance components, using flexible machine learning methods to model the latter. While machine learning allows for rich representations of the underlying relationships, they may introduce regularization bias and overfitting in finite samples. The DML-IV addresses these concerns through two complementary adjustments: (i) Neyman-orthogonal scores, which render the causal estimate first-order insensitive to errors in nuisance estimation and (ii) cross-fitting, which prevents overfitting by ensuring that nuisance components are estimated on samples separate from those used for causal estimation (Annex III).

**As a result, the DML-IV allows the analysis to fully exploit the richness of the EU27 panel while maintaining valid statistical inference.** First, it allows the inclusion of a rich set of macroeconomic and institutional controls without requiring *ad hoc* variable selection, thereby improving cross-country comparability. Second, it accommodates nonlinearities and interactions that are likely to be present in a period marked by significant shocks. Third, it provides a natural framework for exploring treatment effect heterogeneity, which is essential for understanding distributional consequences and policy trade-offs.

**The DML-IV is well-suited to settings with a limited number of time periods.** Traditional econometric methods often require strong parametric assumptions or long time-series to deliver reliable results. Rather than relying on time-series variation, the DML-IV exploits cross-sectional variation and flexibly controls for a rich set of confounding factors. By combining this with a design that guards against bias from complex relationships, the approach allows credible causal inference even in short-panel EU settings, where institutional heterogeneity is large and standard methods can struggle to adequately control for confounding influences.

**The DML-IV allows causality analysis under standard instrumental variable assumptions.** It combines a structural identification strategy, grounded in standard instrumental variable assumptions of relevance and conditional exogeneity, with flexible, high dimensional controls that absorb confounding variation driven by observable economic and institutional factors. By orthogonalizing the treatment and outcome equations with respect to these controls and exploiting plausibly exogenous variation in housing affordability, the approach

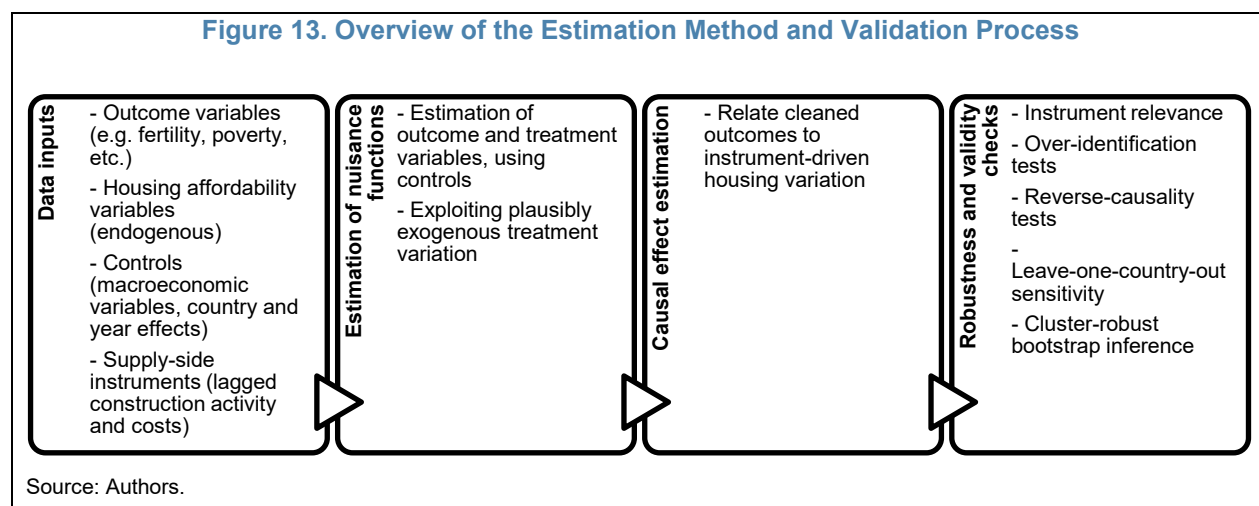
seeks to isolate variation that may be interpreted as reflecting causal responses to affordability shocks, rather than correlated macroeconomic dynamics or policy feedback, conditional on the validity of the underlying instrumental variable assumptions.

**Identification within the DML-IV framework continues to rely on the availability of instruments that shift housing affordability, while satisfying the relevance and exclusion restrictions.** As in conventional instrumental-variable settings, instruments must be sufficiently strong and plausibly exogenous to isolate variation in housing costs that is orthogonal to unobserved determinants of the outcomes of interest. What the DML-IV adds is a way to incorporate such instruments in a complex, high-dimensional environment, allowing for rich sets of controls without compromising inferential validity. Ensuring instrument relevance, validity, and sufficient variation therefore remains a prerequisite for the correct application of the DML-IV approach.

**Overall, the DML-IV combines rich modeling capacity with transparent causal interpretation.** By retaining standard instrumental-variable assumptions while allowing for high-dimensional controls and complex relationships, the approach strengthens the statistical validity of the estimated effects and enhances their usefulness for policy analysis. In addition, the DML-IV naturally accommodates treatment effect heterogeneity. This dimension is particularly important in the EU context, where housing market structures, policy frameworks, and welfare regimes differ markedly across countries.

**The DML-IV estimation and validation method involves four steps (Figure 13).** The analysis starts from a rich country-year panel that combines social outcomes, housing affordability indicators, macroeconomic controls, and predetermined supply-side instruments. The core idea is to separate the adjustment for confounding from the identification of the causal variation. In the first step, outcomes and housing affordability are flexibly related to observed controls, including country and year effects, using out-of-sample estimation at the country level. This step absorbs common trends, persistent country characteristics, and nonlinear macroeconomic relationships, reducing the risk that subsequent analysis is driven by spurious correlations or overfitting to short national time series. Building on this cleaned dataset, the estimation then isolates the component of housing affordability that is associated with predetermined supply-side instruments rather than by contemporaneous demand or social conditions. Under the identifying assumptions, the resulting estimates capture the effect of the instrument-driven changes in housing affordability on the adjusted outcomes.

**Figure 13. Overview of the Estimation Method and Validation Process**



**We instrument housing affordability using construction costs and lagged construction activity.** Lagged construction activity is measured as the building permits in square meters per thousand inhabitants taken with a lag of 1 year, while construction costs are estimated with the annual growth in the construction producer prices for new residential buildings. Higher past construction activity increases the effective housing stock with a lag, while increased past construction costs constrain supply and are quickly reflected in housing prices and affordability.

**The strength and validity of the first-stage relationship between construction conditions and housing affordability are supported empirically by additional tests adapted to work in the DML-IV framework.**

The tests are undertaken to give confidence that the estimated effects are driven by plausibly exogenous housing supply variation and the robustness of the results. We validate all our specifications through a number of identification tests that are used to check for instrument relevance and exogeneity and reverse causality. In lieu of standard inference we apply cluster-robust bootstrap to account for the relatively small time series and cluster structure of the data. Technical details underlying each step, as well as the robustness and validity tests are presented in Annex III.

**To address a potential concern that construction activity and costs may proxy for broader macroeconomic conditions that also directly affect the outcome variables, all specifications include a rich set of macroeconomic controls, as well as country and time fixed effects (Annex IV).** The identifying assumption relies on the idea that, after conditioning on observed macroeconomic factors, residual variation in costs and lagged construction activity reflects supply-side dynamics in housing markets rather than general economic conditions. While some residual correlation with broader economic forces cannot be entirely ruled out in a macro panel setting, the combination of rich controls, absence of reverse causality, and supportive overidentification tests provide a consistent picture in favor of the proposed identification strategy.

**A potential concern is that construction costs and building activity may respond to broader macroeconomic conditions, such as interest rates, wages, or aggregate demand, which could themselves directly affect the outcomes of interest.** We therefore include a rich set of macroeconomic controls and fixed effects designed to absorb common cyclical forces. Remaining variation in construction costs and lagged permits is interpreted as reflecting housing supply dynamics driven by regulatory constraints, planning lags, and input cost shocks. While this interpretation is economically motivated, the exclusion restriction cannot be tested directly and remains an identifying assumption.

**To sum up, we estimate the effect of housing affordability on socioeconomic outcomes using a panel instrumental-variable framework embedded in a double machine learning (DML-IV) estimator.** As outcomes we use several social and economic indicators, such as poverty, fertility, labor force participation, etc. (see Annex IV for the full list of the estimated specifications). The endogenous regressor measures housing affordability. The parameter of interest is the average marginal effect of a change in affordability on the outcome, conditional on observed covariates. Endogeneity arises because housing affordability co-moves with income, labor market conditions, credit availability, and policy interventions. To address this concern, affordability is instrumented using lagged housing supply indicators, which shift housing supply with a lag. The estimation controls flexibly for a rich set of macroeconomic, demographic, and institutional variables, as well as country and time fixed effects. The DML-IV estimator allows these controls to enter nonlinearly, while orthogonalizing the estimating equations so that the parameter of interest is locally insensitive to errors in nuisance estimation.

## 2. Data

**The quantification relies on annual data from Eurostat covering the EU27 over the period 2010–2023.**<sup>20</sup>

Eurostat provides a large set of harmonized and policy relevant indicators. The availability of many variables allows the inclusion of a rich set of controls capturing macroeconomic conditions, labor market dynamics, and social protection systems, which is essential given the complex determinants of housing affordability.

Furthermore, harmonized definitions and methodologies minimize cross-country measurement error, which is critical in a panel setting covering diverse institutional environments. Finally, the data are closely aligned with the indicators used in EU-level policy discussions, enhancing the interpretability and policy relevance of the results.

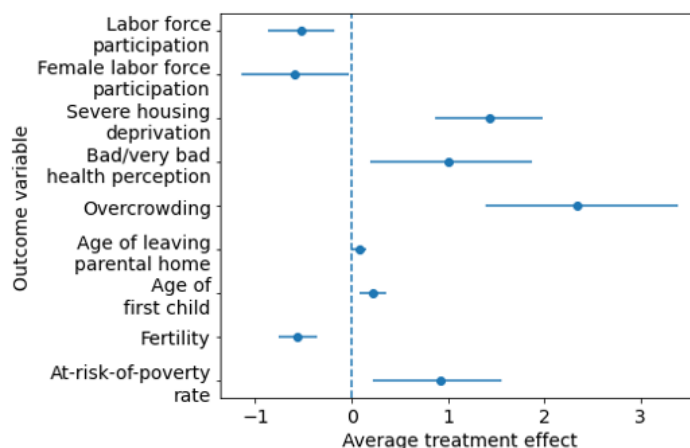
**To focus on relative developments and improve cross-country comparability, all variables are expressed as log deviations from the contemporaneous EU average.** Specifically, for each country and year, variables are transformed into the difference between the natural logarithm of the country-specific value and the logarithm of the EU27 average in that year. This transformation removes common EU-wide trends, such as those driven by monetary conditions or synchronized business cycle fluctuations and centers the analysis on country-specific deviations. As a result, estimated effects can be interpreted as the impact of a relative increase in housing costs compared to the EU average, holding constant broader European dynamics. This normalization offers several advantages. First, it mitigates concerns related to non-stationarity and scale differences across countries, improving numerical stability and interpretability. Second, it allows the coefficients to be read as elasticities with respect to relative positions within the EU distribution. Third, by abstracting from aggregate EU-level shocks, the transformation strengthens the identification of causal effects driven by cross-country heterogeneity. However, this transformation also implies that any developments that are common across all EU countries (such as EU-wide policy shifts, global financial shocks, or synchronized macroeconomic trends) are effectively differenced out and thus not captured in the estimated effects.

## 3. Results

**Housing affordability is measured by two housing costs indicators.** We consider both the housing costs in disposable income and the housing cost overburden rate. These indicators and their pros and cons are discussed in Annex I. Housing cost share in disposable income often gives larger and more consistently significant coefficients. This may be because it captures the intensity of housing costs across the entire distribution, while the housing cost overburden rate only identifies the share of households with severe affordability distress. As discussed in Annex I, the impact of a given housing cost burden is highly dependent on where a household falls in the income distribution. For a high-income household spending 40 percent or more of its disposable income on housing (the threshold for housing cost overburden) may not be a financial burden and have no consequences. Conversely, for a low-income household, spending 10 percent of income on housing may be problematic. Therefore, the housing cost share in disposable income is our preferred measure to assess the consequences of housing affordability.

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<sup>20</sup> For some specifications, the time coverage may be different due to data availability.

**Figure 14. Confidence Interval of Estimates of the Impact of Housing Cost in Disposable Income**

Source: Authors' calculations.

Notes: Variables are expressed in deviations from EU average.

**Filtering out only the specifications using the share of housing costs in disposable income confirms that affordability pressures primarily translate into deteriorating living standards rather than immediate demographic shifts.** Figure 14 shows that all estimates have the expected sign and are significant at 10 percent or less.<sup>21</sup> The magnitude of the impact of housing affordability problems varies markedly. Housing adequacy (overcrowding rate and severe housing deprivation) is a core adjustment margin, and estimates are most of the time significant at 1 percent. There is also evidence that housing costs markedly deteriorate health status, reduce labor force participation and increase at-risk-of-poverty rate. The immediate impact of housing affordability on fertility and age of first childbearing is comparatively less pronounced though highly statistically significant.

### A. Impact on housing adequacy

**The estimated impact of housing affordability on overcrowding is severe, but more limited for severe housing deprivation (Table 2).** 1 percent increase in housing cost share in disposable income relative to the EU average increases the overcrowding rate by 2.34 percent. In other terms, if in a country, the share of housing cost in disposable income is just 0.2 ppt higher than EU average of 20.8 percent, then its overcrowding rate would be 0.4 ppt higher than EU average of 17.4 percent. 1 percent increase in the housing cost overburden rate increases the overcrowding rate by 1.41 percent for the entire population i.e., if in a country, the housing cost overburden rate is 0.1 ppt higher than EU average of 9.9 percent, its severe housing overcrowding rate would be 0.25 ppts higher than in the EU average of 17.4 percent. The impact is more limited on severe material deprivation. A 1 percent increase in housing cost share in disposable income relative to the EU average increases by 1.43 percent the severe housing deprivation rate. Thus, if in a country, the share of housing cost in disposable income is 0.2 ppt higher than EU average, its severe housing deprivation rate would be less than 0.1 ppt higher than EU average of 5.0 percent.

<sup>21</sup> The whiskers present the 90 percent confidence interval.

**Table 2. EU27: Impact of Housing Affordability on Housing Adequacy**

	Overcrowding Rate		Severe housing deprivation	Age leaving parental house
	Total Population	Young (20-29)		
Housing cost in disposable income	2.34***		1.43***	0.08*
Housing cost overburden	1.41***			
Housing cost overburden of the young		0.53***	1.31*	
Social benefits excluding pensions	-0.23	-0.12	-0.21	0.16
Share of children below 3 not attending childcare				
Value of the explained variable (average)	17.4	58.1	5.0	26.5

Source: Authors' calculations.

Notes: \* significant at 10 percent, \*\* significant at 5 percent, \*\*\* significant at 1 percent.

Interpretation: 1 percent increase in housing cost share in disposable income (relative to the EU average) increases the overcrowding rate of the total population by 2.34 percent (compared to the EU average).

**The strong impact on the young is not due to a delay in leaving parental home.** The inability to find affordable independent housing may delay the time when children leave the parental house (Hick and others, 2022 and 2025 for renters), potentially contributing to the overcrowding. We find that this mechanism is not the main reason for the impact of housing affordability problems on the housing adequacy issues of the young: 1 percent increase in housing cost share in disposable income increases the average age of leaving parents only by 0.08 percent leaving the average age virtually unchanged at 26.5 years. This result is (barely) significant at 10 percent and we do not find a robust and significant impact of the housing overburden rate on the age of leaving the parental house.

**The impact of housing affordability on housing adequacy was increasing before the pandemic but has declined afterwards** (Figure 15).<sup>22</sup> The change is sizable for the impact of housing cost in disposable income but more limited for the impact of housing cost overburden rate. While the decline in the stock of social housing since 2010 (see above) may have contributed to the increase in the impact of housing affordability on housing adequacy, but this impact may have been offset post pandemic by the development of remote work.

**The impact of housing affordability on the adequacy of housing differs markedly across EU Member States.** The impact is always negative in Central, Eastern Europe, and Southern Europe, as well as Ireland. In Western Europe and Nordic countries, the impact depends on the indicator considered: an increase in the overburden rate always increases the overcrowding rate in all countries but the impact of an increase in the housing cost in disposable income depends on the country. This may reflect structural differences as well as

<sup>22</sup> The impact of the housing overburden rate of the young on the housing overcrowding rate of the young is an exception, but changes are small.

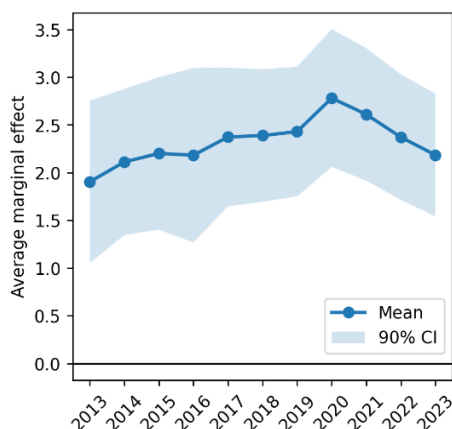
differences in policies (Figure 16).

**Social transfers unambiguously mitigate the negative impact of housing cost on housing adequacy.**

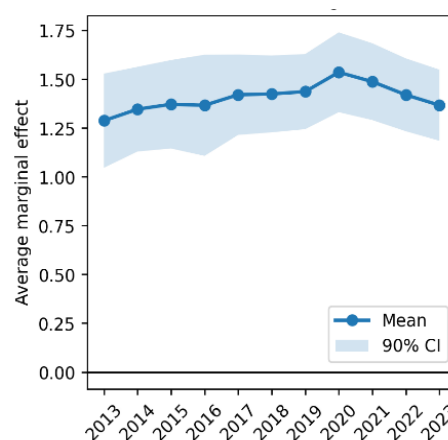
Having social spending 1 percent higher than EU level reduces the impact of housing cost share in disposable income on the overcrowding rate from 2.34 percent to about 2.11 percent and on severe housing deprivation from 1.43 percent to about 1.10 percent. The impact of housing overburden rate on the overcrowding rate is reduced from 1.41 percent to about 1.29 percent. Social transfers also reduce the impact of housing cost in disposable income on the average age of leaving their parents' house by about a quarter (Table 2).

**Figure 15. Evolution over Time of the Impact of Housing Costs on Housing Adequacy**

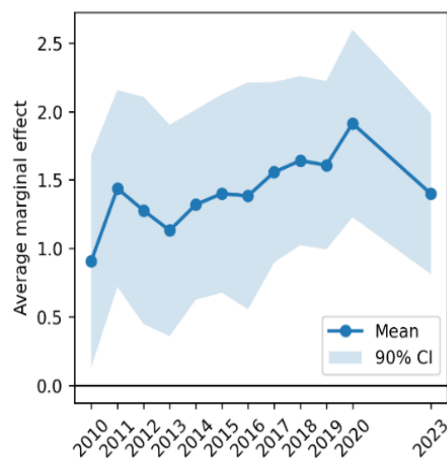
**A. Housing cost in disposable income and overcrowding**



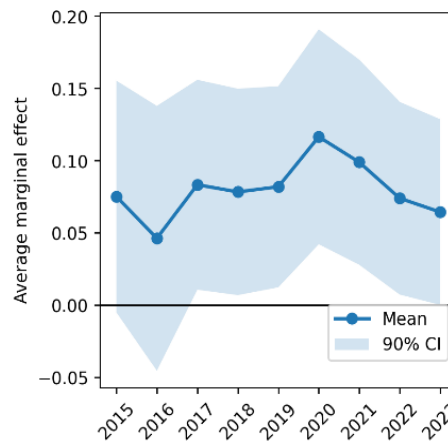
**B. Housing cost overburden and overcrowding**



**C. Housing cost in disposable income and severe housing deprivation 1/**



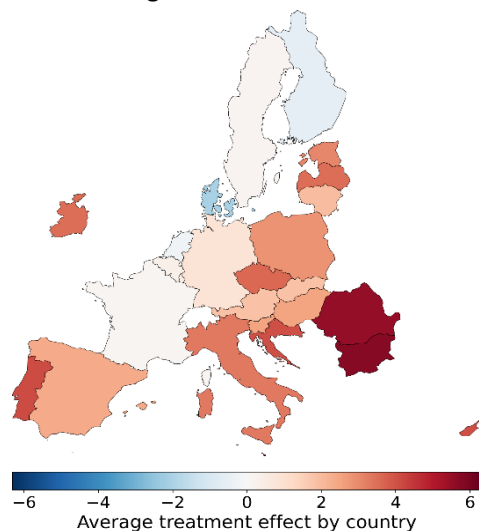
**D. Housing cost overburden and average age of leaving parental house**



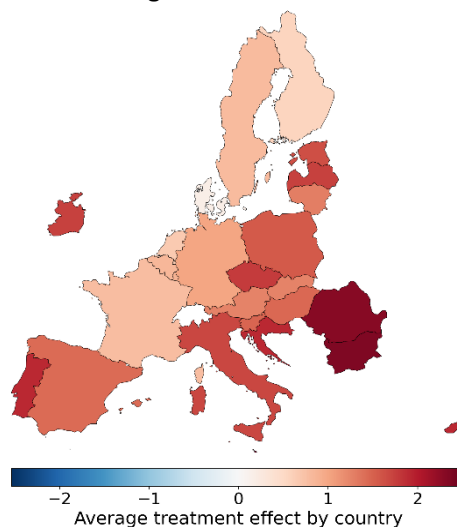
Source: Authors' calculations.  
1/ no data for 2021 and 2023.

Figure 16. Geographical Difference in the Impact of Housing Costs on Housing Adequacy

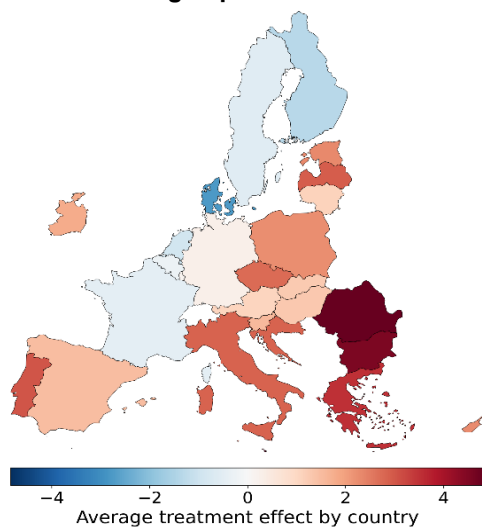
## A. Housing cost in disposable income and overcrowding



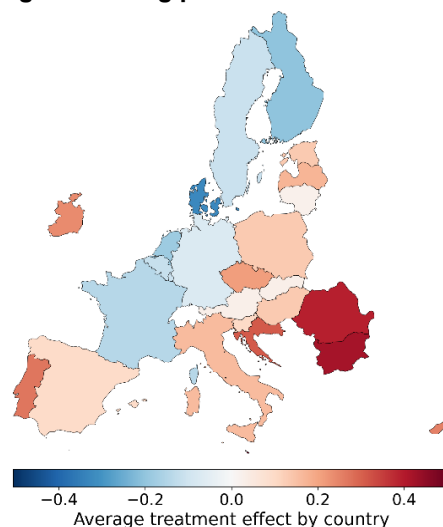
## B. Housing cost overburden and overcrowding



## C. Housing cost in disposable income and severe housing deprivation



## D. Housing cost overburden and average age of leaving parental house



Source: Authors' calculations.

## B. Impact on labor force participation

**Because it reduces mobility, housing affordability reduces labor force participation.** On the one hand, deteriorating housing affordability may provide incentives to increase labor supply at the household level to increase income (resulting in an increase in LFP). On the other hand, it may prevent accepting job opportunities or force a relocation to a place limiting labor opportunities for some members of the household and thus reducing housing affordability. The net effect is uncertain. The simulations show that in the EU during the period considered 1 percent increase in housing cost share in disposable income reduces the labor force

participation (LFP) rate by 0.53 percent and the female labor force participation by 0.59 percent. In other terms, if in a country, the share of housing cost in disposable income is 0.2 ppt higher than the EU average of 20.8 percent, its LFP would be 0.4 ppt lower than EU average (71.7 percent compared to 72.1 percent) its female LFP would be also 0.4 ppt lower than EU average (66.2 percent compared to 66.6 percent (Table 3).

**Table 3. EU27: Impact of Housing Affordability on Labor Force Participation**

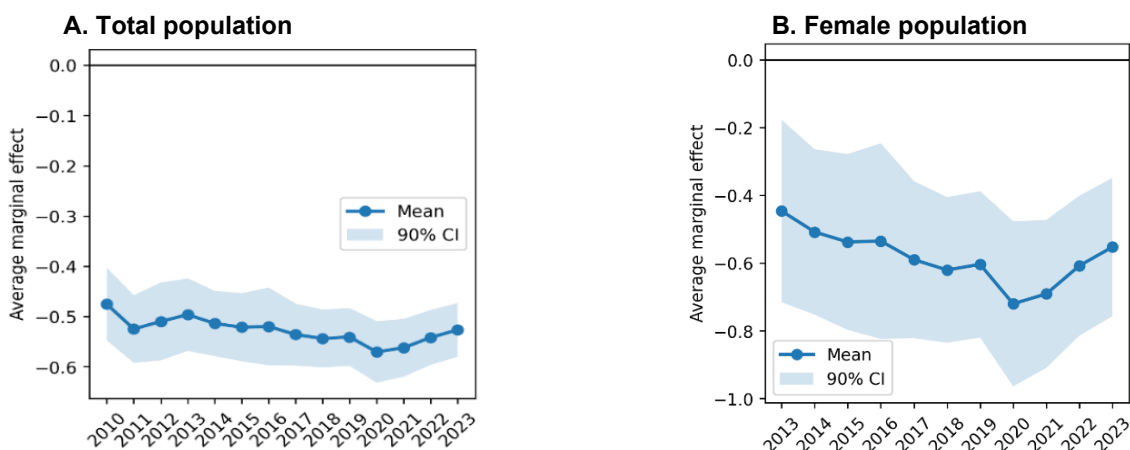
	Total Population	Female Population
Housing cost in disposable income	-0.53***	-0.59*
Social benefits excluding pensions	0.01	0.03
Share of children below 3 not attending childcare		-0.01
Value of the explained variable (average)	72.1	66.6

Source: Authors' calculations.

Notes: \* significant at 10 percent, \*\* significant at 5 percent, \*\*\* significant at 1 percent.

Interpretation: 1 percent increase in housing cost share in disposable income (relative to the EU average) reduces the total population labor force participation rate by 0.53 percent (compared to the EU average).

**Figure 17. Evolution over Time of the Impact of Housing Costs on Labor Force Participation**

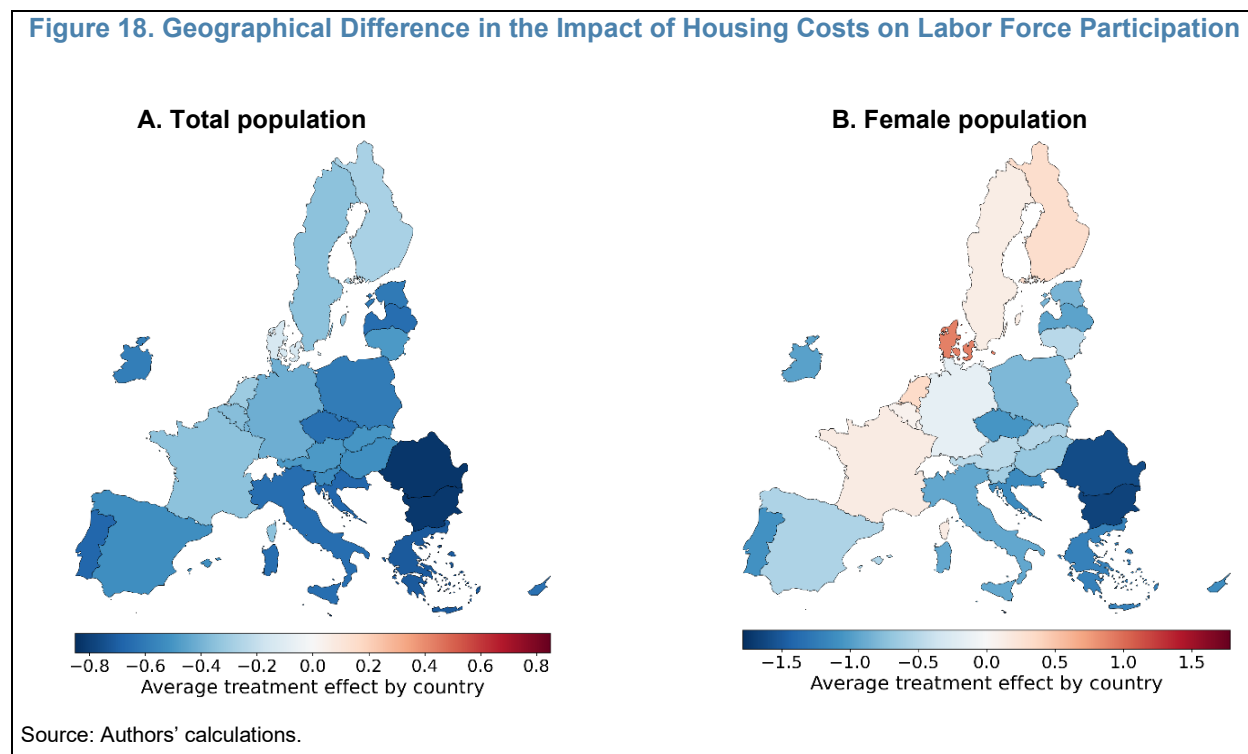


Source: Authors' calculations.

**The negative impact of housing costs on LFP is declining post-pandemic.** The decline is marginal for the entire population but larger for the female population (Figure 17). Moreover, if the negative impact of housing costs on total LFP is experienced by all EU countries, it is not for female LFP (Figure 18). This may reflect

different legislations and practices related to female labor and differences in access to childcare (notably for low-income household). Notably, there is evidence that higher enrollment in childcare is associated with higher female labor force rate participation (EC, 2018; Hallaert and others, 2023). Our results add to this body of evidence as a lower enrollment in childcare of children below 3 increases the negative impact of housing cost on female LFP though only marginally (from -0.59 to about -0.60). Social benefits mitigate this LFP impact of housing affordability though the impact is relatively small for both total LFP and female LFP.

**Figure 18. Geographical Difference in the Impact of Housing Costs on Labor Force Participation**



### C. Impact on poverty

**Housing affordability also increases the share of the population at risk of poverty.** Lower labor force participation and turning down a job offer or a training / education opportunity because of housing costs affect individuals' present and future income. Hence, it can increase the poverty rate. We estimate that 1 percent increase in housing cost share in disposable income increases the at-risk-of-poverty rate (AROP) by 0.92 percent and 1 percent increase in housing cost overburden rate increases the AROP by 0.29 percent for the entire population and by 0.65 percent for the young (aged 20 to 29). All three estimates are significant at 5 percent (Table 4).<sup>23</sup> In other terms, if in a country, the share of housing cost in disposable income is 0.2 ppt above the EU average of 20.8 percent, the AROP would be 0.2 ppt higher than the EU average of 16.8 percent. If the housing cost overburden rate is 0.1 above the EU average of 9.9 percent, the AROP for the entire population would be 0.05 ppt higher than the EU average of 16.8 percent. The impact is about twice as large for the young as if the housing cost overburden rate of the young is 0.1 ppt above the EU average of 12.6

<sup>23</sup> The at-risk-of-poverty rate is the proportion of persons with an equivalized disposable income below that 60 percent of the national median equivalized disposable income after social transfers. For details, see [Eurostat - Glossary: At-risk-of-poverty rate](#).

percent, the AROP of the young would be 0.1 ppt higher than the EU average of 19.4 percent. Therefore, our results confirm that housing affordability is playing a role in creating poverty not just reflecting poverty (Desmond, 2016).

**The increase in housing costs in disposable income affects all countries and this impact has been broadly stable over time.** In all EU countries an increase in housing costs in disposable income leads to an increase in the AROP though with a different severity. In contrast, the impact of housing cost overburden on poverty is muted in some countries (Figure 19). This may in part reflect differences in policies, notably social transfers. Social transfers marginally reduce the impact of housing cost in disposable on the AROP, but their offsetting impact is larger for the housing cost overburden rate, especially for the young. The impact over time has been broadly stable, though there are signs of a lower impact of housing affordability on poverty post-pandemic (Figure 20).<sup>24</sup>

**Table 4. EU27: Impact of Housing Affordability on Poverty**

	Total Population		Young (20-29)
Housing cost in disposable income	0.92**		
Housing cost overburden	0.29**		
Housing cost overburden of the young			0.65**
Social benefits excluding pensions	-0.02	-0.04	-0.11
Value of the explained variable (average)	16.8		19.4

Source: Authors' calculations.

Notes: \* significant at 10 percent, \*\* significant at 5 percent, \*\*\* significant at 1 percent.

Interpretation: 1 percent increase in housing cost share in disposable income (relative to the EU average) increases the at-risk-of-poverty rate of the entire population by 0.92 percent (compared to the EU average).

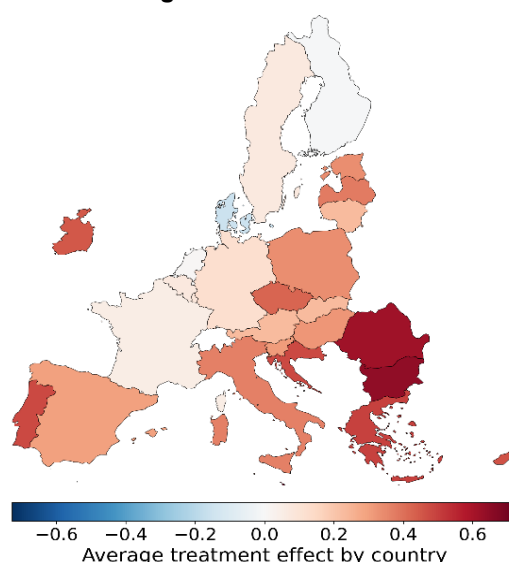
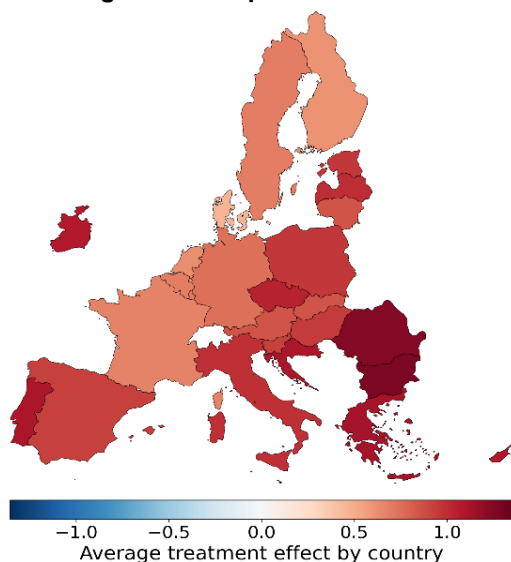
<sup>24</sup> It is also pronounced when one considers only the young.

**Figure 19. Geographical Difference in the Impact of Housing Costs on the At-risk-of-poverty Rate**

(Total population)

**A. Housing cost in disposable income**

**B. Housing cost overburden**



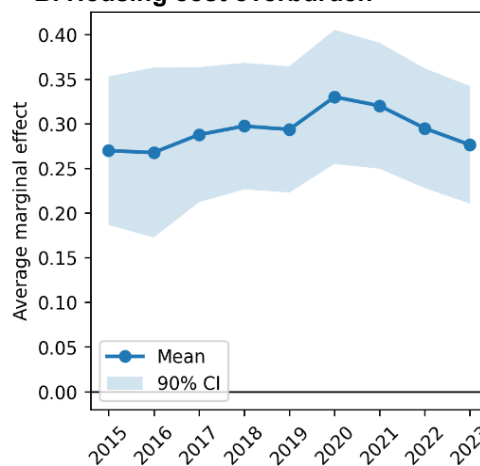
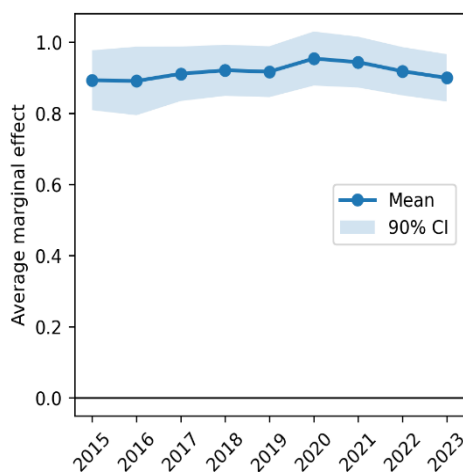
Source: Authors' calculations.

**Figure 20. Evolution over Time of the Impact of Housing Costs on the At-risk-of-poverty Rate**

(Total population)

**A. Housing cost in disposable income**

**B. Housing cost overburden**



Source: Authors' calculations.

**D. Impact on fertility**

**Our housing cost indicators aggregate the cost of housing for both tenants and homeowners** (Annex I). As such they account for variations in homeownership rates and differences in the mortgage market across countries (e.g., fixed-rates loans versus adjustable-rates loans as well as extent of recourse to loans). While

they do not capture the direct impact in change in the cost of buying a house, they have the advantage of accounting for differences in real estate taxation and of considering the sharp increase in energy prices following the war in Ukraine.

**Table 5. EU27: Impact of Housing Affordability on Fertility**

	Fertility Rate		Mean age of first childbearing
Housing cost in disposable income	-0.56***		0.21***
Housing cost overburden	-0.08*		
Housing cost overburden of the young			
Social benefits excluding pensions	0.06	0.01	-0.02
Share of children below 3 not attending childcare	0.00		0.01
Value of the explained variable (average)	1.51		29.3

Source: Authors' calculations.

Notes: \* significant at 10 percent, \*\* significant at 5 percent, \*\*\* significant at 1 percent.

Interpretation: 1 percent increase in housing cost share in disposable income (relative to the EU average) reduces the fertility rate by 0.56 percent (compared to the EU average).

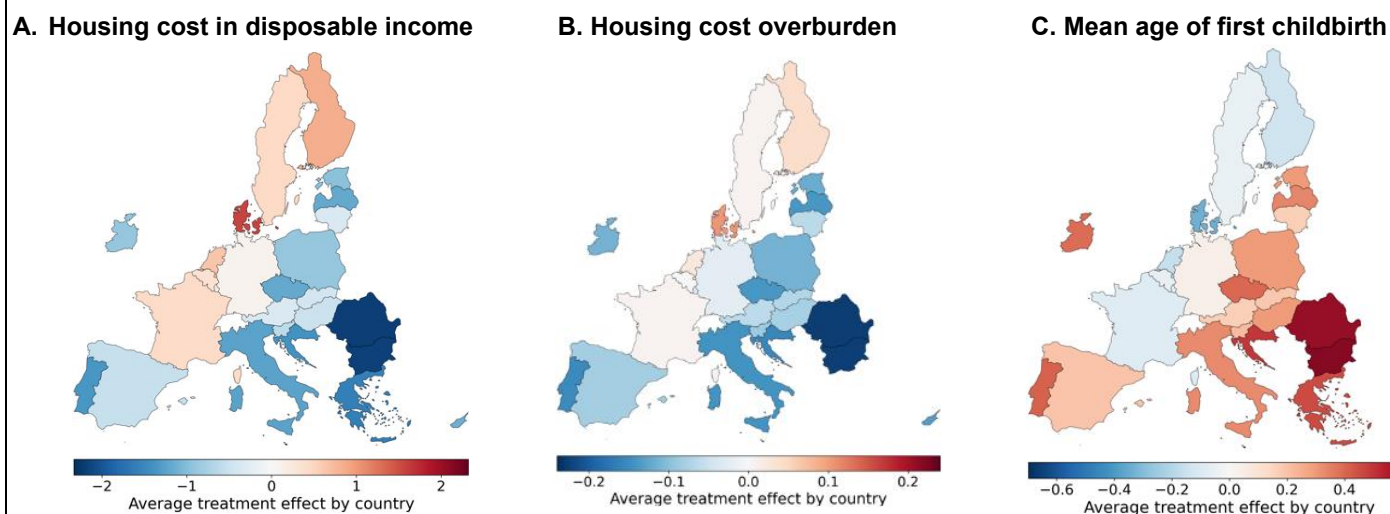
**Consistent with the literature, we find that housing costs reduce fertility, but the impact is comparatively small.** A 1 percent increase in the share of housing cost in disposable income increases the average age at which women have their first child by 0.21 percent. In other terms, if in a country, the share of housing cost in disposable income is 0.2 ppt higher than EU average (21.0 percent instead of the 20.8 percent), women would have their first child on average less than 1 months later than the EU average (at 29.4 years instead of 29.3).<sup>25</sup> Delaying childbearing contributes to a reduction in the total fertility rate.<sup>26</sup> A 1 percent increase in the share of housing cost in disposable income relative to the EU average lowers the fertility rate by a 0.56 percent. In other terms, if in a country, the share of housing cost in disposable income is 0.2 ppt higher than EU average, the fertility rate would be 0.1 lower than the EU average of 1.51. The increase in housing cost overburden appears to be even more limited (and less statistically significant). If the housing cost overburden rate is 10.0 percent instead of the EU average of 9.9 percent, the fertility rate would be 1.509 compared to an EU average of 1.507 (Table 5).

<sup>25</sup> By delaying when children can leave parental house, housing costs may also delay the formation of families and thus the age when mother have their first child. However, the impact of housing costs on the average when children leave the parental house is so small that this mechanism does not appear meaningful (Table 2).

<sup>26</sup> Kearney and Levine (2025) find that, in advanced economies, the decline in fertility reflects delayed or foregone entry into parenthood.

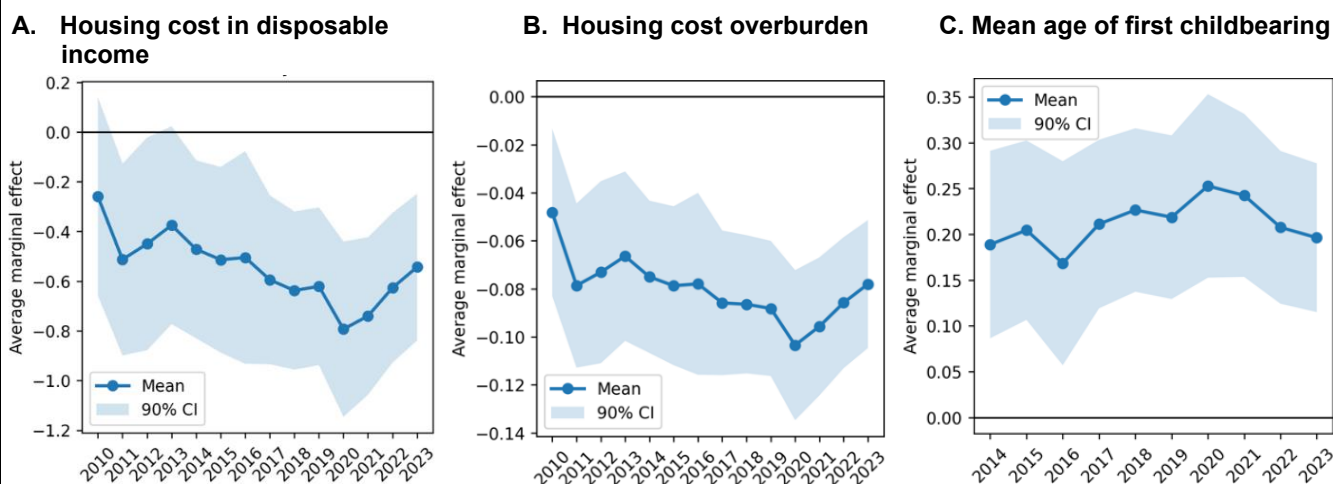
**Social spending reduces the impact of housing costs on the fertility rate by about 11 percent.** When social spending exceeds the EU average by 1 percent, it reduces the impact of housing overburden on fertility by a mere 0.01 percentage point (from -0.08 to about -0.07) and the negative impact of a higher housing costs as a share of income from -0.56 to about -0.50. The impact on age of first childbirth is somewhat smaller at close to 8 percent (the impact is reduced from 0.21 to about 0.20).<sup>27</sup> Though childcare has reduced the impact of housing affordability issues on labor force participation of women, it does not increase fertility (Table 5).

**Figure 23. Geographical Difference in the Impact of Housing Costs on Fertility**



Source: Authors' calculations.

**Figure 24. The Impact of Housing Costs on Fertility over Time**



Source: Authors' calculations.

<sup>27</sup> Difference with direct calculation in Table 5 is due to rounding.

**The negative impact of housing affordability on fertility differs significantly across the EU and has changed over time.** At EU level, the negative impact of housing costs is driven by the South and South-Eastern part of Europe and Ireland while it is positive in the Western part of Europe and the Nordics (Figure 23). This may reflect differences in policy and differences across countries in the change in homeownership rate during the period. The impact of housing costs on fertility and age of first childbirth was increasingly negative before the pandemic but has since declined (Figure 24). The reversal in the trend post-pandemic warrants further analysis (that goes beyond the scope of this paper) to identify the relative importance of various determinants of housing affordability on fertility. Notably, the development of work from home is likely to have reduced the demographic impact of housing costs post-pandemic. The high housing cost in the “working place” area is less constraining as household who can work remotely can move to areas where housing is cheaper. Even for households that do not move, work from home reduces the commuting time, makes it easier to care for children (thus reducing the burden of limited availability of childcare and the opportunity cost of motherhood for working mothers). This can foster fertility. Aksoy and others (2026) find for a panel of 38 countries that when both partners work from home at least one day per week the estimated lifetime fertility is 0.32 children per women (about 14 percent) higher than for couples where neither does.

## E. Impact on health

**Consistent with literature, we find that housing costs have an impact on health.** A 1 percent increase in the share of housing cost in disposable income relative to the EU average increases by 1 percent the share of population perceiving their health as bad or very bad (Table 6).<sup>28</sup> In other terms, if in a country, the share of housing cost in disposable income is 0.2 ppt higher than the EU average of 20.8 percent, the share of population perceiving their health as bad or very bad would be 0.1 ppt higher than the EU average of 9.2 percent. The negative impact of housing cost on health is generalized across the EU but is stronger in Southern and Eastern part as well as Ireland (Figure 25). Again, the impact of housing on health increased before the pandemic but declined afterwards (Figure 26).

**Health is another channel through which housing affordability affects individual’s well-being, human capital formation, and has fiscal consequences.** Affecting a key component of human capital and individual’s ability to join fully the workforce, housing has again an impact on productivity and potential growth. Stress, an important component of the impact of housing on health of adults, also affects children’s development. Chronically elevated levels of parental stress (due to material hardship such as those related to housing affordability problems) affect their relationship, the quality of parenting, and can, in turn, increase children’s stress. This harms children’s health as well as their cognitive and socioemotional development and thus their educational achievement, reducing their well-being, prospects, and productivity (Hallaert and others, 2023, Newman and Holupka, 2025). As housing affordability problems affect only part of the population, it also increases health inequality and reduces population happiness and sense of control (ESS, 2025).

<sup>28</sup> Finding an indicator that covers all the health dimensions through which housing may affect health is challenging. We use the self-perception of health status from the [European Statistics of Income and Living Condition survey](#). In that survey, respondents are asked to assess their health as “very good,” “good,” “fair,” “bad,” or “very bad.” We use the percent of respondent that responded “bad” or “very bad.” Self-rated health is used in several studies of the impact of housing affordability on health (Chung and others, 2020).

**Table 6. EU27: Impact of Housing Affordability on Health**

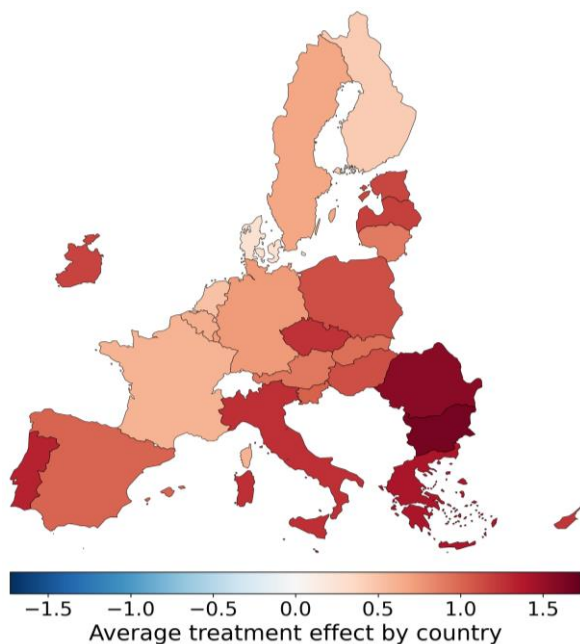
	Health status (Bad or very bad)
Housing cost in disposable income	1.00*
Social benefits excluding pensions	-0.03
Share of children below 3 not attending childcare	
Value of the explained variable (average)	9.2

Source: Authors' calculations.

Notes: \* significant at 10 percent, \*\* significant at 5 percent, \*\*\* significant at 1 percent.

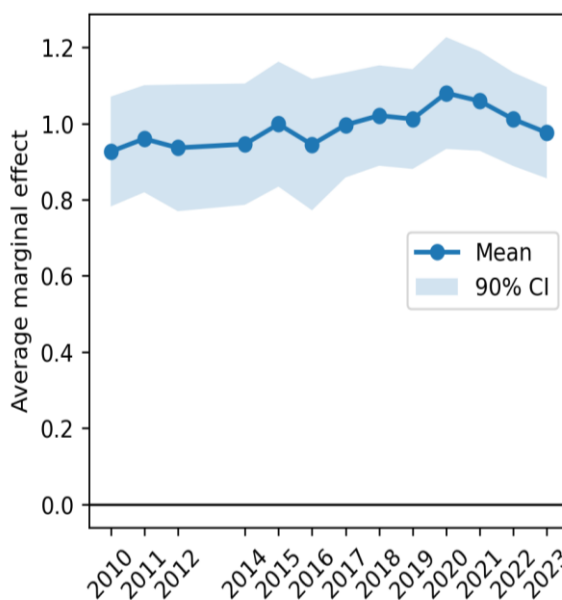
Interpretation: Interpretation: 1 percent increase in housing cost share in disposable income (relative to the EU average) increases the share of people reporting bad or very bad health by 1 percent (compared to the EU average).

**Figure 25. Geographical Difference in the Impact of Housing Costs on Health**



Source: Authors' calculations.

**Figure 26. Evolution over Time of the Impact of Housing Costs on Health 1/**



Source: Authors' calculations.

1/ No data for 2013.

## Conclusions

**Housing affordability is high on the European agenda.** Reports of housing affordability problems in Europe are ubiquitous. The concern is such that it has become a priority for the current European Commission and has been an important topic in various local elections. At the European level, a Commissioner for housing was appointed for the first time in the EU history and a European Affordable Housing Plan is implemented.

**However, data does not point to a recent generalized deterioration in housing affordability.** The inflation shock (notably energy prices increase) triggered by the war in Ukraine increased housing costs increased faster than income, real price of houses accelerated, and the increase in interest rates all reduced the home-buying power of households. This may have triggered the perception of housing affordability problems even if overall, and despite differences across countries. However, when housing affordability is measured by the housing costs, it remains relatively low in a long-term perspective. Another increase in energy prices due to the conflict in the Middle East may again result in a rapid increase in housing costs and housing concerns.

**This paper looks at many consequences of the housing affordability problem highlighted by economic, sociological, demographic, urban sciences, medical, and public health literature.** This allows us to identify three pathways through which housing cost burden has consequences: a deterioration in housing adequacy, a loss of opportunities, and a reduction in non-housing spending. We find that all these pathways have been at play in the EU since 2010.

**Housing cost burden affects, to various degrees but always in a statistically significant way, housing adequacy, poverty, labor force participation fertility, and health.** The impact of an increase in housing cost burden is particularly large on housing adequacy as well as on poverty and health. It is somewhat smaller on fertility and labor force participation, and small on the average age at which children leave parental house or on delaying entry into parenthood. Many other consequences could be considered by future research such as the impact of housing cost on inequality, wage dynamics, economic confidence, subjective poverty, education.

**Interestingly, we find consistent evidence that the consequences of high housing costs were increasingly severe before the pandemic, but the trend was reversed afterwards.** This reversal warrants further analysis but there are reasons to believe that the development of remote work / work from home has played a role.

**Our findings highlight complementarities between housing policy and other social policies.** Increasing the supply of housing, as considered in the European Affordable Housing Plan will help alleviate pressure on housing prices and rents. This would dampen housing costs and its negative consequences. Our econometric results show that reducing housing costs would have a positive impact on areas that other public policies aim at improving. Thus, there are synergies and opportunities to coordinate housing policy with a broad range of social policies. Coordinating social spending with housing policies is also important because increasing the supply of housing will take time, while social policies can have an immediate impact. Given the widespread sense of a housing affordability emergency, it may be worth complementing long-term structural solutions with measures that can deliver faster results.

# Annex I. Definition and Description of Housing Costs

## 1. Housing costs

Housing cost is defined as the monthly expenses associated with the right to live in a dwelling. This includes the cost of utilities (water, electricity, gas, and heating), structural insurance, mandatory services and charges (e.g., sewage and refuse removal), regular maintenance and repairs, and taxes.

**For homeowners**, the housing cost calculation includes mortgage interest payments net of any tax relief, and gross of housing benefits (i.e., housing benefits should not be subtracted from the total housing cost). Importantly it does not include payment of the principal of the mortgage loan which is considered a saving (investment) rather than a consumption item. From a budgetary perspective this is important as disposable income remaining after paying housing costs is overestimated. This is key when one considers the impact of housing costs on non-housing spending. This also distorts the comparison of housing costs for renters and homeowners.

**For tenants**, the housing cost includes rental payments gross of housing benefits (i.e., housing benefits should not be subtracted from the total housing cost).

For more details see: [Eurostat Glossary](#).

## 2. Housing cost overburden rate.

The housing cost overburden rate is the percentage of the population living in a household where the total housing costs ('net' of housing allowances) represent more than 40 percent of disposable income ('net' of housing allowances).

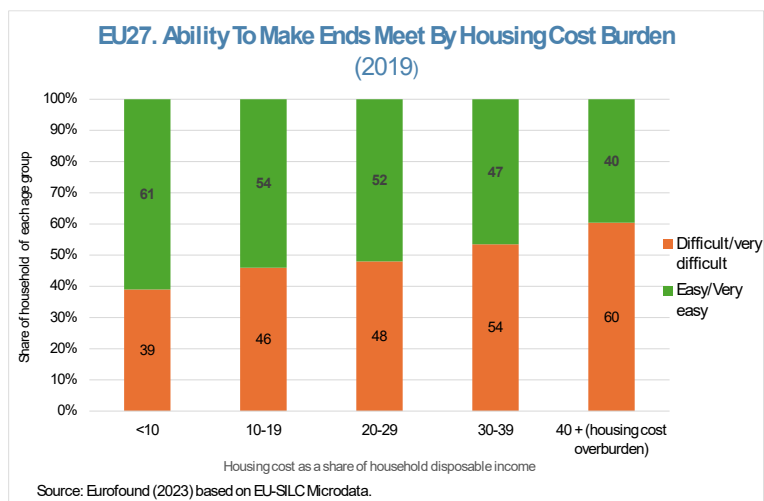
This indicator is used in the [Social Scoreboard](#) of the [European Pillar of Social Rights](#).

An advantage of the Housing cost overburden rate is that it changes with both variations in housing cost and income. Moreover, unlike the housing cost as a share of disposable income, data are available by age group allowing to assess the impact of housing affordability for the young that the literature and surveys suggest are the most affected by housing affordability problems.

This indicator has three main limitations:

- The 40 percent threshold is somewhat arbitrary. Other countries such as the United States consider a threshold of 30 percent.

- Moreover, the implications of spending more than 40 percent of income on housing are highly dependent on where a household falls in a country's income distribution. A high-income household may spend 40 percent of its income on housing without feeling this as a burden or having difficulties to "make ends meet". There may be incentives for higher income to "overconsume" housing, notably if the tax system favors ownership. Inversely for a low-income household, spending 10 percent of their income on housing may be problematic. This is supported by EU-SILC micro-data presented in the text chart.



- Individuals facing housing affordability problems may decide to share accommodation to reduce the housing cost. Income-earning adult children may decide to stay longer in their parents' home. In that case, the household income increases and the housing cost overburden is reduced, and the indicator may underestimate the affordability problems.

### 3. Housing cost in disposable household income

The housing cost in disposable income is the financial burden of housing costs relative to the total income available to the household.

Unlike the housing cost overburden rate, the housing cost in disposable income is not dependent on a specific threshold. Thus, it measures the housing costs burden for the entire population and allows a different assessment of the impact of housing availability problems.

like the housing cost overburden rate, the housing cost overburden rate

- covers both tenants and homeowners and changes due to variation in housing cost or to decline in income or both.
- is calculated at the household level and may underestimate the housing affordability problems if individuals try to reduce their housing costs by sharing the apartment or staying longer at their parents' house.

# Annex II. Disconnect Between Perception of a Housing Affordability Problems and Various Measures of Housing Affordability

This Annex illustrates that the evolution of various affordability ratios in each EU27 Member States does not correlate strongly with the change in the perception of housing as a concern measured by Eurobarometer. Perceptions may be affected by cultural expectations. To limit this impact, we consider the change in perceptions rather than their level.

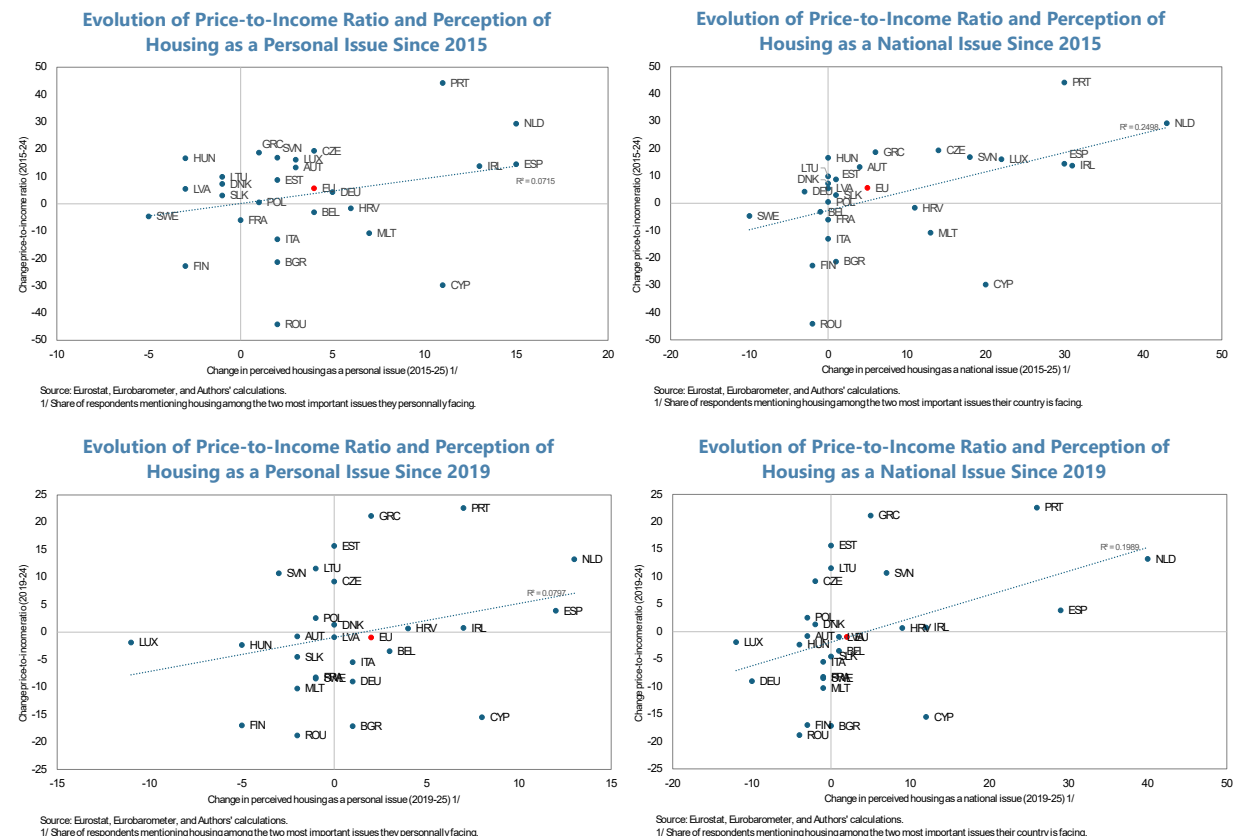
## Housing prices

Whatever the period considered (2015-24 or 2019-24) changes in housing prices are not correlated with changes in perception of housing as an issue.



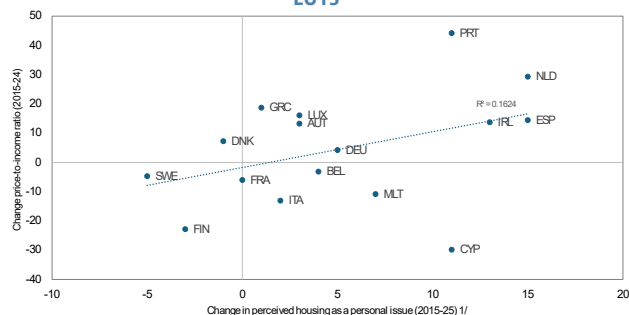
This is expected as affordability depends on the relation to income. The change in the price-to-income ratio is correlated with the change in perception of housing as a problem. This is true whether one considers (i) the change since 2015 (when the ratio was at its lowest in 2 decades) or post pandemic, or (ii) the perception of

housing as a personal issue or as a national issue for the country. However, the correlation is weak for housing perceived as a personal issue.



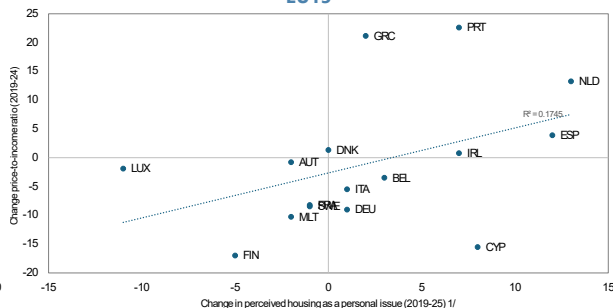
Homeownership status is likely to affect the perception of a change in the price-to-income ratio. An increase in the ratio is likely to be perceived positively by homeowners (who benefit from a wealth effect) and negatively by prospective buyers (who see housing purchases as more difficult). As expected in the Newer Member States, where homeownership rates are the highest in EU27, the correlation between change in the perception of a housing problem and change in the price-to-income ratio is negative or non-existent depending on the period (Figure 8). It is positive for the other EU members.

**Evolution of Price-to-Income Ratio and Perception of Housing as a Personal Issue Since 2015**  
EU15



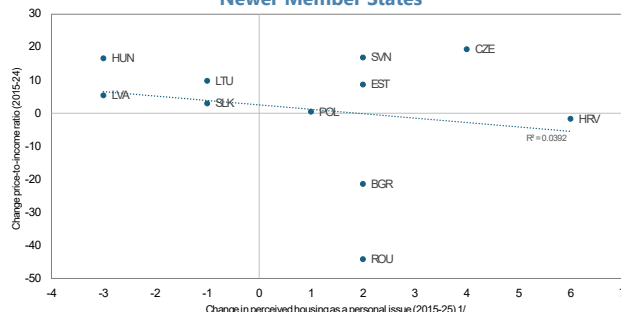
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.

**Evolution of Price-to-Income Ratio and Perception of Housing as a Personal Issue Since 2019**  
EU15



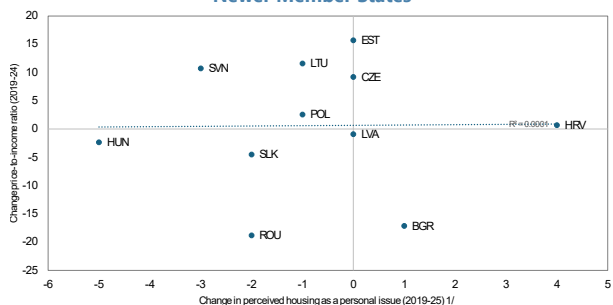
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.

**Evolution of Price-to-Income Ratio and Perception of Housing as a Personal Issue Since 2015**  
Newer Member States



Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.

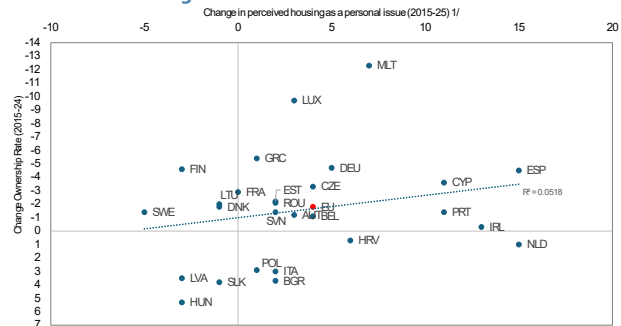
**Evolution of Price-to-Income Ratio and Perception of Housing as a Personal Issue Since 2019**  
Newer Member States



Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.

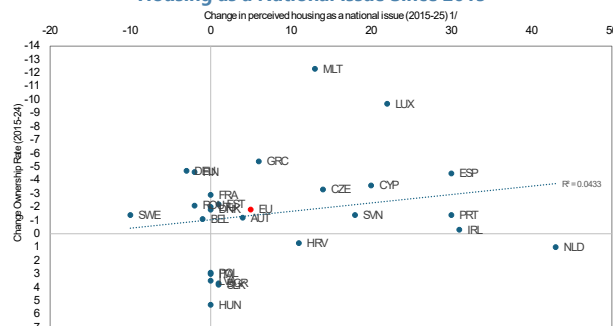
However, change in the homeownership rate is not associated with the changes in perceptions. The link over the past decade is weak.<sup>29</sup> It disappears for the most recent period when homeownership rate declined the most.

**Evolution of Ownership Rate and Perception of Housing as a Personal Issue Since 2015**



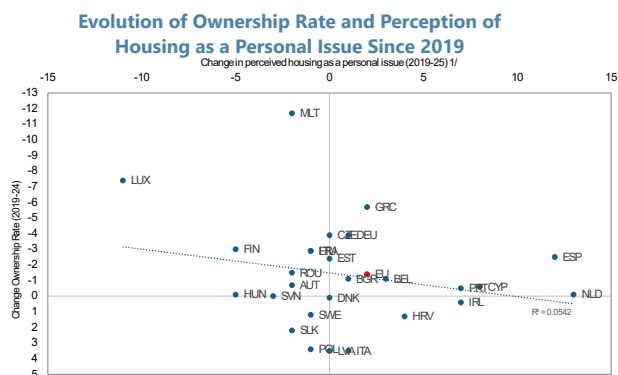
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.

**Evolution of Ownership Rate and Perception of Housing as a National Issue Since 2015**

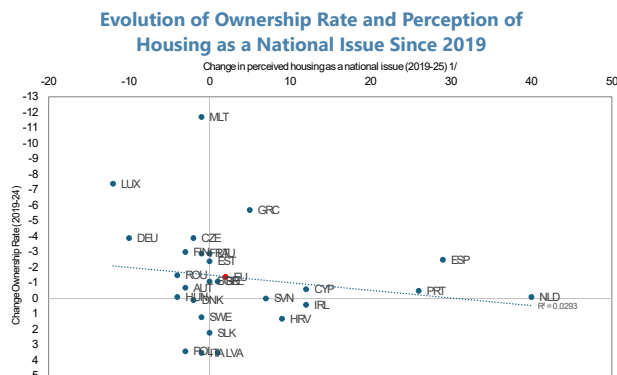


Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues their country is facing.

<sup>29</sup> The positively link is due to Newer Member States. There is no association for the rest of the EU27.



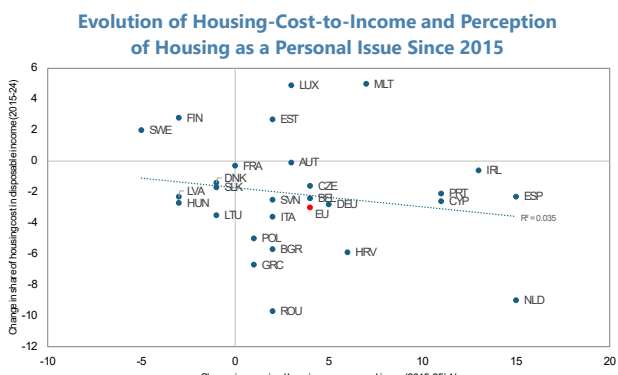
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.



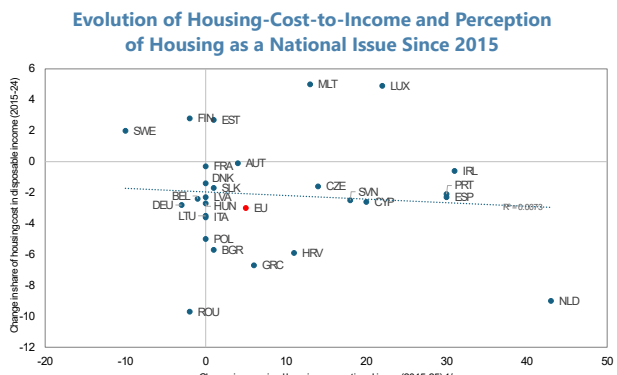
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues their country is facing.

### Housing costs

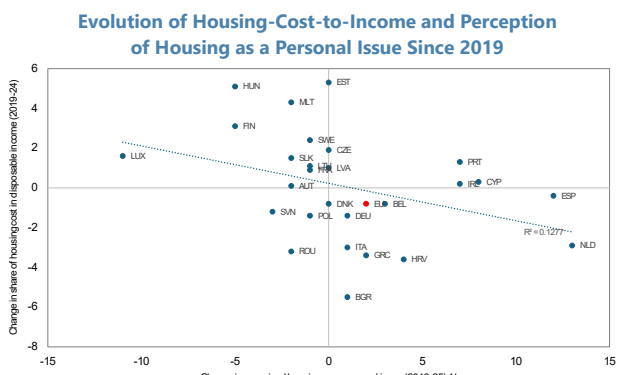
Whatever the period considered, the changes in housing affordability (housing-cost-to-disposable-income, housing-cost overburden, and housing-related arrears) are not positively correlated with changes in perceptions of housing as an issue (personally or for the respondents' country).



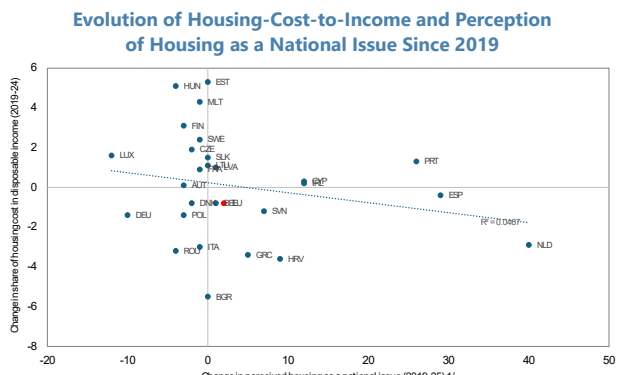
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.



Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues their country is facing.

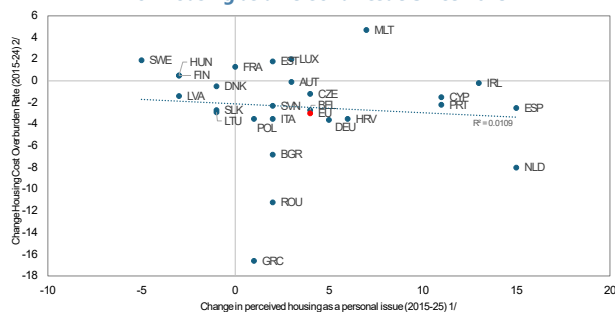


Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues they personally facing.



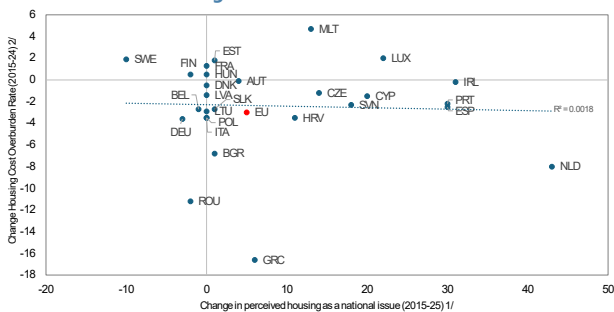
Source: Eurostat, Eurobarometer, and Authors' calculations.  
1/ Share of respondents mentioning housing among the two most important issues their country is facing.

**Evolution of Housing Cost Overburden and Perception of Housing as a Personal Issue Since 2015**



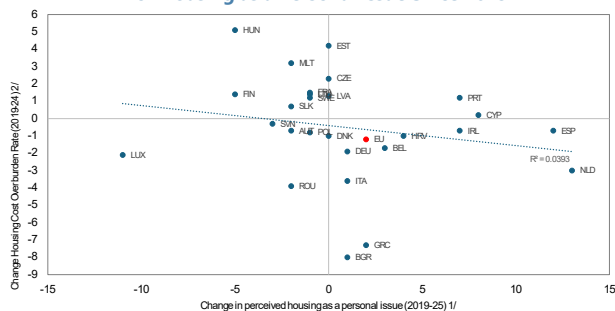
Source: Eurostat, Eurobarometer, and Authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues they personally facing.  
 2/ Percentage of the population living in a household where total housing costs (net of housing allowances) represent more than 40 percent of the total disposable household income (net of housing allowances).

**Evolution of Housing Cost Overburden and Perception of Housing as a National Issue Since 2015**



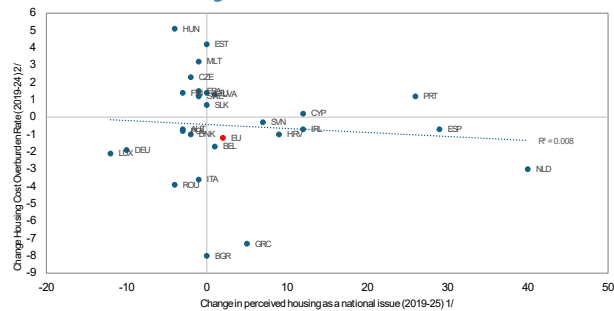
Source: Eurostat, Eurobarometer, and Authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues their country is facing.  
 2/ Percentage of the population living in a household where total housing costs (net of housing allowances) represent more than 40 percent of the total disposable household income (net of housing allowances).

**Evolution of Housing Cost Overburden and Perception of Housing as a Personal Issue Since 2019**



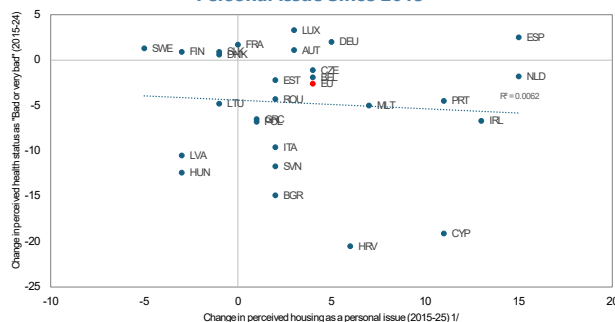
Source: Eurostat, Eurobarometer, and Authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues they personally facing.  
 2/ Percentage of the population living in a household where total housing costs (net of housing allowances) represent more than 40 percent of the total disposable household income (net of housing allowances).

**Evolution of Housing Cost Overburden and Perception of Housing as a National Issue Since 2019**



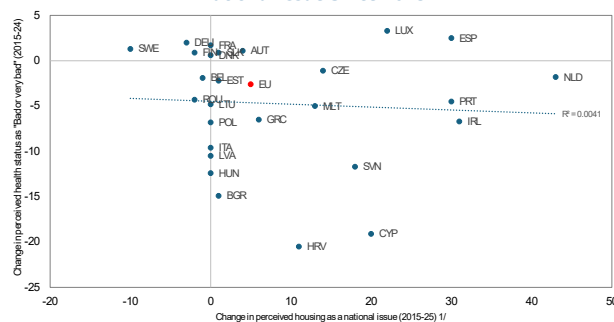
Source: Eurostat, Eurobarometer, and Authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues their country is facing.  
 2/ Percentage of the population living in a household where total housing costs (net of housing allowances) represent more than 40 percent of the total disposable household income (net of housing allowances).

**Evolution of Arrears and Perception of Housing as a Personal Issue Since 2015**

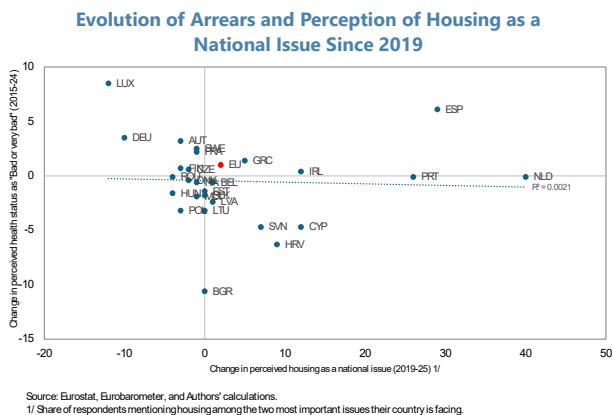
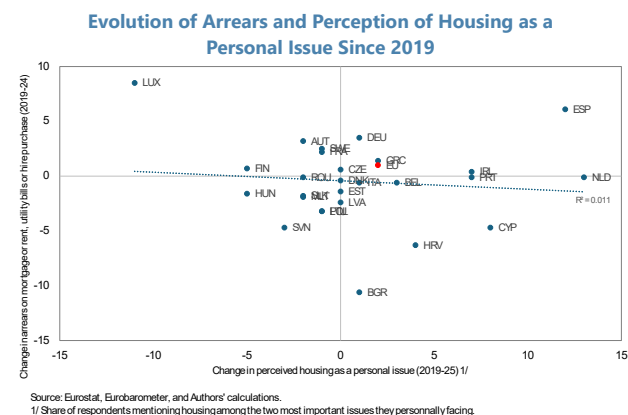


Source: Eurostat, Eurobarometer, and Authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues they personally facing.

**Evolution of Arrears and Perception of Housing as a National Issue Since 2015**

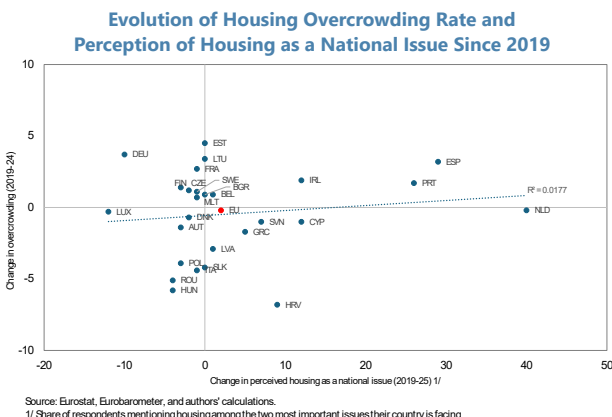
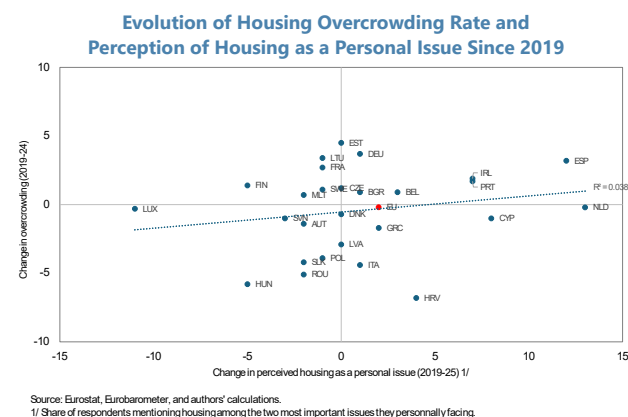
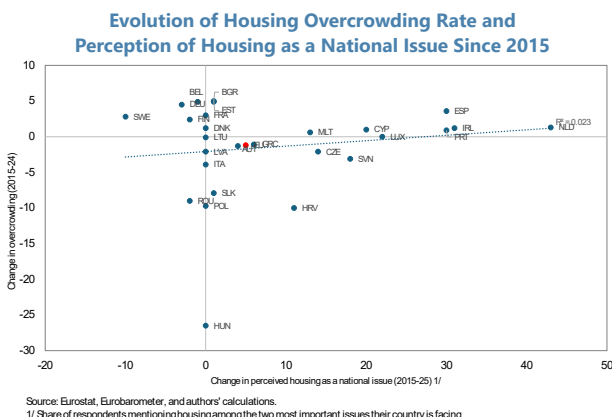
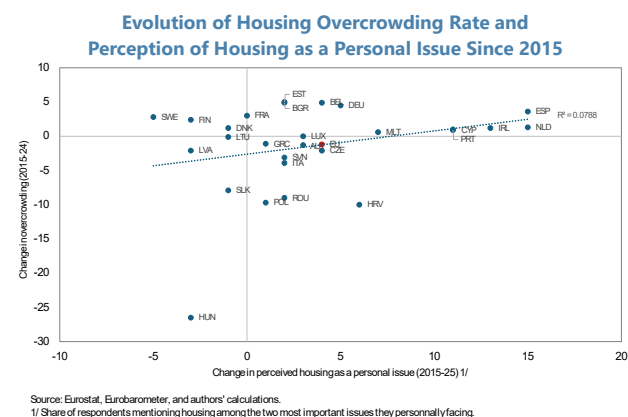


Source: Eurostat, Eurobarometer, and Authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues their country is facing.

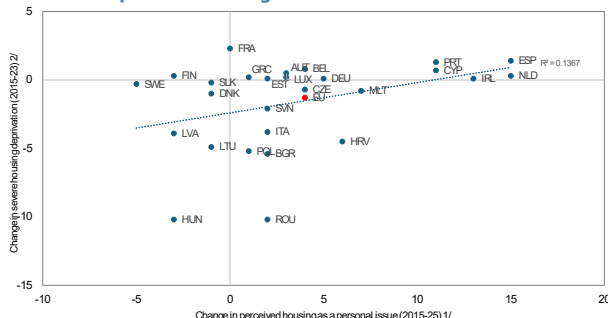


## Housing adequacy

Change in housing adequacy ratios are positively associated with change in perceptions of housing as a problem but the link remains weak and often driven by outliers.

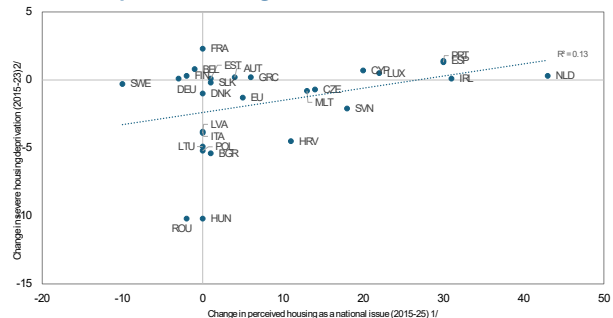


**Evolution of Severe Housing Deprivation and Perception of Housing as a Personal Issue Since 2015**



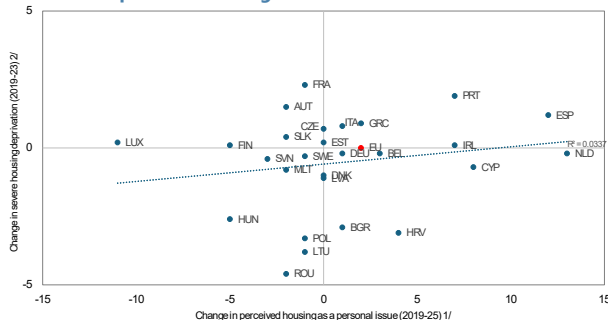
Source: Eurostat, Eurobarometer, and authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues they personally facing.  
 2/ 2020 for Ireland due to data availability.

**Evolution of Severe Housing Deprivation and Perception of Housing as a National Issue Since 2015**



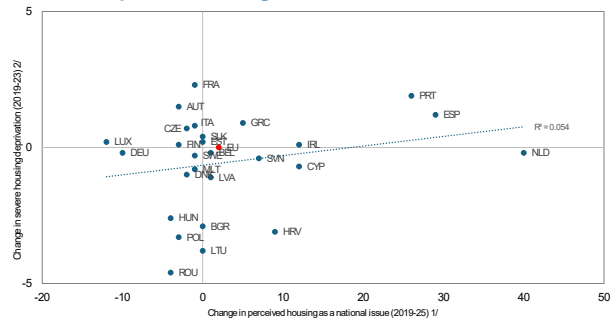
Source: Eurostat, Eurobarometer, and authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues their country is facing.  
 2/ 2020 for Ireland due to data availability.

**Evolution of Severe Housing Deprivation and Perception of Housing as a Personal Issue Since 2019**



Source: Eurostat, Eurobarometer, and authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues they personally facing.  
 2/ 2020 for Ireland due to data availability.

**Evolution of Severe Housing Deprivation and Perception of Housing as a National Issue Since 2019**



Source: Eurostat, Eurobarometer, and authors' calculations.  
 1/ Share of respondents mentioning housing among the two most important issues their country is facing.  
 2/ 2020 for Ireland due to data availability.

## Annex III. The Double Machine Learning with Instrumental Variables, Instrument Validity, and Diagnostic Checks

Consider the **structural model**:

$$Y = \theta(X)T + g(X, W) + \varepsilon,$$

where  $X$  denotes a low-dimensional set of covariates entering the parameter of interest,  $W$  is a potentially high-dimensional vector of controls, and  $\theta(X)$  is the (possibly heterogeneous) causal effect of the treatment. Endogeneity of  $T$  is addressed using an instrument  $Z$ , which affects  $T$  but influences  $Y$  only through  $T$ .

The **treatment assignment equation** is:

$$T = h(X, W, Z) + v.$$

Standard linear instrumental variables estimators, such as two-stage least squares (2SLS), impose restrictive functional form assumptions and require strong dimension reduction in the control set. When controls are numerous and relationships are nonlinear, these restrictions can induce bias or misspecification. DML-IV provides a framework to address these challenges by combining machine learning with orthogonalized moment conditions.

**Identification** relies on the following standard instrumental variable assumptions:

1. Relevance:

$$\mathbb{E}[T \mid X, W, Z] \neq \mathbb{E}[T \mid X, W],$$

i.e., the instrument  $Z$  induces variation in the treatment after conditioning on observables.

2. Exogeneity (exclusion restriction):

$$\mathbb{E}[\varepsilon \mid X, W, Z] = \mathbb{E}[\varepsilon \mid X, W],$$

meaning that the instrument affects the outcome only through the treatment.

3. Overlap (common support):

The conditional distribution of  $Z$  given  $(X, W)$  exhibits sufficient variation to identify the effect of  $T$ .

These assumptions are identical in spirit to those required for classical IV estimation; DML-IV does not weaken identification requirements but improves robustness to high dimensionality and functional form misspecification.

A central feature of DML-IV is the use of **orthogonal (or Neyman-orthogonal) moment conditions**, which make the estimator locally insensitive to small errors in the estimation of nuisance functions.

The following conditional expectations are estimated using flexible machine learning methods:

- Outcome regression:

$$m_Y(X, W) = \mathbb{E}[Y \mid X, W],$$

- Treatment regression without the instrument:

$$m_T(X, W) = \mathbb{E}[T \mid X, W],$$

- Treatment regression with the instrument:

$$m_T(X, W, Z) = \mathbb{E}[T \mid X, W, Z].$$

These objects are treated as nuisance parameters and can be estimated using machine learning models, allowing for nonlinearities and interactions among covariates.

Using the estimated nuisance functions, DML-IV constructs residualized variables:

$$\tilde{Y} = Y - \hat{m}_Y(X, W),$$

$$\tilde{T} = \hat{m}_T(X, W, Z) - \hat{m}_T(X, W).$$

Intuitively,  $\tilde{Y}$  removes all variation in the outcome explained by observed covariates, while  $\tilde{T}$  isolates the component of the treatment that is driven exclusively by the instrument, net of controls. This orthogonalization step eliminates regularization bias arising from machine learning estimation of the nuisance functions.

The causal effect is then estimated from the orthogonalized equation:

$$\tilde{Y} = \theta(X)\tilde{T} + u,$$

where  $u$  is an error term orthogonal to  $\tilde{T}$ .

In practice,  $\theta(X)$  is often approximated by a linear function of  $X$ , which allows for observed heterogeneity in treatment effects while keeping the final stage interpretable. Estimation is carried out using elastic net on the residualized variables, as the endogeneity problem has been addressed by construction.

The **average treatment effect** is calculated as an average over the empirical distribution of the features  $X$ :

$$ATE = \mathbb{E}_X(\hat{\theta}(X_{it})),$$

while the **conditional average** treatment effects for  $i$ -th country and  $t$ -th year are computed as:

$$CATE_{it} = \hat{\theta}(X_{it}).$$

Our approach, therefore, is to estimate a global causal model, where countries and periods enter as fixed effects and also through the features, which take different values for the different countries at different periods. Then  $ATE$  and  $CATE$  are subsequently obtained by averaging the predicted values, based on the globally estimated causal effect.

To avoid overfitting and ensure valid inference, DML-IV relies on **sample splitting and cross-fitting**. The sample is divided into folds. Then nuisance functions are estimated on one subsample and evaluated on

another. This procedure ensures that estimation errors in the machine learning stage do not contaminate the second-stage regression.

Cross-fitting improves efficiency and stability while preserving the orthogonality properties required for asymptotic normality.

Under regularity conditions, the DML-IV estimator is:

- $\sqrt{n}$ -consistent, i.e. the estimation error shrinks at the rate of  $1/\sqrt{n}$  as the sample size  $n$  increases.
- asymptotically normal, and
- robust to high-dimensional controls and flexible functional forms.

Relative to 2SLS, DML-IV offers several advantages:

- Functional form flexibility: nonlinear relationships between outcomes, treatment, instruments, and controls are allowed.
- High-dimensional controls: large covariate sets can be included without ad hoc selection.
- Heterogeneous treatment effects: effects may vary systematically with observed characteristics.
- Bias reduction: orthogonalization mitigates overfitting and regularization bias.

These gains come at the cost of higher computational complexity and more demanding implementation, as well as less transparent mechanics compared to linear IV models.

DML-IV preserves the causal interpretation of instrumental variables while extending their applicability to modern empirical settings characterized by rich data and complex relationships. The estimated parameter captures the causal effect of the treatment variation induced by the instrument, conditional on observed characteristics, and can be interpreted analogously to a local average treatment effect under standard IV assumptions.

### Cluster bootstrap inference

Typically, in the context of DML-IV standard sandwich variance estimators are used for inference. Given the specifics of the dataset, namely panel data with a short time span, to conduct inference on the average treatment effect, we implement a wild cluster bootstrap procedure that accounts for within-cluster dependence and finite-sample uncertainty. The implemented algorithm can be broken down in the following steps:

1. Cross-fitting of the nuisance functions  $m_Y(X, W)$ ,  $m_T(X, W)$  and  $m_T(X, W, Z)$  with grouped cross-validation to account for data clusters created by the presence of data of different countries.
2. Calculation of the orthogonalized outcome and instrument-induced treatment variation  $\tilde{Y}$  and  $\tilde{T}$ .
3. Estimation of the final-stage regression  $\tilde{Y} = \theta(X)\tilde{T} + u$ .
4. Calculation of the ATE as the sample average if the predicted treatment effect.
5. Wild cluster bootstrap using Rademacher weights. For each bootstrap replication we:
  - Generate cluster-level Rademacher weights  $\{w_g\} \in \{-1, +1\}$
  - Multiply the residuals  $\hat{u}_i$  by the corresponding cluster weight  $w_{g(i)}$
  - Construct pseudo-outcomes  $Y_i^* = \hat{Y}_i + w_{g(i)}\hat{u}_i$
  - Re-estimate the final-stage regression using  $Y^*$  and compute the bootstrap ATE  $\hat{\tau}_b^*$ .

6. Inference and confidence intervals are constructed by calculating the bootstrap standard error as the standard deviation of  $\{\hat{t}_b^*\}_{b=1}^B$ , and constructing percentile-based confidence intervals. A two-sided p-value is obtained by comparing the absolute deviation of bootstrap draws from the original estimate.

Clustering is performed at the country level, which reflects the natural grouping structure of the macroeconomic panel. Given the short time dimension of around 10 years and the moderate number of 27 cross-sectional units, residuals are likely to be correlated within countries due to unobserved institutional, policy or structural factors. Clustering at the country level allows for arbitrary intra-country correlation over time, which is particularly important when the number of time periods is small and standard asymptotic approximations may be unreliable. This choice aligns with best practices in empirical macroeconomics and panel data econometrics.

### Instrument Validity and Diagnostic Checks

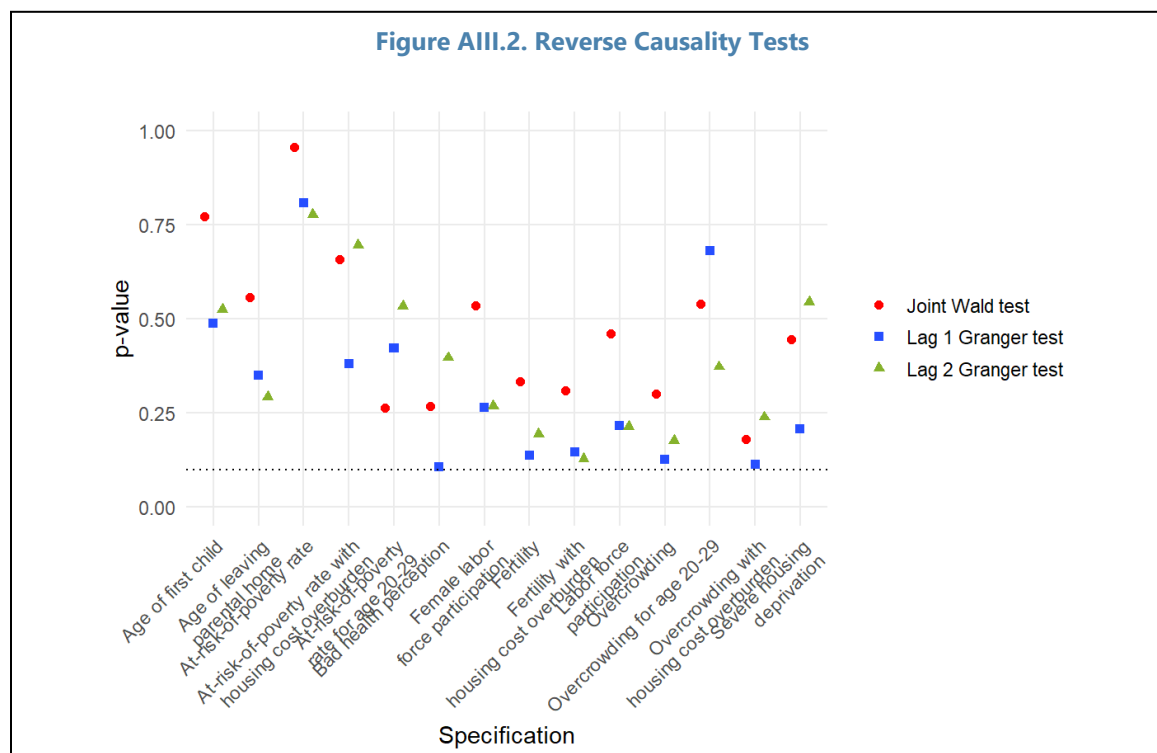
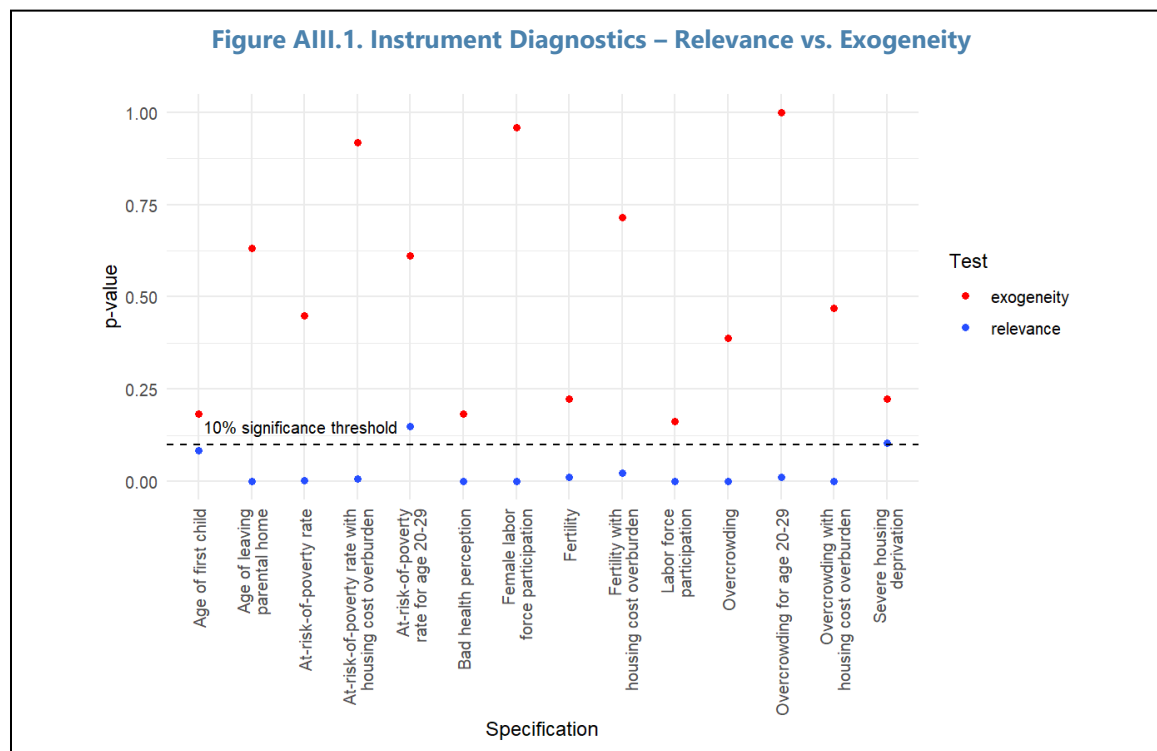
To assess the credibility of the causal interpretation, we assess the validity of the instrumental variables used in the DML-IV framework along two key dimensions: relevance and exogeneity. We also test for the absence of reverse causality.

**Relevance** is evaluated by comparing the predictive performance of the treatment model with and without instruments. Specifically, we compute the out-of-sample partial  $R^2$  of the instruments, defined as the relative reduction in mean squared error when the instrument set is added to the treatment model conditional on covariates. Across specifications, the partial  $R^2$  values are consistently positive and non-negligible. All partial  $R^2$  values are above the 0.02 threshold and the majority is even above 0.05, indicating that the instruments provide meaningful variation in housing costs beyond what is explained by observed controls. We further test instrument strength using a cluster-robust Wald test of joint significance in an auxiliary regression of the residualized treatment on residualized instruments, yielding p-values well below conventional thresholds. In Figure AIII.1 we plot the 10 percent significance level. The blue dots represent the p-values for the Wald test of the significance of the instrumental variables for explaining the treatment. To account for the short time dimension and potential serial correlation, we also implement a time-preserving permutation test of instrument relevance, which supports the robustness of the partial  $R^2$  findings. The specifications show relevance at 10 percent significance level or better. Only the specifications with the at-risk-of-poverty for the age 20-29 and the severe housing deprivation are somewhat borderline, but very close to the 10 percent threshold.

**Exogeneity** is assessed using a moment-based overidentification (J) test adapted to the DML-IV setting. We construct orthogonalized residuals from the final-stage regression using fully out-of-fold predictions and test whether the residuals are uncorrelated with the residualized instruments. Because the panel consists of a relatively small number of clusters (EU countries), p-values are obtained using a wild cluster bootstrap, which provides more reliable finite-sample inference than asymptotic chi-square approximations. The red dots on Figure AIII.1 report the corresponding bootstrap p-values. Exogeneity cannot be rejected at the 10 percent significance level, which is consistent with the validity of the instruments.

**Causality.** Figure AIII.2 reports p-values from auxiliary tests checking for presence of reverse causality, i.e. assessing whether the outcome variable predicts the treatment. For each specification, we report (i) a Granger-style test including one lag of the outcome, (ii) a Granger-style test including two lags of the outcome, and (iii) a joint Wald test of the null that all included outcome lags have zero coefficients in the treatment equation. All tests are conducted conditional on the full set of controls, fixed effects, and instruments used in the DML-IV estimation. The horizontal line indicates the 10 percent significance threshold. Across

specifications, p-values are generally large, implying that lagged outcomes do not significantly predict the treatment and providing no evidence of reverse causality.



## Annex IV. Specifications

Specification	At-risk-of-poverty rate	At-risk-of-poverty rate	At-risk-of-poverty rate for age 20-29	Fertility	Fertility	Age of first child	Age of leaving parental home
<b>Treatment</b>	Housing cost overburden rate	Share of housing costs in disposable household income	Housing cost overburden rate for age 20-29	Housing cost overburden rate	Share of housing costs in disposable household income	Share of housing costs in disposable household income	Share of housing costs in disposable household income
<b>Features</b>	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population
<b>Controls</b>	Share of population with less than or lower secondary education Share of population in households with very low work intensity	Share of population in households with very low work intensity	Share of population in households with very low work intensity	Share of temporary employment  Domestic credit to GDP  Children not in formal childcare or education until the age of 3  Female labor force participation  Share of women aged 20-39 in total population	GDP per capita PPS (lag 1)	Percent of arrears  Cost of borrowing for households for house purchase  Overcrowding (lag 1)  Female labor force participation	Cost of borrowing for households for house purchase  Domestic credit to GDP  Share of population with less than or lower secondary education  Share of population in households with very low work intensity
<b>Instruments</b>	Building permits (lag 1)  PPI in construction	Building permits (lag 1)  PPI in construction	Building permits (lag 1)  PPI in construction	Building permits (lag 1)  PPI in construction	Building permits (lag 1)  PPI in construction	Building permits (lag 1)  PPI in construction	Building permits (lag 1)  PPI in construction

Specification	Overcrowding	Overcrowding	Overcrowding for age 20-29	Bad health perception	Severe housing deprivation	Female labor force participation	Labor force participation
<b>Treatment</b>	Share of housing costs in disposable household income	Housing cost overburden rate	Housing cost overburden rate for age 20-29	Share of housing costs in disposable household income	Share of housing costs in disposable household income	Share of housing costs in disposable household income	Share of housing costs in disposable household income
<b>Features</b>	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population	Social benefits for working age population
<b>Controls</b>	Domestic credit to GDP	Domestic credit to GDP	Percent of arrears	Share of population with less than or lower secondary education	Share of house owners	Share of house owners	Share of house owners
			Share of house owners	Unemployment rate	Share of single person households	Share of population with less than or lower secondary education	Share of population with less than or lower secondary education
			Cost of borrowing for households for house purchase	At-risk-of-poverty rate	Unemployment rate	Unemployment rate	
			Net migration as a share in total population (lag 1)	Old age dependency ratio		Age of first child	
			Domestic credit to GDP				
			Share of urban population				
			GDP growth (lag 1)				
<b>Instruments</b>	Building permits (lag 1)	Building permits (lag 1)	Building permits (lag 1)	Building permits (lag 1)	Building permits (lag 1)	Building permits (lag 1)	Building permits (lag 1)
				Cost of borrowing for households for house purchase (lag 1)			
	PPI in construction	PPI in construction	PPI in construction	PPI in construction	PPI in construction	PPI in construction	PPI in construction

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## PUBLICATIONS

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