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Precarious lives: Exploring the intersection of insecure housing and energy conditions in Ireland

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ABSTRACT

This paper deploys the concept of *'precariousness'* to examine the combined impacts of insecure and unaffordable housing and energy conditions on Irish households. Energy poverty is a major societal challenge as households struggle with rising energy costs and energy insecurity, which is then amplified by poor housing conditions, tenure insecurity and housing unaffordability. However, despite increasing research attention, the combined impacts of precarious housing and energy conditions are rarely considered together, or how this *'double precarity'* might be distributed across social groups. Furthermore, it is unclear how precarious housing and energy conditions have evolved over time or in response to political-economic or energy market shocks. To address this gap, this paper connects debates within the energy poverty literature to more recent work on precarious housing. The paper develops a novel Housing-Energy Precarity Index (2020–2022) and applies it to data on Irish households (EU-SILC). It analyses the combined impacts of housing and energy precarity across housing tenures, demographic and socio-economic groups. We find that housing tenure is a particularly strong predictor of housing-energy precarity, and that private renters, low income groups, lone parents and younger persons (<25 years) are particularly exposed to this combined effect. The results will deliver pragmatic contributions for policy makers and practitioners at the intersection of housing and energy.

1. Introduction

Access to affordable and secure energy remains a major societal challenge today, as millions of households struggle with rising energy costs, energy poverty and inadequate thermal efficiency in their homes [1]. In Ireland, the focus of this study, 43 % of households are at risk of energy poverty if energy prices continue to rise [2], while 14 % are in arrears on their utilities or housing payments, and 7 % are unable to keep their homes warm [3,4]. As such, precarious energy conditions are a key cost of living concern for lower-income households [5]. Households with children, the disabled and unemployed have greater domestic energy needs and face increased cost pressures. High energy bills are leading to cutbacks on other necessities, sometimes prompting decisions about whether to *'heat or eat'* [6]. Older homes and houses in the rental sector perform poorly in terms of thermal efficiency, which add significantly to cost pressures [7]. Inadequate thermal control can pose a significant health risk for vulnerable groups, like the elderly and young children, who struggle to regulate their temperature [8]. Vulnerable households that limit their energy usage are more exposed to physical frailty, illness, depression and social isolation [9].

At the same time, many households are also struggling with precarious housing arrangements [10], defined here as a as "*state of uncertainty which increases a person's real or perceived likelihood of experiencing an adverse event, caused by…the physical qualities, affordability, security of their home and access to services*" [11]. Rising costs and divided housing access are shaping new patterns of social inequality [12]. Young people are increasingly locked out of the wealth-enhancing effects of homeownership and forced into unaffordable and insecure renting [13]. Precarious housing is increasingly felt across all housing tenures and income distribution. Mortgaged homeownership is no longer a sure-bet for middle class prosperity, while even those on relatively good incomes struggle with rental affordability in affluent cities [14]. Highly educated millennials employed in high-demand sectors, like tech, often must resort to undesired house sharing and sub-leasing [15]. Even older homeowners, who may be asset-rich, may reside within older, poor-quality housing with consequences for energy

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poverty and ill-health [16].

However, despite the extent of the energy and housing crises facing households today, the combined impact of these issues is rarely considered in the academic or policy literature. The literature on precarious housing tends to focus on the impacts of unaffordable, insecure and inaccessible housing on vulnerable demographic groups [17,18]. This literature certainly acknowledges poor housing conditions as a key concern [11,13], but rarely links this to related issues of energy poverty or vulnerability. At the same time, energy scholars have specifically linked energy precarity to poor quality housing [19–21], but the evidence is often based on qualitative studies of residents living in the poor quality housing (and often in public housing) [22–24]. Whilst this research is undeniably powerful and important, the evidence base would further benefit from additional quantitative investigation into the effect of housing tenure as a contributing factor in exposure to energy precarity, or how the combined effects of housing and energy insecurity might be differentially distributed across tenures, and demographic and socio-economic groups. Furthermore, it is unclear how the relationship between housing and energy precarity has evolved over time, and how their combined effects might be amplified by sudden political-economic shocks (*e.g.* covid-19 pandemic).

In response, the purpose of this paper is fourfold. Firstly, it mobilises the concept of precarity to examine the multiple and over-lapping dimensions between energy and housing, with particular reference to issues of affordability, security and quality. Secondly, by drawing on Irish data from the European Union's *'Statistics on Incomes and Living Conditions'* (2020–2022) it develops a novel measure of the combined impacts of energy and housing precarity. Thereafter, it analyses the distribution of housing-energy precarity across different population groupings and the key statistical predictors. The discussion and conclusions sections reflect on the implications of the findings for theory and policy.

2. Literature review

Energy poverty is widely understood as a situation where a household is unable to attain sufficient levels of domestic energy services, such as lighting, heating and cooling [25]. The concept emerged in the 1970s in the UK and Ireland, where the term *'fuel poverty'* was mobilised by social rights campaigns to protest inadequate space heating standards among poor households. In the 1980s and 1990s, the term was given a more formal definition based on the *'energy burden'* of a household, and those needing to spend >10 % of their income on heating were considered energy poor [26]. However, as energy increasingly came to be seen as a multi-faceted and complex problem, the term *'energy poverty'* came to be used to distinguish it from more generalised forms of deprivation, and increased emphasis was placed on households' lack of access to energy and related issues of inadequate lighting, water heating and cooling [27]. While earlier research emphasised low income, high energy prices and inefficient buildings as the main drivers of energy poverty, more recent work has come to emphasise more systematic and structural causes [28]. Indeed, the term '*energy precarity'* is now used to describe the politically induced nature of energy vulnerability, and how one's exposure to risk and harm is shaped through socio-material relations of energy infrastructure [29]. The term captures the dynamic and uncertain nature of energy access, unaffordability and unpredictability, and the vulnerability of individuals to systemic conditions such as volatile energy markets, neoliberal housing markets, or climate risks.

Precariousness and precarity refer to the increasing prevalence of instability, uncertainty, and insecurity in socio-economic life. While often used interchangeably, both have distinct meanings. Within cultural studies [30], precariousness is conceived as a universal condition of bodily vulnerability with ubiquitous effects that are tied to the fragility of life itself, and our mutual dependence on social and political conditions for survival. By contrast, precarity refers to the segmented and specific forms of precariousness and its uneven distribution, often by highlighting the systemic conditions that disproportionately affect certain groups [31]. While precariousness is a shared condition, precarity is induced by political-economic conditions with uneven social and spatial implications for the reproduction of inequality. These political-economic conditions are not only social or economic but also spatial. Significant geographic work has applied precarity to examine the neoliberalization of labour markets and the rise in insecure working, while other research focuses on migration and the precarious existence of asylum seekers and irregular migrants, and the constraints they face in navigating insecure housing and labour markets [32,33]. Other studies focus on the micro-geographies of precarity and the processes of informalisation that underpin squatting, informal settlements and temporary housing [34,35]. More recently, attention has been paid to the politics of resistance to precarious urban conditions, and the strategies and tactics communities deploy as organised resistance to express and recreate the urban political [29,36].

As Petrova [19] notes, the term energy precarity acts as a *"double signifier"* that not only captures individuals' performative experiences of energy unaffordability and insecurity, but also highlights the political and institutional embeddedness of fuel poverty beyond the home. The privatization and liberalization of energy markets has driven rising energy costs [20], while unaffordable utilities bills can lead to disconnection, rising financial pressures, and reduced heat and energy consumption [24]. When energy takes up a high proportion of household income, individuals may be forced into decisions between paying their energy bills and other household priorities, including food, clothing and housing costs [37]. High energy bills, alongside political processes of austerity and social welfare retrenchment [38], have further diminished individuals' ability to accumulate the financial buffers to protect themselves from unanticipated economic shocks, while financial stress has been linked to numerous health problems, including mental health [39]. Fear of disconnection can dramatically diminish one's sense of ontological security and hamper people's experience of the home as a place of refuge, social reproduction and familial exchange, as well as negatively impact upon their mental wellbeing, self-perceptions and social relations [23,40]. Insufficient investment in energy infrastructure, the prevalence of poor quality housing and limited access to energy services further impede the individuals' access to comfortable living [41]. Poor quality housing impacts on individuals' energy usage and health [42], particularly due to poorly insulated buildings, inefficient heating systems (*e.g.* storage heaters) and poor ventilation [43].

Precarity signifies a differential exposure to socio-economic vulnerability, where certain subjects and populations face a greater exposure than others. In terms of energy precarity, poor quality housing and inadequate thermal comfort impact more severely on children, the elderly and those with chronic health conditions [8]. Such groups often struggle to regulate their temperature in periods of severe cold and heat, and are more exposed to serious ill-health, physical frailty, illness and social isolation [9]. Indeed, the elderly are more likely to develop respiratory and cardiovascular complications from living in cold homes, and *'excess winter mortality'* can be a consequence of energy poverty [44]. However, the elderly are far from the only group vulnerable to such conditions. Young adults and students are exposed to cold housing due to concerns over heating affordability and low incomes, oftentimes with pronounced effects on mental health [27]. Low income households are clearly more exposed to issues of energy affordability, but are also more likely to live in private rented or social housing, with little ability to improve the thermal efficiency of their homes [22]. Low income households are more than twice as likely to live in poor quality housing than wealthy households [45].

The thermal efficiency of the home, has been raised as a key driver of energy precarity [23,27,46]. Even within housing specific research, issues of damp, mould, inefficient heating and insulation have been identified as key drivers of tenant dissatisfaction within the private rental sector [13,33]. Tenants often report struggling with the worry and fear of high energy bills, and how they will juggle these costs on top of

other household expenses [47]. The fear of entering debt to cover living expenses, particularly high-cost pay-day loans, is a constant refrain. Borrowing from family or friends often provokes feelings of shame, which can be internalised as a sense of personal failure [48]. At worst, households are prioritising certain expenses over others, sometimes necessitating choices between 'heat or eat.' Curtailing energy expenditure, cutting back on energy use and restricting their usage of energy to just a few rooms within the home are all commonly reported coping mechanisms within the literature [49]. These strategies often take a physical and emotional toll on one's personal comfort. By restricting spending and mobility, energy poor households often forego socializing and engaging with social networks, which can result in feelings of isolation [23]. Reporting maintenance or poor quality issues to landlords is often avoided because of fears of rent increases to cover the costs of physical improvements [27].

Within housing research, precarity is defined as a "*state of uncertainty which increases a person's real or perceived likelihood of experiencing an adverse event, caused by…the physical qualities, affordability, security of their home and access to services*" [11]. The increasing commodification and financialization of housing has amplified housing affordability concerns, particularly where rising housing costs push a household below the poverty line [50]. The failure to adequately regulate rental housing markets, space standards and housing quality can impact on tenants' health and wellbeing through issues of overcrowding, damp or insufficient heating [42]. Uneven landlord-tenant relations, insecure lease conditions and restrictions on homemaking reduce tenants' sense of ontological security in their homes [51]. As noted in Section 1, in recent decades increasing numbers of people are experiencing precarious housing circumstances in the form of unaffordable homeownership, a shortage of social housing, and rising rents, insecure tenure and poor conditions in the private rented sector [13]. However, there has been limited research considering how these trends interact with, and impact upon, the prevalence and experiences of energy poverty. An exception relates to debates about how to measure energy poverty, and specifically whether household income should be measured before or after housing costs [52]. A study in the USA by Hernández et al. [53] found that African Americans were more likely to be subjected to a 'double burden', whereby they spend disproportionately higher amounts on energy and housing relative to income. Various studies have also highlighted the particular challenges with energy poverty faced by many tenants living in the private rented sector [19,54,55]. Yet while these studies all demonstrate clear linkages between housing precarity and energy poverty, on the whole the two problems tend to be analysed as separate dimensions of material disadvantage, with housing and energy scholars typically publishing in distinct journals with limited cross-pollination of insights. However, given the scale of both problems, developing a stronger understanding of their linkages is of paramount importance.

The purpose of this paper is to bring the concepts of energy and housing precarity together, examine their intersections, and unpack their combined impacts across different socio-economic and demographic groups, housing tenures and spatial settings. We argue that this will deepen understanding of the causal mechanisms underpinning each problem, as well as which groups are rendered most vulnerable to experiencing them, thus informing the development of more effective policy and practice. In the next section, we provide a brief overview of the energy and housing context in Ireland, as well as a brief overview of policy, and thereafter we introduce our methodology and approach to measurement.

3. Policy and context

Energy poverty remains a significant and enduring socio-economic issue in Ireland. Estimates suggest that 12 % of the Irish population spend >10 % of their income on energy costs, while 20 % report they are unable to adequately warm their homes [2]. The majority of Irish households are heated by gas, oil and electricity, which have witnessed price increases of 86 %, 53 % and 45 % respectively between 2015 and 2021 [2]. At the same time, Ireland has experienced a significant and enduring crisis in its housing sector, with a shortage of affordable housing [56]. The private rental sector has been particularly impacted, where a third of renters struggle with their housing costs [57]. An average rent in Dublin costs €2400, which is equivalent to 61 % of median monthly national income [58]. Such hardships are amplified by the poor quality of the rental housing stock, where 50 % of properties have a Building Energy Rating[1] (BER) of less than a C grade. Forty percent of private rental properties have a BER score of D/E, while 10 % have a rating of F/G. To put this in context, the National Residential Retrofit Plan has a policy ambition to retrofit 500,000 homes up to a BER B2 standard by 2030 [59]. At present, 90 % of properties in the private rental sector are below this threshold. Inspections of rental properties are far below the 25 % rate committed to by policy, while enforcement rates for failure to comply with minimum standards are low [13].

Responsibility for addressing energy poverty lies with the Department for Climate, Environment and Energy. Historically, the Irish Government's support for energy poor households has traditionally focused on direct income support [1]. The Fuel Allowance is a means-tested payment to specified 'vulnerable' groups, such as the elderly, disabled and low-income families. Other direct income supports include the Household Benefits Package, which includes allowances for electricity and gas payments, and is available to all households aged over 70. While recognising the importance of these supports, they have been described as *"limited"* in addressing persistently high energy poverty levels [60] and as a subsidy for the use of fossil fuels [2].

More recently, policy has shifted toward longer-term investments in improving the thermal efficiency of Ireland's housing stock. The *'Climate Action Plan 2021'* commits to tackling energy poverty by funding a national retrofitting programme (€12.9bn) to upgrade 500,000 homes and provide 400,000 heat pumps by 2030. The plan aims to ensure a better targeting of social welfare measures to prevent fuel poverty to support a just transition. These commitments were further underpinned in the most recent '*Energy Poverty Action Plan 2022,*' which was introduced in response to the energy price shock of 2021/22. The plan introduced an emergency benefit scheme of €1.2bn provided to all domestic electricity customers *via* a €600 credit to their electricity accounts. The income thresholds for the Fuel Allowance and the electricity and gas allowances under the Household Benefits package were also increased. A €10 m emergency hardship fund was established to support those at risk of utilities arrears. Furthermore, the plan increases funding for the Better Energy Homes Scheme, to support homeowners and landlords with the costs of insulation upgrades, and the Warmer Homes Scheme which provides specific home upgrades for low-income households. There are also commitments to expand the local authority retrofit scheme and to implement a minimum BER B2 standard for all private rental properties.

However, while these commitments are welcome, it is worth reiterating the scale of the retrofitting challenge. Currently, 80 % of Irish homes are estimated to have a BER score of a C or below, while this figure rises to 90 % of homes within the private rented sector [61]. Indeed, 40 % of private rented homes display a BER score of D or E, while 10 % have a score of F or G. Recent unpublished estimates suggest the average cost of upgrading a rental property to a minimum B standard is €30,000 - €40,000, and the cumulative sectoral cost of upgrading is €7bn to €8bn. At the same time, there are concerns both about the financing capacity of private landlords to meet these costs, as well as the costs of older homeowners living in older, less thermally efficient

[1] A Building Energy Rating or BER is an energy label with accompanying advisory report for homes. The rating is a simple A to G scale. A-rated homes are the most energy efficient and will tend to have the lowest energy bills. An owner must provide a BER to prospective buyers or tenants when a home is offered for sale or rent. There are exemptions for certain building categories *e.g.* protected structures.

housing.

To summarise, Ireland faces deep challenges relating to housing affordability, insecurity and energy poverty. While recent policy announcements to improve the energy efficiency of the housing stock are welcome, to ensure their effectiveness and minimise barriers to implementation a deeper understanding of the interplay between energy and housing precarity is required.

4. Methodology

This article utilises Irish data from the EU *'Statistics on Incomes and Living Conditions'* survey, a panel survey that collects information on the income and living conditions of households alongside demographic and socio-economic data. It combines cross-sectional and longitudinal elements with nationally representative samples of the population. The data is drawn from the years 2020–2022 and captures answers provided by the head of the household across 13,709 observations (*4231 from 2020; 4835 from 2021; and 4643 from 2022*). The EU-SILC deploys a multi-stage cluster sample, resulting in all households in Ireland having an equal probability of selection. The sample clusters are based on Census Enumeration Areas, and the sample (*i.e.* 100 households per block) is extracted from 1200 of these blocks. The data is weighted by household tenure to match the proportionate shares of households in the most recent Irish census (2022). Before weighting, the sample provided 53 % outright owner households, 28 % mortgagors, 7 % private renters and 12 % social renters. After weighting, the sample was adjusted to represent 37 % of households as outright owners, 29 % as mortgagors, 18 % as private renters and 16 % as social renters, including those living rent-free.

The analysis draws on eight variables related to heating adequacy, housing and energy affordability and security, and the household's financial capacity, to create a composite index of housing-energy precarity (Table 1). The index allows us to combine multiple indicators to capture the complexity of precarious housing-energy conditions, and to combine objective measures of disadvantage (*i.e. percentage of income spent on energy*) with respondents' subjective experience of their housing conditions (*e.g. ability to warm their home adequately*). Aggregating and weighting indicators in a single score enables direct comparability of results across socio-economic groups and regions over time, making it possible to highlight patterns in the data, and inform policy responses.

While the EU-SILC does not capture all elements of precarity (*e.g. questions regarding housing condition were removed following a review of the survey form in 2020*), it is the best available data source using a nationally representative sample to undertake the analysis. Our variable selections were informed by literature, and in particular those studies that had previously utilised the EU-SILC to interrogate housing and energy conditions separately [11,41,57]. Heating adequacy is captured by two subjective questions related to the household's *"ability to keep the home adequately warm"* and having *"to go without heat in the last 12 months through lack of money."* If the household had been in arrears in the previous 12 months on their energy bills, they are determined to have an energy security issue as they risk disconnection. Similarly, a household is considered to have tenure insecurity if they have been in arrears on their mortgage or rent, and at risk of eviction. Affordability is captured by households' energy and housing costs as a percentage of income. If a household spent >30 % of net income on their rent or mortgage, they demonstrate an affordability problem. By subtracting the household's rent or mortgage payments from total housing costs, we can approximate their utility expenditure. This figure includes spending on electricity, water, gas and heating, including service charges and maintenance. Therefore, we set a higher share of net income for this variable (20 %) than is commonly used in literature (10 %) [28]. The household's wider financial security is assessed by two questions relating to their difficulties in making ends meet and whether the household is pushed below the Irish poverty threshold (*i.e. 60 % of median income)* after their housing costs have been deducted.

A Categorical Principal Components Analysis (CATPCA)[2] determines how well these variables fit as a composite measure [63]. Selecting the main components was determined by the eigenvalue of each component. Eigenvalues which are >1 are more useful in explaining the variance of the data set. Our eight EU-SILC variables clustered around two main explanatory components. The first relates to the heating adequacy of the home and households' exposure to arrears on their housing and energy bills. However, the variable that captures the household's 'ability to make ends meet' also loads onto this component. The second component relates to housing affordability, particularly if the household is pushed below the poverty line after their housing costs are deducted. A total variance of 46 % is explained by the CATPCA, where the first component explained 32 % and the second 14 % (Table 2). Following Krishnan's

Table 1
Housing- Energy Precarity Index Measures.

Variable	EU-SILC Indicator	Percentage respondents		
		2020	**2021**	**2022**
Heating	Had to go without heating during the 12 months though lack of money	*10 %*	*7 %*	*9 %*
	Deprived of the ability to keep the home adequately warm	*4 %*	*4 %*	*6 %*
Arrears	Whether the household has been in arrears on utility bills in the last 12 months	*9 %*	*7 %*	*7 %*
	Whether the household has been in arrears on mortgage or rental payments in the last 12 months	*8 %*	*6 %*	*4 %*
Affordability	Utilities Costs >20 % Disposable Income	*5 %*	*4 %*	*5 %*
	Housing Costs >30 % Disposable Income	*12 %*	*10 %*	*10 %*
Security	At risk of poverty after rent and mortgage interest are deducted (*at 60 % of median national disposable income*)	*25 %*	*24 %*	*22 %*
	Ability to make ends meet (*With Difficulty / Great Difficulty*)	*19 %*	*15 %*	*16 %*

Source: EU-SILC.

Table 2
Component Loadings and Cronbach's Alpha Score.

Variables	Components	
	Arrears & Heating	Affordability & Security
Utilities Arrears	0.68	
Very Difficult / Difficult Making Ends Meet	0.66	
Without Heat	0.62	
Unable Warm House	0.60	
Housing Arrears	0.59	
Utilities Affordability		0.65
Poverty After Rent/ Mortgage		0.55
Housing Affordability		0.43
% of Variance Accounted for	32 %	14 %
Normalized for Weighting Index	69 %	31 %
Cronbach's Alpha	0.833	

Source: EU-SILC.

[2] Categorical Principal Components Analysis (CATPCA) is a dimension reduction technique used to explore nonlinear relational structures in data sets that contain both categorical and numeric variables. Unlike traditional PCA, it can be applied to data sets containing variables with different measurement levels (nominal, ordinal, or numeric). The aim of CATPCA is equivalent, however, to PCA, namely to reduce a data set of many variables with complicated correlation patterns into a smaller number of uncorrelated summary variables (principal components). The algorithm seeks to explain as much variance in the data as possible, thereby revealing relational structures among the observed variables.

[64] approach, these component scores were normalized so that component 1 contributed 69 % toward the weighted index (*i.e. 32/46 *100 = 69 %)* and component 2 contributed 31 % *(i.e. 14/46*100 = 31 %)*. To create a linear scale ranging from 0 to 1, the component loadings were summed, divided by the number of contributing variables (*e.g. by 5 for component 1*), and then multiplied by the component weighting (*e.g. by 0.69 for component 1*).

A Cronbach's alpha test determined the reliability coefficient of the scale based on the average correlation among items (internal consistency) and the number of items. Our test produced an acceptable test score of 0.833, indicating a high internal consistency. Thereafter, we created a linear index ranging from 0 (no precarity) to a maximum value of 1 (all 8 precarity indicators). In the descriptive findings we group respondents by equal intervals in terms of their index scores, distinguishing between those that experience no precarity (0), 'low' (≤0.33), 'medium' (0.34–0.66) and 'high' (≥0.67) levels of housing precarity.

We apply descriptive and inferential statistics to analyse the extent, nature and trajectory of housing-energy precarity across years. Initially, we provide the percentage of respondents reporting difficulties with each of the eight index variables across years (Table 1). Approximately one-fifth to one-quarter of households are pushed below the poverty threshold after their housing costs are deducted, while one-fifth struggle to make ends meet. Some 5 % are unable to keep their home warm, while 10 % regularly reduce their heat use due to lack of money. Interestingly, the only variable to record an increase in the share of households affected *(from 4 % - 6 %)* was the inability to keep the home adequately warm. The impacts of Ukraine war, which has destabilised Europe's energy markets, and the removal of post-Covid income supports have likely impacted on households' ability to warm their homes. Indeed, 7 % - 9 % of households are consistently in arrears on utilities bills. Five percent of households demonstrate an affordability problem with their utilities costs, while 10 % struggle with the unaffordability of housing. Thereafter, we pool the years and conduct a comparative analysis of mean HEPI scores across demographic and socio-economic groups, before running different model specifications of standard OLS regressions to identify the main risk factors for housing-energy precarity.

As with any analysis of secondary data, there are limitations. Firstly, the measures in our index clearly give greater weight to affordability and security considerations, while other dimensions are overlooked. In 2020 variables that captured the physical quality of properties (*e.g. leaks in roof/ windows, presence of damp etc*) were removed from the EU-SILC. It is likely that the physical properties of the home and the adequacy of the energy supply system would be highly relevant for inclusion on the housing-energy index. Secondly, there are elements of one's subjective experience of precarious conditions that would be very difficult to capture by standard survey methodologies, and further work is required to understand this emotional dimension. Thirdly, by nature of our variable choices, we are limited to three years of data. While this captures the impacts of the Covid-19 pandemic and the inflation crisis of 2022, it would be preferrable to have a longer time period to analyse the impact of sudden political-economic shocks on the housing-precarity index. That said, the revised EU-SILC will ask new questions regarding households energy usage on a three year rotating basis from 2023, which may include variables that can augment the index proposed here.

5. Results

5.1. Socio-demographic patterning of housing-energy precarity

The average Housing-Energy Precarity Index (HEPI) score across our full sample of 13,716 households was 0.10. Sixty percent of households experience no issues with their housing or energy situation, while 29 % demonstrate an HEPI score of between 0 and 0.33. A further 10 % of households display a medium HEPI score of between 0.34 and 0.66, while 1 % experience a high HEPI score in excess of 0.67. Table 3 displays the percentage share of households experiencing medium to high levels of housing-energy precarity (*i.e.* scores >0.33) and the mean index scores for a series of social, economic and demographic groups.

Interestingly, there is little variation in households affected by housing-energy precarity across years. Indeed, the mean HEPI score remains remarkably stable between 2020 and 2022. The greater availability of Covid-19-related income supports, as well as the introduction of a temporary ban on rent increases and evictions, may have contributed to a slight decline in the share of households affected between 2020 and 2021 (from 12.6 % to 9.5 %). However, there is a clear disparity in the share of households affected across housing tenures. Thirty-one percent of private renters experience medium to high housing-energy

Table 3
Comparison of Mean Values for the Housing-Energy Precarity Index.

Variable	Mean	N	% HEPI score > 0.33	SD
Total	0.10	13,716		0.16
Year				
2020	0.11	4401	12.6 %	0.17
2021	0.09	4789	9.5 %	0.15
2022	0.10	4526	11.1 %	0.16
Tenure				
Private Renter	0.22	2464	30.9 %	0.21
Mortgagor	0.05	3978	3.7 %	0.11
Social / Rent Free	0.17	2206	19.8 %	0.19
Outright Owner	0.05	5068	3,2 %	0.10
Dwelling Category				
Semi-Detached or Terraced	0.11	6643	13.2 %	0.18
Apartment	0.17	1696	20.1 %	0.19
Other	0.28	20	40.0 %	0.30
Detached	0.06	5357	5.3 %	0.12
Income Quartile				
Quartile 1	0.20	3430	24.2 %	0.20
Quartile 2	0.12	3428	15.0 %	0.17
Quartile 3	0.06	3430	4.5 %	0.11
Quartile 4	0.02	3428	0.4 %	0.05
Labour Status				
Unemployed	0.26	594	37.7 %	0.23
Retired	0.06	3293	4.3 %	0.11
Other	0.20	2396	27.0 %	0.21
Employed	0.07	7434	6.7 %	0.13
Household composition				
1 adult & children	0.27	685	40.7 %	0.22
2 adults & children	0.09	2943	9.4 %	0.15
Other households with children	0.11	1147	13.3 %	0.17
Adult household, no children	0.09	8941	9.0 %	0.15
Educational Attainment				
Primary	0.15	1629	16.0 %	0.19
Secondary	0.13	3623	15.0 %	0.18
Post Secondary - No Degree	0.11	2969	12.9 %	0.17
Tertiary - Degree	0.06	5444	5.8 %	0.13
Age				
<25 years	0.21	120	26.7 %	0.18
25–49 years	0.11	5660	13.8 %	0.18
50–64 years	0.11	4135	12.6 %	0.17
65+ years	0.07	3802	4.7 %	0.12
Married				
Single	0.15	3655	17.7 %	0.19
Widowed	0.09	1364	7.4 %	0.14
Divorced or Separated	0.19	1517	25.7 %	0.21
Married	0.06	7175	5.2 %	0.12
Sex				
Female	0.11	7202	13.0 %	0.17
Male	0.09	6514	8.9 %	0.15
Debt Repayment Burden				
Heavy Burden	0.24	883	32.7 %	0.22
Somewhat or No Burden	0.09	12,834	9.5 %	0.15
Unexpected Expenses				
No	0.23	4454	30.4 %	0.21
Yes	0.04	9262	1.7 %	0.08
General Health				
Very Poor / Poor	0.25	772	37.3 %	0.23
Other	0.09	12,944	9.5 %	0.15

Source: EU SILC.

precarity scores relative to 3.7 % of mortgagors and 3.2 % of outright owners. Interestingly, the share of private renters impacted is even larger than that for social renters (19.8 %). The quality of the rental stock and poor thermal efficiency have long been identified as issues within Ireland's private rental market, and problems regarding the physical repair of properties, heating and insulation, ventilation and mould, and overcrowding are widespread [13]. Social renting in Ireland has largely been treated as a residualised sector, reserved for the poorest households and traditionally was provided through local authority-managed housing estates. Issues of financial stress and poor quality have been pervasive, marked by high levels of rent arrears, long waiting lists and poor supply levels [65].

The percentage share of apartment dwellers impacted by medium to high levels of housing-energy precarity (20.1 %) is markedly higher than for those living in detached (5.3 %) or, to a lesser extent, semi-detached (13.2 %) units. Apartments in Ireland are largely concentrated within the country's major cities, particularly Dublin, and largely accommodate those in the private and social rental sectors. However, those most impacted by precarious housing-energy conditions are those residing in 'other' forms of accommodation (40 %). This group includes those living in mobile homes and other forms of temporary accommodation, who are known to be particularly exposed to low indoor temperatures and insecurity of tenure [66]). However, it must be noted that the overall number of respondents in this group is very low ($n = 20$). The results also reveal how the combined impacts of energy and housing precariousness are disproportionately felt among those from more vulnerable socio-economic backgrounds. Almost a quarter (24.2 %) of those found in the lowest income quartile (*mean €19,255*) are experiencing medium to high precarity scores, and their average HEPI score is ten times the average of those in the highest income quartile (*mean €165,577*) (0.02). Almost 38 % of households headed by an unemployed person experience medium to high HEPI scores, relative to just 6.7 % of households headed by an employed person.

Lone parents are among the most vulnerable group to precarious housing and energy conditions, and 40.7 % display a medium to high HEPI score. Interestingly, the proportion of couples with children (9.4 %) and other adult households with children (13.3 %) display significantly lower proportions of affected households. Hence, it appears to be the compounding effect of raising children from a single income that exposes the household to greater housing and energy precariousness rather than the presence of children *per se* [67]. At the same time, households that are more likely to have dual incomes, or at least other income streams within the household, are significantly less impacted.

Table 3 demonstrates the effect that higher education, and particularly tertiary education, can play in reducing households' exposure to precarious housing and energy conditions. Those with a tertiary level degree display a significantly lower average HEPI score (0.06) than those with a secondary (0.13) or primary (0.15) level education. Indeed, the share of households with a medium to high HEPI score is almost three times higher for those with a primary education (16 %) relative to those with a tertiary degree (5.8 %). This may well be a result of greater earning potential among degree holders [68]. In terms of marital status, just 5.2 % of married households experienced precarious housing and energy conditions (a medium-high HEPI score) relative to those that are divorced (25.7 %) or single (17.7 %). Married couples are more likely to be wealthier, enjoy two incomes and receive significant tax advantages that provide a buffer to the effects of housing and energy precariousness. On the contrary, those that are divorced or single may struggle with the costs of establishing a home on a single income, which is then amplified by rising energy and heating costs.

While significant research has pointed to the role of labour market insecurity and low income as significant drivers of energy and housing poverty, an overlooked, though related, dimension is the financial capacity of the household. Almost one in three households who struggle with additional debt repayment burdens, including credit cards and personal loans, are also experiencing precarious housing and energy conditions, compared to just 9.5 % of households who do not have the compounding effect of additional debt. Similarly, households with weak financial buffers, who are unable to meet an unexpected expense of €1000 from their immediate savings, demonstrate a significantly higher mean HEPI score (0.23) than those with adequate levels of financial reserves (0.04).

Research has documented that households with poorer levels of overall health are more likely to experience greater levels of housing and energy insecurity [69]. Poor quality heating, insufficient insulation, damp and mould can expose households to physical health issues, like chest infections or asthma, but the effects on mental health can be equally profound, including greater levels of anxiety, depression and mental health, as well as to one's sense of identity and social relations [33,70]. Interestingly, a very clear dichotomy emerges between those with underlying health conditions and their exposure to housing-energy precarity. More than one third of households (37.3 %) reporting poor or very poor health are also exposed to housing and energy precarity, relative to just 9.5 % of those reporting average to very good levels of self-reported health.

Finally, while literature has emphasised the increased exposure of older persons to fuel and energy poverty [71] our results suggest that younger households are most exposed to the combined effects of housing and energy precarity. Indeed, some 26.7 % of households aged under 25 years report medium to high levels of housing-energy precarity. This is in stark contrast to the those aged 65 years or older, where just 4.7 % of households are impacted. Younger households are less likely to have reached their full earning potential, are more likely to be in temporary or part-time working, or are more likely to be in further education [15]. They are also much more likely to be private renting households, where housing quality and the thermal efficiency of housing are poorer [18,57]. That said, however, it is worth noting there are only 120 households in the sample headed by someone aged under 25 years, and as such their effect on the overall models will be lesser. Furthermore, it may be that younger households experience of precarity is more the result of housing affordability and security concerns, while older households, who are more likely to be owner occupiers without mortgage debt, may be more strongly influenced by the energy cost related variables.

Fig. 1 further interrogates how the different variables of the Housing-Energy Precarity Index are experienced across these two age groups. Those aged 25 years and younger, who are also more likely to be private renters, display higher scores across all variables that compose the HEPI index, while those aged 65 years and older, who are more likely to be outright owners, display relatively low scores. The variables relating to the household's financial capacity and affordability dimensions are particularly pronounced. Indeed, 33 % of the under 25-year group struggle with their housing and utility costs, while 34 % struggle to make ends meet after their rent costs have been deducted. Conversely, only 4 % of the over 65 years group struggle with housing or energy affordability, while only 11 % experience problems making ends meet. While problems maintaining adequate heating were lesser overall, they were still much more pronounced among the younger households (14 %) relative to the older group (4 %).

5.2. Key predictors of housing and energy precariousness

Next, we present a series of linear regression models to further interrogate the main predictors of housing-energy precarity and estimate the relative importance that should be attached to each socio-economic factor. We calculate six OLS regression models to show the effect of year (Model A) and tenure type (Model B) on the index, followed by a range of moderating factors including demographic (Model C), economic (Model D), financial (Model E) and health-related (Model F) variables. The unstandardised coefficients presented in Table 4 represent the size and direction of the effect of the characteristics of interest on our housing-energy precarity index. Our number of

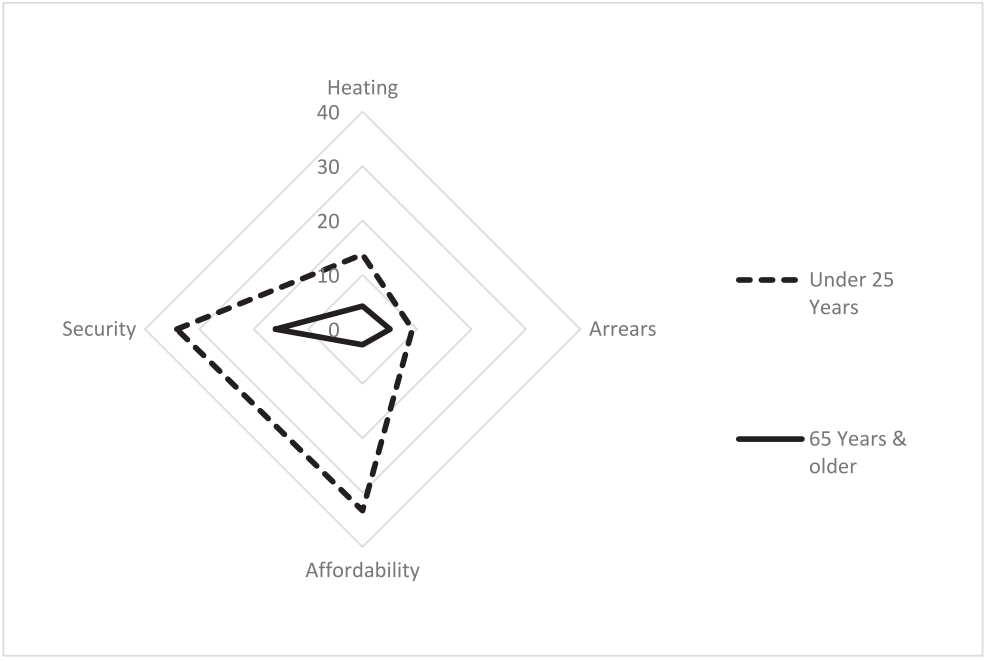

Fig. 1. Radar Chart of Housing-Energy Precarity Index Components for two age groups (under 25 years & 65 years and older; % of respondents). Source: EU-SILC.

observations across all models is 13,709, and the R^2 increases from 0.003 in Model A to 0.493 in Model F.

Model A compares the effect of the year of study on one's exposure to housing and energy precarity by holding the year 2021 as the reference category. The year 2020 captures the impact of mobility restrictions associated with Covid-19 pandemic, while 2022 captures the spike in energy prices associated following the Russian invasion of Ukraine which destabilised global energy markets. Respondents in 2020 experienced a slightly elevated HEPI score, with an effect size of 0.002 that was significant at the $p < 0.000$ level. As individuals were required to stay and work from home during the initial pandemic wave, this led to increased demands on domestic energy consumption and space heating [13]. Furthermore, incomes were reduced due to higher unemployment levels and furlough schemes, thereby increasing the affordability burden of both housing and utilities costs. The year 2022 emerges as a significant predictor of housing-energy precarity once other housing and socio-economic factors are controlled for.

`Housing tenure (Model B) is a strong significant predictor of housing-energy precarity across all models. Private renters demonstrate a marked effect size (0.17) relative to outright owners, while the effect for social renters is slightly lower (0.13). Interestingly, the effect for both sets of renters remain high across all models, while the effect for mortgagors only becomes significant (0.02) once the employment and income-related variables are controlled for. Indeed, private renting remains one of the strongest predictors (0.09) of housing-energy precarity once all other moderating factors are controlled for, and is only surpassed by the effect of low income (*i.e.* Quartile 1) in Model F (0.13). The result confirms existing research that points to the marked vulnerability of private renters relative to other housing tenures in Ireland, notably with regard to poorer housing quality standards and maintenance [13,51].

Model C introduces the demographic characteristics of respondents and we find the effect of housing-energy precarity is more pronounced among specific population sub-groups. Lone parent households demonstrate, on average, a higher HEPI score by 0.09, and this is an effect that endures when all other socio-economic, employment and income predictors are included under Model F (*although the effect size reduced to 0.05*). Similarly, other adult households with children demonstrate a markedly higher effect (0.04) relative to those without children. Clearly, the presence of children is a significant driver of housing-energy precarity due to the additional heating and electricity needs, and childcare costs [53]. This effect is compounded for households reliant on a single income as a lone parent – demonstrated by the finding that households who are headed by a divorced or separated person display a significant effect size of 0.08. Gender also emerges as a predictor, although the effect is weak (0.01 for females) and it disappears once other economic factors are controlled for.

As above, the literature emphasizes the exposure of older households to insufficient thermal warming and electricity usage [16]. However, once the combined effects of energy and housing precarity are considered, it is clear that younger households are relatively more vulnerable than older ones. We hold those aged 50–64 years as the reference category as this group have most likely reached their full earning potential. Relative to the reference group, households headed by someone aged over 65 demonstrated a lower HEPI score by −0.02, and this negative effect actually increases (−0.04) once additional economic and financial variables are controlled for. This lower level of precarity among older groups is also reflected in recent analysis of UK disconnections data [72]. In contrast, the effect for the under 25 years group is initially negative (−0.02), but turns positive once income and employment are controlled for (although the effect doesn't reach statistical significance).

While the role of tenure likely reduces older households' exposure to housing and energy precarity, mainly because older homeowners have limited housing costs and more significant housing wealth, it is notable the negative effect of older age on housing-energy precarity actually increases after tenure is controlled for. It is also notable that those aged under 25 years (€41,978) and over 65 years (€41,126) display very similar disposable income levels. It may be that older households receive greater levels of social support that reduce their exposure. Indeed, households aged over 70 are eligible for additional fuel subsidies, household benefits payments and a living alone grant [1]. Older households are more likely to have accrued financial reserves that can be drawn upon in times of hardship. Our data demonstrates that just 25 % of households aged over 65 years would struggle with an unexpected expense of €1000, compared to 55 % of the under 25 years group. As Petrova [19] notes, younger people have often been an overlooked group in energy poverty debates, and their situation has perhaps been

Table 4
Determining Predictors of Housing-Energy Precarity by Linear Regression Modelling.

Independent Variables	Model A	Model B	Model C	Model D	Model E	Model F
(Constant)	0.093	0.043	0.03	−0.04	−0.020	−0.02
2021						
2020	0.02***	0.01*	0.01**	0.01*	0.00	0.00
2022	0.00	0.01*	0.01**	0.02***	0.02***	0.02***
Owned Outright						
Private Rented		0.17***	0.15***	0.12***	0.09***	0.09***
Mortgaged		0.00	0.00	0.02***	0.01**	0.01**
Social Rented		0.13***	0.10***	0.06***	0.03***	0.03***
Adult Household, No Child						
1 Adult with Children			0.09***	0.07***	0.05***	0.05***
2 Adults with Children			0.02***	0.02***	0.02***	0.02***
Other Adult Hhld with Children			0.04***	0.05***	0.03***	0.03***
Married						
Single			0.04***	0.00	0.00	0.00
Widowed			0.04***	−0.01	−0.01*	−0.01*
Divorced/Separated			0.08***	0.03***	0.02***	0.02***
50–64 years						
≤25 years			−0.02	0.01	0.01	0.02
26–49 years			−0.03***	−0.01	0.00	0.00
≥65 years			−0.02***	−0.05***	−0.04***	−0.04***
Male						
Female			0.01***	0.00	−0.01*	0.00*
At Work						
Unemployed				0.10***	0.08***	0.08***
Retired				0.01**	0.01**	0.01*
Employed Other				0.06***	0.04***	0.04***
Income Quartile 4						
Income Quartile 1				0.16***	0.13***	0.13***
Income Quartile 2				0.08***	0.06***	0.06***
Income Quartile 3				0.03***	0.01***	0.01***
Tertiary Degree						
Primary				0.02***	0.00	0.00
Secondary				0.01***	0.00	0.00
Post Secondary - No Degree				0.00	0.00	0.00
Debt Not Heavy Burden						
Debt Heavy Burden					0.07***	0.07***
Able Manage Unexpected Expenses						
Unable Manage Unexpected Expenses					0.09***	0.09***
Health Status						
Very Poor or Poor						0.06***
Observations						
R^2	0.00	0.12	0.26	0.40	0.46	0.47

Source: EU-SILC.

normalized by a socio-political expectation that younger people are expected to reside in poor quality housing during the earlier part of their housing careers. Further research is needed on the relationship between age and housing-energy precarity,

The next set of explanatory factors (Model D) relate to income, employment and education. The results reinforce the picture that housing-energy precarity is concentrated among households with weaker socio-economic profiles [73]. Low income emerges as the strongest predictor of housing-energy precarity (0.16) and its effect is significant ($p \leq 0.000$). Indeed, this effect remains high even when additional financial and health-related variables are included. However, it is also worth noting that even households with middle (0.08) and upper-middle incomes (0.03) experience elevated housing-energy precarity relative to the wealthiest households. As such, while precariousness represents a scale of escalating pressures that are clearly concentrated among the poorest households, the impact extends well up the income distribution into more middle-income groups.

Furthermore, there is a strong and significant relationship between the employment status of the household head and housing-energy precarity. Households that are headed by an unemployed person on average witnessed a HEPI score that was 0.10 higher, while those who were otherwise employed (*i.e. engaged in home duties, caring responsibilities or full-time education)* displayed an average HEPI score that was 0.06 higher. Interestingly, the effect for retirees is lower (0.01) than other categories, which again suggests that the impact is lesser for older households. The results point to widening intergenerational inequalities that are being perpetuated through the housing system, particularly where older homeowners accrue significant wealth gains through their appreciating properties [74]. It also suggests that older persons may have developed more substantial financial buffers that moderate the impacts of housing-energy precarity relative to the younger cohort.

The household's financial capacity is assessed under Model E, and is captured by two variables which emerge as strong predictors of precarity. Households carrying additional non-mortgage related debt (*i.e. credit cards, personal loans*) and heavy repayment burdens are more likely to demonstrate a housing-energy precarity score that is 0.07 higher. Similarly, households who are unable to meet an unexpected expense of about €1000 without recourse to borrowing also demonstrate a markedly higher HEPI score (0.09). Clearly, it is the combination of multiple and compounding forms of material disadvantage, low incomes, insecure employment and financial over-indebtedness that are among the strongest predictors of one's vulnerability to housing and energy insecurity.

Finally, Model F considers the health position of the household head. Those who report their health status as *'very poor or poor'* demonstrate an effect size 0.06 relative to those with *'average to very good health.'* Within the full model the effect size of ill-health is comparable to that of being unemployed (0.08). The reasons behind this relationship are less clear in the data. It may be that the experience of unaffordable and insecure housing and energy is driving physical ill-health or mental

stress, for example, because households with higher housing and energy costs have less income for food, heat and electricity. However, it may also be that individuals with pre-existing health conditions, who are less able to work, filter toward cheaper and poorer quality housing and use their utilities to a lesser extent. Better understanding of the exact nature of this bi-directional relationship between ill-health and housing-energy precarity is a task for further research.

6. Concluding discussion

To our knowledge, this article is the first to study the combined impacts of energy and housing precariousness through a multidimensional approach. While significant research has examined energy poverty and housing insecurity separately, few have analysed how this *'double precarity'* is felt across tenures, demographic and socio-economic groups. The research presented here details the extent, nature and trajectory of precarious housing and energy circumstances in Ireland over the years 2020 to 2022 by drawing on a nationally representative survey of the population. We demonstrate how a significant minority of the population are vulnerable to the combined effects of housing and energy insecurity. Indeed, 11 % of Irish households demonstrate medium (0.34–0.66) to high (>0.66) housing-energy precarity scores. However, these effects are magnified within particular demographic and socio-economic sub-groups. In this regard, in the remainder of this section, we highlight four of the most noteworthy findings arising from our study, alongside their policy and research implications. We finish by reflecting on the value of precarity as a conceptual lens for understanding inequalities relating to housing and energy.

Importantly, we find that housing tenure is a strong predictor of one's exposure to housing-energy precariousness - *even when controlling for other explanatory factors such as income or employment*. Private renters are most vulnerable to precarious housing and energy conditions, and the size of this effect is even greater than being unemployed. Indeed, private and social renters demonstrate average precarity scores that are four and three times that of homeowners. The energy poverty literature needs to give greater consideration to the amplifying effects of tenure and housing market conditions in driving energy insecurity, and to further interrogate their combined impacts on individual health and well-being [46,75,76]. Only by deepening understanding of the causal mechanisms driving this heightened precarity within rental tenures can more effective and lasting policy measures be adopted.

A further critical and original finding from our research relates to the age groups most exposed to housing-energy precarity. Here our findings diverge somewhat from existing evidence. Previous studies (and dominant media and policy narratives around energy poverty) have documented older persons' exposure to energy vulnerability and their greater vulnerability to negative health shocks as a result of living within colder homes [16]. However, once measures for housing and energy insecurity are combined, we find it is younger people who are at greater risk. Indeed, those aged under 25 years exhibited average precarity scores three times higher than those aged over 65 years. Furthermore, old age was actually a *negative* predictor of housing-energy precarity – and this effect was significant even when controlling for other factors of material disadvantage. Our analysis reveals that younger people are more vulnerable across all dimensions of our housing-energy precarity index, including the heating adequacy of the home. Yet there is limited political recognition of their vulnerability and an associated lack of social support [19]. Further research is required into the exposure of younger persons to energy insecurity, how they utilise energy and heat services and how their exposure to economic hardship might be exacerbated by their specific residential patterns. This finding also suggests that policymakers should be more cognisant of the particular energy and housing challenges facing younger households, and renters in particular, potentially through broadening or redefining the targeting of age-related supports for energy and heating costs.

Thirdly, our findings also add further layers of nuance to existing knowledge about the income groups most exposed to housing and energy precarity. Echoing existing research on energy poverty [28], we find that households on single incomes, including lone parents, are particularly vulnerable, as are those who have separated or divorced from their partners who must bear the costs of establishing a second, independent home. However, our analysis also suggests that middle income groups are far from immune from the experience of these problems. Households from the second and third income quartiles exhibited elevated precarity scores, albeit the effect size halved between groups. In terms of policy, this finding suggests that the narrow targeting of social support measures exclusively at those on very low incomes or means-tested benefits, which has become common in relation to energy poverty, risks missing out some households who are nonetheless vulnerable to housing and energy precarity [77].

Fourthly, our findings also emphasise the role that the wider financial capacity of the household (in terms of savings or debt) can play in amplifying or downplaying exposure to housing-energy precarity. Households that have adequate financial reserves and display lower debt burdens are better equipped to withstand the pressures of high and uncertain housing and energy costs. Conversely, those with high levels of indebtedness, and who struggle with repayments, are exposed to greater levels of precariousness. In a period of rapidly rebounding interest rates and high inflation these effects have likely been increased. As such, households' experience of precarious living conditions arise from the overlapping and mutually-reinforcing effects of unaffordable housing and energy costs, inadequate thermal efficiency, low incomes and over-indebtedness. Policymakers seeking to address these conditions may also need to consider debt clearance schemes, financial literacy and forbearance options as well as strategies to better target energy subsidies and retrofit schemes.

Overall, our article has specifically sought to explore the articulation of precarious energy and housing conditions across housing tenures. Although based on the Irish case, our findings have political and policy implications for similar liberal housing regimes. The decline in homeownership, the growth of the rental sector and widening housing wealth disparities are trends that are evident in cases including Australia, Canada, the United Kingdom and United States [73,78,79]. By improving statistical understanding of the predictors and impacts of precarious housing-energy conditions across tenures, geographic regions, and socio-economic groups, it provides an evidence base to inform more effective and targeted policy interventions. Furthermore, the index could be utilised to measure the impacts of housing-energy precarity on other domains of the life course, including health and well-being. While we have presented the aggregated impacts of precarious housing-energy conditions here, more fine-grained analysis of the impacts of specific index components on at-risk groups could further inform the development of more tailored policy recommendations. For example, the data clearly points to the need for more specific interventions to address the needs of younger households, single persons and lone parents in particular. Developing schemes to incentivise landlords to upgrade the energy efficiency of their properties is also key. While existing studies emphasise the problem of split-incentives in retrofitting private rental housing (*i.e. where landlords must invest in upgrades but may not directly gain from investment in the short run*) [7] further research is required in the Irish context to better understand why take up of existing retrofit support schemes for landlords has been so low.

A considerable literature has emerged on the concept of precarity within social scientific research to understand the risks arising from neoliberal economic restructuring, insecure work, austerity and the weakening of the social safety net. The value of precarity as a concept is that it can capture multiple dimensions of a household's experience under a single framework, quite unlike related concepts like economic instability or deprivation, which are narrower in scope and tend to focus on the most marginalised. Indeed, the experience of precarity to some extent cuts across traditional class or socio-economic lines, as even those from more middle-income backgrounds can experience precarious living

conditions – even if the vulnerability to housing-energy precarity is especially amplified among those whose financial budgets are most strained (*e.g.* single-parents). Furthermore, precarity maintains a focus on the subjective experience, of and resistance to, material hardship, recognising that an individual's perception of their circumstances might be different from their reality, but is nonetheless likely to affect their wellbeing [80]. As such, precarity is a particularly valuable lens through which to examine individual exposure to the everyday dynamics of energy poverty and the multiple vulnerabilities experienced by those who lack adequate energy services and security in the home [19].

CRediT authorship contribution statement

Richard Waldron: Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Shane Sugrue:** Writing – review & editing, Methodology. **Neil Simcock:** Writing – review & editing, Writing – original draft, Validation, Conceptualization. **Lorraine Holloway:** Writing – review & editing.

Declaration of competing interest

The authors declare they have no conflicts of interest to report.

Data availability

The authors do not have permission to share data.

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