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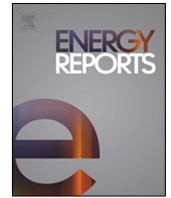
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Understanding tenants' responses to energy efficiency renovations in public housing in Sweden: From the resigned to the demanding



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ABSTRACT

This study focuses on the experiences of tenants in renovation projects of public housing rental apartments in Sweden. Tenants' perspectives are under-researched in the context of energy efficiency renovation projects, which is a considerable oversight given the many ways in which such projects impact their lives. The aim of the paper is to reveal rare qualitative insights into tenants' experiences of, and attitudes towards, energy efficiency renovations in a public housing context and the extent to which they feel motivated and able to influence the renovation project. Participatory observations at tenant meetings were conducted as well as semi-structured phone interviews. An empirically driven typology is developed indicating that tenants have different interests and attitudes regarding energy efficiency renovations. Six different types are identified: the satisfied; the demanding, the conservative, the resigned, the sceptical and the resistant.

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1. Introduction

The building sector is one of the most crucial sectors in relation to reducing carbon emissions. In Sweden, 40% of energy use comes from the building sector and energy efficiency is a central policy objective for the country as is the case with the European Union (EU). Improving energy efficiency in the existing building stock is a significant challenge compared to what can be achieved in new buildings. This article will consider tenants' experiences of participation in renovation processes in multi-family public housing schemes in Sweden, drawing on data gathered through participant observation in consultation meetings and semi-structured phone interviews with 23 tenants across three different case study housing schemes.

The objectives of the paper are threefold: first we reveal rare qualitative insights into tenants' experiences of and attitudes towards energy efficiency renovations in a public housing context. Second, we use these insights to inform a typology of tenants in terms of their response to such an intervention. Third, we explore these responses in relation to previous research to generate lessons for policy and practice.

1.1. The tenants' role in energy efficiency renovation projects

Tenants should rightfully play an important role in the renovation process given the impact on their experience of the home as the nucleus of their everyday lives and the implications for their comfort, health, wellbeing and prosperity associated with both the process of renovation and the outcomes (Kearns et al., 2000). However, tenants who want to have involvement in the process, face considerable challenges associated with the fact that their homes are owned by another party- the landlord, which places certain constraints on decision-making regarding the installation of energy efficiency measures (such as insulation, triple glazed windows, or better ventilation). This is a common problem identified across many developed countries (see for example Ambrose and McCarthy, 2019) and affects tenants renting public and private housing. However, public housing tenants in Sweden arguably have even less influence over energy consumption in their own homes than in many other countries. This is because most tenants do not own the major appliances in the home (including refrigerators and freezers) and the costs associated with their heating and hot water are usually included in the rent (Palm and Reindl, 2016). Tenants do, however, have to pay directly for the electricity they use which gives them a vested interest in some aspects of the energy performance of the property. In addition, some tenants are interested in energy efficiency for environmental reasons. Tenants are also key actors when it comes to energy efficiency in the buildings in that their everyday activities determine how much energy is used. However, if the

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tenants want to influence the energy performance of their home, they need to lobby the housing organisation (or landlord) to invest in energy efficiency measures.

Tenants of multi-family housing, despite making up 28% of the housing stock in Sweden, are often overlooked in research related to decision-making processes on energy efficiency measures in the construction or renovation of buildings. Most research focuses on single-family homes. Thus, limited qualitative research has been conducted (in Sweden and more broadly) on how multi-family housing tenants think about their domestic energy consumption and how much they want, and are able, to influence energy efficiency interventions affecting their homes (Ambrose and McCarthy, 2019; Ambrose et al., 2016). Earlier studies have often used surveys to ask people about their experiences after an energy related decision making process has been concluded (Jakob, 2007; Mahapatra and Gustavsson, 2008; Nair et al., 2010; Thomsen et al., 2016). Such studies provide only a partial picture of tenants' views and experiences, fail to afford tenants a 'voice' and neglect the critical 'how' and 'why' questions associated with tenants' responses (Coatham and Jones, 2008). Other studies focus on hypothetical choices and situations (Banfi et al., 2008; Poortinga et al., 2003), the limitations of which are self-evident. Participant observation and interviews with tenants which encourage reflection on energy efficiency interventions are not common (Ambrose et al., 2016), and this study aims to contribute to this research gap and to stimulate further qualitative research in this area by offering a typology of tenants attitudes and approaches for further empirical testing and elaboration.

Thus, a key function of this paper is to analyse how tenants across three renovation projects reflect upon their experiences of, and ability to influence, energy efficiency measures in the renovation of their flats. Based on the empirical material we identify a typology comprised of six types of tenant, which demonstrates that tenants have different interests and attitudes regarding the implementation of energy efficiency renovations and the associated measures and thus, need to be targeted differently. This typology is then explored through an analytical framework based on the principle-agent thesis, which has increasingly been used as a conceptual tool to help us to better understand landlords' and tenants' decisions and behaviour regarding investment in their properties. The concept has been applied and developed across many disciplines but has been repeatedly applied to the case of landlords and energy efficiency improvements (IEA, 2007). This analysis raises important considerations for policy makers and housing providers promoting and implementing energy efficiency renovation projects, which will increase in number as the climate crisis grows increasingly urgent.

1.2. Disposition

This paper is comprised of five sections including this one. Section 2 sets out the context to the study and briefly describes the case study renovation projects and the project methodology. Section 3 provides an overview of relevant literature, establishing the extent of existing knowledge and the gaps to which this paper responds. Section 4 sets out key findings and explains the typology derived from the empirical data. The final section provides a discussion and conclusions, referring back to the key objectives of the paper.

2. Background, the case studies and methods

2.1. Types of tenure and ownership structures in Sweden

In Sweden there are three different tenure types in the multi-family building stock: public housing rental apartments,

privately-owned apartments rented out and owner-occupied apartments. In this study public housing rental apartments are investigated. One third of the Swedish population live in rented apartments. Of those rented apartments, half are owned by private companies and half by public housing companies (<https://www.sabo.se/allmannyttan/>). Public housing companies are owned by the municipality with the aim of providing access to affordable housing for everyone. Unlike in many other countries, in Sweden there is no upper income limit for those who rent municipal accommodation (Palm and Reindl, 2018). A large proportion of the existing building stock owned by the municipal housing companies are ageing and in need of renovation. This gives rise to an opportunity to improve energy efficiency in these buildings when they undergo renovation (Mangold et al., 2018; Meijer et al., 2009; Reindl and Palm, 2020).

2.2. The renovations projects – an overview

The studied buildings were multi-family dwellings built between 1941 and the beginning of the 1960s. Table 1 shows the three studied buildings and their characteristics.

The three multi-family buildings studied comprise of a total of 77 flats from the post-war period. These three renovation projects had an explicit goal to include energy efficiency measures. The multi-family buildings were built in the early 1950s and 1960s and were in need of renovation due to general wear and tear. The façades and roof construction were poor, ventilation was inadequate, and indoor temperatures were low and varied. Plumbing and wiring also needed to be replaced. The buildings were located in different parts of the city, two in the city centre and one in the inner centre.

Because a thorough renovation was needed for all three buildings, energy efficiency measures were implemented at the same time. Energy efficiency was a specific goal and the implementation approach followed The Policy Led Ambitious company hierarchy described by Högberg et al. (2009). The Policy Led Ambitious company has ambitious energy efficiency goals and energy efficiency is viewed as necessary in the long run to improve overall environmental and performance outcomes. Since the energy efficiency priority comes from the owner, the company is able to use measures that are not immediately profitable. The measures included in the renovation project studied concerned the building itself and the equipment within the apartments. Measures related to the building included the replacement of windows; heat recovery and ventilation systems; new heating systems; additional insulation to lofts and the replacement of mains water pipes. Domestic appliances were also replaced with more energy efficient ones. The renovations were completed in 2014 and 2015.

Before a renovation starts, there needs to be a dialogue between the housing company and the tenants as required by the law. Information about the upcoming renovations were sent to the tenants by the housing company as well as an invitation to two tenant meetings. The first meeting included general information for tenants about the upcoming renovation and the second meeting informed the tenants about which measures would be implemented. Tenants were free to ask questions and raise issues at both meetings. At the end of the planning and design phase, before the renovation started, all tenants needed to sign a tenant agreement stating that they agreed to the upcoming renovation. If they disagreed, then their case would proceed to the Regional Rental Tribunal where usually the decision is made in favour of the landlord. If the tenants had demands related to the renovation, they could raise these during the meetings or talk to the housing company directly.

Table 1
Overview of three renovation objects.

	Renovation project 1	Renovation project 2	Renovation project 3 (two buildings)
Built	1961	Early 1950s	1961 (partly renovated 1985)
Number of apartments	12	33	32, 4
Number of floors	4	3	4, 2
Building construction	Concrete frame	Lightweight concrete construction	Lightweight concrete construction
Windows	Triple glazing	Double glazing	3-pane windows
Ventilation	Exhaust air with inlets under the windows by the radiators	Natural ventilation	Supply and exhaust ventilation with heat exchanger
Energy consumption (Heat and water)	153 kWh m ⁻² y ⁻¹	141 kWh m ⁻² y ⁻¹	154 kWh m ⁻² y ⁻¹ (building 1, not known for building 2)
Heating before and after renovation	District heating	District heating	District heating
Identified problems by the housing company	Poor external façade and balconies, poor roof construction, old and draughty windows, cases of water damage in bathrooms	Poor plumbing, inadequate ventilation, outdated wiring, inadequate fire insulation, and limited accessibility	Indoor environmental problems, low and varying indoor temperature, stuffy air, and odours
Measurements conducted	HRV ventilation; Supplementary insulation (walls); Supplementary insulation (loft); New windows	HRV ventilation; Supplementary insulation (walls); Supplementary insulation (loft); New windows	Building A-C: Supplementary insulation (walls); New windows Building D: HRV ventilation; New windows

2.3. Methods

Limited research has been conducted on how tenants think about energy efficiency measures in the context of the renovation of their rental flats and how much they would like to be involved in both the renovation and energy related improvements. To shed light on these gaps in knowledge we followed the planning and design process and conducted participatory observations (Clark et al., 2009) from the perspective of the tenants across the three renovation projects. To achieve this, we attended five tenants meetings. Two researchers participated at three meetings and one researcher at the other two. The researchers talked to the participants and took detailed notes at all meetings, providing rich observation field notes for the analysis.

Semi-structured phone interviews were also conducted with tenants after the renovations (Kvale and Brinkmann, 2009). Of the 77 flats, 23 tenants were interviewed after the renovation. The interviewees were a mix of men and women of different ages. The interviews were conducted in 2015 after the renovations were completed and the tenants had moved back in. The aim was to investigate their perspective on the renovation process and the interviews lasted on average 20 min and extensive notes were taken during the interviews.

Energy is an invisible service that most people do not reflect upon in their everyday life. Studying how tenants' perceive energy efficiency needs to be done in a context which the tenants are familiar with in order to understand energy in the context of the activities or the practices the tenants are engaged in (Palm and Ellegård, 2017; Palm et al., 2018; Shove, 2003). It is unusual for tenants to be interested in energy per se, but they are interested and invested in the functions and conveniences that energy can provide. Energy is required for needs such as preserving and preparing food, supplying heat and light, and maintaining health and sanitation. When exploring energy consumption in households, everyday routines and activities need to become the focus of attention. In practice, this means that to understand how tenant's perceived the energy efficiency renovations, we needed to frame our questions in terms of the demands or wishes they had for the renovation process in relation to new appliances, comfort, brightness, sound proofing, materials used for tiles and walls etc. As a result, the interviews came to more reflect the tenants' general attitude towards the renovations than energy efficiency per se. The renovation process and energy efficiency were in practice closely intertwined and by talking about the renovation in general terms it was possible to capture also attitudes to energy efficiency. The interviews focused on what their expectations were in relation to the renovations and the

renovated apartment; what they wanted done to their flats; what sort and what level of information they received; what choices they had made regarding appliances; what they thought about the results; if they felt their requests had been acknowledged and how they had experienced the process.

The study applies a qualitative and inductive approach as analytical categories were derived from the empirical data (Elo and Kyngäs, 2008). Participatory observations and interviews were analysed in three phases. In the first phase a categorisation of the observations and interviews was carried out manually. A first outline of the categorisation tried to capture the different attitudes to energy efficiency in the renovations that existed amongst tenants. The categorisations were adjusted several times, both in number and in content. In a second phase, two of the authors read all of the material through again and started individually to divide the interviewees into different categories. The results from the individual categorisation were compared and discussed. In phase three, the categories were again deliberated to find a description that was neither too broad nor too narrow. In the end six categories, or ideal types, were identified reflecting the nuance in the material. Some households ended up appearing in several categories. We did not try to force someone into one category, but if a household made statements during the interview that represented different categories, we accepted this as a consequence of the complexity of everyday life rather than trying to force them into one ideal type. In the end four interviewees ended up in two ideal types. The sixth ideal type was just represented by one interviewee, but because this is not a quantitative study and because it was such a clear representation, we decided to keep that and not try to integrate the person into one of the other categories. Table 2 below shows how the interviewees were divided between the different categories.

3. Tenants' perspectives in earlier research

In this section we explore some of the key studies representing the extent of existing knowledge in relation to tenant and resident responses to energy efficiency renovation schemes and drivers of and barriers to participation in such schemes, where the choice exists. Studies with a Scandinavian focus are prioritised but studies from other developed countries have also been considered.

3.1. The principle-agent thesis

The principle-agent thesis has increasingly been used as a conceptual tool to help us to better understand landlords' and

Table 2
Ideal types for how tenants perceived a renovations (the bold ones fit into different categories).

Ideal types	Who
The satisfied	1, 4, 12, 18 , 19, 20 21
The demanding	13, 14, 18 , 21 , 22
The conservative	3 , 10, 15 , 16
The resigned	3 , 5, 6, 8, 9, 22
The sceptical	2, 11, 15 , 17, 23
The resistant	7

tenants decisions and behaviour regarding investment in their properties. The concept has been applied and developed across many disciplines but has been repeatedly applied to the case of landlords and energy efficiency improvements (IEA, 2007; Palm and Reindl, 2018) and has particularly been used to unpick private landlords' apparent aversion to investing in the thermal and energy performance of their properties (Ambrose and McCarthy, 2019; Jaffe and Stavins, 1994). The International Energy Agency (IEA) has cemented the place of the principal-agent problem as the dominant explanation for sub-optimal take-up of energy efficiency measures through their 2007 publication 'Mind the Gap'. In this report, the thesis is described by IEA as the situation where "two parties engaged in a contract have different goals and different levels of information" (IEA, 2007). Jaffe and Stavins (1994, pp. 805) were the first to apply the concept to the matter of energy consumption. In this context, they state that:

"If the potential adopter [of energy efficiency measures] is not the party that pays the energy bill, then good information in the hands of the potential adopter may not be sufficient for optimal diffusion; adoption will only occur if the adopter can recover the investment from the party that enjoys the energy savings. Thus, if it is difficult for the possessor of information to convey it credibly to the party that benefits from reduced energy use, a principal/agent problem arises".

Traditional interpretations of the thesis assume that principals (tenants) are poorly informed about energy efficiency measures and are therefore likely to resist paying a premium for a more energy efficient property and to make the connection between this and a warmer, more comfortable home. Knowing this, the agent (landlord) is unwilling to invest in such measures on the basis that they will not be able to recoup the cost of their investments through high rents or higher sale values (Ambrose, 2015; Barton, 2012). In Sweden it is however possible to increase the rent if an energy efficiency measure also leads to improved comfort.

The application of the principal-agent theory to the relationship between landlords, tenants and energy efficiency has mostly focused on the landlords and their behaviour and attitudes. So far there has been much less of a focus on tenants' perceptions and understanding of energy efficient renovations. Focusing on households and their perspectives on energy efficiency renovations, we enable a fuller understanding of the dynamics of the problem from the tenants' perspective and in a scenario where the landlord has a duty to improve the energy performance of their properties and where tenants are not directly responsible for all of their energy costs.

3.2. Tenants' attitude: other values before energy

Whilst research into tenants experiences of and attitudes towards energy efficiency schemes is limited, a cluster of studies conducted about a decade ago provide some useful insights into tenants' and building owners' attitudes towards energy efficiency

renovation schemes in Sweden (Banfi et al., 2008; Farsi, 2010). These studies used surveys and data modelling to identify that whilst tenants generally felt positive towards energy efficiency measures they would not always understand the benefits of the various measures and energy efficiency was often considered a lesser priority than more immediate financial concerns. The potential for energy efficiency measures to possibly reduce expenditure on energy was not well understood within the sample and this may be linked to the fact that heating and hot water costs are usually included in the rent in Sweden. Bruel and Hoekstra (2005) studied renovations as an opportunity to implement energy saving measures and came to similar conclusions; energy efficiency measures are highly dependent on the dweller's financial situations and that environmental concerns have lower priority, even if they are considered important. Other studies regarding low energy buildings support these conclusions; low energy houses are seldom chosen for their energy efficiency, instead location and planning are more important aspects when deciding which house to choose (Green and Ellegård, 2007; Isaksson, 2009; Palm and Darby, 2014). Energy efficiency is, however, considered a good thing and 'bonus' (Palm, 2011).

3.3. Household energy consumption behaviour

Despite the lack of literature directly related to tenant or household responses to energy efficiency renovation, useful insights can be distilled from the broader literature around household energy consumption behaviour. Qualitative exploration of this issue by Aune (1998) which examined everyday energy use in Norwegian households identified the existence of "energy cultures" and how energy use is interwoven with the fabric of everyday life in households. Aune (1998) identified a typology of energy cultures, each with different implications for energy consumption, ranging from "the self-indulgent" who do not reflect at all on their energy consumption to "the environmentalists" who are deeply engaged in environmental issues and sustainable resource use. Aune (2007) continued this approach and found, in contrast to other studies cited above, how a household's financial situation was only loosely connected to their energy use. Aune (2007) demonstrated that factors other than economy, such as the meaning of "home" and a desire to adopt certain life-styles (e.g., a "traditional home" or "green life-style") were as important in terms of households energy use.

3.4. Renovation and the home

These factors, identified by Aune (2007), are also echoed in research in to general (rather than energy efficiency focused) renovation in the UK. For example, Walshaw (2011) and Kearns et al. (2000) both suggested that the psycho-social aspects of the home (as a source of pride, status and ontological security) were of critical importance in terms of how renovations led by landlords were received. It was found that, although the renovation process was stressful, renovation projects resulted in tenants feeling more positive about their homes and neighbourhoods. This was primarily linked to increased warmth and comfort and the 'smarter' appearance of homes following the installation of measures like double glazing. These findings raise questions about the extent to which it is possible for tenants to derive these psycho-social benefits from an energy renovation scheme. Walshaw (2011) provides some insights into this, pointing out that, in her study, it was the comprehensiveness of the renovation scheme (a whole house renovation) that brought about these benefits. This suggests that an energy efficiency renovation that focuses on a limited range of measures (some of which will be invisible to tenants) and is not part of a broader renovation is unlikely to yield these types of benefits to any significant degree.

3.5. Final remarks

Although there is some consensus around the idea that the drive for greater comfort and financial concerns are common considerations for most households – many studies suggest that households approach energy issues in very different, almost idiosyncratic, ways and that no particular characteristics can reliably predict households' attitudes towards energy conservation and their likely response to an energy efficiency renovation scheme. The literature suggests that when consulting and engaging tenants on the matter of an energy efficiency renovation, the lead agency will need to treat each household individually and work with their particular motivations and lifestyles as well as their preferences for engagement. However, although our analysis (set out later) broadly supports this individualised approach, we contend that it is possible to identify 'types' of tenants in terms of their response to energy efficiency renovation schemes.

4. Results: tenants' many perspectives on energy efficiency and renovation

This analysis is based on the participant observations of the tenant–landlord meetings and the interviews with 23 tenants after the renovations. Manual analysis identified some trends in the data which suggested that tenants' attitudes and experiences were not entirely individual and instead coalesced around a spectrum of six types of response which have been categorised as follows: the satisfied; the demanding, the conservative, the resigned, the sceptical and the resistant. As mentioned above, four tenants ended up in two categories, reflecting the fact that, during a conversation, people show complexity in their answers and often emphasise different and sometimes contradictory things.

Whilst the number of interviews and observations conducted were not sufficient to be definitive about the categories and their universality; the resulting typology is put forward for further empirical testing and elaboration.

The different ideal types are discussed below with typical examples of how an interviewee responded to be categorised in that ideal type.

4.1. The satisfied

The satisfied were those who were content with the renovation, particularly because they felt that their flat had been in a poor condition and needed to be refurbished. They were satisfied with the renovation process in general, i.e. with the amount of information and the choices offered to them beforehand, as well as the result.

I am very happy about the renovation. Everything looks so nice now. The bathroom is new, the shower is new. It is nice getting everything new when you are getting old. (Interview 1)

These tenants tended to be liberal in their outlook and were generally happy with the selection of measures offered as part of the renovation package. These tenants did not make any additional requests of the landlord in terms of more or deeper energy efficiency measures or additional appliances. There was some concern about the impact that the renovations may have on future rent levels but also an understanding of the importance of the energy efficiency measures installed and a belief that all levels in society should be contributing to energy conservation efforts. They also found it acceptable that some of the costs associated with the renovation should be passed on to tenants.

Everybody should contribute so that we can all live good lives, both the housing company and tenants. We only have one earth with limited resources, that is why everybody needs to pay (Interview 12)

There was a sense amongst this group that the poor condition of their homes prior to the renovation programme was a key factor driving their relatively grateful and uncritical position – something identified by studies of renovation programmes elsewhere including the UK and New Zealand (Ambrose and McCarthy, 2019; Femenías et al., 2020; Walshaw, 2011).

4.2. The demanding

In contrast to the satisfied group, there were people who demanded more than the landlord was offering in terms of the renovations proposed. Sometimes they were successful, other times not, but they were pleased to have been offered the opportunity to come forward with their requests.

I wanted a filter in the air vent and I got it as well. (Interview 18)

Some tenants also managed to get relatively minor changes done, such as moving a wall or installing an additional benchtop in the kitchen. This type of request was generally accommodated within the renovation budget, but sometimes the tenants paid an additional cost for something special:

I got a special wooden floor that I paid a little extra for (Interview 21)

These tenants actively tried to influence the renovation to try and ensure it met their individual objectives and aspirations for the appearance and function of their homes. Whether they succeeded or not appeared to have a bearing on how positive they felt about the renovation. Although this group was active, engaged and had their own ideas about what should be included, they did not appear to have any additional demands of aspirations with regards to the energy efficiency aspects of the renovation. For instance, they could have asked for energy efficiency appliances, but nobody did. Their motivations appeared to relate to the potential of the renovation to enhance the aesthetic appearance and general function of the home.

4.3. The conservative

The conservative group was not as satisfied with the renovation and largely wanted their flats to remain as they were. When the housing company asked the tenants what they would like to influence in the renovation, this group specifically asked to keep the original features, including bathtubs, old doors and walk-in-closets, either because they were considered attractive (i.e. the doors) or because they were useful (i.e. closets) or enjoyable to use (i.e. bathtubs) (Observations 6 May 2013). This was also found in the study of Femenías et al. (2020).

I wanted to keep the old vintage doors in the living room, but they were gone when I moved back, even though they had promised me they would keep them. They said it was a misunderstanding, but I think they just said that. (Interview 10)

Nobody got to keep the old doors, and it is unclear why. Some of the tenants wanted to keep their bathtubs, but they were replaced with a shower. Some tenants did get a new bathtub, so in some cases there was more flexibility regarding installations. The hall with a big walk-in closet was, however, by far the feature that most tenants wished to hold on to.

I wanted to keep the old walk-in closet but that was removed when they changed the layout of the hall. I know many who wanted to keep the hall unchanged. (Interview 3)

It appears that, to a certain extent, the people in this group did not necessarily want an extensive renovation but just to freshen up the old ones. However, this was not allowed, and because of this, many tenants felt they were not able to influence the renovation process and that it was not meeting their needs and preferences. From a resource perspective retaining the old storage space could have been beneficial, but this does not seem to have been an option for the tenants. On the other hand, nobody mentioned that they wanted to keep their old appliances, so not everything old was felt to be worth keeping. Aside from the desire for new (and therefore more efficient) appliances, the energy efficiency aspects of the renovation were far less important than maintaining the original features.

4.4. The resigned

A general feeling in this group was that it was not possible to influence anything of value or importance during the renovation. They felt that it was possible to influence cosmetic aspects of the apartment, but that anything else would be decided by the landlord. One tenant summarised this frankly:

Well, you could not influence anything substantial, only the small things the housing company offered themselves. (Interview 5)

The sense that they were not being meaningfully consulted on the renovations appeared to have a disempowering effect on these tenants:

We had no wishes whatsoever. We were against the whole project but realised that our opposition had no influence. They would renovate the building anyway. (Interview 9)

In the same manner, others said that if the housing company decided on renovations then that was that, the tenants could not stop it. The negative feelings about the renovation were connected to the expected costs and how that would affect rents in the future.

4.5. The sceptical

These tenants tended to acknowledge the importance of reducing energy consumption associated with the flats and they also thought that tenants should be involved in this process. However, there was some concern amongst this group about who should bear the cost of energy efficiency measures and there was ambivalence among tenants on the issue of rent increases as a means of funding such measures:

I am a bit ambivalent about it. I think it is good that the housing company implements energy efficient solutions, but I am also against it because it is not voluntary for the tenants. We do not have a choice. It is also a question of where the higher rents end up. Are they used for profits and where does that profit go? Is it used for energy efficiency or for other purposes? (Interview 17)

The concern here was whether the rent paid by the tenants goes where it is supposed to go. Another issue related to a heavily debated suggestion to implement individual metering and billing for heat and hot water. The Swedish Tenant Association was against it and in the end the technology was installed but the billing was never implemented. Several tenants did, however, mention this during the interview and were sceptical about the solution because some households might get a 'better deal' depending where in the building they are located.

If they will charge for hot water, there will be a difference as to where you live in the building. If you live on the top floor, it takes longer to get hot water, which means that you must pay for flushed cold water before it gets hot. Likewise, if your flat has two exterior walls it will probably be colder than if your flat is in the middle of the building. It must be done fairly. (Interview 11)

These issues despite not being directly related to the results of the renovations, had led tenants to feel sceptical about their landlord and about the potential for the renovations to address these perceived inequalities.

4.6. The resistant

About a year before the renovation started the housing company sent out the first information letter to all tenants. The tenant meetings offered tenants the opportunity to ask questions directly to the project manager. The tenants received information about the schedules for the works, practical information on when to move out and back in, what was being done to the building and what choices were available. At this point some tenants did not want the renovation to take place at all, even though the measures would improve the building's energy performance and standard in general (Observations 23 January, 2013). One tenant explained:

I had for a long time searched for a cheap living, so I think they could have saved energy in another way, for example by photovoltaics on the building. I do not think they could save much in this house anyway. (Interview 7)

Some tenants chose to move away from the building, because they did not want to live through the whole renovation process and the associated inconveniences. This intense anxiety about the anticipated upheaval of the renovation process has been commonly identified in other studies of tenants' responses to renovation programmes, but in this case it seems to have led some tenants to dismiss the potential benefits associated with the energy efficiency aspects of the programmes. The interviewee quoted above would clearly have preferred a less intrusive approach to improving the energy performance of the building. If we had interviewed also the people choosing not to move back to their flat, several of these would probably have ended up in this category.

5. Discussion and conclusions

The value in creating a typology of tenants is to highlight the variety of ways they experience an energy efficiency focused renovation and their differing attitudes towards such an intervention. The typology is summarised in [Table 3](#).

It is striking that of the six types of tenants identified, most (four) are in some way negative about or resistant to the intervention with only the 'satisfied' and 'demanding' being relatively positively disposed to the renovation. The 'conservative', 'resigned', 'sceptical' and 'resistant' all express reservations about the project which, it could be argued, result from a lack of understanding of the motivations and potential benefits of the interventions and/or concerns about the impact they will have on rent levels. Overall, these reservations suggest that the landlord has failed (to borrow from the language of principle-agent) to convey or to credibly convey the information they hold about the costs and benefits of the programme. The 'satisfied' and 'demanding' appear highly motivated to improve the appearance and function of their homes and therefore arguably require less convincing to support the programme, whatever the cost. These findings support previous research set out in [Section 3](#) which suggests that the desire for

Table 3
A typology of tenants' perspectives on energy efficiency renovation projects.

Ideal types	Rational
The satisfied	Appreciates a new and fresh flat, even if it cost more
The demanding	Would like to have additional work done in their flat
The conservatives	Wants to keep the flat and its interior design as it always was
The resigned	Feels that their opinion does not matter
The sceptical	Are not against energy efficiency measures or renovations as such, but have strong opinions about how the measurements are implemented and the cost
The resistant	Are very much against energy efficiency measures, because of the added cost for the tenants

greater comfort and a smarter looking home can be key drivers of the take up of some energy efficiency measures.

The empirical data clearly suggests that tenants wanted and needed more information on costs and benefits or did not trust the information they were given. The apparent inability of the landlord to convey or credibly convey this key information to tenants can be traced back to the consultation process they followed. As set out previously, the housing company ostensibly offered opportunities for the tenants to become informed and gave them a chance to influence the renovation plans. To some extent the tenants had the opportunity to come forward with their wishes; they were not excluded from the process *per se*. However, some tenants felt that it would take more effort than they were willing and able to give to genuinely influence the process, some did not want to expend any effort engaging with it and some felt that efforts to influence the process would be futile. Some of these scenarios reflect a lack of trust in the landlord in the sense that the opportunities to engage with the renovation appeared tokenistic and reflected the lack of credibility of the landlord in the eyes of tenants. Others point to a lack of personal resource on the part of tenants to engage with the process – perhaps because they have higher priorities elsewhere in their lives. principle-agent operates on the basic assumption that all principles (tenants) are motivated to engage with the proposition and will respond positively to it as long as the information provided is credible and they stand to benefit (or not lose out) financially. Here our research adds to knowledge by raising the possibility that there may be other reasons why principles do not engage with the process, however credible and beneficial it may be to them.

Even if the principle-agent thesis was developed primarily in the context of private rented housing, the thesis resonated significantly in this new context suggesting that it provides a useful framework for understanding factors underpinning take up of energy efficiency measures across tenures. However, we identified several instances where our empirical data raises new considerations for the model and helps to elaborate it.

It is certainly true that, as principle-agent contends, the tenants and the landlord have different goals regarding the renovations: landlords are fulfilling an obligation and tenants hope that it will improve their homes or in some cases, as the data suggests, are averse to the renovations or are more concerned about the cosmetic aspects. Both landlord and tenant will, as the model and other previous research predicts, be concerned about the cost of the renovations and how this may impact on rents. The landlord will be keen to increase rents to offset the impact on their surpluses and the tenants are likely to resist this or be unhappy with it. However, tenants do stand to make savings on their energy bills as a result of more efficient appliances, but this appeared poorly understood according to the data.

Principle-agent is not just about motivations and costs but also emphasises levels of information. In relation to this, the landlord will have a much greater understanding of the costs and benefits of the renovations than the tenants and Jaffe and Stavins (1994) argue that this is at the heart of the principle-agent problem and can only be overcome if the agent can credibly convey the information they hold to the principles. Yet, our data

and that of previous studies also suggests that communicating with tenants about something that is unlikely to represent a top priority for them will always be challenging (Hauge et al., 2013; Palm, 2013). Furthermore, even those who are eager to engage may find that they do not have sufficient knowledge to meaningfully participate in decisions on energy efficiency measures (Mårtensson and Fredriksen, 2005).

We therefore contend that the information related aspects, put forward in the principle-agent theory, do not take sufficient account of the well-established fact that energy efficiency is rarely a high priority for households. In turn, some tenants feel that a disruptive process has been forced upon them and are resistant and resentful (see the latter four categories of the typology).

The assertions of principle-agent that a mis-match between who pays for the measures and who benefits is a key problem in relation to uptake of measures, is born out in a public housing setting. There is a discernible resistance amongst the respondents to any prospect of a rent increase and this is ostensibly left unresolved. Communication around this issue appears to have been poor and tenants have been left unsure. Similarly, to the private rented sector context, landlords and tenants in the public sector must negotiate to find a way of offsetting the costs of the intervention with neither party willing to take a financial hit.

Application of the principle-agent thesis reminds us that whilst financial issues are important determinants of take up, they are just one part of the jigsaw and our analysis has revealed a range of more nuanced considerations which are overlooked by the model. Further considerations raised by our research include the need to consider the emotional nature of any intervention in the home (Kearns et al., 2000). Energy efficiency related aspects of an intervention in the home cannot be studied in isolation when, in reality, any intervention in the home (unless very discrete) is likely to impact on the look and feel of the home and therefore on the psycho-social relationship between tenant and home (Ellegård and Palm, 2015; Kearns et al., 2000). This is apparent in the views of the 'conservative' group in particular and is likely to underpin their resistance to the renovation. This reminds us that when energy efficiency measures are being delivered as part of a more comprehensive renovation with cosmetic aspects, tenants are less likely to follow the rational thought processes e.g. that principle-agent assumes.

An aim of the paper was to demonstrate the value of developing a typology of tenants' responses to energy efficiency renovations. As set out in Section 3, the literature has already highlighted the idiosyncratic and highly individualised way that households engage with domestic energy issues. Whilst this is a helpful observation, it is difficult for housing providers and policy makers to work with. The typology we have developed recognises that tenants are diverse in terms of their knowledge, opinion, interests and perspectives on energy efficiency renovations and the approach to engagement needs to take account of this but also recognises that there are patterns in terms of tenants' responses. To divide tenants into different types could be an important tool when identifying different ways to approach the tenants, helping landlords to move beyond the standard public meeting format. This more nuanced approach could help to ensure a more

inclusive approach that makes better use of the vast knowledge of the building held by tenants and addresses issues such as the cost of energy efficiency from different angles depending on the tenant's perspective. The typology is put forward in the hope of further empirical elaboration through future studies in this area.

CRedit authorship contribution statement

Jenny Palm: Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft, Responsible for revision of the paper. **Katharina Reindl:** Investigation, Writing - review & editing, Contributed to revision of the paper. **Aimee Ambrose:** Conceptualization, Writing - review & editing, Contributed to revision of the paper.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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