Practices to overcome split incentives in the EU building stock

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Abstract

Split incentives are typically regarded as a major barrier to investments in energy efficiency upgrades in the building sector. Stemming from a transaction whose benefits do not accrue to the person who pays for it, they affect a large share of Europe's buildings: privately rented homes, multi-apartment buildings, social housing units and leased commercial or public premises. As the Energy Efficiency Directive calls for Member States to take appropriate measures and address this barrier, increased interest is drawn on how to design policies and measures that successfully resolve this long-lasting problem.

Our paper focuses on how various regulatory measures, contractual solutions and financial mechanisms can effectively mitigate this barrier. A broad overview of the split incentive problem across Europe is first outlined, by identifying the different groups affected, most vulnerable groups and extent to which the building sector is exposed to this problem in different parts of Europe. It is then shown that current solutions addressing split incentives in the building sector vary in nature, ranging from revised rent acts, green leases, on-bill finance mechanisms, minimum energy performance standards, use of inclusive rents and others. Each solution and its applicability for each segment of the building sector are discussed and a set of common principles upon which successful strategies are drawn is provided. Current and planned efforts by the EU Member States outlined in the recently published National Energy Efficiency Action Plans are reviewed. The paper concludes with a number of policy recommendations for stimulating energy efficiency investments in the affected segments of the building sector.

Introduction

The building sector consumes more energy than any other economic sector in Europe and numerous studies in the literature have demonstrated its significant energy saving potential and benefits (Ryan & Campbell, 2012; BPIE, 2011; Ürge-Vorsatz, et al., 2013). Energy efficiency has been regarded as the "first fuel" which can address issues such as high energy costs, energy dependence and global climate change (IEA, 2014). Even in the face of increasing pressure to reduce energy consumption, studies have shown that a substantial part of the energy efficiency potential in the building sector is unrealised and many otherwise profitable energy efficiency investments remain unexploited.

The large untapped potential of the building sector is associated with a number of structural, regulatory and market barriers that hamper the adoption of cost-effective energy-efficient practices and measures. Many barriers to energy efficiency have been identified in the literature in order to justify the existence of the "so-called" energy efficiency gap, which refers to the difference between the cost-effective energy efficiency potential and the actual level of energy efficiency that takes place (e.g. Hirst & Brown, 1990; Uihlein & Eder, 2009). These include fuel price distortions, uncertainty about future fuel prices, upfront costs, limited access to capital, attitudes toward energy efficiency, perceived risk of energy-efficiency investments, information gaps, and split incentives. The presence of split incentives, in particular, inhibits the deployment of energy efficiency upgrades in various segments in the building sector

Table 1. Split incentives classification according to building type.

	Owner-occupied	Rented
Single unit buildings	No split incentives	USI, ESI
Multi-unit buildings	MSI	MSI, USI, ESI

such as privately rented homes, multi-apartment buildings, social housing units and leased commercial or public premises. It stems from the misplacement of incentives between different actors (e.g. landlords and tenants), which discourage energy efficiency improvements to come into effect in reality. Despite this long-lasting barrier, little attention has been drawn on how to resolve it and current public policy interventions have made relatively little progress towards providing effective solutions that align incentives between concerned actors.

In order to help overcome this issue, the Energy Efficiency Directive (Directive 2012/27/EU) includes a provision in its Article 19(1)(a), which calls Member States to evaluate and if necessary take appropriate measures to remove regulatory and non-regulatory barriers to energy efficiency. In particular, it requests Member States to address the split of incentives between the owner and the tenant of a building or among owners, with a view to ensuring that these parties are not deterred from making efficiency-improving investments. Measures may include rules for dividing the costs and benefits between them and measures regulating decision-making processes in multi-owner properties.

Given the above, the purpose of this work is to examine the split incentive barrier in the European context. The paper first provides a comprehensive definition of the problem and identifies the different groups affected. This is followed by their relevance in different segments of the building stock in Europe, identification of most vulnerable groups and extent to which the building sector is overall exposed to this problem. We then focus on solutions to overcome incentive misalignments. The first National Energy Efficiency Action Plans submitted in compliance with the Energy Efficiency Directive are, in particular, examined in order to review the efforts made by Member States to tackle this issue. The paper suggests a number of principles that need to be considered in effective approaches for aligning incentives between different actors and provides policy recommendations for future action.

Problem definition

Split incentives refer to any situation where the benefits of a transaction do not accrue to the actor who pays for the transaction. In the context of energy efficiency in buildings, split incentives are linked with cost recovery issues related to energy efficiency upgrade investments due to the failure of distributing effectively financial obligations and rewards of these investments between concerned actors. This can ultimately result in inaction from either actor's side, despite the fact that many of these upgrades are of positive net present values. Investment costs of energy efficiency upgrades are part of the capital expenses, while its financial benefits, in the simplest form, are seen as reduced energy bills in the operational expenses side. If the actor who invests in energy efficiency measures (i.e. actor in charge of capital expenses) is not the same as the actor who reaps the subsequent financial benefits (i.e. actor in charge of operational expenses), split incentives can arise. They simply refer to the misplacement of incentives between the actor selecting the equipment or technologies of the upgrade and the actor who pays the energy costs.

Split incentives are present in various segments and transactions within the building sector and appear in many end-uses (IEA, 2007; Murtishaw & Sathaye, 2008). Table 1 illustrates the cases where the issue arises. While owner-occupied single-family/single-unit buildings are not of concern, it is clear that all other cases may be exposed to one or more types of split incentives. Moreover all buildings can be exposed to temporal split incentives. In its most widely-known form, the issue of split incentives occur between a landlord and a tenant in rented buildings. The main lease structures and associated implications on split incentives are presented in Table 2. There are, however, several types of split incentives that affect the building sector. These, together with examples, are discussed below.

Efficiency-related split incentives (ESI): These refer to situations where the end user is in charge of the energy bills but cannot choose the technology needed to improve the energy efficiency of their property and thereby has limited power in reducing their energy bills or negotiating an energy efficiency upgrade. The landlord-tenant dilemma in rental housing and commercial leasing cases based on 'net' or 'cold' type of lease is the most typical example (see Table 2). In these cases, the landlords lack incentives for investing in energy efficiency upgrades as they do not directly reap the benefit and often cannot capitalise these upgrades into higher rents due to the uncertainty over the impact of the upgrade on the property value and lack of experience on rent premiums. Efficiency-related split incentives are also a concern in new properties, often sold to new owners after the design and construction has been completed. In this case, the new owner is not involved in the decision making process and the selection of energy-related features, while the property developer's main concern is to reduce the construction costs. The issue of asymmetric information and premium charges exacerbates the problem.

Usage-related split incentives (USI): These have also been referred to as the "reverse" split incentives in the literature (Bird & Hernandez, 2012). They occur when occupants are not responsible for paying their utility bills and thereby have little or no interest to conserve energy. In other words, the occupants do not face the marginal cost of their own energy use and are not given any incentives in using energy efficiently. They occur under "warm rent"[1] and gross rent structures where utility costs for heating, other operating and capital expenses are all borne by the landlord. Evidence exist that tenants, under such rent structures, tend to consume more energy, e.g. several studies have provided empirical evidence showing higher indoor temperatures during winter periods in the case of heat inclusion in

1. The term "warm rent" is a term typically used in some Western or Northern European countries (e.g. Germany and Sweden) to refer to rent structures which include heating costs. .Cold rent, on the contrary, refers to rent structures which do not include heating costs ((Bullier & Milin, 2013) (Blom & Sandquist, 2014)).

Table 2. Lease structures and implications on split incentives.

	Cost structure	Advantages	Disadvantages	Possible presence of split incentives?
Gross warm rent	All operating expenses incl. heating are covered in the rent.	Allows the tenant to take into consideration all costs in the choice of apartment. Landlords have an interest in keeping expenses low.	Tenant is not motivated to save energy.	USI
Gross cold rent/net cold rent	Heating costs must be paid separately. In the case of gross cold rent, all other operating expenses are included in the rent.	Tenant has an incentive to save energy.	Energy efficiency is not visible to tenant. Landlord is not motivated to upgrade the energy efficiency of the rented unit.	ESI

Table 3. Share of dwellings that may be exposed to various types of split incentives in 70 % of all EU dwellings.

	Owner-occupied	Private/social rented and other
Single-family house	No S.I. – 36 %	ESI and/or USI – 9 %
Multi-family house	MSI – 26 %	ESI, USI, MSI – 30 %

the rent (e.g. Levinson & Niemann, 2004). This type of incentives is also present in the hotel industry.

Multi-tenant, multi-owner split incentives (MSI): Multi-tenant and multi-owner buildings face an additional challenge associated with collective decision making between various actors. Energy efficiency projects in these buildings can only be realised if consensus is reached by all decision-making parties. Current decision structures act as a barrier in collective agreements between owner-occupants of many existing buildings such as condominiums (Matschoss, et al., 2013). In both multi-tenant and multi-owner buildings, the benefits and costs of an energy efficiency upgrade may vary from apartment to apartment, which further complicates the situation.

Temporal split incentives (TSI): This refers to situations where the energy efficiency investment does not pay off before the property gets transferred to its next occupant/owner. In this situation, the occupant (tenant or owner-occupier) does not have a clear idea of how long they will live in their property or simply plan to move relatively soon. An energy efficiency upgrade attached to a high upfront capital cost will not be an appealing investment in this situation and may be perceived as risky (Bird & Hernandez, 2012).

Split incentives in the European context

This section presents evidence for the extent to which the building sector is exposed to the split incentive problem in the EU. We first provide estimations of the share of building stock affected by the barrier of split incentives and then discuss each segment individually. Due to data availability restrictions, we primarily focus on the quantification of split incentives found in residential buildings. Based on data published by the IEE project ENTRANZE[2], Table 3 provides a summary of the share of dwellings falling under each category in 70 % of all EU dwellings. In summary, 65 % of the dwellings examined may face one or a combination of different types of the barrier. It should be noted that this does not take into account the issue of temporal split incentives. Data on the share of rented commercial and or public sector are scarce. Statistics published by Leaseurope[3] showed that real estate leasing (in terms of volume €) is dominated by industrial buildings, retail outlets and offices and the contract term for the majority of leases in this sector spans between 8–16 years.

OWNER-OCCUPIED HOUSING

Home-ownership is a dominant feature in the EU. Based on ENTRANZE data, owner-occupied dwellings account for 64 % of all dwellings in Europe with important variations from country to country. While a steady increase in home-ownership rates has been observed in most EU countries (Andrews, et al., 2011), the share of owner-occupiers has experienced a small drop of 4 % over the last 5 years (see Figure 1), which may be largely attributed to the financial crisis. Following the fall of communism in Central and Eastern Europe, mass privatisation of the housing stock led to the high levels of home ownership

2. Data can be retrieved at www.entranze.eu.

3. www.leaseurope.org

in these countries. Countries with the highest share of owner-occupier population (in the order of 90 %) include Romania, Lithuania, Slovakia and Hungary.

While single family owner-occupied do not face any traditional types of split incentives, collective decision problems between owners are a critical barrier to the deployment of energy efficiency measures in multi-family buildings. Many of these buildings fall under a condominium type of ownership, where the condominium owners are in charge of the overall maintenance of the building and have the ultimate decision and financial responsibilities for any investment associated with the building. Matschoss, et al. (2013), who examined this type of ownership and its implications on energy efficiency in 9 EU Member States, identified various issues with regards to the required majority for decisions on renovations in owner-occupied condominiums including practical hurdles with the acquisition of bank loans. Owner-occupied multi-family buildings are dominant in Southern European countries (e.g. Spain, Greece, Italy and Cyprus) as well as post-communist Eastern European countries (see Figure 2).

RENTAL HOUSING

Around 30 % of the EU population were tenants in 2013, a share which has experienced a 10 % increase compared to 2007 (see Figure 1). Estonia, Slovenia, Latvia and Ireland have experienced the largest increases in the share of tenants in recent years, while the opposite is true for Poland and Slovakia. Germany is the only country in the EU whose rental sector is larger than the owner-occupied one; a situation which has been relatively constant over the last years.

Both single and multi-family dwellings in the rental housing market are exposed to issues related to misplacement of incentives (see Table 3). The type of rental contract will determine whether tenants are exposed to usage- or efficiency-related split incentives, however an overview of the rent structure practices across the EU is not clear. Gross cold rent and net cold rent structures are most common, however warm rents are practiced in certain cases especially in Northern European countries. For example, Sweden's dominant residential lease type is warm rent, where landlords charge a lump sum consisting of the base rent plus heating and/or hot water costs.

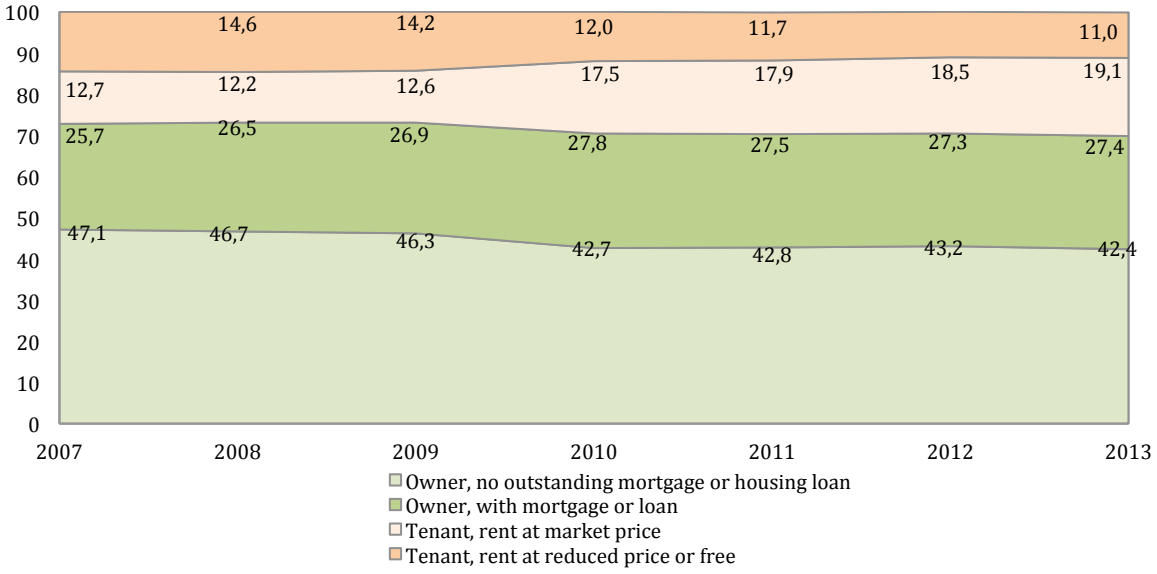

Figure 1. Trends in owner and tenant populations in the EU27 over the last 5 year period [Source: Eurostat].

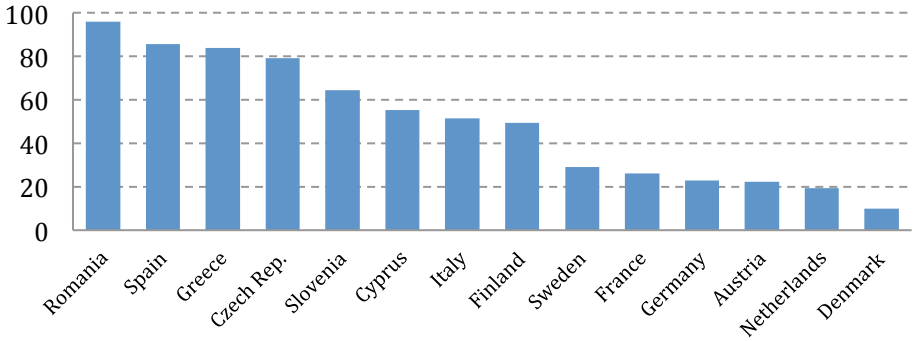

Figure 2. Share of multi-family dwellings which are owner-occupied across EU Member States [Source: Entranze IEE project].

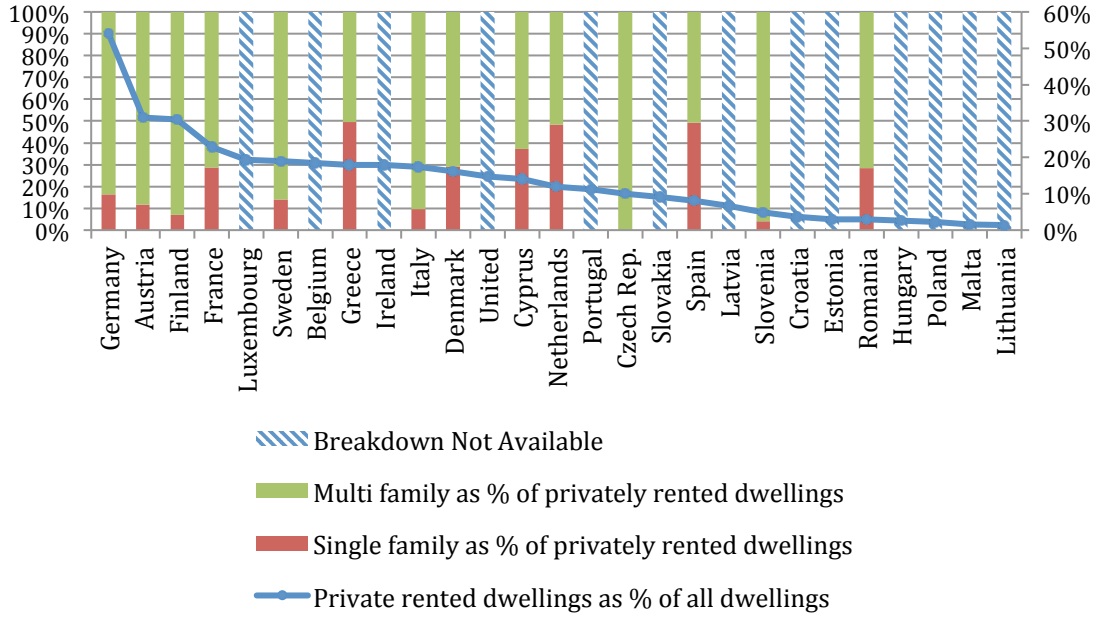

Figure 3. Privately rented dwellings across EU Member States [Source: Entranze IEE project].

While rental housing is dominated by privately rented dwellings, more than a third of all EU tenants benefitted from rents at reduced price or free in 2013. Within the rental sector, the relative importance of private versus social rental varies substantially. In a few countries social rental housing accounts for more than 50 % of the rental market (Netherlands, Austria, UK as well as in Eastern European countries which don't have a well-developed rental sector), while in others it represent a rather marginal sector within the housing market (Pittini & Laino, 2012).

Solutions to overcome incentive misalignments

In this section current solutions to split incentives practiced in the EU and beyond are presented. Table 4 shows an overview of various solutions which are classified according to the measure type, type of split incentives that they address, eligible sectors and relevant experience acquired for each solution to-date. A discussion of each solution together with a description of their applicability for each segment of the building sector is presented below.

REGULATORY SOLUTIONS

Minimum performance levels in rented units

Mandating minimum standards for rented properties is a powerful measure which can ensure that very inefficient buildings undergo energy efficiency upgrades or are simply removed from the rental market. This can primarily protect social tenants or tenants facing efficiency-related split incentives, who would otherwise have no power to negotiate an energy efficiency upgrade in their rented properties. Under such regulation, the responsibility rests with the owners, who are called to ensure a reasonable level of energy efficiency in rental units, thereby sending a clear signal to the market. Based on the same motivation behind minimum standards for equipment set by the Eco-design directive (Directive 2009/125/EC), this can apply to both residential and commercial properties, and can target both private and social landlords. The measure can complement existing requirements set in the building codes for minimum energy performance levels which currently apply only for new and major renovated buildings.[4] To ease the burden of compliance by landlords, the availability of financial incentives or the use of models that overcome the barrier of the upfront costs can be considered alongside this regulation (see section on Financial incentives & models).

This practice is not yet widespread in Europe, however there are a few noteworthy examples. The UK, in 2011, adopted a legislation stipulating that no landlord can let out a property with an energy performance label F or below by 2018. While sale transactions of buildings with label F or below can still be undertaken after 2018, these properties can only be occupied by their new owners. With a 7 year period between its adoption and enforcement, the legislation provides a sufficient window of opportunity for landlords to take measures before the law is in effect. A push during this transitional period is anticipated by the enforcement of additional measures (see section on financial and fiscal incentives).

In the Flanders region of Belgium, an obligation for roof insulation in rental dwellings is set in the Flemish Housing Code, which shall apply from 2015 onwards. In apartment buildings this rule considers that the roof is a common part of the building so the obligation applies to all residents, including those who do not occupy the top floor. The obligation, which also covers non-rental dwellings, consists of a phased introduction of roof insulation standards, which currently correspond to R-value of 0.75 m^2 K/W. Penalties for non-compliance are based on a point system and are expected to be gradually increased

4. As required by Directives 2002/31/EC and 2010/91/EU on the energy performance of buildings.

Table 4. Solutions for addressing split incentives in the building sector.

	Measure type	Split incentives addressed	Eligible sectors	Experience to-date
Minimum EP levels in rented units	Regulatory	ESI	Rented residential dwellings; Commercial spaces	Low – only the UK and Flanders region of Belgium
Revisions in rent acts & condominium laws	Regulatory	MSI, ESI	Rented dwellings; Owner occupied and rented multi-family units	Low – with unclear results
Energy labelling	Information/ regulatory	ESI, USI	All	High – mandatory EPC schemes in all EU Member States
Individual or sub-metering	Information/ Regulatory	USI, MSI	Multi-family buildings; Rented dwellings and commercial properties	Requirement set in the Energy Efficiency Directive
Green leases	Voluntary	ESI, USI	Leased commercial and public spaces	Low – experience mainly outside EU
Financial and fiscal incentives	Financial	MSI, ESI, USI	All, with special focus on properties where upfront costs are a real hurdle	Medium
On-bill finance model	Financial model	TSI, ESI	All	Low – Green Deal in the UK,
Property Assessment Clean Energy	Financial model	TSI, ESI, MSI	All, commercial and multi-tenant residential buildings	Low – mainly practiced in the US

from 2015 to 2020. If 15 penalty points are incurred, the house can be declared "unsuitable for habitation" because they do not meet the legal standards.

Ireland, in its recent Construction Strategy of 2014, stated that a working group to explore the feasibility of introducing minimum thermal efficiency performance standards for properties offered for rent. Such a change, if introduced, would reduce energy poverty, improve health and minimise emissions from the private rented sector.

Revisions in rent acts and condominium acts

Improving the rent and condominium acts is essential for encouraging investments in energy efficiency in rented properties or multi-unit buildings. Revisions to lift barriers in regulations that inhibit the adoption of energy efficiency in these segments of the building sector need to be considered in order to support the dialogue between involved parties and introduce flexibility that would facilitate voluntary agreements between the tenant and landlord (e.g. green leases). These should lay out legal framework and specific conditions for the redistribution of investment cost and energy cost savings of an energy efficiency upgrade between the landlord and the tenant or between multiple owners. This should be accompanied with guidelines on cost- and benefit-sharing practices. For example, when an energy efficiency upgrade is undertaken by a landlord, a contribution from the saved energy costs can be asked from the tenant, provided that both the landlord and tenant directly benefit from the undertaken work. Additional issues that need to be addressed include extent to which the rent can be increased and conditions under which the tenants can reject rent rises. Condominium laws should also better define the democratic rules with respect to changes and maintenance work undertaken in the building and the roles of all actors involved including the owners. A single owner should not be allowed to stand in the way of the improvements, and majority-based rules should be adopted.

A number of countries have introduced or plan to introduce revisions in order to update their rent acts. For example, France amended its tenancy law in 2009 to facilitate the redistribution of the financial benefits of an energy efficiency upgrade between concerned actors. Under this amendment, a landlord has the right to ask the tenant to make a contribution to an energy efficiency investment by participating in the cost recovery of the work. The contribution is separate from the rent paid by the tenant and cannot exceed 50 % of the cost of energy savings. This contribution can however only be asked if substantial work has been done or if the dwelling reaches a minimum level of energy performance. The participation, limited to a maximum 15 years, is specified in the rent agreement. A consultation between the landlord and tenant regarding the nature and advantages of the renovation has to be first initiated and should be followed by the agreement of the tenant for the redistribution arrangement. If the tenant changes during the contribution period, the landlord then has to justify the energy saving renovation made and the maintenance of this contribution until the agreed deadline before concluding a new rent contract with a new tenant. It is not clear how successful these amendments have been in reality in incentivising landlords and

tenants to engage in projects that improve the energy efficiency of the rented dwellings.

Other examples include the Italian region of Emilia Romagna, where a law was approved in December 2013 that permits the use of energy cost savings for investment repayments of energy efficiency interventions. In addition, an amendment in the rent act aimed to make energy efficiency upgrades more attractive for landlords and tenants is foreseen in Denmark. In particular, the benefits of the upgrade will be divided between landlords and tenants without changing the overall housing costs for the tenant. This principle is also applied in the Netherlands, through a bill approved in March 2011, which incorporates energy performance in the rental price evaluation system used in the social housing sector. The rental price evaluation system, which is used to determine the rental price for houses and apartments in the social housing sector, offers landlords the opportunity to increase the rent if the score on the energy label improves, thus incorporating energy efficiency in the evaluation criteria. The decrease in energy costs due to energy efficiency measures should outweigh the rental price increase in order to ensure lower living expenses.

INFORMATION TOOLS

Energy labelling

Building energy labelling is a powerful disclosure tool which provides potential buyers, tenants, financiers and other real estate actors with information on a property's energy performance. It offers the possibility to make more informed decisions during sale and lease transactions and overcome, to a certain extent, information asymmetry issues, which typically exacerbate the split incentive barrier. Through this information, the actor can make comparisons with other similar properties of interest, gain a better understanding of the holistic costs associated with a property, and identify where and how to invest in energy efficiency upgrades.

In the EU, the main policy framework through which this information tool has been introduced is the Energy Performance of Buildings Directive (EPBD, Directive 2002/31/EC). Under this Directive, all Member States were required to set up the mechanisms and establish systems of certification of the energy performance of buildings which make it possible for owners and tenants to identify the energy class of their building together with recommended improvement measures on how to further increase its energy performance. These mandatory Energy Performance Certificate (EPCs) schemes set up by the Member States were further strengthened with additional requirements, introduced with the recast of the EPBD (Directive 2010/91/EU). EPCs are currently among the most important sources of information on the energy performance of buildings, which, historically, has been very hard to obtain.[5] Available at the point of lease or purchase, they can guide a potential owner or tenant during their decision making process, can be used as a tool for calculating the pre and post-performance of a renovated building and predict energy cost savings as a result of an energy efficiency upgrade.

Although these schemes have been in place for more than a decade, EPCs have not yet offered an opportunity to demonstrate the value of their investments in energy efficiency. Various weaknesses and areas of improvement related to these European schemes have been identified in the literature (Arcipowska, et al., 2014; Ástmarsson, et al., 2013). The value of energy efficiency in the certificates (through lower energy bills) is not clearly displayed to prospective building tenants and purchasers. Issues related to their public acceptance and practical usage of EPCs have been raised. The need for proper implementation which can reinforce the quality assurance process has also been recognised. This can be achieved by independent control systems and penalties for non-compliance, improvements in the methodological framework and software tools and further requirements on the qualifications of the certifiers and data collection approaches (Arcipowska, et al., 2014).

Another shortcoming of the EPCs is that it is based on energy performance calculations which assume a standard occupant usage. While this allows for a level playing field comparison of various properties during transactions, the impact of the tenant on the overall energy consumption is not captured by the certificates. Indeed, the measurement of energy efficiency is particularly complex and a distinction between building- and user-related energy consumption, where the responsibility of the first lies with the landlord and the second with the tenant, is increasingly needed. In addition, the use of both building and tenancy ratings can be particularly beneficial for the cost or benefit sharing models of energy efficiency upgrades. The National Australian Built Environment Rating System (NABERS) for offices is an example, which can be used to differentiate the performance of a tenancy, the base building or the whole building. Under this system, base building rating covers the performance of the building's central services and common areas – usually managed by the building owner, while the tenancy rating includes only the energy or resources that the tenant controls. A whole building rating covers both the tenanted spaces and the base building, and is typically used in an owner-occupied building, or where there is inadequate metering to obtain a base building or tenancy rating. In the US, the Better Buildings Act[6] – a bill amending federal law aimed at improving the energy efficiency of commercial office buildings – requires the Environmental Protection Agency (EPA) to develop a voluntary Tenant Star program within the Energy Star program to recognize tenants in commercial buildings that voluntarily achieve high levels of energy efficiency in separate spaces. The Tenant Star program will certify tenants operating commercial office spaces and encourage them to team up with landlords in order to design, construct and operate within leased spaces in commercial buildings that achieve high levels of energy performance.

Individual metering, sub-metering and direct feedback

Individual metering is a prerequisite for the development of innovative rental structures which can encourage energy efficiency upgrades in rented properties. Measurement of individual energy consumption provides consumption feedback and increases awareness on the usage patterns, which can ultimately

5. A small number of countries (Netherlands, Denmark and some regions of Austria) had an energy rating system before the adoption of EPBD in 2002 (Arcipowska, et al., 2014).

6. https://www.congress.gov/bill/113th-congress/house-bill/2126

change the behaviour of the tenant. It also allows for detailed monitoring of energy efficiency upgrades based on actual, rather predicted energy savings. The measured energy consumption can be a more useful indicator when the redistribution calculation of costs and benefits are made. They are particularly important for overcoming the usage-related split incentives. For example, a gross warm rent model with direct feedback can allow landlord and tenant to agree on a set of comfort conditions (e.g. indoor temperature during winter time). All costs including heating are covered in the rent but direct feedback means that tenants can get compensation if they consume less. Individual metering therefore encourages tenants to adopt a more energy efficiency behaviour. Conversely, if tenants exceed the pre-set consumption levels, the additional energy costs are borne by the tenants. The functionality of real-time information on consumption for the users offered by smart meters can further strengthen this feature and indeed align incentives between landlords and tenants. Sub-metering can ensure detailed energy monitoring of apartments in multi-family buildings and allow apartment tenants and owners to become more aware of the monetary implications of energy consumption and savings.

The Energy Efficiency Directive includes a set of articles (namely Articles 9, 10 and 11) on metering and billing which intend to have a profound impact in cases where individual and sub- metering is not available. In particular, Articles 9 (1) & (3) of the Directive impose metering requirements on district heating, district cooling and communal heating/hot water systems. Article 9 (2) sets requirements for the roll-out of smart meters. Article 9 (3) calls for individual metering in multi-unit buildings and also states that Member States may consider the introduction of transparent rules on the allocation of the costs of heat consumption in multi-apartment buildings. The impact of these articles on metering practices, together how they can assist in energy efficiency investments should be further examined.

FINANCIAL INCENTIVES & MODELS

Financial and fiscal incentives

Energy-efficiency incentives from governments, energy suppliers and other sources are intended to overcome upfront costs barriers. They are however not designed to meet the unique challenges faced by multi-unit buildings or rented properties. A survey carried out by the JRC in 2013 showed that a large share of financial instruments targeted homeowners, while many schemes whose eligible recipient list included multi-apartment or rented units, did not use financing options that were carefully designed to meet the specific needs of these segments of the building sector (Economidou & Bertoldi, 2014).

Various financial and fiscal incentive schemes can be designed to support specific segments of the building sector in which involved parties would refrain from improving the energy efficiency of the building under normal circumstances. In the UK, a tax break scheme (with a dedicated budget of £35 million) has been designed to support residential landlords in the period 2014 to March 2017. Its intention is to provide support to private landlords before the legislation on minimum energy efficiency levels for rented properties come into force in 2018. The Landlords Energy Saving Allowance, a tax break scheme which has been in existence for many years, also gives the opportunity to landlords to deduct the cost of acquiring and installing certain energy saving measures against their income tax. The Government has also already taken action to encourage the installation of energy efficient measures in rented properties, with the implementation of the Green Deal scheme, which allows repayments to be passed through bill savings.

In the Netherlands, the state plans to make available a €400 million subsidy for landlords in the rental social housing sector for investments in energy efficiency for the period 2014–2017 with the aim of contributing to the objectives of the Energy Saving Agreement for the Rental Sector. Under this agreement, housing corporations have set an energy saving target of 33 % between 2008 and 2020, which corresponds to an average energy label B by the end of 2020. Housing corporations in the Netherlands own around 2.3 million homes, which correspond to 30 % of all Dutch housing stock The Flanders region of Belgium will provide a grant of €23 per m^2 as an additional incentive for rental dwellings occupied by vulnerable tenants.

Financial incentive programmes specifically designed to provide grants to multi-apartment buildings include the National Renovation Programme for Residential Buildings in Bulgaria and Latvian Improvement of Heat Insulation Programme. In the Flanders region of Belgium, the procedures for energy grants were reformed in 2011 to simplify applications from multi-owner apartments.

On-bill finance

On-bill financing is a mechanism of obtaining access to capital to fund building energy efficiency upgrades, where repayments are made through the energy bill. On-bill financing allocates the financing responsibility to the utility and maintains the loan attached to the property, thereby offering an appropriate solution to overcome temporal split incentives. It can also avoid the need to obtain upfront capital to cover the cost of buying energy efficient equipment, which can be beneficial to the landlord. The energy utility will typically aim to make the monthly payments equal to or less than the energy savings achieved through the upgrade, which means that the tenant will be no worse off financially.

The UK has been the first European country which adopted an on-bill finance scheme, designed to address, inter-alia, the split incentive barrier. The Green Deal, which came into force in the beginning of 2013, allows owners to install measures at no upfront costs and enables repayments to be made through a charge on the occupants' utility bills. The repayment stays with the utility bill rather than the occupier and gets transferred to whoever is the electricity supplier. The scheme has so far failed to attract sufficient participation as it contains a number of weaknesses, the main one being the high interest rate attached to the Green Deal loans of at least 7 % plus add-ones (references).

While an on-bill finance scheme can address both owner-occupied and rented properties, Bird & Hernandez (2012) stressed the need for a careful design of such schemes specifically targeting rented properties. A successful on-bill finance programme should create incentives for all stakeholders: tenants (savings), landlords (savings/investment), utilities (protection/decoupling) and by extension, banks. As high transaction costs linked to the realisation of investments deter landlords

from upgrading their rented property, the authors proposed a small incentive to be considered for landlords of rented properties in the private and/or social housing sectors. If landlords are allowed to get an incentive in the form of a small share of savings, covering the transaction costs attached to the upgrade, this could trigger participation in on-bill programmes on behalf of landlords.

Property Assessment Clean Energy (PACE)

Property Assessed Clean Energy (PACE) is a means of financing energy efficiency upgrade through the use of specific bonds offered by municipal governments to investors. As in the case of on-bill finance, they can provide a solution to the temporal split incentive problem. With PACE, the difference is that governments use the funds raised by these bonds to loan money towards energy efficiency upgrades in residential and commercial buildings. The loans are repaid over the assigned term – typically 15 or 20 years – via an annual assessment on their property tax bill. The long repayment term attached to PACE programmes allows for investments with long payback times to be considered in the upgrade. This additional tax assessment is placed on the property rather than the property owner, which means that PACE assessments are also transferable and can help overcome the split incentives between tenants and owners in commercial and multi-tenant residential buildings. PACE programmes are secured by a senior lien on the owner's property, which avoids repayment security to be attached to the borrower's creditworthiness and is therefore more attractive to financiers and borrowers alike.

No PACE-based schemes are in place in Europe. PACE programmes are mainly implemented in the United States with a reported $150 million in federal grant funds initially allocated (LBLN, 2011). It should be noted that PACE programmes were suspended in 2010 due to the fact that U.S. mortgage authorities Freddie Mac and Fannie Mae refused to finance mortgages with PACE liens. This occurred because PACE loans are generally assigned first lien status; that is, in cases of default, they are paid off to the municipality before the main mortgage is paid to the lender (Bird & Hernandez, 2012). Despite this issue, there is still growing interest around the PACE mechanism.

VOLUNTARY APPROACHES

Green leases

As discussed previously, traditional forms of lease create asymmetries in the relationship between landlords and tenants and therefore do not set the ground for energy efficiency investments. Green leases can bridge these differences by splitting costs and benefits between the parties in such a way that both parties can benefit from an energy efficiency upgrade. Given that the necessary legislative foundations exist (see section on rent and condominium acts), they can bridge the differences between landlords and tenants in a way that both parties can gain from an energy efficiency upgrade.

Through a green lease, a clause or separate agreement is made between the concerned actors that allows a property owner to raise the rent to finance energy efficiency improvements to a property. As in the case of on-bill financing model, green leases assume that energy cost savings should exceed finance charges, and should be set at a percentage of monthly energy cost savings to the tenant. The cost recovery, typically done by amortisation, can be based on the actual or predicted energy savings. In New York City, recovering the cost based on predicted energy savings is considered risky by tenants in case energy upgrades underperform. For this reason, the owners' capital expense that can pass through can be up to 80 % of predicted savings in a given year. This is based on industry's experience which showed that actual savings are generally within ±20 % of predicted savings. Tenants are therefore protected from underperformance by a 20 % "performance buffer" (performance corrector factor).

This type of leases has gained increasing popularity in the past few years in the U.S. and Australia. They are appropriate for large, commercial buildings rather than small units such as houses. Despite their potential, green leases are not currently widely used in Europe. In Finland, some contracts in the public sector with positive results have taken place. In the Netherlands, sustainable leases are currently investigated by the Platform for Sustainable Housing. A survey carried out by European Property Federation highlighted that there are still various regulatory and non-regulatory hurdles that inhibit a wider use of green leases in Europe (Hordijk, 2013). Sharing standard green lease guidelines can increase awareness among key interest groups. The public rental sector can also lead by example by adopting green leases for their rented premises.

Principles of a successful approach to align incentives

It is clear that there are many individual measures that can help mitigate the misplaced incentive barrier between various actors. A comprehensive approach to remove the barrier, however, should consider multiple measures in order to be effective. Indeed, a successful approach should consist of the following elements: accurate and regular information, appropriate incentives and effective enforcement of regulations or policies driving demand. Based on the findings of this work, the following principles can be drawn to determine a successful approach:

- In order to align incentives, redistribution of costs and savings between involved parties should be considered, e.g. a landlord can be entitled to amortize the capital expenses of an energy efficiency investment by passing a share of the costs to the tenant.
- Agreements between involved parties should be structured in a way that the energy efficiency investment benefits all of them. Owners should also take into consideration the positive impact of an energy efficiency upgrade that will have on their rented property value, while tenants should consider the gains in increased comfort. More research is needed to quantify non-energy benefits, which are often neglected in either's party decision making process.
- To overcome accuracy issues between actual and predicted energy savings in cost recovery models, a performance correction factor, derived from empirical evidence, should be considered. This incorporates a buffer to protect tenants against the possibility of underperforming energy efficiency measures. The correction factor should be based on robust evidence on the performance gap from real case studies.

- Energy use and costs need to be made more transparent. While energy performance certificates offer a valuable tool for understanding the energy performance of a building during sale and lease transactions, the information provided in the certificate does not directly determine the energy-related operating expenses for the user. More transparent information can lead to more informed decisions.
- Building occupants, whether owner-occupiers or tenants, need to be more closely engaged in energy efficiency. This could be achieved through energy tenancy rating systems, which assess their own impact on the overall consumption and separates it from the building-related impact. Landlords should be in charge of the efficiency of the building, while tenants in charge of the efficiency of their own premises. The installation of smart meters and provision of direct feedback of consumption can help occupants identify wasteful habits, have a better control of their own operating expenses and appreciate the benefits of simple improvement measures.
- Attaching the energy efficiency upgrade to the property rather than the owner or tenant offers the flexibility of engaging in energy efficiency upgrades whose payback time is longer than the occupancy or ownership duration, effectively removing the barrier of temporal split incentives. This can be done by attaching the capital cost recovery to the utility bills (on-bill finance model) or property tax (PACE model).
- Owners and tenants are required to take expert decisions and engage in complex projects despite their lack of technical knowledge. Good planning and project execution are particularly essential, especially in large and complex projects such as renovations of multi-apartment buildings. The involvement of an independent energy expert is necessary in order to facilitate and co-ordinate the process.

Conclusions and recommendations

Market barriers, such as split incentives, have been a long-lasting impediment to energy efficiency improvements in the building sector. Traditionally used to describe the misplacement of incentives between landlords and tenants, this barrier appears in many segments of the building sector. They can arise from asymmetries embedded in current rental structures, either by offering no incentives to landlords to invest in energy efficiency in rental properties (efficiency-related split incentives) or by providing no incentives to tenants to save energy (usage-related split incentives). Multi-tenant and multi-owner buildings face the challenges of collective decision making between various actors and uneven distribution of benefits and costs of potential energy efficiency upgrades. Our research shows that at least 65 % of all dwellings in the EU may face one or a combination of different types of split incentives. While data on the commercial sector is lacking, leasing retail, office buildings and other non-residential space are widespread practices. There is also a temporal dimension in this barrier, which is less quoted in the literature, and refers to cases whereby an investment does not pay off before the property gets transferred to its next owner or tenant.

Several current practices tackling split incentive issues across Europe and beyond have been discussed in this paper. These range from regulatory measures, such as minimum standards for rented properties, individual metering, energy labelling to the use of financial models that remove upfront costs and pass costs through to tenants etc. While it is clear that a one-size-fits-all solution does not exist due to particularities across various segments of the building sector and different national conditions, a number of common principles can be highlighted. These include the engagement of building occupants in saving energy, development of agreements that benefit all actors involved, transparency of energy use and related costs, more accurate attribution of energy consumption to tenants and amortisation of energy efficiency investments through cost recovery models attached to the property. It is also clear that packaged policy solutions are necessary to tackle misalignments between landlords and tenants. These solutions should aim to provide incentives, reliable information and effective enforcement at the same time. For example, while revisions in rent and condominium acts are necessary for reducing disincentives between landlord and tenant or owner and owner, these acts alone cannot incentivise them to uptake an energy efficiency upgrade in a property. Conversely, the implementation of innovative financing measures will not be successful if regulatory barriers are not first addressed.

Our paper shows that experience with some policy and financial responses proposed herein is currently limited. Exchange of good practices is thus particularly beneficial for increasing confidence and providing guidance on how to implement the various solutions in practice. For example, reliable information on common practices is very difficult to find on green leases – a promising solution for overcoming this barrier in commercial properties, as these leases are typically private transactions. The publication of standard templates, common green lease language and clauses used can increase awareness among interested actors. Municipalities and public institutions can lead by example by entering into green leases for their rented premises and guide other landlords and tenants on how to follow this practice. Sharing experiences for other solutions such as on-bill finance and PACE models, which are somewhat new in the European landscape, is also necessary. Finally, scaling-up investments require standardised processes in order to increase confidence among investors and financiers. Leveraging past experiences in energy efficiency upgrades and harnessing data from numerous case studies can support these processes. In addition they can be used to make a link between energy efficiency and its ancillary non-energy benefits, a link which is not well quantified in the literature. Support should be therefore given to initiatives that collate real data from case studies and help build more innovative cost recovery models, which in turn can successfully mitigate traditional barriers such as split incentives.

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