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Energy efficiency investment in the residential sector

A critical analysis of financial measures used for incereasing household investment in the UK

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"There are some anti-capitalist activists who don't want to talk about money [in connection with urbanisation]; they think that to talk about it is to mention evil. But not talking about it, and especially how to share the value between all of a city's stakeholders, makes it very easy for the clever ones, or the corrupt ones, to take this value. There's a silence on this; a naive ignorance of the economic reality that drives urbanisation." (Clos 2016)

- Dr Joan Clos, Executive Director of the United Nations Human Settlements Programme (UN-Habitat) and former mayor of Barcelona

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Abstract

This thesis investigates the consequences of neoliberal practices in relation to financial measures designed to increase household investment in energy efficiency.

Climate change has become one of the most important and most accepted environmental challenges. However, by being intertwined with the neoliberal ideology, the agenda is not solely about environmental concerns but it is rather the rationale that underpins the idea of low-carbon growth. Today, climate change is rewriting political discourses on a global scale putting economic and social challenges in a new perspective and creating new opportunities and models of growth.

Increasing energy efficiency is seen as a crucial step in the shift towards a greener growth path. Buildings, and in particular residential buildings account for a significant amount of carbon emissions which is why increasing the energy efficiency of the residential building stock is seen by governments as a great opportunity for decarbonisation and economic growth.

For this reason, the UK Government decided implement two market-based schemes (the Green Deal and the Energy Company Obligation) to help households finance energy efficiency measures. While these financial measures are intended to stimulate investment in energy efficiency in the residential sector, in theory, they also have the potential to reduce energy poverty by providing finance for vulnerable households. Therefore this thesis attempts to answer the following research question:

'What effects did the neoliberal practice of improving the energy efficiency of residential buildings by using financial measures had regarding alleviating energy poverty as a matter of social justice in the UK?'

Preface and acknowledgements

This thesis was written as a part of my studies of the Masters programme in Urban Planning and Management at Aalborg University, Denmark from the 1st of February 2016 until the 1st of June 2016.

The title of this thesis is:

Energy efficiency investment in the residential sector – A critical analysis of financial measures used for increasing household investment in the UK

References in this thesis are written in the Chicago style e.g. (Whitehead, 2013), in there are two references from the same author from the same year a letter is added to the end of the year in order to distinguish between the sources e.g. (Whitehead, 2013a). The full list of references can be found at the end of this paper.

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1 Introduction

As the introductory quote from Dr Joan Clos, the Executive Director of UN-Habitat, illustrates, the economic reality plays important role in driving urbanisation and thus has a significant effect on urban society. Therefore indulging in discussions about economics and the financing of cities is of utmost importance for us, urban planners as well, to be able to understand what is going on in cities behind the curtains, and what forces are driving the processes that we can see. Only by this can our profession be able to influence these processes and thereby shape their outcomes on cities.

The importance of this is quite well illustrated by the continuously growing literature from critical urban theorists on the influence of the financial sector on urban development. The financialisation of the housing sector and the growing influence of the financial sector on housing is one of the central elements of these discussions. Some scholars argue that its influence has been increased to a degree that the relentless commodification of housing has undermined the promise of homeownership in western countries forcing the current generation into private landlordism (Forrest and Hirayama 2015). Another researcher of the topic, Pryke (1994), argued that integrating property markets into international circuits of capital accumulation had made the relatively sheltered and secured circuits of property finance subject to the turmoil of the global financial flows (Pryke 1994). Nevertheless, Pryke's alarming forecast has turned into a reality. And today, linking the housing market with financial markets and commodifying property into a financial good through the securitisation of mortgages is considered as a central factor in the 2008 economic crisis (Lima 2016).

Still, Whitehead (2013) argues that critical urban theory has not contributed much to the debates surrounding climate change regardless of the growing importance of climate change mitigation and adaptation strategies in facilitating economic growth. He claims that the policies underpinning these strategies seek to establish a tertiary circuit of ecological accumulation and they are as much about finding a solution to the overaccumulation crisis of capitalism as they are about fighting climate change. Therefore, Whitehead (2013) sees critical urban theory as a significant tool, because it can be used to reveal the contradictions of capitalism and policies framed by neoliberal practices of market-oriented governance.

One of the key areas of climate change mitigation is increasing the energy efficiency of the building stock and in particular residential buildings which are responsible for a significant amount of carbon emissions. Hence, with the objective to utilise the opportunity of improving the energy efficiency of residential buildings to induce economic growth and decarbonisation simultaneously, the UK Government decided implement two market-based schemes (the Green Deal and the Energy Company Obligation) to help households finance energy efficiency measures.

This thesis intends to take a step forward and challenge what Dr Joan Clos called as a *"naïve ignorance of the economic reality"* and study the intersection of finance, climate change and housing. It attempts to make a contribution to the topic, following Whitehead's steps, by investigating climate change mitigation in the United Kingdom focusing on financial measures that are intended to stimulate investment in energy efficiency in the residential sector.

2 Problem formulation

2.1 Climate change and Green growth

In 2008, the world was hit by a financial crisis resulting in what can be called as the worst global economic recession since the Great Depression of the 1930s (Barbier 2009). However, the financial crisis and the recession is not the only contemporary global challenge that needs to be met. Other growing concerns include worsening global poverty, climate change, energy insecurity, freshwater scarcity and deteriorating ecosystems which are threatening nations differently all around the globe (Barbier 2009).

Barbier (2009) in a report prepared for United Nations Environment Programme (UNEP) argues that economic recovery after the crisis needs rethinking and the world economy and requires an initiative similar to Roosevelt's New Deal after the great depression in the 1930s. What is required, according to him, is to revive growth, ensure financial stability and create jobs with the right mix of policy actions which simultaneously address the sustainability of the world economy (Barbier 2009).

Similarly, the Organisation for Economic Co-operation and Development (OECD) surges an action under the name of 'Green growth' defining it as follows:

> *"Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our wellbeing relies. To do this, it must catalyse investment and innovation that will underpin sustained growth and give rise to new economic opportunities."* (OECD 2016)

Though the aims of green growth are similar to those of the sustainable development agenda, it is not a replacement of sustainable development. Rather, with a greater focus on the economic pillar of sustainability it provides a practical approach in order to make progress in sustainable development achievable and measurable. Ideally, taking the environmental and social aspects and the limits of available resources into account it ensures that natural assets can deliver their full economic potential (OECD 2016).

Climate change has become one of the most important and accepted environmental challenges and it is the agenda that is underpinning the rationale behind the need for green growth. Today, climate change is rewriting political discourses on a global scale putting economic and social challenges in a new perspective and creating new opportunities and models of growth (Ürge-Vorsatz and Herrero 2012).

Indeed, fighting climate change is becoming treated besides being a global threat as an opportunity for many economies which can be clearly exemplified by the fact that it has been presented as something that can set a "New Growth Path for Europe" by Jaeger et al. (2011). Jaeger et al. (2011) see tackling climate change as the key for Europe to revitalize its economy claiming the goals of increasing growth and decreasing unemployment and greenhouse gas emissions are reinforcing each other.

The mechanism advocated by Jaeger et al. (2011) is presented by Figure 1 which illustrates the importance of the inflow of international green investment in addressing the current economic situation in Europe. The idea behind this investment-oriented climate policy is that the investment impulse could create an innovation impulse which could go beyond the transformation of the

energy sector and surge the development of new technologies and low-carbon materials making Europe competitive in those markets (Jaeger, et al. 2011) (Jaeger, et al. 2015).

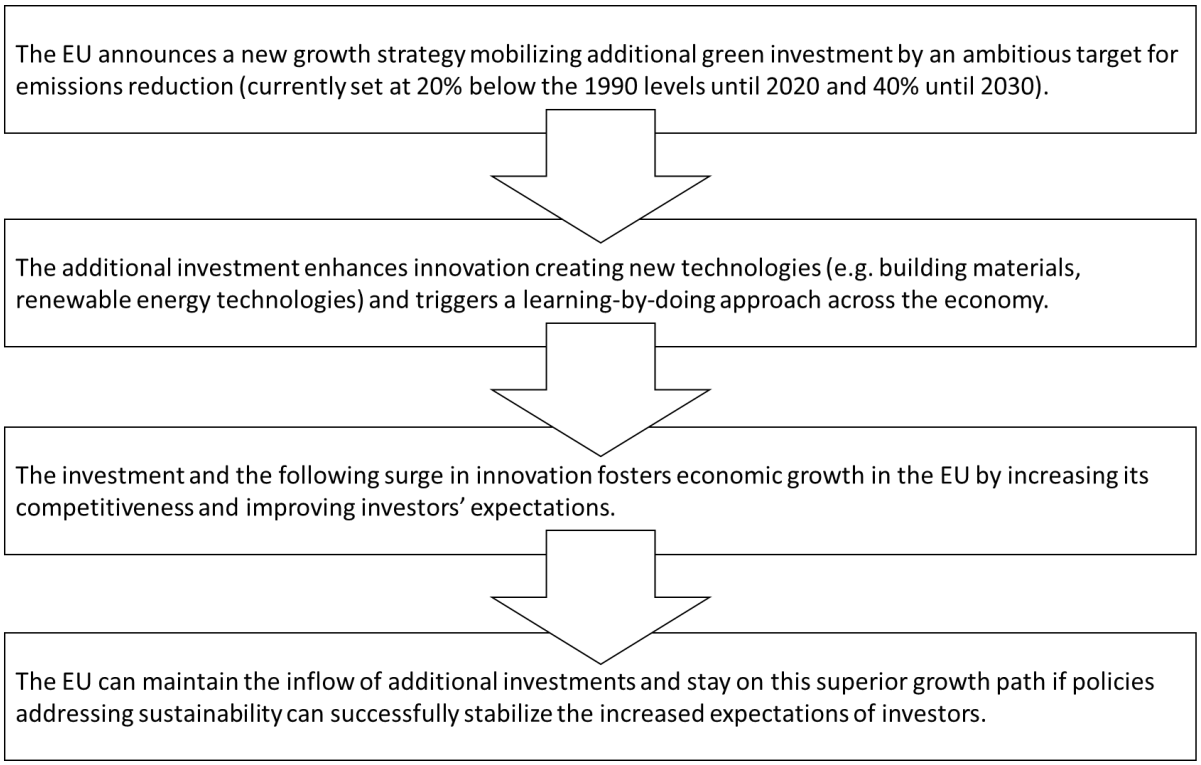

Figure 1: The mechanism drawn up by Jaeger et al. (2011) that supposed to create an opportunity for a new growth path for the European Union by mobilizing a self-propagating influx of investment. *Source: (Jaeger, et al. 2011) (European Commission 2016) (European Commission 2016)*

What becomes clear by realising the importance of continuous investment inflow is the competition between different geographical locations seeking to seize the opportunity and take a bite from the international capital. This process puts greater stress on nation states and in particular on those that Sassen coined as 'Global cities' to make efforts in order to take leadership (Sassen, The Global City: introducing a Concept 2005). As Josef Ackermann (2010) a former chief executive officer of Deutsche Bank put it:

> *"[A] new world order is emerging. The race for leadership has already begun. For the winners, the rewards are clear: Innovation and investment in clean energy technology will stimulate green growth; it will create jobs; it will bring greater energy independence and national security."* (Ackermann 2010 p. 5)

2.2 Energy efficiency

A significant element of the proposed green growth agenda is reducing emissions by increasing energy efficiency which is a matter of not solely but mainly buildings (Jaeger, et al. 2011).

Buildings account for 40% of energy consumption and 36% of CO_2 emissions in the EU (European Commission 2016) of which about two-thirds can be attributed to residential buildings and one-third to commercial buildings (EC Green-Paper 2000). Whereas new buildings, due to strict energy

efficiency requirements, consume less energy (3-5 litres of heating oil per square meter per year) older buildings are more inefficient and consume about 25 litres on average with some requiring up to 60. The necessity to upgrade the current building stock is even more critical because about 35% of the EU's buildings are over 50 years old (European Commission 2016). Therefore, energy efficiency is considered as "the first fuel" because it can be used to replace other resources and reduce energy costs. Moreover, it also has the potential to support economic growth because it is competitive, cost effective to produce and widely available (United Nations Economic Commission for Europe 2015).

Furthermore, besides the environmental benefits of reducing energy consumption and lowering CO_2 emissions it has the potential to respond to other broad societal challenges as well. A report prepared by the Energy Efficiency Financial Institution Group (EEFIG) suggests that energy efficiency investments can bring further benefits for the EU including improved energy security, competitiveness, social and territorial cohesion, job creation and well-being (Energy Efficiency Financial Institutions Group 2015).

In the case of buildings, even further benefits can be achieved because the energy efficiency of a building directly affects energy affordability and thereby poverty which is in many cases influenced by high household spending on energy bills. Figure 2 shows the multiple benefits that can be achieved in through energy efficiency improvements in the building stock as drawn up by Hilke and Ryan (2012).

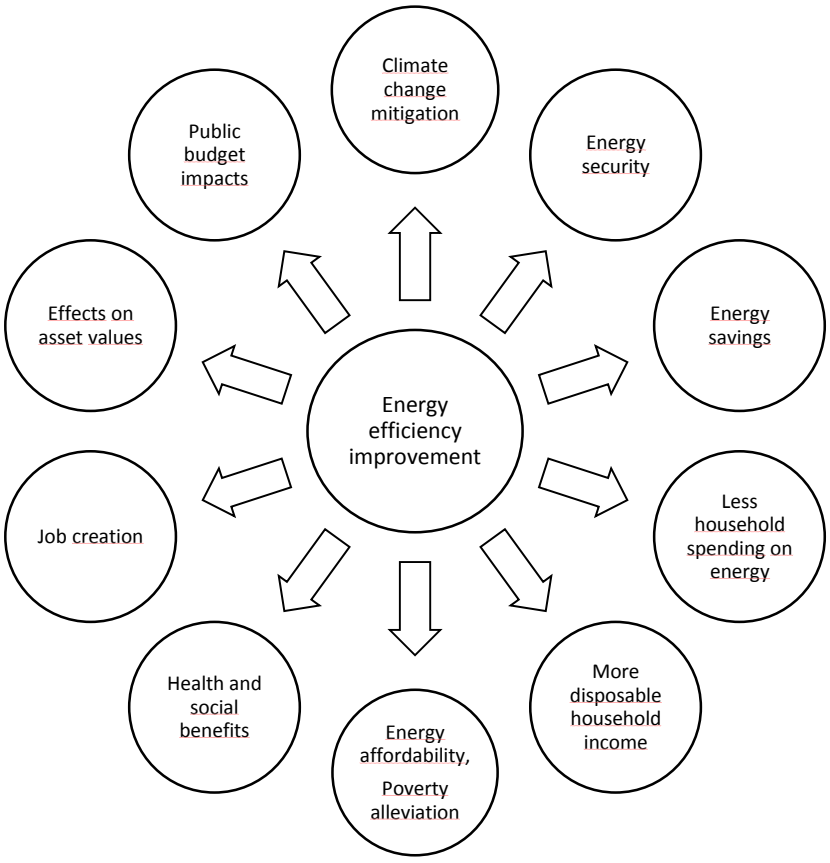

Figure 2: The multiple benefits associated with the energy improvement of buildings according to Hilke and Ryan (2012). *Source: (Hilke and Ryan 2012, p. 70)*

According to the EEFIG, these benefits can be reached by actions that are aimed at developing confidence and supporting the emergence of the market because currently there is an insufficient

amount of public and private investment (Energy Efficiency Financial Institutions Group 2015). Similarly, the United Nations Economic Commission for Europe (UNECE) sees promoting energy efficiency investments as the main opportunity for climate change mitigation. It supports the idea of market-based policy approach that overcomes the barriers associated with energy efficiency investments and realizes bankable solutions for the benefit of both investors and consumers (i.e. the residents):

> *"Despite the multiple benefits, improving energy efficiency remains elusive. The state of the global economy and the economics of energy markets have prioritized short-term economic considerations, and geopolitics has moved energy security to the forefront of policy considerations. To make the first step in overcoming the current inertia, countries need to develop policies and capabilities in the private and public sectors at the local level to identify, formulate and present energy efficiency investment projects that are bankable; introduce policy and institutional changes to support energy efficiency investments; and create favourable conditions for financial institutions and commercial companies to invest in energy efficiency projects."* (United Nations Economic Commission for Europe 2015 p. III)

For residential buildings the bankable solution described by the UNECE would mean *"[a] simple, easily accessible, low interest rate, tax beneficial (ideally) retail energy efficiency financing offer"* (Energy Efficiency Financial Institutions Group 2015, p. 20). What this means in essence is that in the residential sector households are reponsible fo implementing energy efficiency meaures therefore they need to finance the improvement of their homes either from their own savings or by taking out a loan. Consequently, the challenge for governments is to encourage household investment by offering grant schemes where appropriate and loans preferably with mechanisms that make loans more attractive for households such as on-bill financing (Energy Efficiency Financial Institutions Group 2015).

2.3 Realising synergies between improving residential buildings' energy efficiency and alleviating energy poverty

Improving the energy efficiency of our building stock is clearly an important challenge to tackle and a good cause to include in political agendas not only because of its environmental benefits but because it can lead to a better economy and improve the well-being of people simultaneously. Nevertheless, the current efforts aiming at undertaking the problem of climate change are based on market-based assumptions and bear the marks of neoliberalism (Whitehead 2013) which is why they cannot be left unproblematised. Energy efficiency is in particular a challenge where the effects of neoliberal policies can be investigated because aside from being a critical component in fighting climate change, it is also an important factor in a different social issue. It is one of the three determinants of 'energy poverty' besides a household's income and energy prices, which is why Ürge-Vorsatz and Herrero (2012) call attention to the potential benefits that can be leveraged though the integration of policies addressing energy poverty and climate change.

Before further elaboration, the term energy poverty needs to be explained because of the apparent confusion in terminology between fuel poverty and energy poverty. The concept originates from the UK where, among other English speaking countries, the wording *fuel poverty* is favoured. However, academics working on the topic in Central and Eastern Europe and EU-level institutional sources refer to the phenomenon as energy poverty. In the meantime, referring to

the global South authors use the term energy poverty differently, as the lack of access to energy carriers (Ürge-Vorsatz and Herrero 2012). This thesis follows the terminology used in Eastern Europe and the EU and defines energy poverty as a "*condition wherein a household is unable to access energy services at the home up to a socially- and materially-necessitated level*" (Bouzarovski, Petrova, and Sarlamanov, 2012 referencing Buzar, 2007). Though it is important to add that due the climate change theme of the thesis the definition of energy is used at a broader scope, including besides heating other energy service demands, such as cooling in the summer, lighting and powering appliances (Ürge-Vorsatz and Herrero 2012).

Energy poverty is a growing concern among developed countries and is occurring across the EU hitting on Eastern and Southern European states the most. In the meantime, fighting climate change has become the most accepted environmental challenge rewriting political discourses and putting economic and social challenges in a new perspective around the globe. Despite being in relation, the two topics are frequently dealt with separately. However, the goal to reduce energy poverty is also affected by this reconfiguration being sometimes in friction with other efforts related to climate change (Ürge-Vorsatz and Herrero 2012). As Walker and Day (2012) puts it:

> *"Whilst fuel poverty is a problem of energy underconsumption, it is occurring within an overall climate of energy overconsumption and the two issues must be addressed in an interconnected way. Without this, the justice of reducing fuel poverty may be overshadowed by consequent exacerbation of global social and climate injustice."* (Walker and Day 2012 p. 75)

The interrelated and sometimes contradictory goals of fighting climate change and reducing energy poverty creates a challenge for policy makers who need to find the right levers and develop policies that can create synergies. Integrating strategies aimed alleviating poverty and climate change mitigation is difficult, despite the fact that both of them are significant elements of political agendas today. One of the problems with their integration is that they are parts of different political agendas, the first is a more of a social issue, whereas the second is regarded as an environmental one.

Still, Ürge-Vorsatz and Herrero (2012) argue that energy poverty as a specific type of poverty offers an opportunity for integration and synergies with the two agendas and therefore policies should be harmonized. Firstly, as discussed above, because buildings are responsible for a major share of CO2 emissions and thus they offer the largest and most cost-effective potential to mitigate climate change. Secondly, because this potential can be achieved through upgrading those residential buildings that house people affected by energy poverty and thereby address the two problems at the same time (Ürge-Vorsatz and Herrero 2012).

Previous experiences in the UK, the most researched country within the topic, show that fuel poverty cannot be treated as an issue that can be solved by social and fuel pricing policies in which case households in need are offered direct subsidies (Boardman 2010 p. 17). Ürge-Vorsatz and Herrero (2012) argue that social tariffs and energy efficiency upgrades at a smaller scale cannot give a right answer to the problem:

> *"In comparison, direct support measures implemented as fuel allowances or social tariffs do not provide a long term solution to the energy deprivation challenge – in fact, they may lock-in households in energy poverty if implemented on their own because they remove incentives to invest in energy efficiency at the household level – and do not reduce carbon emissions either."* (Ürge-Vorsatz and Herrero 2012 p. 89)

Rather, they suggest that the biggest synergies can be achieved through deep energy retrofits in which case the lock-in risk may also be avoided. However, delivering deep efficiency in buildings especially in the form of state-of-the-art solutions require significant investment which makes the task challenging for governments (Ürge-Vorsatz and Herrero 2012).

Others, such as Whitehead (2013), on the other hand see deeper problems than misaligned policies and link the urban optimism and competitive drive behind strategies addressing climate change with the logic of neoliberal urban environmentalism. Neoliberal urban environmentalism is norm framework that linked ecological protection with economic growth through promoting market-based approaches and deregulation which originates from environmental policy developments in the 1970s (Whitehead 2013). Whitehead (2013) sees the problem in climate change adaption being driven by economic interests and thereby exposing vulnerable citizens and urban future to the potential exploitation of neoliberal anticipatory elites:

> *"the associations between these policy regimes and neoliberal urban environmentalism are often obscured or deliberately obfuscated. While climate change mitigation policies, and associated forms of carbon trading and ecological modernisation, bear the clear marks of neoliberalism, the market-based assumptions associated with adaption are often masked by a rhetoric of urban care, defence and protection."* (Whitehead 2013 p. 1349)

Bulkeley and Betsill (2013) also call attention to the importance of urban economies and their ongoing reconfiguration due to current pediod of economic restructuring through the realization of the low-carbon economy. The outcomes of such reconfiguration on society and are not clear and well addressed by academia in terms of equity and equality. This is why they assert that there is a need for research that address in detail the political economies and political ecologies of these procecess and question their implications on social and environmental justice (Bulkeley and Betsill 2013).

In conclusion, this chapter has outlined the problem that is sought to be investigated in depth by this thesis. Firstly, it presented the neoliberal logic behind the climate change mitigation agenda that seeks to address the problem through improving energy efficiency by fostering green growth and the emergence of a market. Secondly, it highlighted that – in theory – with the right alignment of policies, through energy efficiency improvements the environmental agenda of climate change mitigation could be used to leverage synergies with another social agenda (i.e. alleviating energy poverty). However, these synergies require more serious measures in order to avoid locking-in households in energy poverty which also mean that they demand high expenditure. Thirdly, it shed light to the criticism of other market based assumptions of the climate change agenda that question the effects of these on vulnerable citizens that cannot meet the requirements of the market.

This thesis intends to follow the criticism of Whitehead (2013) and Bulkeley and Betsill (2013) on the climate change agenda and investigate the topic of energy efficiency renovations of residential buildings which is also similar in characteristics to the logic of neoliberal urban environmentalism. In particular, it intends to address financial side of retrofitting by analysing how the UK attempts to address the financing gap in order to intensify investments in renovation and what are the effects of this on energy poverty as a matter of justice. The thesis seeks to address the previous by examining financial measures implemented by the UK Government to find out whether synergies are achieved with goals related to alleviating energy poverty.

3 Theoretical framework

The theoretical framework is built upon three interrelated sections that will serve as foundation for critical analysis:

1) **Neoliberalism in environmental governance**: this section will explain how environmental discussions are framed by the neoliberal logic.

2) **Critical urban theory and climate change**: this section will provide the critical perspective on the neoliberal ideology that shape urbanisation and strategies that are used to address climate change.

3) **Energy poverty as injustice**: this section will conceptualise justice in regard to energy poverty which will be used as the basis of the critique of the government's goal to increase energy efficiency investment in the residential sector.

3.1 Neoliberalism in environmental governance

The exploitation of nature has been long part of human history as natural resources have been and are vital to the survival and development of the human population (European Environment Agency 2016). The Enlightenment ideals followed the Christian mandate, where nature was seen as subordinate to humanity and simply a means to fulfil their needs. The task of humanity was to dominate and improve nature to better accommodate its needs and thus to create a human-made balance of nature (Disfor and Porcu 2014, Bruckmeier 2013, p. 23, Lepenies 1983, p. 547).

The dominance over nature has been intensified from the 18th century due to the spread of the liberal ideology that underpinned the development of economic policies in the western countries. As a result of that, Disfor and Porcu (2014) argue that:

> *"The faith in the positive action of economic voluntary trade reduced the environment to one resource, available to be indefinitely shaped by human desires. The economic capitalistic system translated the nature in monetary terms, a commodity in an immense accumulation of commodities."* (Disfor and Porcu 2014, p. 65)

This paradigm has been challenged by ethical arguments built on a variety of views and interpretations over the relationship between human and nature (Bruckmeier 2013). As a consequence, during the second half of the 20th century more attention was given in public debates to environmental concerns, with questions raised about the health of the planet and the well-being of people (Disfor and Porcu 2014).

However, the social movements that sought to bring light to these problems have also seemed to provide useful devices for spreading ideas that were driven more by economic interests such as the idea of sustainable development (Disfor and Porcu 2014). Consequently, despite over the recent years environmental concerns have been more and more addressed in western countries and have become part of their political and economic agenda, they have also been integrated into, and subordinated to, the overall objectives of the process of neoliberalisation (Disfor and Porcu 2014). Therefore, Bernstein (2000) argues that as a result of the convergence of liberal economic and environmental norms, their common norms have been institutionalised under 'liberal environmentalism' predicating the protection of the environment and the maintenance of the

economic order at the same time (Bernstein 2000). In order to understand the consequences of liberal environmentalism on how government policies are formulated why its critics find it problematic, at first the neoliberal idea of good governance and the process neoliberalisation needs to be explained.

Neoliberalisation is the process through which the neoliberal logic has been reproduced since it gained significance around the beginning of the 1980s. It was the strategic political response to the preceding global recession which articulated that the optimal mechanism for economic development consists of open and competitive markets which can be achieved through massive deregulation and decreased influence of the public sector (Brenner and Theodore 2002). At the ideological core of the neoliberal belief is to follow the free-market doctrines and attempt to create self-regulating markets by keeping state intervention to a minimum (Holifield 2007, Brenner and Theodore 2002).

This utopian vision of the free-market economic theory was most aggressively politicized in the UK and the USA by the Thatcher and Reagan administrations in the 1980s (Peck and Tickell 2002). This period that Peck and Tickell (2002) calls the "roll-out" of neoliberalism, consisted of dismantling the institutions of the Keynesian welfare state and rearranging the governments' activities to support the free market. The period of roll-out was followed by a period of "roll-back" in the 1990s which meant a reduction of the states' function and outsourcing public tasks to the private sector (Peck and Tickell 2002). Through these two periods, the neoliberal ideology has been stabilised, institutionalised and spread globally which is why Peck and Tickell (2002) argue that today neoliberalism is everywhere.

However, neoliberalism does not exist in a single, ''pure'' form. On the contrary, there are different versions of neoliberalism that actually exist due to historically and geographically different expressions of the same vision (Brenner and Theodore 2007). Consequently, Brenner and Theodore (2002) call attention to the contradictions of neoliberalism and the disjuncture between what the ideology says (i.e. the pure form articulated by the theory) and what has been realised in practice:

> *"On the one hand, while neoliberalism aspires to create a "utopia" of free markets liberated from all forms of state interference, it has in practice entailed a dramatic intensification of coercive, disciplinary forms of state intervention in order to impose market rule upon all aspects of social life […]. On the other hand, whereas neoliberal ideology implies that self-regulating markets will generate an optimal allocation of investments and resources, neoliberal political practice has generated pervasive market failures, new forms of social polarization, and a dramatic intensification of uneven development at all spatial scales."* (Brenner and Theodore 2002, p. 352)

It means that the "actually existing neoliberalism", as drawn up by Brenner and Theodore (2002), is higly distinct from the orthodox neoliberal ideology particularly because the operation of markets is not self-sustaining (Polanyi 1957, Brenner and Theodore 2007). Brenner and Theodore (2007) argue that opposite to what the economic theory suggested, rather than establishing a framework for sustainable development, neoliberalism exacerbates the political-economic crisis tendencies of capitalism. It does so by underpinning the systemathically emerging various forms of market failures and regulatory failures produced by capitalism (Jessop 1998, Brenner and Theodore 2007). Consequently, in order to survive, neoliberalism requires the constant construction and maintenance of regulatory arrangements (Polanyi 1957, Brenner and Theodore 2007).

Turning back to the topic of the environment, the emergence of liberal environmentalism and the integration of neoliberalism into discussions about the environment means three things. Firstly, an attention on the rule of markets and their ability to provide meaningful solutions to environmental problems. Secondly, a promotion of deregulation in order to allow markets to regulate themselves (McCarthy 2004, Disfor and Porcu 2014). And thirdly, a recognition and promotion of individuals' (i.e. consumers) responsibility in producing environmental issues and their responsibility in addressing this through changing their behaviour (Agrawal 2005, Disfor and Porcu 2014).

Consequently, this way of thinking turns environmental problems into a matter of production and consumption and therefore, solving these problems into a matter of "greening" the markets. As such, Disfor and Porcu (2014) argue that:

> *"Ecological modernization, as well as the ideologically analogous discourse concerning sustainable development, denies the existence of a trade-off between environment protection and the performances of economic systems. […] What has been for long an unsolvable conflict opposing environment protection and economic system development has resulted in a positive-sum game."* (Disfor and Porcu 2014, p. 66, citing Hajer 1995 and Dryzek 1997)

According to the environmental-economic paradigm, ecological questions need to be resolved by market mechanisms which require nature to become monetized (McAfee 1999, Disfor and Porcu 2014). Under this paradigm, ecological problems such as the depletion of resources, pollution or anthropogenic climate change are considered as external social costs that need to be internalised into the prices of the products that cause the problems. After these costs are internalised, market forces should solve the problem and lead to a greener economy. Although this thinking recognizes ecological issues and their human sources, its proposed solutions rely heavily on market forces and thereby suitable regulations and technological progress (Disfor and Porcu 2014). Consequently, this highlights the limitations of integrating environmental concerns into the neoliberal ideology i.e. that the concept of self-regulating markets is ambiguous in the sense of being able to provide growth while simultaneously taking the environment into account.

Despite this ambiguity, the norms of neoliberal environmentalism has been institutionalised, and thus a compromise between the agenda of environmental protection and the agenda of economic growth defines and guides international policy-making. However, Bernstein (2000) argues that although this compromise is probably the reason that enabled environmental concerns to gain prominence on the environmental agenda, its normative underpinnings have been largely ignored and left unquestioned (Bernstein 2000).

Climate change mitigation, as described in the previous chapter, is also closely intertwined with the green growth agenda. The logic behind seeing the fight against climate change as an opportunity to set a new growth path clearly bears the marks of the set of norms that Bernstein (2000) called as liberal environmentalism. As a part of the agenda of mitigating climate change, improving the energy efficiency of the building stock is also seen as an opportunity to increase economic activity and a problem that can be solved by creating the right market conditions. In order to challenge the neoliberal ideology that underpins this logic, a critical framework will be established in the following sections.

3.2 Critical urban theory and climate change

The agenda of green growth and the quest for establishing leadership due to the increasing level of urbanisation takes place more and more in cities, setting them in a key position in the competition for international capital (Ackermann 2010). They are the strategically important arenas where contestation materializes on different political agendas including climate change. Cities therefore play an important role in addressing climate change firstly because of their vast numbers of residents on areas threatened by climate change. And secondly, because their competitive advantage allows them profit from it. The idea of linking the issue of climate change with urban success under the umbrella of green growth has already been introduced[1] (Whitehead 2013). For this reason, this thesis uses critical urban theory as a basis for the critique of governments' goal to increase the energy efficiency of the residential building stock, which represents contemporary climate change mitigation strategies that are built upon the neoliberal ideology. In the following, it will be explained why cities can be used to investigate the topic (or in order words, why critical *urban* theory will be used throughout the thesis) and how critical urban theory can help in addressing it.

*Why critical **urban** theory?*

Capitalist cities have long been criticized by Marxist scholars for being crucial sites for strategies of capital accumulation, envisioning and mobilizing a profit-driven urbanization with relentless commodification and re-commodification of urban spaces (Brenner, Marcuse and Mayer 2009). Due to being the sites of capital accumulation and the process of globalisation, the competition between them has been escalated to a global scale leading to the emergence of what Sassen (2005) has coined as 'global cities':

> *"Global cities around the world are the terrain where a multiplicity of globalization processes assume concrete, localized forms. […] The large city of today has emerged as a strategic site for a whole range of new types of operations—political, economic, "cultural," subjective. It is one of the nexi where the formation of new claims, by both the powerful and the disadvantaged, materializes and assumes concrete forms."* (Sassen 2005 p. 40)

As being sites where such a process happens, Brenner and Theodore (2002) argue that that cities have become the strategically important arenas where the process of neoliberalisation and its initiatives take place (Brenner and Theodore 2002). The topic in the recent decades has been well addressed by critical Marxist scholars who emphasized its consequences on urban life. One of the most significant arena where the limits of profit-based forms of urbanism has been illuminated is in the case of growing problems arising from the hypercommodification of land and social amenities such as utilities (Brenner, Marcuse and Mayer 2009).

The field of critical urban studies emerged from the debates on the urban question in the late 1960s and early 1970s that challenged the mainstream Chicago School of thought and illuminated contemporary urban challenges and struggles (Brenner, Madden and Wachsmuth 2011). One of the main goals of critical urban theory is make noteworthy contributions to mainstream ideas of the urban – that are based on the neoliberal ideology – by revealing the outcomes of the

[1] For more see Matthew E. Kahn's book 'Climatopolis: How Our Cities Will Thrive in the Hotter Future' (Kahn 2010) and its criticism by Mark Whitehead (Whitehead 2013)

sociospatial transformation that is generated by the process of urbanisation. Brenner (2009) highlights why studying the outcomes of urbanisation such as uneven spatial development is becoming more and more important today:

> *"Urbanization no longer refers simply to the expansion of the 'great towns' of industrial capitalism, to the sprawling metropolitan production centers, suburban settlement grids and regional infrastructural configurations of Fordist–Keynesian capitalism, or to the anticipated linear expansion of city-based human populations in the world's 'mega-cities'. Instead, as Lefebvre (2003 [1970]) anticipated nearly four decades ago, this process now increasingly unfolds through the uneven stretching of an 'urban fabric', composed of diverse types of investment patterns, settlement spaces, land use matrices and infrastructural networks, across the entire world economy."* (Brenner 2009, p. 205 citing Lefebvre (2003 [1970]))

Hence, according to Brenner (2009), the growing importance of the sociospatial transformation generated by urbanisation is due to its global scale. While in previous decades the uneven outcomes of capitalist development were confined to certain geographies, today these "barriers" no longer exist (Brenner 2009). That is why Brenner (2009) argues that the urban today is condition that has been generalised and facilitates capital accumulation at a planetary scale. It is because of this ubiquitousness of urbanism as a condition that defines human society why critical theory for Brenner is necessarily a critical *urban* theory (McFarlane 2011).

Following this track of thought, Brenner, Madden and Wachsmuth (2011) argue that:

> *"Even though the urban process has taken on new forms in its planetary mode, […] it remains a fundamentally capitalist urban process. […] [T]his dimension of urbanization—mediated, of course, through state institutions, diverse social forces and systemic crisis tendencies at all spatial scales—figures crucially in producing and reproducing contemporary geographies of deprivation, dispossession and marginalization, both within and among urban regions throughout the world."* (Brenner Madden and Wachsmuth 2011, p. 237)

Therefore, cities and the discussions about urbanism in this sense reflect the organisation of contemporary capitalism (Farías 2011) and thus they are able to serve as sites where the structures of political economy can be observed. Scholars of critical urban theory therefore study capitalist cities and their sociospatial forms which are organised and reorganised frequently with the intention of increasing their profit-making capacity and the accumulation of capital (N. Brenner 2009).

How can the topic be addressed by critical urban theory?

The origins of critical urban studies go back to the modern idea of critique which has gained its significance through Marx's critique of political economy that sought to formulate a critique of ideas and discourses about capitalism and intended to develop alternatives to capitalism (N. Brenner 2009, Postone 1999). In Marx's dialectical conception, in order to develop alternatives, *"a key task of critique is to reveal the contradictions within the historically specific social totality formed by capitalism"* (Brenner 2009, p. 199). Building on Marx's conception, critical urban theory rejects market-oriented and market-driven forms of urban knowledge and views the city as non-static urban space that is socially contested by politics and different ideologies. Pointing at the

normative nature of current urban practices, it emphasizes what Brenner (2009) calls *"the disjuncture between the actual and the possible"* (Brenner 2009, p. 198). But most importantly, by rejecting the urban form as something that is fixed, it asserts that urbanization can be different (Brenner 2009):

> *"[C]ritical urban theory involves the critique of ideology (including social–scientific ideologies) and the critique of power, inequality, injustice and exploitation, at once within and among cities."* (Brenner 2009 p. 198)
>
> *"[It is] grounded on an antagonistic relationship not only to inherited urban knowledges, but more generally, to existing urban formations. It insists that another, more democratic, socially just and sustainable form of urbanization is possible, even if such possibilities are currently being suppressed through dominant institutional arrangements, practices and ideologies."* (Brenner 2009 p. 198)

Although, the common aim is clearly set, the field of critical urban theory is broad and there is no clear theoretical, methodological or political consensus among scholars working in the field. Nevertheless, there are some general approaches shared in critical urban studies, for example those that intend:

> *"to examine the changing balance of social forces, power relations, sociospatial inequalities and political–institutional arrangements that shape, and are in turn shaped by, the evolution of capitalist urbanization"* (Brenner, Marcuse and Mayer 2009 p. 179), or
>
> *"to expose the marginalizations, exclusions and injustices (whether of class, ethnicity, 'race', gender, sexuality, nationality or otherwise) that are inscribed and naturalized within existing urban configurations."* (Brenner, Marcuse and Mayer 2009 p. 179)

In general, critical urban theory provides an onthological framework that can be used as a tool to explain the sociospatial, political– economic context and institutional arrangements, practices and ideologies that surround urban society and which constrains the agency of local social forces. The concepts structures (i.e. political and economic structures and institutions) are therefore central for critical urban theory as they are considered the central forces that define constraints on society and impede the possibility of social transformation (N. Brenner 2009, Brenner, Madden and Wachsmuth 2011).

According to Whitehead (2013), critical urban theory can contribute to the work on the city and climate change in addition to the current practices that are following positivist thinking in two ways. Firstly, it leaves behind the thinking of a city as an onthological location and offers an understanding of them as sites for political and economic processes. Secondly, it reveals how urbanism could be different by challenging current work on climate change that is framed by neoliberal orthodoxy and where neoliberalism itself remains unproblematised (Whitehead 2013).

Whitehead (2013) asserts that *"it is neoliberalism that now delimits the present urban condition and the conditions of possibility for the climatisation of urban policy"* (Whitehead 2013 p. 1354). That is to say, that imagination of alternatives to capitalism is delimited by structural constraints on social change because of the continuous penetration of the neoliberal logic (Brenner 2009). Urban order is therefore being conditioned on the one hand by climate change and the consequent fear of an ecologic crisis and, on the other hand, an urban climate polity constructed by a neoliberal logic and thereby a market-oriented governance (Sassen, Cities are the centre of

our environmental future 2010, Whitehead 2013). Critical urban theory can be used connect climate change policy the processes of the global market, finance and interurban competition that is associated with neoliberalism and as such it can be used to challenge the orthodoxy of neoliberalism and reveal how urbanism could be different (Whitehead 2013).

Still, Whitehead (2013) claims that neoliberalism should not be regarded as the main and only source of the problem and as such, we should not simplify the otherwise complex problems of urbanisation and climate change. On the contrary, the diverse nature neoliberalization should be respected which helps to draw attention to the process itself, which is a series of periodic contradictions that is (often partially) resolved through geographically dispersed trials and experimentations (Whitehead 2013). Therefore, Whitehead indicates that critical urban theory – as a process of normative abstraction – should propose alternatives by exploring contradictions and thus exposing the weaknesses of current practices of urban capitalism (Brenner 2009, Whitehead 2013).

One of the weaknesses derives from the gap between the required financial capital to address climate change and the available public fuds. Because of this, solutions for climate change mitigation or adaptation are market based, and aimed at connecting these solutions with revenue-generating opportunities for private investors with the intention to tap into private capital (Whitehead 2013). In the case of the residential sector, private investors are households and tapping into private capital means that either households use their own savings or take out a loan to improve the energy efficiency of their homes. This approach is built upon a neoliberal assumption what Davis (2010) calls as a 'spontaneous decarbonisation' (Davis 2010, Whitehead 2013) that will eventually solve the climate change problem if the right market conditions are realised. Given the right conditions, it suggests that the international economy will naturally produce the required socio-technical solutions by the help of entrepreneurs leveraging international private financial capital (Whitehead 2013).

However, from a critical perspective, this strategy incorporates a great threat due to the shift in responsibilities from the public to the private side which can lead to a new round of privatisation in the city. Because the nature of these markets are uncertain, privatisation can not only expose municipalities to private-sector competition, but also to the risk of private-sector failure (Whitehead 2013). On the other hand, this market-based solution can be alarming for households who cannot finance to upgrade the energy efficiency of their homes either because they do not have enough savings or because they do not meet banks' credit criteria.

Whitehead (2013) points at the problems of capitalism at the structural level, that this neoliberal mode of climate change governance facilitates the emergence of a new form capital accumulation:

> *"that contemporary urban mitigation and adaptation policies are as much about the search for a tertiary circuit of ecological accumulation, into which the overaccumulation crises of existing circuits of capital can be temporarily displaced, as they are about addressing the dangers of climate change."* (Whitehead 2013 p. 1361-1362)

This leads to realisation that after all, the neoliberalist agendas of mitigation and adaptation are built upon the necessity of continuous economic growth (Whitehead 2013) disregarding the possible adverse socioeconomic consequences and the question of whether continuous growth is sustainable.

Consequently, as illustrated above, critical urban theory can be effectively used to shed light on these contradictions. But most importantly, by drawing attention to the contradictions of capitalism and by illuminating the possibilities of alternatives, it can provide us with other strategies that can take other non-financial factors into account and achieve more effective and just forms of climate change mitigation and adaptation (Whitehead 2013). Therefore, Whitehead (2013) argues that urban adaptation presents an opportunity to address climate change and other related topics as injustices through redistribution:

> *"Climate change is reconfiguring urban politics and it is critical that neoliberal anticipatory elites are not able to exploit the urban future as a basis for controlling the metropolitan present"* (Whitehead 2013 p. 1364)*,* therefore *"[a] key part of this process [of providing alternatives] is distinguishing between urban adaptation as a series of competitive assets and its potential role as a basis for socioecological redistribution and compensation."* (Whitehead 2013 p. 1364)

In light of this, building on Whitehead's (2013) argument, this thesis seeks to shed light on the contradictions of capitalism by analysing the government's policies that intend to increase energy efficiency in the residential sector. To reveal the contradictions, the ongoing practice will be analysed based on the conceptualisation of justice in the case of energy poverty which conceptualisation will be established in the following section.

3.3 Energy poverty as injustice

The urban planning profession since its beginning was about visions of a good city and efforts aimed at realising those. While the 'good' is always central, the understanding of what exactly a good city can vary wildly. Therefore these visions and approaches can differ in their orientation toward democracy, in their content and in their distributional outcomes (Fainstein 2011). Different visionaries, such as Ebenezer Howard, have made their arguments in defining the good city creating every now and then common ideals and collaborations between people with the ambition to reach a common goal. Today the emphasis is on the pursuit of economic competitiveness which is at the centre of all levels of decision making. However, critics argue that its objectives, which were exacerbated as a result of the global financial crisis, are giving a priority to growth and restore the economy at the expense of other environmental and social concerns (Fainstein 2011). Taking a critical perspective, one could argue that the market-based approach to increase energy efficiency in the residential sector is also such an agenda that focuses on growth at the expense of social concerns. This will be explained in the following.

As it has been elaborated in the previous section, critical urban theory involves inter alia the critique of injustices and "*insists that another, more democratic, socially just and sustainable form of urbanization is possible"* (Brenner 2009 p. 198). However, there is no uniform definition of what can be considered just that everyone agrees with. The ongoing discussion about defining the term social justice has involved theorists from both liberal (e.g. John Rawls and Martha Nussbaum) and Marxist (e.g. David Harvey and Henri Lefebvre) sides in the last 60 years (Paddison 2009, Ibsen, Richner and Udvari 2015). Therefore, defining energy poverty in relation to social justice can also be done in different ways. Walker and Day (2012) argue that energy poverty as an issue of injustice has to be understood in multiple interconnected ways. While it is essentially a result of complex distributive issues, other forms of injustices also play a role in creating and sustaining energy

poverty, such as procedural injustice and injustice arising from the lack of recognition of the problem (Walker and Day 2012).

Although energy poverty is understood differently in the context of the global South and the global North (as it has been explained in chapter 2.3), both understandings rely on the positive association between energy consumption and well-being. In the context of the UK and the global North the relationship between well-being and energy is addressed through thermal comfort. According to the latest definition, which reflects the rule of "Low Income High Costs", a household in the UK is considered energy poor if 1) *"they have required fuel costs that are above average (the national median level)"* and 2) *"were they to spend that amount, they would be left with a residual income below the official poverty line"* (Department of Energy & Climate Change 2015). Therefore, the fundamental concerns here are about the affordability of energy as service and with heating in the centre of attention. In this view, the relationship between energy and wellbeing is articulated through the excess winter mortality caused by the lack of adequate energy service provision (Day, Walker and Simcock 2016).

Conceptualising energy use and energy poverty using a capabilities approach

Day, Walker and Simcock (2016) claim that the dominant discourse of energy poverty leaves other issues under-explored and weakly acknowledged such as issues of cooling in the summer or the difference in individuals' needs. Therefore they put forward a different conceptualisation of energy consumption and energy poverty using the capabilities framework developed by Amartya Sen and Martha Nussbaum.

Capability theory challenges the concept of measuring development in terms of increase in household income or GDP because it fails to recognise other factors that are crucial to life. Rather, Sen and Nussbaum argue that measuring human development should focus on individuals' abilities (i.e. what they are capable of to do and do not) by taking a broader spectrum of factors into account (Day, Walker and Simcock 2016). Therefore, the capability approach emphasizes individuals' differences in their ability to utilize resources and focuses on the quality of life that individuals are able to achieve (Wells 2016). Consequently, in Sen's view:

> *"[t]he poor within a society are defined as those unable to achieve a minimum capability set of elementary functionings, like the ability to be well-nourished or to have access to education."* (Rippin 2012, p.3)

The two concepts central to the capability approach are functionings and capability. Functionings are states of 'being and doing' including states such as being well-nourished, being housed or being educated, and activities such as undertaking paid work, travelling or consuming fuel to heat a home (Day, Walker and Simcock 2016, Robeyns 2011). Whereas capability refers to the set of valuable functionings that can be accessed by a given individual. In other words, capabilities represent the opportunities and freedoms to achieve certain beings and doings. Thus the difference between the two terms is that while functionings are realized, capabilities are effectively possible (Robeyns 2011, Wells 2016).

In this sense, poverty represents a deprivation of capabilities that can influence individuals to achieve certain valued functionings. As such, Rippin (2012) argues that the capability approach can be best used to identify capability failures and highlight their causes:

> *"From a justice perspective, the capability approach's relevance […] is to argue that if people are falling short on a particular capability that has been collectively agreed to be a significant one, then justice would require addressing the shortfall itself if at all possible, rather than offering compensation in some other form, such as increased income."* (Wells 2016)

Consequently, according to Sen, seeking distributional justice should move beyond attempts of providing equal access to primary goods such as income and address capability failures (Walker and Day 2012, Sen 2009, Sen 1999). Injustices are therefore evaluated in in the capability space which means that the evaluation is based on individuals' capabilities rather than their income or other primary goods (Day, Walker and Simcock 2016, Rawls 2009). Translating the Rippin's (2012) definition of poverty under the capability approach to the case of energy, individuals being in energy poverty does not mean that they are unable to meet a certain level of energy use but rather it means that they are being excluded from opportunities that can enable them to choose and obtain welfare according to their needs (González-Eguino 2015).

At its core, energy poverty is a matter of unequal distribution of three main contributing factors: energy prices, households' income and the energy efficiency of their homes (Walker and Day 2012). In this understanding households are exposed to energy poverty where the income is below a certain level in relation to energy prices while energy efficiency is also an important factor as it can reduce utility bills.

However, under the capabilities approach, households' energy demand should be understood as demand for energy services (such as lighting, cooking heating and cooling) which is a perquisite to achieving valued capabilities. Figure 3 explains this conceptual relationship, and introduces the concepts of basic and secondary capabilities. In this understanding, basic capabilities are those that are substantial for humans (e.g. maintaining good health) while secondary capabilities are more concrete which can be seen as materialisations of basic capabilities (Day, Walker and Simcock 2016, Smith and Seward 2009, Sovacool, Sidortsov and Jones 2014).

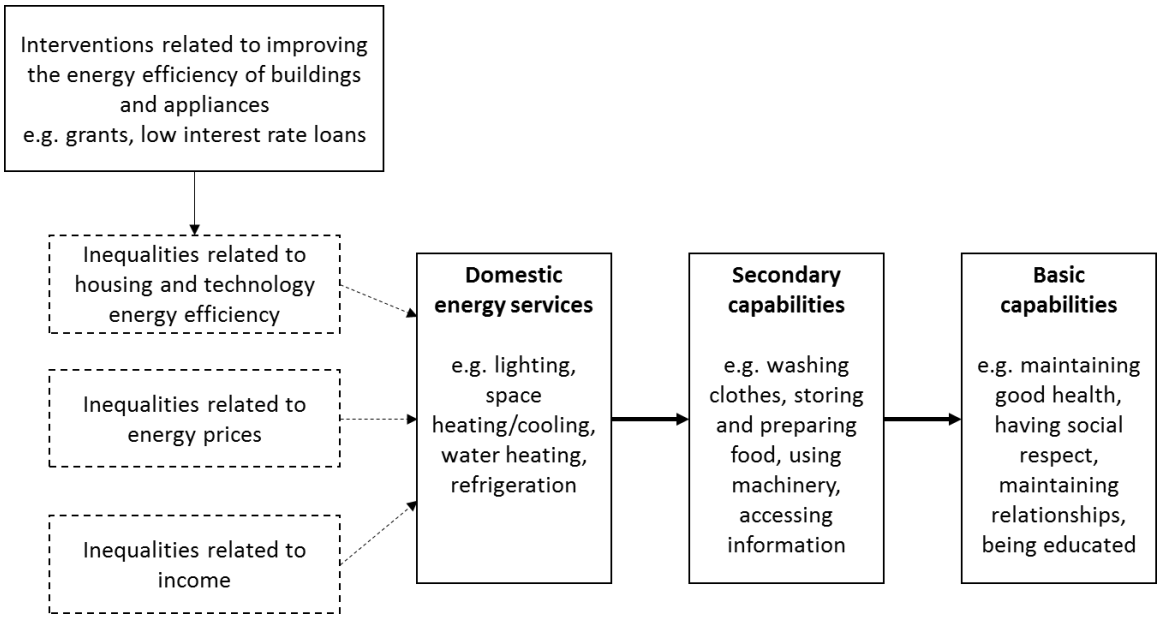

Figure 3: Conceptual relationship between the sources of distributional injustices that influence domestic energy services, the intervention related to inequalities in buildings' energy efficiency, and the outcomes of energy services. Interventions target inefficient buildings with grants and loans that can be taken up by households to improve the efficiency of domestic energy services which in turn affects their secondary and

basic capabilities. Source: own elaboration, building on figures and elaborations of *(Day, Walker and Simcock 2016)* and *(Walker and Day 2012)*.

So, in this understanding, injustices arising from the three factors affect energy services which then in turn influence secondary and basic capabilities. For example, lower household incomes or worse energy efficiency of the building means that a higher fraction of the household's income has to be spent on energy services in order to maintain the same level of outcomes. However, that also means that a less amount of income remains disposable for the household to achieve the other capabilities. Following this conceptualisation, interventions such as providing financial support for a household to improve its building's energy efficiency should be understood as a means for a household to achieve certain capabilities.

Conceptualising the mechanism that is designed to improve energy efficiency in the residential sector and its relation to alleviating energy poverty

As the previous section has illustrated, the capability approach – as a normative theory – can be used to conceptualise notions such as poverty or energy poverty. It is not an explanatory theory, hence it cannot be used to explain energy poverty, well-being or injustice. However, the conceptualisations produced through this approach can be used as components of other explanations (Robeyns 2011). This section will describe how this approach and the conceptualisation of injustices related to energy services and their outcomes can be utilised in the topic of this thesis.

One of the most important features of the capability approach is that it allows interpersonal comparisons of well-being and thereby it can be used as a normative framework for policy analysis. Whereas in the narrower use it focuses on the evaluation of individual levels of capabilities, in its broader uses it can also include other normative considerations such as procedural fairness (Robeyns 2011).

By providing a normative framework, the capability approach can be used for evaluating policies based on their impact on individuals' capabilities and functionings. By its very nature it concentrates on the *ends*, opposing the particular focus of previous approaches (e.g. the Rawlsian social primary goods approach) on *means* to well-being. Therefore, making a distinction between means and ends is central to the capabilities approach (Robeyns 2011).

It asks for example whether people's resources and capabilities (in this case affordable energy services) are present which allow them to maintain a good health through access to secondary capabilities such as washing clothes and cooking. Here the focus is on ends i.e. what people can actually do. Sen illustrates why ends should be in the centre of attention through the example of a bicycle. As a means, a bicycle can hold the opportunity to provide transportation, but only for a person who is able to ride it. For a person who is unable to ride it due to being handicapped the bicycle is useless for transportation which would the reason for using a bicycle on the first place (Wells 2016). Therefore, a significant factor is the individual's ability to convert means into valuable opportunities (capabilities) or outcomes (functionings) (Robeyns 2011, Sen 1992). As Figure 4 illustrates, the capabilities (or capability set) that defines what functionings can be achieved are subject to the individual's ability to utilize the available resource. Using the bicycle again as an example: although the bicycle (resource) is available, if the person is not able to ride

it (cannot utilize it) then no opportunities (capability set) will be made available for that person and at the end he or she cannot realise actual functionings (Wells 2016).

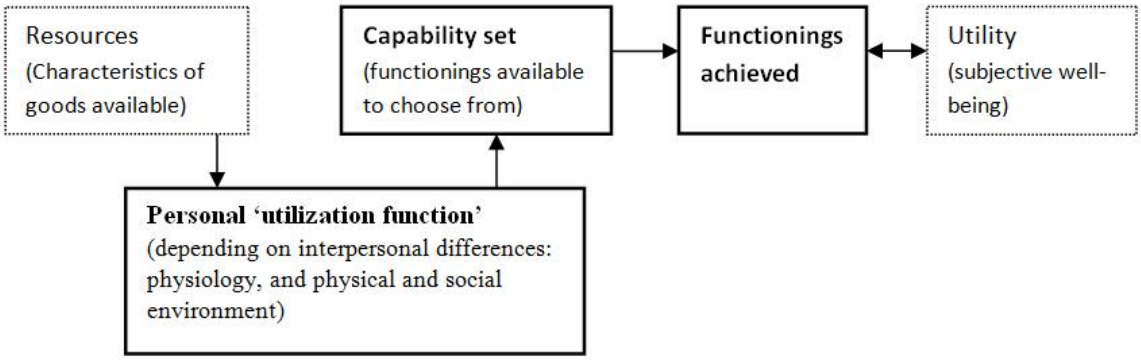

Figure 4: Outline of the core relationships in the capability approach highlighting that whether someone can utilise the available resources or not into valuable capabilities depends on the individual's personal utilisation function. Consequently, the availability of certain resources does not necessarily mean that people can convert those means into valuable ends which indicates the existence of potential differences within society even if the same resources are available for all *(Wells 2016)*. Source: *(Wells 2016)*

Consequently, the focus of the capability approach on ends rather than means is firstly because it considers ends as what ultimately matter for people. Secondly it is because capability scholars claim that inter-individual differences are significant because they cause different outcomes for different individuals even if the means are the same (Robeyns 2011).

However, the capability approach does not solely focus on ends but rather on the question of whether a person is in the right conditions where he or she is able to realize his or her ends (Robeyns 2011). Therefore, in the case of a bicycle, the question is not whether somebody is utilising it as a means of transportation. The question is rather whether this person has a bicycle and whether he or she is *able to* convert the bicycle into valuable capabilities. Ultimately, what is not relevant for the capability approach is whether this person decides to use the bicycle for transportation or not.

Consequently, the capability approach includes a criticism of the Rawlsian resourcism that stresses the importance of equal access to resources as the most significant determinant of people's well-being. Contrarily to Rawls' account of fair distribution of primary goods, Wells (2016) argues that:

> *"Sen's central argument is that resources should not be the exclusive focus of concern for a fairness-based theory of justice, even if, like Rawls's primary goods, they are deliberately chosen for their general usefulness to a good life. The reason is that this focus excludes consideration of the variability in individuals' actual abilities to convert resources into valuable outcomes. In other words, two people with the same vision of the good life and the same bundle of resources may not be equally able to achieve that life, and so resourcists' neutrality about the use of resources is not as fair as they believe it is."* (Wells 2016)

Therefore, the capability approach can address this deficit and include in the evaluation also the fairness of a procedure by not only focusing on the distribution of resources but also on the relationship between the resources and people (i.e. how they can utilise resources). Moreover, diagnosing capability failures is also useful to shed light on the relevant causal pathways that are

responsible for creating these failures and thereby highlight deeper problems that influence certain parts of the society (Wells 2016).

Consequently, the most important reason for using this approach in this thesis is that it can *reveal interpersonal differences* by focusing on people's capability to achieve certain ends rather than solely evaluating means. Thus, I argue that it can supplement critical urban theory. As it has been explained, critical urban theory can be used as an onthological framework to explain the structures of political economy (e.g. economic structures, institutional arrangements, practices and ideologies) that surround society and constrains individuals' agency. From the perspective of the capability approach, these structures influence what resources are available for people.

While critical urban theory can explain what is outside of an individual's reach, the capability approach can be used to explain what is within his or her reach by illuminating to what extent they are able to utilise the available resources for their own prosperity. So altogether they can be used to describe both external factors and internal factors that influence the ability of people to achieve certain functionings. But most importantly, the capabilities approach can reveal the interpersonal variations and thereby individuals' different abilities to access resources which is critical to reveal injustices arising from policies that fail to recognise these individual differences.

Although the focus of the thesis is on the provision of resources (i.e. grants and loans) for energy efficiency improvements rather than ends, the capability approach is applicable because as Robeyns (2011) argues:

> *"the normative focus on ends does not imply that the capability approach does not at all value means such as material or financial resources. Instead, a capability analysis will typically also focus on resources and other means. […] In sum, all the means of well-being, like the availability of commodities, legal entitlements to them, other social institutions, and so forth, are important, but the capability approach presses the point that they are not the ends of well-being, only their means."* (Robeyns 2011)

In light of this, using the capability approach allows this thesis to step forward from analysing whether resources (i.e. grants and loans in this case) are available for all to investigating how these resources can be utilised by different individuals. Figure 5 illustrates the conceptualisation of the process of a mechanism that is designed to improve energy efficiency in the residential sector[2], and its relation to alleviating energy poverty.

[2] As it has been elaborated in the problem formulation chapter, advocacy groups such as the Energy Efficiency Financial Institutions Group suggest that governments should encourage household investment in energy efficiency by providing grant schemes and offering loans preferably with the possibility of on-bill financing and interest rates below the market. The basis of this conceptual model is this mechanism.

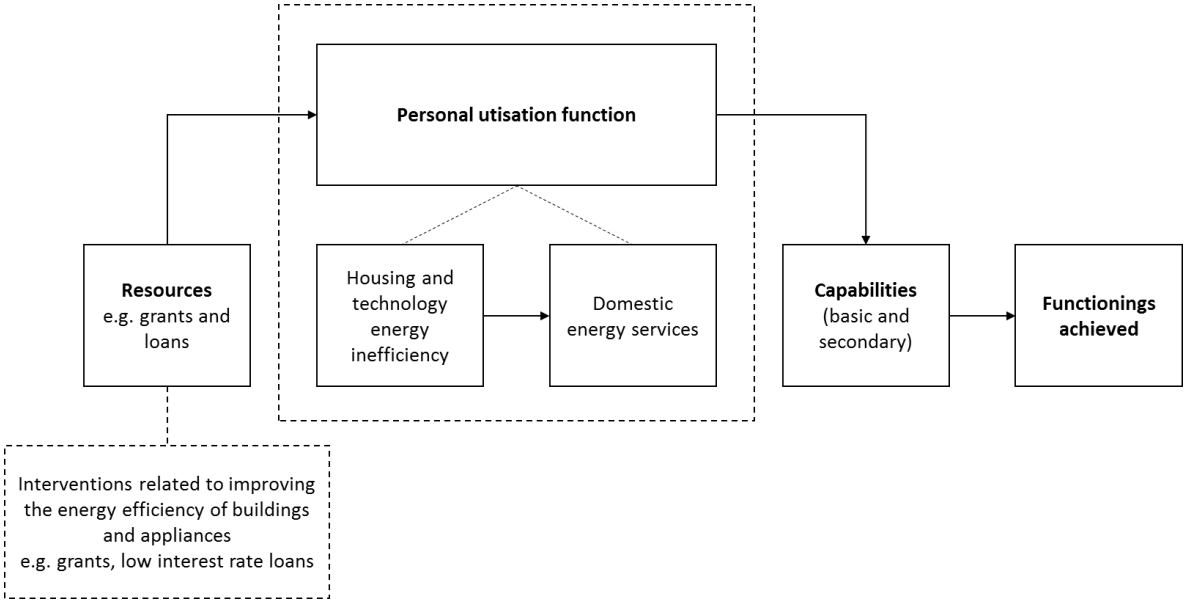

Figure 5: Conceptualisation of the process of a mechanism designed to encourage households to improve the energy efficiency of their homes through offering grants and loans, and its relation to alleviating energy poverty illustrated by its ability to provide access to valuable capabilities for households. Source: own elaboration

This conceptualization allows dividing the process of the mechanism into two parts from the perspective of individuals. The left side of the figure shows the resources that households can convert into valuable capabilities and achieved functionings. From the perspective of individuals, resources are external factors of the mechanism because they are independent from them. Resources are grants and loans provided by governments with the intention to encourage households to implement energy efficiency measures in their buildings. Governments decide the form of these resources, however as it has been explained, their decisions are influenced by the ideology of neoliberalism. The neoliberal ideology stresses market-based interventions as the correct form of interventions and thus puts constraints on the form of available resources.

However, it is up to households' utilisation functions whether they can convert resources (i.e. loans and grants) into valuable capabilities. These are the internal factors of the mechanism because they are dependent on households' competencies. By improving the energy efficiency of their homes, households can provide themselves a greater amount of energy services for the same amount of supply. Therefore by producing better outcomes in energy services, or reducing their costs, energy efficiency improvements influence what valuable capabilities are available for households. Consequently, the utilisation function of a household depends on their ability to take up loans and grants offered by the government in order to finance energy efficiency measures.

4 Research question

This chapter intends to formulate a research question based on (1) the topic of improving the energy efficiency of residential buildings that was outlined during the problem formulation chapter, and (2) the theoretical framework which established a critical proposition against the previous, using critical urban theory and the conceptualisation of justice with regards to energy poverty.

Throughout the thesis, the following research question will be investigated:

What effects did the neoliberal practice of improving the energy efficiency of residential buildings by using financial measures had regarding alleviating energy poverty as a matter of social justice in the United Kingdom?

Firstly, the main goal of the thesis is to formulate critique of neoliberal governance practices by illuminating their contradictions. In order to this, the effects of ***financial measures*** used in the residential sector to improve the qualities of buildings in regards of energy efficiency are going to be investigated. These financial measures include, on the one hand, loans and grants offered for households to improve the energy efficiency of their homes. Furthermore, it also includes their related programmes such as informational programmes intended to enhance the take up of these financial measures.

Secondly, the effects of financial measures will be investigated in relation to their potential to ***alleviate energy poverty*** which means two things in terms of operationalising the research question. At first, the analysis will examine whether the measures are suitable for low-income households i.e. whether they can influence low-income households to consider improving the energy efficiency of their home. The second thing that will be considered is the same question but in particular to low-income households' ability to enact deep energy retrofits which are, as explained in the previous chapters, essential to provide permanent solution for energy poverty.

Thirdly, the concept of ***social justice*** will be used throughout the analysis. It means that the previous questions will be investigated by using a capabilities approach which has been established in the theoretical framework. It will be considered whether all households have the same opportunities to use the available resources (i.e. loans and grants) to invest in energy efficiency after the financial measures are implemented, or whether internal factors (i.e. interpersonal variations) create different opportunities for different households at different income levels. Then the justness of financial measures will be evaluated based on how they take into account the above described interpersonal differences, and on their ability to alleviate energy poverty.

5 Methodology

Yin (1994) argues that doing a case study is the right approach when the how and why questions are posed. This is not the case in this thesis, however a case study approach might prove to be beneficial due to the comprehensive theoretical framework that drives this report. As Yin (2009) formulated it:

> *"The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points and, as a result, relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result, benefits from the prior development of theoretical propositions to guide data collection and analysis".* (Yin 2009, 18)

Therefore, it can be used to study a real-life phenomenon based on a previously established theoretical framework by analysing a variety of different sources. Using a qualitative case study approach allows the researcher to analyse a given problem within its actual context (Baxter and Jack 2008). Moreover, a qualitative case study allows the researcher the interpretation of data which creates flexibility in conducting (Kohlbacher 2006, Cassell and Symon 1994). Cassell and Symon (1994) list the most important characteristics associated with qualitative case studies (Kohlbacher 2006):

> *"a focus on interpretation rather than quantification; an emphasis on subjectivity rather than objectivity; flexibility in the process of conducting research; an orientation towards process rather than outcome; a concern with context—regarding behaviour and situation as inextricably linked in forming experience; and finally, an explicit recognition of the impact of the research process on the research situation"* (Cassell and Symon 1994, p. 7)

Due to these features, qualitative case studies provide a multi-dimensonal perspective (Kohlbacher 2006, Remenyi, et al. 2002, 5) and enable researchers to deal with complexity and integrate context through the theory guided analysis (Kohlbacher 2006).

On the contra side, due to its flexibility in terms of interpretations, qualitative case studies also involve the issue of normativity and its weakness lies in its strength of being theory heavy. The normative notion of justice could raise critical questions from other researches about the scientific reliability of this thesis. Critical urban theory, being also a theory based on normative grounds, can be used to provide an external critique i.e. to formulate criticism on the basis of normative values (Ibsen, Richner and Udvari 2015, Weber 2012). However, this implies that results of this thesis can be criticised by questioning the appropriateness of the set of normative rules that were the basis of the analysis. Keeping this in mind, the following section presents the research design.

Research design

Figure 6 illustrates the research design. The left side of the figure shows the sources of information that is used throughout the report. These sources include academic articles, reports and semi-structured interviews.

As explained in the previous section, the design of the research heavily reflects the conceptualisations developed in the theoretical framework by using the capabilities approach. The first part of the analysis is, on the one hand, used to provide an understanding of financial measures and important concepts related to loans and finance. On the other hand, it is used to determine the interpersonal differences between households based on their income levels (i.e. it is investigated what differences exist in terms of the ability utilise available resources between a low-income household a household with an average income).

These outcomes are used in the second part of the analysis. This part presents the actual financial measures used in the UK and evaluates those critically based on the outcomes generated by the first part of the analysis (i.e. the capabilities approach is used to evaluate of the justness of the measures based on individuals' ability to utilise the available resources).

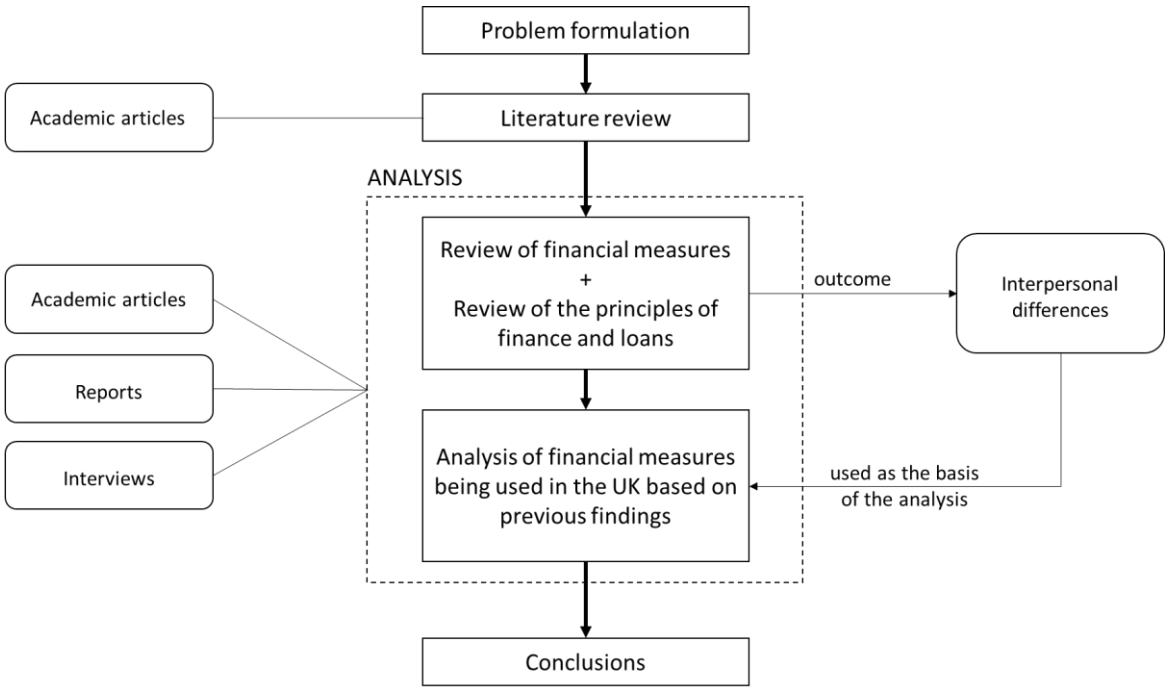

Figure 6: Illustration of the research design representing the methodology that will be used in the thesis. Source: own figure

6 Analysis

The analysis chapter is divided into three main sections. The first section is dealing with the financial barriers to investments in energy efficiency in the residential sector and introduces the taxonomy of the economic instruments that are used by governments to overcome those financial barriers. At the end of this section, the factors will be presented that can influence low-income households' utility functions i.e. their ability to utilise the resources provided by economic instruments. In the second section, the economic background of finance and loans (i.e. the basic principles of monetary policy and interest rates) will be discussed in order to provide an economic understanding. It will be used thereafter to analyse financial instruments and to link finance with the critique of neoliberalism that was discussed in theoretical framework. The next section will focus specifically on analysing how financial instruments have been realised in the UK and how successful they might have been in alleviating energy poverty based on the capabilities approach established in the theoretical framework. The last section will provide a critical analysis of financial measures used in the UK.

6.1 Financing energy efficiency investments

In this section energy efficiency investments will be elaborated in the building sector and in particular residential buildings. At first, the reasons for investing in energy saving measures and difficulties associated with such investments will be discussed in general. This is followed by a detailed description of the barriers that are impeding household investment in energy efficiency. Lastly, economic instruments will be presented that can be used to overcome these financial barriers.

6.1.1 Energy efficiency investments in general

The reason for investors to invest in energy efficiency, similarly to any other investment types, is to achieve returns on their investments. These returns may take different forms such as monetary savings, increased profits or additional value created through improved comfort (International Energy Agency 2015). However, the International Energy Agency Energy (2015) argues that most of the created value is delivered by the ongoing stream of monetary returns generated by avoided energy consumption:

> *"Avoided energy consumption – i.e. the volume of energy saved through energy efficiency improvements – is central to most of the benefits generated by energy efficiency investments. It can be calculated as the volume of joules or tonnes of oil equivalent (toe) not needed following efficiency improvements to acquire a similar level of energy service. In this way, energy efficiency delivers to the original investor a monetary "return" (a value) that reflects market prices."* (International Energy Agency 2015, p. 25)

Besides a monetary value for the original investor, energy efficiency investments can also provide wider benefits for the society as a whole. It has been demonstrated that end-users' small-scale improvements in efficiency has contributed to the steady improvement of the overall energy intensity. However, defining and measuring these "returns" precisely is difficult. Therefore, the

benefits resulting from the avoided consumption and the consequent decrease in the required production capacity remain predominantly unnoticed (International Energy Agency 2015).

The difficulty of formulating a clear definition for energy savings is a result of its very nature, i.e. that savings represent energy that has *not been consumed*, therefore for example in the case of loans there is no single asset on which to base the loan. Measuring savings is also difficult compared to the simplicity of calculating consumption. It is because savings, or the lack of consumption, cannot be measured directly, instead it can only be estimated by using more or less complex and questionable protocols (United Nations Development Programme 2010). The complexity of making estimations is in part caused by the uncertainties in drawing up future "what would have happened" scenarios and the uncertainty in consumers' future behaviours:

> *"It is always difficult to define the baseline case (i.e., what would have happened without the energy efficiency programme), as it is to estimate the number of 'free riders' (i.e., the number of people who would have adopted energy efficiency in the absence of the programme). Another source of uncertainty is the extent of the 'rebound effect', that is, the extent to which consumers will opt to use their increased energy efficiency to improve their comfort level (for instance, by turning up their heating) rather than to decrease their energy consumption."* (United Nations Development Programme 2010, p. 15-16)

In essence, this means that drawing up a precise business case for an energy efficiency improvement project is difficult because nobody can know what will happen after the improvements are in place or what would happen if the project was not carried out at all. Nevertheless, defining the overall effects of energy efficiency improvements on society becomes even more complex, although, its potential is still considered to be high.

For investors, the uncertainty of measuring the outcomes of energy efficiency investments makes these types of investments less appealing. Normally, in return of higher risks associated with an investment an investor will expect higher returns. But because of this uncertainty in energy efficiency investments, it is more difficult to estimate risks and thus it is also more difficult for investors to define what returns they should expect. Besides its potential benefits for society, this is the reason why government intervention through policies is necessary in order to scale up investments in energy efficiency. Through the right intervention for example by making additional value generation possible for investors, governments can create a better environment and spur the development of the market.

As described above, implementing energy efficiency measures can result in avoided energy consumption which in turn generates a monetary value for energy consumers. The value can be expressed in the form of avoided expenditure which is determined by two factors: the amount of energy that has not been consumed and the cost of each type of fuel which has been saved by the avoided consumption (International Energy Agency 2015). In light of this, potential monetary value that can be realized by improving the energy efficiency of a building is subject to two main elements. The first element is a measurable factor i.e. the energy performance of the building prior to implementing the measures, whereas the second one is a less predictable factor i.e. energy prices. The uncertainty in predicting future energy prices along with the uncertainties described in the previous sector, makes the financial consideration of whether to invest in energy efficiency or not difficult for investors (Monnin and Barkawi 2015).

6.1.2 Energy efficiency in the residential sector

Despite the uncertainties associated with these investments, studies suggest that many energy efficiency measures that are available today are cost-effective even considering that current energy prices do not reflect the externalities belonging to greenhouse gas emissions (Ameli and Brandt 2015). However, especially in the residential sector besides cost-effectiveness other important factors are present that can influence the decision of whether to invest or not. The investment decisions of homeowners are not purely driven by financial considerations especially in cases where they spend a lower fraction of their household income on energy bills (United Nations Development Programme 2010).

Because of the low take up of energy efficiency products and practices that are considered profitable there is an ongoing debate on why consumers fail to adopt these measures and what impedes household investment. Studies suggest that the actual use of energy saving products is lower than the optimal use therefore there is an underinvestment in energy efficiency. However, despite of the different theories developed in order to explain this "energy efficiency gap", its size and even its existence can be questioned (Ameli and Brandt 2015).

Nevertheless, Ameli and Brandt (2015) argue that although this gap is probably smaller than assumed, there are still identifiable barriers that impede household investment. Figure 7 shows the main barriers that can explain and be possibly responsible for the lack of household investment in energy efficiency measures according to Ameli and Brandt (2015). In their reasoning, barriers can be categorised into market failures (i.e. the lack of ideal circumstances, which result in a situation where the consumer demand for a given product is not equal to the quantity supplied by producers (Investopedia 2016)) and issues related to the behaviour of households.

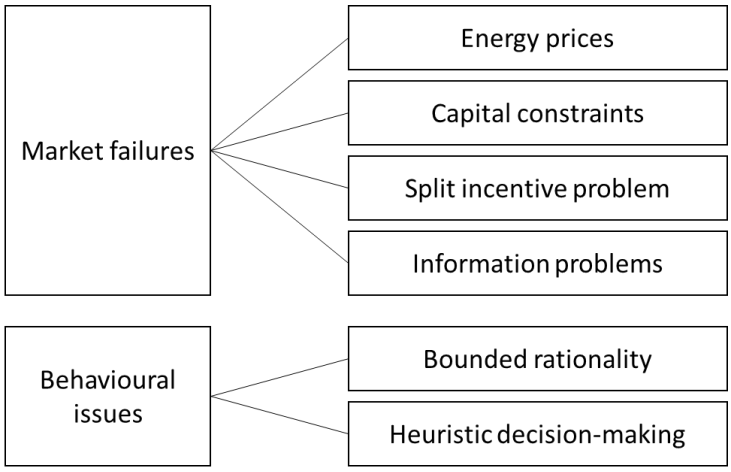

Figure 7: Main barriers to household investment in energy efficiency measures. *Source: own based on (Ameli and Brandt 2015)*

Energy prices

Energy prices do not reflect the externalities associated with energy production i.e. the true costs of energy consumption to society such as the costs of environmental damage and its consequent effects on society caused by greenhouse gas emissions from burning fossil fuels. Thereby energy consumers do not have an appropriate economic incentive to adopt energy saving measures in order to reduce their consumption which results in energy overconsumption and an inefficient level of investment in energy efficiency (Ameli and Brandt 2015).

Capital constraints

Similarly to any other capital-intensive investment, the lack of access to capital can impede investment in energy efficiency. Therefore, constraints on financing is considered to be one of the most significant barriers to household investment in energy efficiency (Ameli and Brandt 2015). Even the decision to invest in smaller energy efficiency measures can be discarded (e.g. buying new energy efficient appliances) because they cost more compared to their less efficient counterparts. Nevertheless, the cost of major upgrades in energy efficiency such as deep-retrofitting represent an even bigger expense to households. The high upfront investment especially for poorer households may require additional financing such as in the form of loans. However, if households are not able to access credit they might also decide not to invest in energy efficiency measures (Ameli and Brandt 2015). Consequently, the barrier of financing constraints for households is twofold. Firstly, there are households with low income that do not have enough savings to pay for energy efficiency measures on their own. Secondly, some of those households are not able to access credit and finance the measures by taking a loan from a bank.

Ameli and Brandt (2014) has found that income is a crucial factor of investment decisions in most energy saving technologies except for a few such as light bulbs, solar panels and heat pumps. Figure 8 shows how an individual's probability to invest in energy efficiency appliances increases as the individual's income rises.

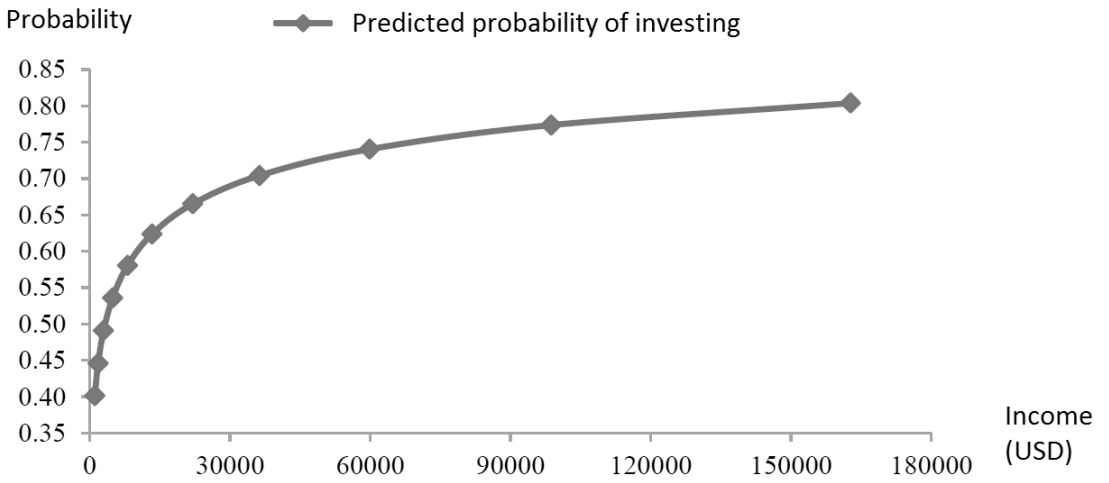

Figure 8: A representative individual's probability to invest in energy efficiency appliances based on his/her income according to the model of Ameli and Brandt (2014). *Source: (Ameli and Brandt 2014, p. 21)*

The figure highlights that financing constraints is the most relevant for households with income in the lower range and that the marginal impact of higher income to invest decreases with income. Ameli and Brandt (2014) pointed out that:

> *"An increase in income leads to a big increase in the probability to invest for low-income levels, but this marginal effect decreases and finally levels off for high income levels. In the case of energy-efficient appliances, increasing income from 15 000 $ to 45 000 $ would lead to an increase of about 10 percentage points in the probability to invest, while the same increase in income would lead to an increase of only 3 percentage points in the probability to invest for an individual that starts with 60000$."* (Ameli and Brandt 2014, p. 20)

The figure suggests that while the investment barrier is less relevant for higher-income households, for lower-income households the upfront costs of energy efficiency measures seem really huge and represent a barrier to their budget. Consequently, below a certain threshold people simply cannot afford to invest in energy efficiency (N. Ameli 2016, Ameli and Brandt 2015, Ameli and Brandt 2014).

The problem of credit constraints typically arises from the supply side (lenders), however lending can be also impeded from the demand side as some households might be reluctant to take out a loan. Loans represent a risk and while all people are risk averse in general, risk aversion can change according to the person's level of income because for low-income households it represents a bigger burden and therefore they might decide not to take a risk of a loan (N. Ameli 2016). Moreover, when the loan is attached to the mortgage, this risk aversion might be even more significant because of the fear from repossessions which has been exacerbated by the events of the recent crisis (N. Ameli 2016). On the other hand, Weller (2007) has shown that access to credit is in particular limited for low-income households. So even if they are willing to borrow they might not be able to, because they are less likely to meet lender's criteria compared to households with higher income (Weller 2007, Ameli and Brandt 2015).

Energy efficiency investments in the building sector and especially in the case of residential buildings can be unattractive for lenders. Supply side factors related to, such as credit risk[3], asymmetric information and high transaction costs might be discouraging circumstances that hinder them to offer loans for individual households (Ameli and Brandt 2015, Saheb, et al. 2012, Palmer, et al. 2012).

The perceived **credit risk**, on the on hand, results from the uncertainties associated with energy efficiency investments and, on the other hand, arises due to the fact that financial institutions often lack the know-how necessary to measure and verify energy savings (Ameli and Brandt 2015). Another risk of energy efficiency investments is that repayment is a factor of savings and not assets (e.g. a property) which could otherwise secure the loan for the lender. Moreover, there can be a risk even if the loan is attached to a property because these often already have a primary loan and it might be more difficult for the borrower to repay both of the loans simultaneously (Hilke and Ryan 2012).

Asymmetric information in this case means that the lenders lack adequate information about their borrowers therefore they often cannot distinguish between high-risk and low-risk borrowers. To protect themselves (i.e. compensate for the risk of not knowing entirely who they are lending to and how many high-risk and low-risk borrowers they have) lenders often raise interest rates. However, this might be disadvantageous for both lenders and borrowers. Some of the potential borrowers might not be able to finance their energy saving measures because they cannot afford to take the loan with the increased interest rate. Whereas lenders might lose profit because of the low-risk borrowers that dropped out with those who were scared away by the higher interest rates (Ameli and Brandt 2015).

[3] In banking credit risk means a risk of losing financial reward as a result of a borrower's failure to repay a loan or meet an obligation. Credit risk is calculated based on the borrower's overall ability to repay. It is a major determinant of the interest rate on a loan which is basically the compensation towards the lender for taking the risk. In principle, the higher the perceived risk and the longer the term of the loan, the higher the rate of interest that investors will demand in return for lending their capital (Investopedia 2016, BusinessDictionary 2016).

Because of **high transaction costs**, energy efficiency investments can become either too costly for borrowers or unprofitable for lenders. Firstly, banks consider a typical loan for such measure in the residential market, which is often less than $10,000, as a small investment. Secondly, the initial fees of the fixed administrative costs are around $300-400 that are relatively high for these small investments and can make the loan uneconomic for both lenders and borrowers (Palmer, et al. 2012, Ameli and Brandt 2015).

Principal-agent or split incentive problem

Split inventive problems in energy efficiency investments are especially relevant in the case of the residential sector. The problem can arise either when the decision making involves intermediaries or when the person who is in charge of the decision is not the same as the person who will benefit from its consequences. It is a typical problem that arises in the case of renting including both social rented housing and private rented housing (Ameli and Brandt 2015).

There is a barrier to invest both for the owners and the tenants of the building. From the owners' point of view, in most of the times there are no incentives to invest in energy saving measures. Whereas from the tenants' perspective investment to reduce energy consumption might seem a good opportunity as they are the one who would benefit from the lower energy bills. However, there is a high probability that they would move from the apartment before they can fully reap the benefits of their investment (Ameli and Brandt 2015, Jaffe and Stavins 1994, Schleich and Gruber 2008).

Informational problems

Informational problems can be caused by the lack of access to information, the lack of accuracy of the information or even the lack of willingness of the consumer to seek information about energy efficiency (Golove and Eto 1996, Ameli and Brandt 2015). Informational problems can include for example:

- Households not being aware of their energy consumption and spending on energy bills (Ameli and Brandt 2014);
- Households having misperceptions about energy use or savings and not being aware of options that can help them save energy (Attari, et al. 2010, Ameli and Brandt 2015);
- Energy efficiency measures not being well represented in properties' prices whereas, it could be an incentive for owners to invest as they could be able to retrieve the costs of their investment when selling their homes (Ameli and Brandt 2015).

Bounded rationality and heuristic decision-making

This explanation for underinvestment is related to consumers' behaviour which differs from what can be predicted by rational choice theory (Ameli and Brandt 2015). According to the theory, individuals are rational actors who are able to determine what options are available and choose the most suitable one according to their consistent preferences to maximize their utility (Levin and Milgrom 2004). Unlike what the theory would predict, consumers are often not in the possession of all the available information and have to make decisions under uncertainty which results in decisions that are influenced by personal perceptions and preferences. Heuristic decision-making means that individuals use only a fraction of the available information and apply a simplified decision-making process in the case of a complex decision (McFadden 1999, Ameli and Brandt 2015). Bounded rationality refers to these alterations from the ideal rational choice

and questions the unrealistic rationality that is used in modern mainstream economic theory to understand human decision making (Selten 1999).

The issue of bounded rationality and heuristic decision-making in the case of energy efficiency investments is often about the bias that households tend to put higher emphasis on initial costs than on future energy savings and the consequent reduction of costs (Ameli and Brandt 2015). Furthermore, another bias is related to consumers' lack of investment skills and unrealistically high expectations on returns. Houston (1983) argues that:

> *"Many consumers appear to rationally calculate the net worth of a household investment, but a substantial minority may lack the skills or alertness to perceive an investment opportunity and initiate analysis."* (Houston 1983, p. 236)

People do not necessarily have the skills to assess the calculations properly, moreover what has been found is that this issue is even more relevant among low-income households. When people were asked about what expectations they had about energy efficiency investments they usually overestimated the potential gains or in other words "applied" higher implicit discount rates in their investment decisions. Studies have found that especially low-income people expect unrealistically high interest rates that are absolutely out of the market whereas people on higher incomes expect lower returns but still higher than what is attainable (N. Ameli 2016).

According to the literature this is partly because of their lower education compared to middle income people. However, the phenomenon can also be interpreted as a matter of relative costs of the investment compared to the household's income. It means that someone on a lower income will expect more gains from the same amount of money spent because if you earn less the same amount of money has a higher value for you compared to someone who earns more (N. Ameli 2016).

6.1.3 Encouraging investment in energy efficiency

As it has been described previously, energy efficiency investments face uncertainties which impede the development of the market. Therefore, the growth of the market is in part driven by more and more assertive and comprehensive efficiency-targeted policies. Consequently, global agreements and national governments' goals and strategies to pursue a sustainable economic development, energy security, lower energy dependency and lower levels of GHG emissions play a significant role in the development of the market (International Energy Agency 2015).

There is a need for energy efficiency policies in order to motivate investments and ensure the growth of the market. However, there is no "silver bullet" and no policy measure can overcome the barriers alone. Therefore, the Energy Efficiency Financial Institutions Group (2015) recommends that policy packages should be developed that seek to tackle multiple barriers and address both the demand and supply side of the economy simultaneously (International Energy Agency 2008, Energy Efficiency Financial Institutions Group 2015).

To overcome the financial barriers to investment and promote the emergence of an energy efficiency market, policy makers widely use economic instruments to provide financial incentives for investment in energy efficiency. The overall goal of using economic instruments is to scale-up private investment in deep retrofitting in order to realise the full cost-efficient energy saving potential in the building sector (Hilke and Ryan 2012).

These instruments can be used for different purposes and at different points throughout the up-scaling process. Firstly, they can serve as **enablers** of the regulations and stimulate the market by increasing the amount of finance available or by facilitating access to finance by improving financing terms. These can include e.g. concessional loans, risk guarantees or on-bill finance (Hilke and Ryan 2012).

Secondly, they can serve as **incentives** or "sweeteners" and encourage potential investors to invest in energy efficiency. Investment activity can be promoted through reducing the costs of implementing energy efficiency measures for example by direct public investments, tax incentives, loans with interest rates below market rates or direct subsidies (e.g. grants) (Hilke and Ryan 2012).

Thirdly, economic instruments can serve as **disincentives** to energy inefficient activity by increasing the cost of not implementing energy efficiency measures. Disincentives are used to overcome externalities by internalising costs either by reducing the subsidies on consumption or by increasing the taxes on consumption. These instruments can be in the forms of for example energy efficiency certificates or direct taxes on energy consumption (Hilke and Ryan 2012).

An overview of the economic instruments in the context of energy efficiency policy is presented by a schematic diagram shown on Figure 9. According to Hilke and Ryan (2012), economic instruments can be categorised into:

- Fiscal instruments that are related to public treasury or government revenues;
- Financial mechanisms[4] that are used in order to enhance the growth of a market by providing finance through the issuance of debt and/or equity;
- Trading schemes that are used to provide incentives for companies for the reduction of emissions;
- Direct investments which are used for influencing prices and markets for energy efficiency measures.

[4] In this categorisation, grants could be included both in the fiscal and financial categories. However, Hilke and Ryan (2012) argue that *"most governments provide grants with the goal of leveraging further private finance for energy efficiency"* (Hilke and Ryan 2012, p. 15) and therefore they included grants in the category of financial mechanisms. This thesis follows their approach because it studies financial measures (i.e. loans and grants provided by governments) that are intended to increase energy efficiency and their effects on energy poverty.

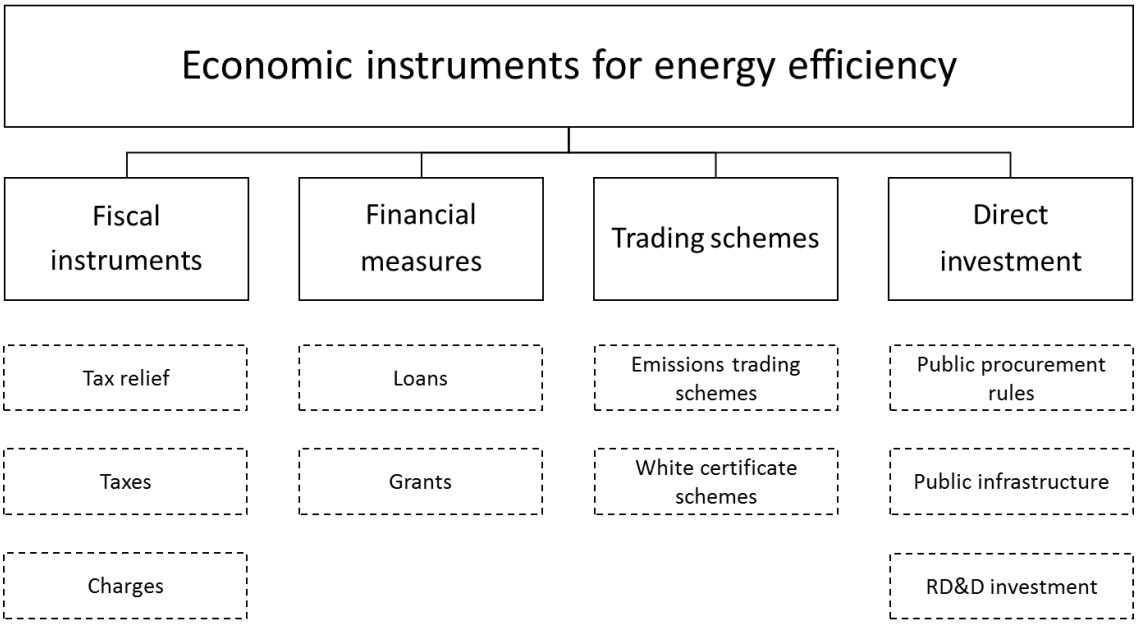

Figure 9: Overview of economic instruments used by governments in the context of energy efficiency to overcome financial barriers to investment. *Source: (Hilke and Ryan 2012, p. 16)*

In the following, due to the scope of this thesis (and physical limitations) only financial measures (i.e. loans and grants) and white certificates and obligation schemes among trading schemes will be elaborated. This is because, those are the most relevant economic instruments related to energy efficiency and energy poverty in the UK.

Loan programmes

Loans can be used to cover the often high initial costs of energy efficiency measures in cases where households are exposed to capital constraints. Debt financing through loans have the potential to be used effectively for investments in energy efficiency as they can result in monthly savings which can serve as the compensation for the loan. However, despite the growing amount of experiences that confirm the effectiveness and profitability of energy efficiency investments, the risks associated with these loans (described in section 6.1.2) are still relevant for investors. Therefore, this means that the interest rates of loans related to energy efficiency are still high as they serve as the compensation for banks for the risk they take (Kats, et al. 2011, Hilke and Ryan 2012).

The role of governments in this case is to ensure the availability of loans with better conditions to make them more appealing for lenders and borrowers and thus enhance lending activity. Their options to intervene in the market include a number of economic instruments. They can provide subsidies either directly to investors (i.e. households) or with direct credit lines through financial institutions by reducing the cost of loans. Indirectly, they can intervene in the market by involving third parties (e.g. energy providers) through policies that enable other structures of financing arrangements. Within this economic instrument the most common mechanisms are concessional loans, guarantees and instruments that provide other structured finance such as energy provider on-bill financing (Hilke and Ryan 2012).

Concessional loans are loans offered with extended terms that are more generous than market based loans either because of below market interest rates or longer grace periods[5] or these combined (OECD 2013). These loan programmes can reduce the cost of financing investments for homeowners, however they do not address many of the barriers that impede investment in energy efficiency thereby in order to be effective they need to be a part of a policy package (Hilke and Ryan 2012).

Guarantees are intended to reduce the cost of capital by addressing the barrier of perceived risks. With loan guarantees the government agrees to share the risks of the investment and provides the security of a lender in the case of a default. The arrangement can involve new third party actors that finance investment and thereby increase the leverage of private debt finance. A guarantee is a transitional measure that can be used to increase the growth of a market by reducing the high risk perception of banks an making them familiar with the market (Hilke and Ryan 2012).

On-bill financing involves arrangements with energy service providers that tie the loan to the utilities and allow households to repay the loan through the energy bills. This is advantageous for the households because they do not have to pay upfront costs and in some cases the increase in the energy bill can be offset by the decrease in energy consumption (N. Ameli 2016). It can also allow the transfer of the loan when the ownership changes and thus assist in overcoming the barrier of split incentives. Thereby it can also act as an incentive for the investor to undertake longer-term finance and invest in more ambitious measures (Hilke and Ryan 2012).

Grants

Grants are the most frequently used economic instruments that are used to support energy efficiency measures in the building sector but in particular in the case of residential buildings. It is an effective way to encourage people to invest in energy saving measures, however only if it covers a high proportion of the investment costs. Offering grants is more costly to the public budget compared to offering low interest rate loans, therefore these programmes tend to target measures with high returns which are less ambitious and where the investment costs are lower (Hilke and Ryan 2012).

These schemes can be effective to prepare the market for deeper retrofit programmes, however after an initial period, other policy instruments need to take over the role of grants because broad scale deep retrofitting is not very likely to be achieved by these programmes due to their high costs to the public budget. Grants can be also used to offer energy efficiency measures for low income households (Hilke and Ryan 2012), however the eligible beneficiaries need to be clearly defined in order to avoid free riders (i.e. consumers that would have invested in the measures even without the help of the grant) (United Nations Development Programme 2010).

White certificates and obligation schemes

An energy efficiency obligation is a regulatory mechanism that requires typically an energy provider (e.g. electricity and natural gas distributors) to meet quantitative energy saving targets by engaging in energy-saving activities (Hilke and Ryan 2012, The Regulatory Assistance Project 2012). Energy providers can meet their targets in many different ways such as by offering customers advice, assistance and financial incentives or by offering them to replace certain types

[5] Grace period is the period of time after a payment becomes due, i.e. after borrowers have to start repaying the loan (Dictionary.com 2016).

of equipment (e.g. refrigerators, electronics or kitchen equipment) (Hilke and Ryan 2012, Heffner, DuPont and Rybka 2012). A white certificate is the authorised document that proves that a specific amount of energy savings have been reached by the company which can either be used for compliance with the energy savings target or, if allowed, traded with other companies (Hilke and Ryan 2012).

Supplementary remarks to economic instruments

All of the economic instruments that governments can use have their advantages and disadvantages, therefore there is not a single instrument that can be used to overcome all barriers. For example, concessional loans can be an effective way to encourage households to consider investing in energy efficiency measures but they do not work very well with low-income households. Consequently, Ameli (2016) suggests that these loans need to be offered with different levels of interest rate accordingly to a household's income (N. Ameli 2016). Moreover, there is need for economic instruments to be a part of coherent policy packages and reduce dissonances and unnecessary costs by avoiding overlaps. Thereby a combination of these instruments with additional informational programmes (e.g. awareness raising) and service packages (e.g. technical assistance, cheap or free energy audits) can address multiple challenges simultaneously (International Energy Agency 2008, Hilke and Ryan 2012).

Besides providing information and service packages, Ameli (2016) argues that it is also important to understand what the top priorities are for households. This is particularly significant in the case of low-income households where energy is often not the most crucial problem they face. In this case, according to Ameli (2016), an interesting idea can be to find out the top priorities for low-income households and attach energy saving measures to other services that are used for overcoming those top priority challenges (N. Ameli 2016).

Considering that sometimes households are simply reluctant to invest in energy saving measures because of the inconvenience of the process, another option can be to nudge consumers. Ameli and Brandt (2014) point to the success of a scheme introduced in the UK where families were introduced an attic cleaning service as an incentive for insulating their lofts. The scheme lead to an increased number of households insulating their roofs which can be a result of the fact that the homeowners were relieved from the inconvenience of cleaning their attic prior to the commencement of work (Ameli and Brandt 2014).

However, it is important to add that there is point where current practices fall short. Hilke and Ryan (2012) argue that subsidies fail to take whole building approach and incentivise the deep retrofit of buildings:

> *"Current targets and eligibility requirements attached to the economic instruments used for energy efficiency in buildings are, with few exceptions, not very ambitious. […] there is a strong focus on low-cost and quick wins through the replacement of equipment (lighting and HVAC), rather than improvements in the building envelope or whole building energy performance."* (Hilke and Ryan 2012, p. 9)

6.1.4 Synthesis

The return on energy efficiency investments is delivered by the monetary savings generated by the avoided energy consumption. However, due to the high upfront costs the take up of these measures by households is considered to be lower than optimal. Moreover, another concern is related to the perceived high risks associated with energy efficiency investments arising from the

difficulties of measuring and estimating avoided energy consumption. Following the logic of neoliberalism, the task of governments is to intervene the market in order to make these investments more appealing for investors, nevertheless for the same reasons of uncertainties in making estimations this is not an easy task for policy makers.

Energy efficiency products and practices are considered to be profitable, therefore it is commonly agreed the lack of household investment is due to incorrect functioning of the market. The lack of household investment is explained by barriers related to market failures (e.g. energy prices, capital constraints, split incentives problems and informational problems) and behavioural issues (e.g. bounded rationality and heuristic decision-making). To overcome these financial barriers, by following the same logic, governments are offered several economic instruments that can be used to increase households' willingness to invest in energy efficiency. The common characteristic of all of these measures is a belief that given the right conditions, an efficient market can solve the problem of low investment activity by making households able to finance the measures.

Further sections will elaborate how financial measures are actually realised through the example of the UK. At this point, the following conclusions can be made about these measures in relation to their competence to contribute to alleviating energy poverty, or in other words, their suitability for low-income households:

- For low-income households, but also in general, capital constraints is the most significant problem in relation to energy efficiency investments due to the high up-front costs associated with energy efficiency measures. Households in the lower income segment are particularly disadvantaged because below a certain income threshold they simply cannot afford to invest. This is even more problematic considering that in order to alleviate energy poverty, without the lock-in risk, deep retrofits are necessary which require an even higher initial investment.
- Loans have the potential to solve the problem of high up-front costs, however several circumstances such as high perceived credit risk, asymmetric information and high transaction costs can generate high interest rates or entirely discourage investors. In order to be available for low-income households, there is a need for government intervention that makes possible for example that loans are offered at below market interest rates or in the form of an on-bill financing mechanism.
- Grants can also be used effectively by policy-makers to overcome the problem of credit constraints while they are also more suitable for alleviating energy poverty by offering non-refundable money for energy efficiency measures, however the eligible beneficiaries need to be selected carefully.
- Informational problems are relevant across all income segments, however it can be particularly disadvantageous for households in energy poverty if they cannot recognise the available solutions (or the governmental support programmes) that can help them overcome their problem.
- Bounded rationality and heuristic decision making are also significant issues that are particularly relevant for less educated and lower income households. In essence, it means that some households might not take up energy efficiency measures because the attainable returns are simply lower than what they would (unrealistically) expect.

The previous observations highlighted those factors of financial measures that can relevant for tackling energy poverty. These are the factors that can influence low-income households' utility functions or in other words their ability to utilise the available resources (i.e. loans and grants). These factors need to be considered to identify whether low-income households have the same opportunities as households at higher income levels to utilise the financial measures implemented by the government.

Consequently, the following sections will focus on two main things. Firstly, in the case of loans, interest rates (i.e. how are interest rates determined) and the specific mechanisms will be analysed in order to find out what external factors influence the resources (i.e. loans) that are available for households. Secondly, the analysis will look at, both in the case of loans and grants, how these financial measures are delivered (and how the information is distributed) in order to find out whether households at all income segments are informed equally and have the same opportunities to benefit from these measures.

6.2 The economic background of finance and loans

This section presents the most important economic principles related to finance and loans. As it has been explained in section 6.1.2, banks set the interest rates on the loans they offer according to the perceived risks associated with the investment. However, besides risks associated with individual types of investments there are also macroeconomic factors that influence interest rates. Therefore, this section begins by describing monetary policy, through the example of the European Central Bank, which is an important factor for loans because it can influence interest rates. Then, it will explain the monetary policy's influence on green investments and elaborate the role of interest rates in present value calculations that underpin investment decisions. With this analysis, the thesis intends to, on the one hand, provide an overview of the current economic environment and, on the other hand, establish an essential understanding of finance that will be used in the further chapters of the thesis.

6.2.1 Monetary policy and loans

Establishing a sustainable and green growth requires efforts and policies that facilitate the uptake of green finance activity which can channel investment to green industries (Global Financial Markets Association 2016). Realigning the financial system towards the green growth agenda can be facilitated in the first step by changing the price relations in the real economy by providing incentives for private green investments to underpin the transformation (Green European Foundation 2014). Incentives can be provided for example via subsidies (e.g. cost compensation through feed-in tariffs in the case of renewable energies) or via taxes (e.g. landfill taxes to divert valuable waste streams from landfills). However, green investment can also be incentivised inadvertently for example through changes in the monetary policy.

The monetary policy is responsible for stimulating aggregate demand to shift it in a desired direction (Khan Academy 2016). It is the process by which the central bank, a currency board or another regulatory committee can determine the rate of growth of the money supply and thereby affect interest rates in order to speed up or slow down the overall economy (Investopedia 2016, Crash Course Economics 2016). One of the tasks of the monetary policy is to influence the money supply by controlling the cost of money through modifying interest rates.

An interest rate is the price of borrowing money expressed as a percentage of the loan amount. When a lender sets the interest rate of the loan it does that by taking into account the expected future inflation and the profit it intends to make (Crash Course Economics 2016). Consequently, the interest rate measures how much return the lender gets and how much money the customer has to repay to the lender.

The economic principle behind monetary policy is that when interest rates are low borrowers will borrow and spend more because it is easier for them to repay the loan. On the contrary, when interest rates are high, borrowers will be less willing to take a loan and therefore they borrow less and spend less (Crash Course Economics 2016). While central banks cannot directly set commercial banks' interest rates and stimulate the overall economy through that, they can manipulate it by changing the money supply. One of the options for a central bank to increase or decrease the money supply is to control the cost of money by defining the base interest rate on which they lend out money to commercial banks. When there is a lot of money available to loan out, commercial banks have to lower their interest rates in order to compete with each other for

customers. On the other hand, if there is less money available to loan out banks will try to charge the highest interest rate possible for the highest profit (Crash Course Economics 2016).

Generally, as Figure 10 shows, depending on whether the goal is to increase or decrease the money supply there are two types of monetary policy – expansionary and contractionary. In case of an expansionary monetary policy, the money supply is increased. By increasing the supply, the central bank pushes down the cost of money available for customers which in turn has an influence on their borrowing and spending which at a broad scale can stimulate economic growth. On the contrary, a contractionary monetary policy decreases the rate of growth in the money supply and it is used with the intention to control the skyrocketing inflation (Investopedia 2016).

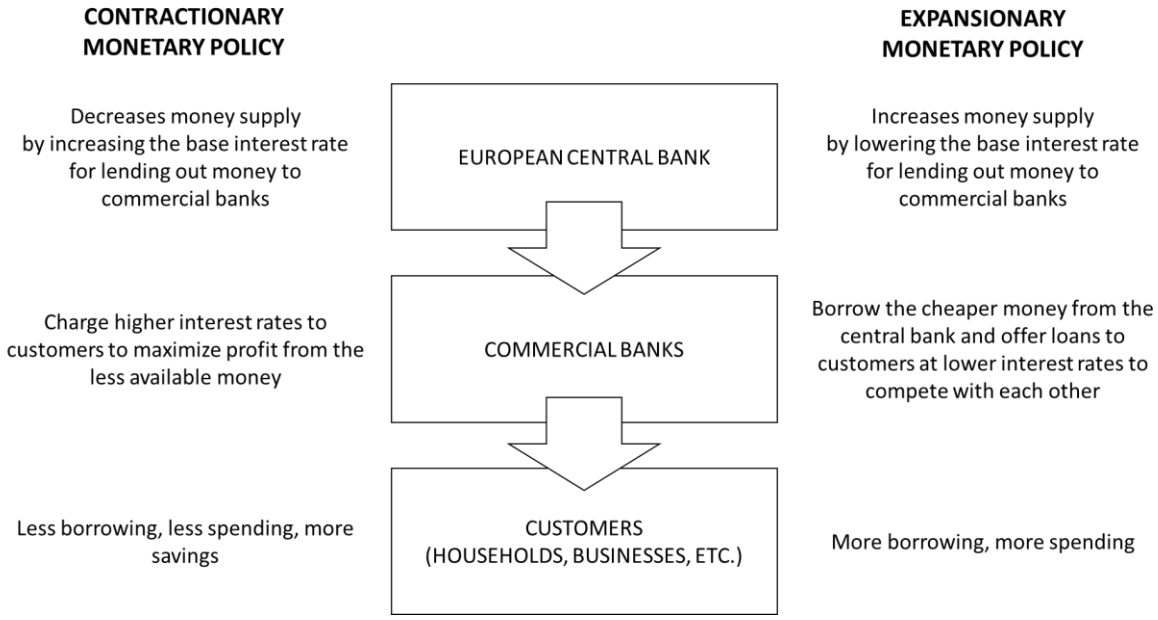

Figure 10: Contractionary and expansionary monetary policy explained through an example where money supply is controlled by the European Central Bank by modifying the base interest rate. *Source: own figure based on (Investopedia 2016, Crash Course Economics 2016)*

Consequently, the decisions of central banks have extensive effects on the economy and society as a whole. Sustainability is also affected by monetary policy because the agenda of greening the economy heavily depends on the uptake of green finance activity. It is therefore subject to the global financial system and the flows of money which means that sustainability is also intertwined with monetary policy (Barkawi and Monnin 2015). However, Monnin and Barkawi (2015) argue that this interrelation has not been thoroughly addressed:

> *"Monetary policy has been largely neglected in the worldwide discussions on green finance. Similarly, most central banks have not even started thinking about their role in helping society reach its environmental objectives and about the potential implications of environmental degradation for their mandates. Bringing light to this blind spot is critical."* (Monnin and Barkawi 2015, p. 155)

Monetary policy has a high potential to affect the real economy and green finance especially now when the European Central Bank (ECB) has recently decided to decrease the interest rate on the deposit facility to -0.40% in March 2016 (European Central Bank 2016). The ECB is not alone with the record low base interest rates. Both the Bank of England and the Federal Reserve of the United States keep their interest rates at 0.5%, which is significantly below levels prior to 2008 (Bank of

England 2016, Trading Economics 2016). These actions illustrate that although it has been eight years since the financial and economic crisis, central banks are still struggling to recover the global economy. Donald P. Gould, president of an asset management company, describes the negative interest rate as an extreme measure with which central banks are experimenting:

> *"Until recently, the concept of an interest rate below zero was mostly confined to the realm of theory. But as economies around the world struggle, central banks have taken extreme measures in an attempt to stimulate economic growth and avoid price deflation. Negative interest rates are one of their tools. The theory is that negative interest rates encourage more business borrowing and spending on plant and equipment, as well as encouraging investors to seek out riskier investments with higher expected returns. In turn, that pushes up asset prices and perhaps stimulates consumption."* (Gould 2016)

Normally, when a central bank lends out money to commercial banks it requires commercial banks to repay that loan plus an extra. On the contrary, what a negative interest rate means is that the ECB pays money for commercial banks to borrow. This is an additional incentive for commercial banks to lend money out to businesses and households which in theory will surge customer spending and stimulate the economy.

This expansionary monetary policy results in low interest rate loans offered for customers which in turn influences their investment decisions for example to take higher risks and to consider investing in projects in which they normally would not, including for example investing in green technologies and energy efficiency. In general the lower interest rate (or in other words the "cheaper" money) might enable investments in projects where otherwise with a high interest rate, a cost-benefit analysis would have shown low returns. Therefore, in theory, lower interest rates result in more projects being realized.

However, Monnin and Barkawi (2015) argue that monetary policy through influencing interest rates can have a significant repercussion especially on green investments. It is because of the calculations used in determining the return on an investment and the peculiarity of green technologies to require high initial investments but low operating costs:

> *"Net present value calculations that help to determine whether a government policy should be pursued, as well as discounted cash flow calculations based on which investment opportunities are assessed, depend greatly on the chosen discount factor and thus on interest rate levels. Against this background, low interest rates may provide a welcome opportunity to increase long-term investments for a green economy. The lower the interest rate, the more attractive are projects that require investments today to reduce costs and seize benefits in the future."* (Monnin and Barkawi 2015, p. 156)

Therefore, according to Monnin and Barkawi (2015), the current economic situation can be in favour of renewable energy technologies. In order to understand their reasoning, at first one of the basic principles of finance has to be explained.

6.2.2 The time value of money

Financial calculations are based on the notion that time has a value. Because everybody has limited resources, when a lender lends money the person who takes the loan has to compensate the lender with an interest for the time he or she used it (N. Ameli 2016). The concept is called the 'time value of money' which in short says that money that is available today is worth more than the same amount in the future (Investopedia 2016). Therefore what matters is not only the amount of money we receive or give but it is also important *when* we have to receive or give the money. This assumption is the basis of calculations in finance such as net present values and discounted cash flows which are used to assess investment opportunities.

For example, it means that 100 dollars that is invested today, assuming a 5% annual interest rate will, worth 105 dollars a year from now. By reversing this calculation (i.e. dividing the future value by 1.05), we can see that 100 dollars a year from now will only worth 95.24 dollars today (Investopedia 2016). Consequently, when we receive money, it is better to receive it immediately than receiving it a year from now, because in that case we can invest it and earn interest over that time. On the other hand, when we have to pay money, it is better to pay it in the future because we can use that money to earn interest while we still own it.

The interest rate also has a significant implication on the appraisal of future cash-flows because it plays a crucial role in calculating the present value (or discounted value) of future costs or earnings. Figure 11 illustrates the difference between present value calculated with a 5% interest rate and a 10% interest rate. While with a 10% interest rate the present value of the $100 that we have to pay next year is only $90.91, with a 5% interest rate it would be $95.24. As it can be seen, this means that the higher the interest rate the lower the present value of future earnings or costs (Investopedia 2016).

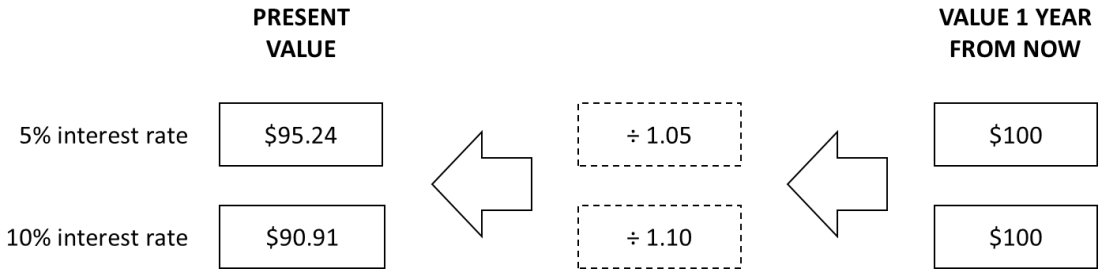

Figure 11: Present values of $100 with an interest rate of 5% and 10% illustrating that higher interest rates produce lower present values in present value calculations. *Source: own figure based on (Investopedia 2016)*

In their example Monnin and Barkawi (2015) argue that expansionary monetary policy creates an investment climate that is in favour of green investment by pushing down interest rates. According to them, investors can see investing in renewable energy technologies as a better investment opportunity compared to investing in technologies generating energy from fossil fuels. This is due to calculations described above and because of the different cost structure of the two technologies. While both renewable energy technologies and power plants running on fossil fuels require high upfront costs, energy generation from fossil fuels has also high running costs (Monnin and Barkawi 2015).

As described above, interest rates serve as the basis of the calculations that are used to estimate the present value of the future costs associated with different projects. For costs that occur in the future, present value calculations will generate lower present values when the interest rates are higher. In the case of renewable energy versus fossil fuel power plants, higher interest rates will

result in lower present values of the of the future operating costs of fossil fuel energy generation. Therefore, the higher the interest rates, the better technologies based on fossil fuels will look compared to renewable energy technologies (Monnin and Barkawi 2015). On the contrary, the current low interest rates move renewable energy technologies in a better position and make conventional energy technologies look less attractive for investors.

6.2.3 Synthesis

This section has been included in the analysis chapter for two reasons: Firstly, because it has highlighted the influence monetary policy can have on the agenda of greening the economy and secondly because it has explained the role of interest rates in investment decisions. The following sections will build on this knowledge and examine whether the low interest rates can influence energy efficiency investments and households' willingness to take out a loan and what does that mean for households in energy poverty.

As it has been explained in this section, monetary policy can affect investment decisions by influencing the growth of money supply and the cost of money through changing interest rates. This has a significant effect on the overall investment climate, particularly today when central banks' interest rates around the world are at a record low level. Monetary policy is the centrepiece of the mechanism that determines interest rates in the overall economy and thereby it is an essential element of the financial system.

The present day expansionary monetary policy central banks is a direct result of and response to the 2008 financial crisis. Fostering the recovery of the economy from the downturn caused by the financial crisis is one of the global challenges policy makers face today. With the expansionary policy central banks intend to revive the economic growth by increasing the growth of money supply and decreasing the cost of money through low interest rates. In theory, cheap money will result in increased borrowing and spending which will spur the economic activity and restoring balance to the economy. Moreover, the cheap money can also persuade investors to invest in also projects with higher risks.

The seriousness of the economic downturn is clearly exemplified by the fact that the ECB's low interest rates and even quantitative easing, a more unconventional monetary policy, is considered to have a little effect on the real economy (Gallo 2015). The idea behind quantitative easing was that it supposed to revive the economy by flooding financial institutions with capital and thereby increasing lending through large-scale purchases of assets from financial markets such as government bonds (World Economic Forum 2015). However, it could not fulfil the expectations, hence central banks are starting to go even further with unconventional monetary policies and engage in theoretical discussions about 'helicopter money' in the form of tax rebates (Bruegel 2016).

Figure 12: Illustration by CNN Money of the helicopter money that was proposed by Milton Friedman in 1969. According to the idea, the most effective way to increase spending and stimulate economic growth would be to give money directly to everyone e.g. via direct transfers. Illustration: *(Egan 2016)* Source: *(World Economic Forum 2015)*

This highlights what Centeno and Cohen (2012) has pointed out that despite the 2008 financial crisis has shaken the neoliberal ideology, its hegemony remains unquestioned and unchallenged by alternatives (Centeno and Cohen 2012). It also illustrates how central banks are mobilized in order to restructure and promote market-based regulatory arrangements when markets and thereby the overall economy does not operate as they should (Brenner and Theodore 2012).

However, the example of Monnin and Barkawi (2015) of the investment decision between renewable energy technologies and traditional energy technologies based on fossil fuels has highlighted that low interest rates can put green investment in a different perspective. Moreover, it has illuminated that the economic challenge is intertwined with global environmental challenges such as climate change. Therefore understanding the financial system is key to tackle both of them simultaneously. Methods used by the finance industry such as the calculation of present values underpin the assessment of investment decisions and define what will and what will not be realised. Greening the financial system is considered crucial to facilitate the transformation towards the green growth agenda that takes besides economic, also environmental and social considerations into account. From a critical perspective, understanding the finance industry and its relation to the agendas of green growth or climate change mitigation and adaptation is also important, as under the influence of the neoliberal ideology these environmental concerns become more and more intertwined with and subject to economic interests. Consequently, analysis of the practices and methods of finance is critical to determine its effects on society.

As Monnin and Barkawi (2015, p. 156) argue "*[t]he lower the interest rate, the more attractive are projects that require investments today to reduce costs and seize benefits in the future".* Not only renewable energy technologies but also energy efficiency improvements represent opportunities where today's investments can reduce costs in the future. Consequently, following the argument of Monnin and Barkawi (2015) it can be said that the current low interest rates might also be in favour of energy efficiency investments. It is because, if an investor assesses the costs and benefits associated with an investment in energy efficiency, a future cost arising from energy consumption will result in a higher present value than what would have been the result if the interest rate had

been higher. The higher present value can influence the rational investor's decision by suggesting that he or she should choose to invest in measures that can reduce energy consumption and thereby reduce future costs. However, this is probably not the case in the residential sector, as households tend not to act as rational investors in decisions related to energy efficiency.

Most importantly, lower interest rates mean that financing is available at a cheaper cost making the investment that is required today lower. This can present investment in energy efficiency and taking out a loan to finance it as a better opportunity for an investor resulting in more lending and also more energy efficiency investments being realised. Consequently, the expansionary monetary policy can surge not only higher spending but also higher spending on energy efficiency through loans offered at low interest rates. Furthermore, this better overall investment climate for the energy efficiency market can not only result in more energy efficiency investments being realised. It can also contribute to alleviating energy poverty because loans offered at lower interest rates can mean that it becomes accessible for more households which thereby become available to afford the measures and upgrade their homes.

However, in Europe, banks' lending activity and growth is still considered lower than expected despite of the expansionary monetary policy and other measures of the European Central Bank (Financial Times 2016). This can be explained both from the supply side (banks) and the demand side (borrowers). Regarding the supply side, there are other factors besides monetary policy that influence the interest rates of banks. As explained in section 6.1.2, risks associated with individual investments play a central role when commercial banks decide the interest rate on a loan. Whereas from the demand side, investment decisions of households are not solely a matter of interest rate levels. Besides the costs and benefits incurred throughout the lifetime of a project, how attractive an investment opportunity is defined by a variety of technical and non-technical factors.

This section provided a general overview of interest rates and monetary policy which influences them, in order to establish an understanding of why loans are considered necessary for the growth of the economy. Loans are also one of the central elements of this thesis as they are also one of the financial measures governments use to enhance investments in energy efficiency. As it has been explained in section 6.1, interest rates play a crucial role in overcoming the problem of capital constraints which is especially a significant challenge for low-income households. In theory, the current economic climate described by low interest rates can offer a window of opportunity to increasing energy efficiency in residential buildings by offering cheap loans which are in particular beneficial for low-income households. Moreover, low interest rate loans also offer an opportunity for households to invest in deep retrofitting instead of smaller energy efficiency measures which is crucial to permanently raise a household from energy poverty and to avoid the lock-in effects caused by smaller upgrades.

In the following sections, it will be investigated through the example of the UK whether loans can be offered at low interest rates and whether they can be used effectively to increase the uptake of energy efficiency measures and to address energy poverty at vulnerable households.

6.3 Financial measures used in the United Kingdom to increase investment in energy efficiency in the residential sector

6.3.1 Energy poverty and financial measures in the UK

Energy poverty is well researched in the UK and has been a concern for decision-makers for long (Boardman 2010). An act of Parliament had already attempted to address the issue in 1811 by establishing a charity that provided coal or other fuel for the poor. However, concerns over the affordability of energy gained significant traction in the 1970s due to increasing oil prices after which academics, such as Brenda Boardman, began to treat energy poverty as a distinct issue from poverty (DECC 2015). As a result of that and growing interest from the Government, energy poverty has become more and more included in policy documents ranging from housing to social security which has led to the alignment of already existing energy efficiency policies with the agenda. The increasing commitment was realised in the Warm Homes and Energy Conservation Act (2000) and the Fuel Poverty Strategy (2001) which established a target to eradicate energy poverty 'as far as reasonably practicable' by 2016 (Kidson and Norris 2014).

The level of energy poverty has varied significantly in the UK throughout the years. It declined in the late 1990s, which was followed by a rapid increase between 2003 and 2010 (due to the increase in electric and gas prices), which was again followed by a decrease between 2010 and 2011 due to rising energy efficiency standards and a fall in energy prices. Since then, it is estimated that the number remained around 10% of the total number of the UK households (Roberts, Vera-Toscano and Phimister 2015). According to the most recent data available from 2009, approximately 2.7 million households inhabited by nearly 8 million people had low incomes and faced high energy costs in England (DECC 2015). Especially older households are subject to energy poverty. In 2013 there were 542,000 older households in England suffering from energy poverty, and the UK has the highest rate of excess winter deaths of around 27,000 annually (Age UK 2015).

Because of this, fuel poverty is still a major concern in the UK which is why the Government intends to help households keep their energy bills low and support those most in need (Gov.uk 2015). The support is delivered on the one hand in the form of direct financial support for vulnerable households in three different ways by (Gov.uk 2015, Gov.uk 2016, Gov.uk 2015):

- Warm Home Discount –a one-off discount of £140 on electricity bills for eligible households between September and March;
- Winter Fuel Payment – direct payment of up to £300 to pensioner households;
- Cold Weather Payment - direct payment of £25 when the temperature in a given household's area is zero degrees Celsius or below for 7 consecutive days.

Nonetheless, one of the most crucial underlying factor of energy poverty in the UK is that the housing stock is considered to be among the least energy efficient in the world. Therefore improving the energy efficiency of buildings is seen as the most critical in solving the energy trilemma (i.e. the challenge of keeping the lights on, at an affordable price, while meeting our long-term decarbonisation goals) (House of Commons 2016). As former Energy and Climate Change Secretary Edward Davey has put it:

> *"More and more families are being hit by the rising cost of fuel bills and the best way people can protect themselves from increased costs is to use less energy."* (Gov.uk 2013)

Therefore, the most recent Government efforts were aimed at realising this agenda of reducing energy bills by improving households' energy efficiency. With this the UK can be able to meet not only the Fuel Poverty Strategy but also two other legal obligations, the Climate Change Act (2008) (which requires the UK to reduce GHG emissions by at least 80% by 2050 from the 1990level) and the EU Energy Efficiency Directive (2012) which specifies the overall energy targets that the UK has to meet by 2020 (National Audit Office 2016).

The two main flagship schemes were the pay-as-you-save framework called the Green Deal and a supplier obligation scheme called the Energy Company Obligation (ECO), both introduced in 2013. The Green Deal was a market-led scheme designed to let 'able-to-pay' householders and businesses pay the cost of energy saving measures over time through their energy bills using suppliers they can trust. Whereas, the ECO was designed to work alongside the Green Deal focusing on vulnerable households and harder to treat properties by providing additional support to deliver measures that are not fully financeable by the Green Deal (Gov.uk 2015, House of Commons 2016). The main difference between the two financial measures is that the Green Deal is a finance mechanism whereas the ECO is a grant.

When introducing the Green Deal, ministers were highly ambitious about the scheme and told the Parliament that it had the potential to improve the energy efficiency of the entire British housing stock and that it would become the biggest home improvement scheme since the Second World War (National Audit Office 2016). However, they did not set any expectations for the scheme to which its progress could have been compared. This was, according to the National Audit Office (2016), due to the fact that it was a market-based scheme and its policy objectives were supposed to be achieved through the market. As such, the Department of Energy & Climate Change (DECC) did not set a target for the Green Deal because it was concerned about intervening the market and increasing inefficiency by influencing market operations (National Audit Office 2016). Rather, the National Audit Office (2016) argues,

> *"The Department viewed its role as putting in place the market conditions that would enable stakeholders – energy suppliers, Green Deal providers, and consumers – to find the most cost-effective means of achieving its scheme objectives."* (National Audit Office 2016, p. 26)

The only target set was a joint target in 2013 which stated that one million homes would have to be installed with energy efficiency measures by March 2015, through the Green Deal and the ECO schemes combined. However, the number of homes is only an indirect measure of objectives which means that it did not specify for example the number of hard-to-treat properties of the one million homes, or how many homes should be occupied by fuel poor residents and how many of them would be lifted out from fuel poverty (National Audit Office 2016).

The target was achieved four months ahead of schedule in the end of November 2014 and by the end of 2015 the number of measures installed had reached 1.76 million on around 1.42 properties (DECC 2016). Although it was joint target, it is chiefly due to ECO that it has been met as it has delivered the majority (96 per cent) of the measures. Compared to the hundreds of thousands of measures installed under ECO, the Green Deal could only deliver less than 15,000 measures installed by the end of November 2015 with another approximately 35,0000 measures being currently in the pipeline (DECC 2016, National Audit Office 2016). Despite of the huge expectations at its announcement, the Green Deal scheme has become billed as a 'disappointing' failure due to its 'extremely' low levels of take-up (Gosden 2014).

As a result of this, the scheme was cancelled in July 2015 'in a move to protect taxpayers' which meant that no more finance is available for households to fund any Green Deal measures and the only scheme to provide support for households to implement energy efficiency measures remained the ECO (Gov.uk 2015). However, the impact of the schemes on fuel poverty or whether the poorest households have received help so far cannot be determined. The following sections are going to elaborate the Green Deal and the ECO schemes respectively.

6.3.2 The Green Deal

The Green Deal was the Government's flagship initiative between 2013 and 2015 to help households and businesses increase their energy efficiency. It was a market-led framework that allowed individuals to implement energy efficiency measures at little or no upfront cost. The financing mechanism was designed with the intention to overcome financing barriers associated with access to capital and split incentives by attaching installation costs to the property's electricity meter and allowing it to be repaid through the electricity bill. Furthermore, it intended to support the growth of the energy efficiency market by providing a trustworthy framework of advice, assurance and accreditation for the whole extents of the energy efficiency supply chain (House of Commons 2013, House of Commons 2014).

To be eligible for the Green Deal's "pay-as-you-save" model, households need to meet the 'golden rule'. The golden rule states that the expected financial savings from implementing an energy saving measure must be equal to or greater than the cost of that measure over 25 years. This means that if the expectations are correct, the household or business that meets the golden rule criteria will not have a higher energy bill after the measure is installed (House of Commons 2014). However, the Department of Energy & Climate Change asserts that:

> *"[Meeting the golden rule] is not a government guarantee, but a guideline for customers that, typically, they should be able to expect to gain more efficient, less wasteful properties with no additional net cost from the Green Deal."* (DECC 2010, p. 11)

The process of the Green Deal begins with an assessment carried out by an accredited assessor. After visiting the property and surveying energy usage, the assessor recommends a package of measures and may offer a Green Deal finance plan according to the golden rule. If the customer agrees to the Green Deal plan it means that the measures are going to be paid for through the customer's bill. In that case, after the plan and the proposed work is signed by the customer, the Provider arranges an accredited installer to install the measures, and notifies the energy supplier. Thereafter the supplier adds the Green Deal repayments to the customer's bill. Lastly, after receiving the payments, the supplier passes the money to the Green Deal provider (House of Commons 2013, House of Commons 2014, National Audit Office 2016).

Figure 13 illustrates the Green Deal mechanism and the relationships between stakeholders. As noted earlier, the key feature of the mechanism is that it allows customers to repay the cost of measures through the energy bill. From a financial perspective, at the centre of the scheme is the Green Deal Finance Company (GDFC) which is responsible for overseeing the Green Deal-related lending activities. It uses capital from the central government (Department of Energy & Climate Change) and private investors to finance Green Deal plans through Green Deal Providers.

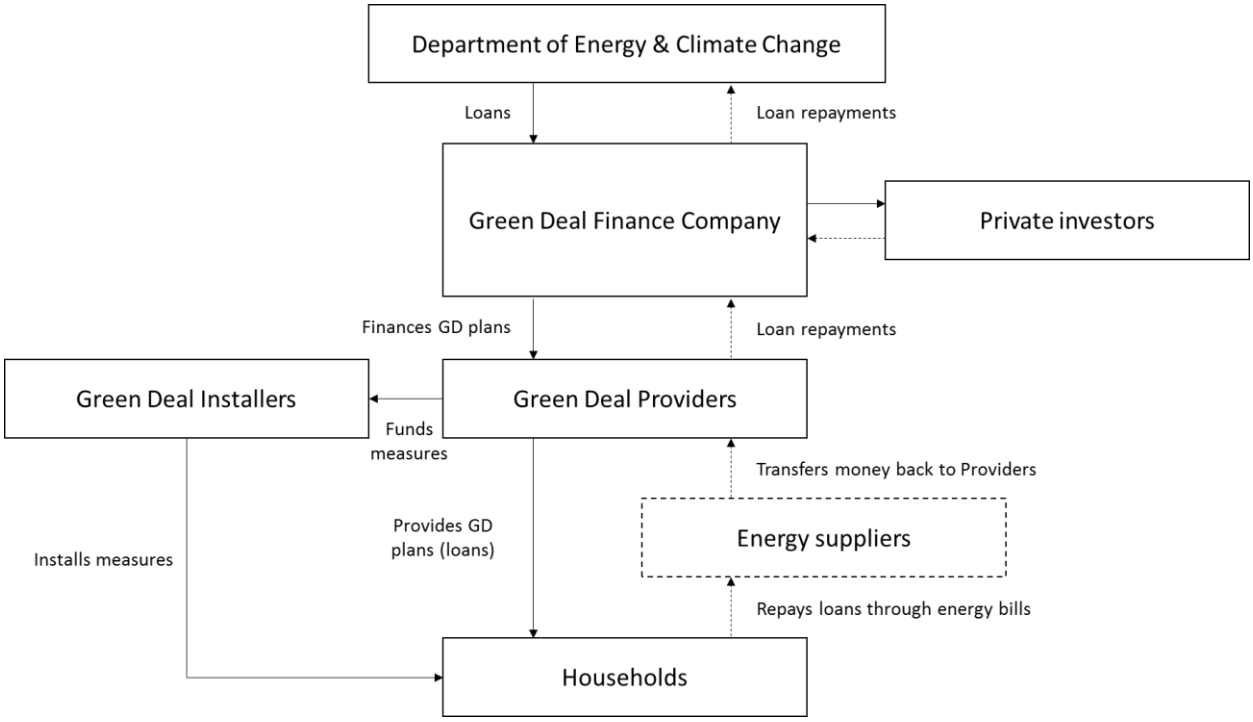

Figure 13: Simplified schematic figure explaining key roles and who pays to whom under the Green Deal financing mechanism. Loans on the one hand are provided by the Department of Energy & Climate Change. However, one of the key objectives of the mechanism is to attract private investors, such as the "for-profit" UK Green Investment Bank, and create a market for financing energy efficiency investments by allowing private investors to provide finance for the aggregation and refinancing of consumer Green Deal Plans through the Green Deal Finance Company *(Cochran and Hubert 2013)*. *Source: own figure based on figure 6 in (National Audit Office 2016).*

So what kind of a loan was the Green Deal and why could it be good for the customers? Most importantly, it has to be made clear that the Green Deal is not a subsidized loan but neither a conventional loan. Rather, the idea behind the Green Deal is that it would create an attractive form of loan for customers based on market terms by allowing repayment through the energy bill for the following reasons:

Firstly, by attaching the loan to the meter, rather than the customer, the Green Deal becomes different from conventional loans in terms of liability. In this case, customers are not liable for the full cost of the capital as they are only responsible for paying the costs back until they are the bill-payers. Because loan is attached to the meter, the respective occupant is responsible for paying it back. Consequently, when a borrower decides to move out from the property, the next occupant takes over the payments, unlike in the case of personal loans where borrowers have to keep repaying the loan even if they are no longer enjoying its benefits (DECC 2010).

Secondly, the Green Deal is an unsecured loan which means that it is only supported by the borrowers' creditworthiness (measured by the applicant's credit score), rather than by a collateral such as a property. As such borrowers do not need to be afraid that in the case of a default their homes will be repossessed (DECC 2010, Investopedia 2016). Rather, those who cannot repay the Green Deal will be treated the same way as customers who cannot pay their energy bills i.e. they become disconnected from the grid in the worst case scenario. However, the DECC (2010) highlights that vulnerable consumers are protected to some extent from being disconnected in case of a default because:

> *"Suppliers are prohibited from disconnecting households in the winter months (October-March) where they know, or have reason to believe, the consumer is a pensioner or lives with other pensioners or those under 18."* (DECC 2010, p. 13)

Thirdly, the DECC (2010) argues customers are less likely to default on their energy bills compared to unsecured personal loans or other conventional forms of financing. According to the DECC, customers are more likely to pay energy bills on time and reliably, compared to meeting the deadlines of loan repayments. What this means essentially is that the cost of finance can be lower in the case of the Green Deal compared to conventional loans, due to the lower level of risk associated with the on-bill financing mechanism (DECC 2010). Consequently, the Green Deal loans can be offered below the standard retail finance offers and with a fixed interest rate (i.e. certainty and protection against a rise in interest rates) which makes it easier for homeowners to calculate their budget (DECC 2010, Evans and Pragnell 2013).

According to the Green Deal Finance Company, the lower risk not only allowed the Green Deal to offer competitive loans at below the standard retail finance offers but also made them possible to lower the credit threshold and provide a higher level of financial inclusivity. In fact, the GDFC argues, while conventional unsecured credit was available for around half of the UK's adult population, the Green Deal provided access for over 80% of the adult population at the same interest rates and terms. Therefore, its low credit threshold made it possible for an additional 30% of the adult population to finance energy efficiency measures at no up-front cost that otherwise could not be able access credit at reasonable terms or at all (Green Deal Finance Company 2015).

Fourthly, due to the golden rule criteria the expected savings should be higher than or equal to the expected costs. Therefore in theory, there should be no increase in households' energy bills and they are able to repay the loan in small amounts over the long term in 10-25 years (Saxon and Keefe 2015). However financial savings cannot be guaranteed because the actual savings are hard to measure due to uncertainties in future energy prices and energy consumption (House of Commons 2013).

6.3.3 Issues with the Green Deal

The Green Deal scheme has received various criticisms for its low take up. The reason why it has failed to live up the high expectations is a combination of several factors. The non-financial issues include criticism about the scheme's complexity for both households and installers; failure to understand behavioural issues and households' main motivations; and poor communication and marketing of the scheme. Nonetheless, most of the criticism it has received was related to finance, including concerns about the expenses of the assessment; about the golden rule and limits of how much loan can be taken up under the golden rule; but most importantly about the conditions of the loan and about its high interest rates (House of Commons 2016).

Complexity, communication and trust barriers, behavioural issues

As explained in section 6.1.2 informational problems, bounded rationality and heuristic decision making are significant barriers in particular for low-income households, therefore a clear communication that addresses behavioural issues and trust barriers is necessary for a scheme like this to work effectively.

Due to its complexity, the Green Deal lacked clarity and was surrounded by confusion, misunderstanding and mistrust. Understanding the concept of a loan attached to a meter and the

concept of the golden rule can be difficult especially because the information that was available was inaccurate, conflicting and contradictory (House of Commons 2014). Moreover, the Green Deal was primarily marketed as a financial proposition that intended to convince people to invest in energy efficiency measures and thus save money on their bills. This approach assumes that the main motivation for a household to upgrade the energy efficiency of their home is to save costs while it leaves out other potential benefits and motivations (Energy Technologies Institute 2015, University of Sussex 2015). On the contrary, Age UK (2015) argues that there are a variety of underlying factors and other higher priorities that people consider:

> *"The Green Deal was not appealing to people, resulting in low demand. It was marketed as a financial proposition, and seen as boring and disruptive. This approach did not reflect the multiple factors that motivate people, such as health and comfort. Nor did it differentiate its marketing to people in difference (sic!) circumstances, such as different life stages. For example, people in or approaching retirement may have concerns over repaying the loan."* (Age UK 2015, 6.2)

Indeed, many considerations influence customers' decisions. A study of Wilson, Chryssochoidis, and Pettifor (2013) suggests that only 1 in 10 people's decision, to invest in energy efficiency or not, is driven primarily by energy savings (Energy Technologies Institute 2015, Wilson, Chryssochoidis and Pettifor 2013). Investing in energy efficiency involves complex choices, therefore even when a customer is motivated primarily by returns on energy savings, behavioural issues can influence decisions. The complexity of the Green Deal and the subsequent time and effort to understand it could be seen as a 'hassle' and discourage potential customers. According to Age UK (2015) older people, for instance, could have found the scheme confusing or too costly which have prevented them to benefit from the loan.

Nonetheless, the confusion and the expenses associated with the loan are not the only reasons why age can be an important factor. Waitt, et al. (2016) argue that elderly people's perception of energy efficiency can be different from younger people and a generational gap exists between those who were raised in today's 'throw away' society and the older 'thriftier' generation which is more responsible about consumption. Previous generations' perceptions are shaped by discourses born in scarcity which is why, for instance, replacing inefficient household appliances can be seen by them as wasteful. Especially older low-income households are more likely to organise their lives according to the principles of careful management of scarce resources rather than according to the neo-liberal market ideology. One of the elderly interviewees of Waitt, et al. (2016) illustrates how communication targeted at the broader society such as the star rating education programme can have little effect on previous generations:

> *"My fridge is so old it was before the star system came in. But what do you do? You've got a good fridge. It's working. You just don't get rid of it like the young ones do and get another one. We're that generation where we don't get rid of it. We keep going."* (Waitt, et al. 2016, p. 37)

Moreover, besides despising wasteful behaviour, Waitt, et al. (2016) argue that there is also a psychological reason related to self-esteem why elderly people choose to do things their own way and refuse taking up more efficient technologies:

> *"Thrifty domestic energy regimes enable many older low-income people to affirm themselves at home as independent and strong, rejecting the dominant language that*

stigmatises an older-aged identity in western society as vulnerable, weak and of lower social status." (Waitt, et al. 2016, p. 43)

High interest rates and unattractive conditions

For many, the most significant problem with the Green Deal was the interest rate and the construction of the loan itself (Ameli 2016). As it has been explained earlier (section 6.1.2) the cost of finance (i.e. the interest rate) is a significant factor for households when it comes to deciding whether to invest in energy efficiency or not. High interest rates can be especially a burden for low-income households, as they are more price-sensitive. A key argument against the Green Deal is that it had high interest rates and therefore there were better loans available from other not public sources with better interest rates or more fitting repayment periods (Ameli 2016).

According to Ed Matthew (2016), the director of the Energy Bill Revolution movement, the main problem was that, despite of many stakeholders' warnings, the Government decided to offer the loan without subsidising it. Matthew (2016) argues that evidence from the from the German infrastructure bank suggested that successful loan schemes require ultra low interest rates at 1% to persuade people. This would necessitate a government guarantee for the loans or subsidies and thus it would be a bigger expense to the public purse, however, he argues that the German example has showed that it can compensate that cost through increases in tax revenue (Matthew 2016). Matthew (2016) believes that the reason why the Government refused to offer subsidised loans under the Green Deal scheme was:

> *"an evangelical belief by the Ministers at the time that the market could deliver without significant government support. They believed that the huge barriers which stood in the way of millions of households taking up energy efficiency measures could be overcome simply by a loan scheme subject to healthy competition and smart marketing*." (Matthew 2016)

But accessing finance at market rates proved to be insufficient as the demand for the scheme remained significantly lower than it had been previously expected. Although a large number of assessments had been undertaken (575,000 by the time the funding was revoked), only 2% of these accepted the Green Deal plan and decided to proceed financing the measure under the Green Deal scheme. This does not mean that none of the rest of the assessed properties have not been refurbished. Rather, some of these assessments have led to measures realised by other sources of finance that had better conditions than the Green Deal loan (Gardiner 2015).

Interestingly, some of the reasons why households decided not to take up the loan offered under the scheme or chose other sources of finance stemmed from the very factors that intended to make the Green Deal appealing and protect customers i.e. the fact that it was unsecured and its long duration. On the one hand, the Green Deal excluded customers in the lowest income range, while on the other hand, it warn off those with higher incomes or who already possessed capital (i.e. owned a property) because they could simply access better deals provided by other sources.

1. *Excluding customers with the lowest income*

The Green Deal was offered as an unsecured loan so it could avoid putting customers in a risk where they can lose their properties if they cannot continue repaying the loan. In the case of unsecured loans, customers' eligibility for the loan is defined by their creditworthiness. The on-bill financing mechanism allowed the Green Deal Financing Company to offer unsecured loans at

a competitive interest rate and also to reduce the credit threshold and thereby offer the loan to people who previously could not access credit (Green Deal Finance Company 2015).

A report by the GDFC reveals that the loan they offered was the most successful among these people as close to 80% of their borrowers were from households with income below £30,000 while only 6% of applications came from households with income over £50,000 (Green Deal Finance Company 2015). Still, a report from the University College London (2015) claims that the lowest income segment of the population could not benefit from the policy:

> *"Whilst the credit score rating was low, it did not help those with no credit rating. The Green Deal finance company simply could not risk people not being able to keep up with repayments, immediately excluding a large section of people who would have benefitted hugely from the scheme."* (University College London 2015, par 16)

Therefore, although the Energy Saving Trust (2015) argues that such a pay-as-you-save can be useful for households that are "near fuel poor" and cannot access credit with better condition due to low credit score or lack of property that can be used as collateral (Energy Saving Trust 2015). The scheme cannot address fuel poverty and might increase social inequities because it excludes those who are most in need (University College London 2015).

2. *Warning off customers with higher income and who already possess a property*

The Green Deal was unattractive for more affluent households because those who were eligible could access mortgage loans at interest rates significantly below the nearly 7% interest rate of the unsecured loan that was offered by the scheme (Gardiner 2015). There are several reasons for this. One of the reasons, is that the interest rates are highly influenced by the level of security attached to the loan. The Green Deal had higher interest rates than mortgage loans because it was unsecured and the expected losses associated with were higher (Frontier Economics 2014). Therefore, while the scheme could offer a loan that was below the interest rates of similar unsecured loans it could not compete with mortgage based loans.

The other reasons why the Green Deal's interest rates were high are largely due to its long repayment period resulting from the golden rule. Meeting the golden rule was required for households to be eligible for the Green Deal. It was designed to make the loan affordable and available for a wider audience by stating that households should not spend more money on their repayments than what they are saving on their utility bill (The Green Deal 2016). For the loan this meant small amounts of payments over a long period of time (i.e. 10-25 years).

The first reason why its longer duration made the Green Deal uncompetitive compared to mortgage based loans is because has been translated into an increased cost of credit due to the concept of the time value of money. As elaborated in chapter 6.2.2, in finance time has a value and the perceived risks associated with an investment grow as time increases. To compensate for the risk, the lender has to increase the loan's interest rate. Therefore, while the golden rule criteria intended to make the repayments affordable for everyone (The Green Deal 2016), conversely it increased the interest rate and thereby made the cost of credit more expensive. For example, if a borrower would repay a loan of £1,500 offered by the GDFC over 10 years, the total amount he or she would have to pay would be £2,373.80 (cost of credit: £873.80), whereas over 20 years repayments would increase to £3,287.25 doubling the cost of credit to £1,787.25 (UK Green Building Council 2014).

Consequently, the University College London (2015) argues that while setting a fixed interest rate at 6.96% at the start of the scheme reflected the high risks associated with long durations, it is probably part of the reasons why some of the potential borrowers were warned off (University College London 2015). Those people who were put-off were probably in the higher income range as they are those who would be able to repay the loan more quickly to reduce the overall amount of payments. As the golden rule did not allow flexibility of earlier repayment these people were probably less likely to choose the Green Deal (UK Green Building Council 2014).

Secondly, the fixed rate long term loan offered by the Green Deal could not exploit the opportunity provided by the expansionary monetary policy and thereby could not provide an alternative to the record low interest rates of mortgage loans. As explained in chapter 6.2.1, the interest rates of loans are influenced by monetary policy as an exogenous factor which defines base interest rates. After the 2008 credit crunch, the Bank of England (the central bank of Great Britain) undertook an expansionary monetary policy and cut interest rates to increase lending. Compared to the rates of at least 4% prior to 2008, at the time of Green Deal's announcement and also today the base interest rate is set at only 0.5% (nominal) (Frontier Economics 2014, Global-Rates.com 2016).

In theory, the low base interest rate would be translated into low interest rates offered by banks for consumers. However, this effect is undermined in the case of the Green Deal because it is offered at a fixed interest rate over long terms. When the Green Deal's interest rate were set, the possible rise in the base rate was already factored in and thus resulted in a higher interest rate that what could have been offered under the current economic climate (Frontier Economics 2014). As a report by Frontier Economics (2014) explains, this optimistic view on the country's economic prospects has a significant effect on the Green Deal's interest rate:

> *"The largest component of the Green Deal interest rate is the cost of funds (~6.5%, nominal) […]. This cost partly reflects the fact that the loans are offered at a long-term fixed rate. Therefore the cost of funds captures expected increases in Bank of England base rates as the economy normalises."* (Frontier Economics 2014, p. 7)

Therefore, while the long duration is an important element of the Green Deal which allows it to be affordable it makes the scheme unable to exploit the currently offered low interest rates due to the fact that calculations are made by factoring in optimistic predictions of base interest rate levels and the overall economy.

Consequently, this highlights that the very elements that intended to make the Green Deal affordable and protect customers contradictorily made it more expensive and even excluded those who are most in need. For the energy poor with low income levels, the Green Deal was inaccessible because they simply could not meet the required credit criteria. Whereas, for customers with equity or higher income, the scheme was unattractive because it did not allow earlier repayments which would have made it cheaper and because mortgage loans with lower interest rates were available at the market. Nonetheless, it was available for a range of people, the near fuel poor, however at significant costs precisely as a result of the characteristics that made the scheme available for them.

Exclusion of deep retrofits

A report of the National Audit Office (2016) highlights that due to the strict restrictions set by the golden rule most energy efficiency measures are not eligible for the Green Deal and thereby cannot be financed without additional an source of funding. Nicholas Eyre, the Director of UK Energy Research Centre pointed out that:

> *"The Golden Rule basically said, "If you do not have a very good cost-benefit analysis on the energy savings loan you are not allowed to do it under the Green Deal" and that is not what people want."* (Eyre 2015)

Figure 14 illustrates the costs and savings related to different measures and their compliance to the golden rule on a hypothetical example. According to these calculations, the only measure that can meet the criteria of the golden rule is easy-to-treat cavity wall insulation (National Audit Office 2016).

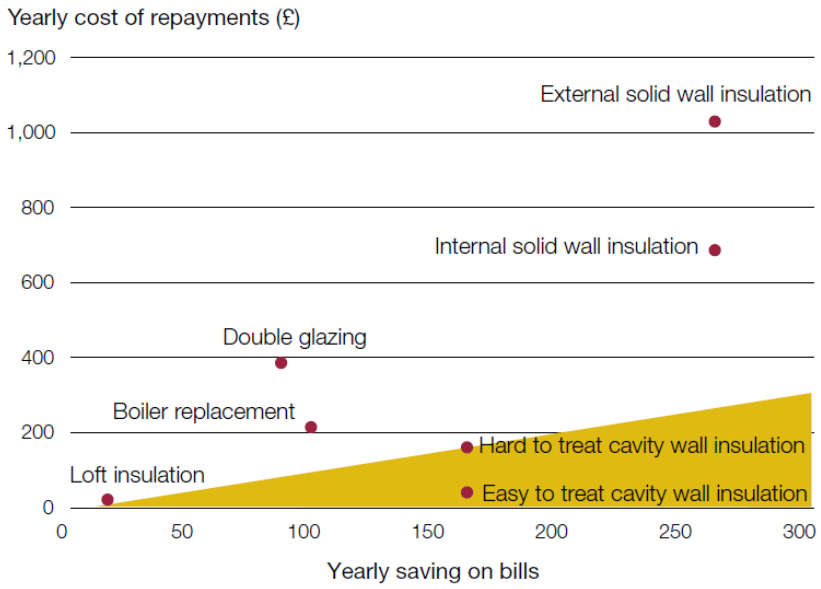

Figure 14: Hypothetical example presenting different measures' annual cost of repayments (£) and the consequent annual household savings (£) with a loan at 7% rate of interest over 25 years. According to the criteria of the golden rule, repayment should be lower than savings (coloured area on figure) indicating that only easy-to-treat cavity wall insulation can qualify for the Green Deal on its own (National Audit Office 2016). Source: (National Audit Office 2016)

Eyre (2015) argues that other countries have proved that similar pay-as-you-save loan schemes can be used more effectively for whole-house retrofits. However, the Green Deal's focus was limited by the golden rule on low cost measures, thus restricted investment in deep retrofits (University of Sussex 2015) which would be required for a permanent solution to energy poverty. Deep retrofits are very expensive whereas its financial returns can be limited or even negative. Households might not recover their investments and therefore even an interest free loan might not be convincing enough for them (Energy Technologies Institute 2015, J. Rosenow 2015).

This is why, the ECO scheme intended to run parallel with the Green Deal and offer and additional source of finance in the form of a grant. By 'blending' the two, the Government expected that households would take the subsidy offered by ECO and use the Green Deal to finance a significant share of the measures with their own spending (National Audit Office 2016).

6.3.4 Issues with the ECO scheme

Great Britain has implemented several Energy Efficiency Obligation schemes since 1994 to impose an energy savings target on energy suppliers (ENSPOL 2015). The most recent scheme, called the Energy Company Obligation (ECO), has been running since 2013. The difference between ECO and previous schemes is that one of the specific objectives of the ECO is to tackle energy poverty. This shift from previous supplier obligations schemes' objectives of reducing carbon emissions to a focus on energy poverty is in part due the withdrawal of the main programme in the UK designed to tackle energy poverty, the Warm Front in the same year (ENSPOL 2015, Rosenow, Platt and Flanagan 2013).

The other reason for the ECO's focus on energy poverty is that it was part of the "Green Deal Landscape" (DECC 2011). The main idea of the Government behind this new landscape was to stimulate private investments by shifting the responsibility of financing energy efficiency measures towards households and reduce their dependence on public programmes (National Audit Office 2016). As the National Audit Office (2016) put it:

> *"In 2010, the Coalition Government stated that it wanted to change the way energy‑efficiency measures were paid for. It wanted households that benefited from measures to pay for them, rather than all energy consumers contributing as under previous schemes."*

While in the new landscape the Green Deal intended to be the mechanism that would support households to finance energy-saving home improvements, the ECO was responsible for providing an extra support for households in the form of a grant. The subsidy from energy suppliers therefore was expected to drive the installation of more costly measures, such as cavity wall insulation, that could not meet the requirements of the Green Deal. An additional objective for the ECO, due to the withdrawal of previous scheme that focused on energy poverty, was to provide the subsidy for the lowest income and vulnerable households to make sure that they also benefit from the programmes (DECC 2011, National Audit Office 2016, House of Commons 2016).

In essence this means that tackling energy poverty has become the responsibility of suppliers which has exacerbated the tensions arising between reducing carbon emissions and alleviating energy poverty. When the two are addressed simultaneously through energy efficiency obligations disparity arises. The first source of disparity is the potential regressive impact caused by cost pass through. The second source of disparity is also a regressive impact which can be potentially generated by the wrong allocation of funds resulting from the complexity of targeting these measures at energy poor households (Rosenow, Platt and Flanagan 2013).

The potential regressive impact of cost pass through arises due to the fact that suppliers finance the costs of the ECO scheme by raising energy bills. While this raise is equal for all households[6], it can place disproportionate burdens on the energy poor as the same amount of raise on their energy bill can mean a higher relative increase for them. The other regressive impact, caused by the misallocation of funds, is especially relevant in the case of the ECO and thus can exacerbate the previous effect. If the ECO focuses on more costly measures it can only provide it for a few, while placing a disproportional extra cost upon a large number of low income households (University of Sussex 2015, Rosenow, Platt and Flanagan 2013). Ultimately, what this means is that

[6] According to a report from the Department of Energy & Climate Change, 5% of an average gas bill, 14% of an electricity bill and 9% of an average bill which includes both gas and electricity derived from energy and climate change policies in 2013 (DECC 2013).

the ECO scheme might potentially contribute to increasing the number of households being in energy poverty (House of Commons 2016).

However, the Department of Energy & Climate Change cannot determine ECO's effects on energy poverty as it does not have data that would allow that. Firstly, the assessment of its impact is impeded by the Department' lack of access to information held by other bodies due the current legal framework' limitations on sharing data. Secondly, the does not collect data on recipient household's income because, according to the Department, it would not be cost-effective because it would increase suppliers' administrative costs. Consequently, it cannot be determined accurately, whether the ECO scheme is meeting its targets in terms of providing harder-to-treat homes with energy efficiency measures for energy poor households (National Audit Office 2016).

Conclusively, the ECO scheme can be seen as socially regressive by its nature because it addresses energy poverty by putting an extra charge on energy bills. Moreover, its outcome on energy poverty cannot be determined. Therefore the next section will rather take a look into the allocation of funds by examining how energy poor households are targeted by energy suppliers.

Targeting assistance at the energy poor

There are several reasons why funds might end up in households who cannot be considered as energy poor. Firstly, it can be a result of the reluctance of the people in energy poverty to admit that they need help. There is a stigma associated with being vulnerable and energy poor and some people can link this with the ECO scheme and therefore they are often not willing to self-identify (Jago 2015). According to Waitt, et al. (2016), especially older low-income people might be unwilling to accept the stigma of being vulnerable, weak and of lower social status.

Though, most of the reasons why funds can be misallocated is related to energy suppliers. Rosenow (2015) argues that ECO is not the right solution for addressing energy poverty. It puts the responsibility in the hands of energy suppliers who, naturally, have interest in meeting their obligations as easily as possible by targeting properties where they can achieve the highest energy savings with the smallest spending (J. Rosenow 2015). Because of this, suppliers might focus on certain groups over others (Citizens Advice 2015).

Firstly, they might ignore vulnerable households and favour those who are able to and willing to contribute to the costs, as there is an 'anecdotal evidence' that some of the households partly financed the measures (Citizens Advice 2015, National Audit Office 2016). Secondly, suppliers might be incentivised to install single low-cost measures, rather than several measures with more costs or whole-house retrofits (Citizens Advice 2015). Thirdly, suppliers might deliver more measures in urban areas than in rural areas where the number of hard-to-treat homes are higher (Jago 2015, Hough and Page 2015).

Besides suppliers' interests another issue that can hider energy poor people to receive the grant provided by the ECO is the lack of available data which makes finding eligible households particularly difficult. British Gas (2015), one of the obligated energy suppliers, highlights that:

> *"Energy suppliers are generally less well-equipped to deliver more targeted energy efficiency programmes aimed at particular households, or requiring residents to qualify for assistance by virtue of their income, or receipt of particular benefits. This is because suppliers are generally not in possession of the data required to identify qualifying households, and as such, a significant proportion of the delivery cost is*

> *spent on simply identifying these households, and not improving their energy efficiency."* (British Gas 2015)

Therefore, finding the eligible homes can be time-consuming, hence expensive which can bring significant additional administrative costs for energy suppliers (National Audit Office 2016).

Finding eligible properties is in particular a huge barrier in the case of the private rented sector. The private rented sector least energy efficient homes in the UK and it is the largest is the fastest growing sector which is expected to rise by 5% to 22% of households renting their home privately by 2025 (British Gas 2015). However, the ECO has been unsuccessful in this area largely due to difficulties and expenses of dealing with both the owners and tenants of the property simultaneously (Princep 2015).

An example for this is the RE:NEW programme in London. As the initiative of the Mayor of London, designed to help organisations in the Greater London are to implement retrofit projects including finding finance and support chiefly through the ECO scheme (Greater London Authority 2016). The programme was launched in 2009 focusing on providing help for the private sector in reducing energy consumption and carbon emissions through retrofitting. In the beginning it started out as an area-based "street-by-street" delivery model. At that time, delivering was managed on the ground by going and knocking on people's houses to conduct surveys and to convince them to take up energy efficiency measures (Winbeck 2012, Tersch 2016).

After the ECO scheme was introduced, the Greater London Authority (GLA) decided to change this practice that focused on individual households. The GLA expected that under ECO it would become more difficult to work with households individually and targeting them would be too expensive with the less funding available. Consequently, the programme became a consultancy focusing on providing assistance to social housing providers rather than the private rented sector (Tersch 2016).

Keith Von Tersch, an Energy Consultant working on the RE:NEW programme, considers the expenses related to finding and engaging with owners (and tenants) as the main reason why the GLA decided to turn away focus from the private sector. Rather, he argues that targeting social housing providers can be a more effective approach:

> *"In practice we are pretty focused on social housing because it is a lot easier to work with them in terms of you've got a single owner for the house and they can make decisions on behalf of a large number of properties."*
>
> *"We can work with the private sector, but we don't tend to ever work individually with householders. We hadn't set a certain service up for that. In that way it would be very cost intensive."* (Tersch 2016)

6.4 Critical analysis and reflections

The Green Deal and the ECO schemes clearly bear the mark of what Whitehead (2013) would call the logic of neoliberal environmentalism. The Government acknowledges both the environmental and social problems associated with energy poverty and the inefficient housing stock. To solve the problems, it applies the discourse of combining economic growth with environmental protection championed by the green growth agenda. While direct help is offered for those who are most in need, the main focus in the UK was on the two flagship programmes that intended to alleviate energy poverty and contribute to meeting the country's decarbonisation goals simultaneously. However, the schemes had a third objective as well was to stimulate significantly more private investment and *"change the way energy efficiency measures are paid for"* (National Audit Office 2016, p. 6).

Consequently, the Green Deal can be interpreted as an example that describes the organisation of contemporary capitalism. It reinforces Whitehead's (2013) argument that contemporary policies addressing the problem of climate change are not only designed with the sole purpose of mitigating its effects or adapting to its consequences. Rather, they *"are as much about the search for a tertiary circuit of ecological accumulation, into which the overaccumulation crises of existing circuits of capital can be temporarily displaced"* (Whitehead 2013 p. 1361-1362).

Changing the way energy efficiency measures were paid for, on the one hand, clearly meant that the Government wanted to reduce energy efficiency programmes' costs to the public purse. However, the Government also had in mind the economic goal of stimulating lending activity. Hence the Green Deal was designed as a mechanism that would be self-sustaining by simply allowing households, installers, energy suppliers and private investors to achieve their own goals in the most cost-effective way (National Audit Office 2016). Furthermore, both schemes were mechanisms that have been constructed under the influence of the neoliberal logic that applauds the rule of markets with a minimal intervention from the state. Unsurprisingly, competition and efficiency were regularly used expressions in official documents that pursued to justify markets' competence in relation to both of the schemes.

The example of the UK thereby highlights that the issue of energy efficiency (and in a broader sense climate change mitigation) is treated today similarly to other environmental concerns, i.e. it is being subordinated to wider economic goals. However, not only in terms of the promotion of the idea that problems can be solved by markets if the right conditions are established. It also means, that similarly to other environmental issues, the responsibility of addressing climate change is being transferred to the private sector and individuals. The example of the Green Deal illuminates that if governments seek to reduce carbon emissions by increasing energy efficiency in the residential sector through the market, it means that the challenge of mitigating climate change becomes the responsibility of individuals' willingness to implement certain energy saving measures. In this understanding, individual households are seen as customers who need act and take up energy efficiency measures in order to reach governments' goal of reducing their carbon emissions and energy consumption.

It is clear, that the Green Deal was a market-based scheme which was not designed with the particular intention to address the problem of energy poverty. Because of that, one could argue that an internal evaluation of its suitability to pull out low-income households from energy poverty does not make much sense. However, an external analysis which considers vulnerable households' ability to access the benefits provided by the Green Deal and the ECO can be used to bring notice to constraints on the agency of certain groups of people. Therefore, it can be used to reveal the

injustices arising under the neoliberal idea of good governance which insists that governments should keep state intervention at the minimum to allow green light to self-regulating markets.

The case of the Green Deal and the ECO resemble an archetype of neoliberal governance, because the main ambition of the schemes was to establish a well-functioning market through a complex financial mechanism. The announcement of the Department of Energy & Climate Change illustrates that the main belief behind the schemes was that the funding offered for households would generate competition between the companies involved in the energy efficiency supply chain:

> *"These policies will boost the burgeoning low carbon economy by supporting up to 60,000 jobs in the insulation sector alone by 2015, up from around 26,000 today. They will empower consumers by giving them new ways of funding home improvements and empower businesses by enabling them to compete for energy efficiency opportunities in new and innovative ways."* (DECC 2012)

According to the logic of economics, the competition would result in lower prices for customers, moreover it would generate jobs and support the emergence of a low carbon economy. According to the neoliberal logic, competitive markets would bring about an optimal allocation of investments and resources and benefit society (Brenner and Theodore 2002).

However, in the actually existing neoliberalism of Brenner and Theodore, practices like this rather generate *"market failures, new forms of social polarization, and a dramatic intensification of uneven development at all spatial scales"* (Brenner and Theodore 2002, p. 352). As such, it could be argued that injustices arise due to the fact that the actually existing neoliberalism differs from the idealistic utopia of free markets dictated by the neoliberal ideology.

Although the Green Deal's take up was negligible, the outcomes of both schemes can be evaluated in terms of their justness by using the capabilities approach. Using the capabilities approach allows an analysis of the schemes' justness by focusing on the relationship between people and the available resources provided by the ECO and the Green Deal. It does so by investigating individuals' utilisation function (i.e. their ability to convert available resources into valuable functionings) and by emphasizing interpersonal differences between individuals. Consequently, by emphasizing interpersonal variations and individuals' different abilities to access resources, the approach can reveal injustices arising from the schemes' failure to recognise these individual differences.

The most significant interpersonal differences that influence individuals' ability to use the loans and grants provided by the Government are related to their income and education. As it has been explained in section 6.1.4, there are important factors related income and education that differentiate households in their ability to benefit from these measures, however it has been also found that age can be influential as well. The following factors have been found to be more relevant barriers for vulnerable households with lower income and a lower level of education: capital constraints and lack of access to credit; informational problems; and bounded rationality and heuristic decision-making.

The following contradictions and injustices can be identified related to the Green Deal and ECO schemes based on the above mentioned factors:

1. *Unjust distribution of measures due to the inappropriate specification and measurement of objectives*

Specifying and measuring the outcomes of the schemes based on the number of homes where energy efficiency measures have been installed was certainly inadequate. The Department of Energy & Climate Change did not specify clear objectives for the schemes individually which made their evaluation problematic. Interestingly, the reason why the DECC did not set clear targets was that it was concerned about increasing the inefficiency of the operation of the market by intervening. Consequently, it did not specify how many of the overall number of properties should be hard-to-treat homes and how many should be occupied by energy poor residents which probably contributed to obstructing vulnerable households' ability to benefit from the schemes. However, this cannot be clearly determined, as the DECC did not collect income data that would be necessary to tell how many fuel poor people have been helped out by the scheme. The Department's reason for not collecting this data is that it would not be cost-effective as it would put additional administrative costs on energy suppliers.

2. *Unjust distribution of measures resulting from giving too much authority to energy suppliers*

This issue is related to ECO and is a consequence of the combination of the previously described inappropriate specification and measurement of objectives, and outsourcing the task of overseeing the ECO to the private sector. Because of the not clearly defined targets and inadequate scrutiny, energy suppliers were able to act according to their interests. Therefore, although measures have been installed in one million homes and the target specified by the DECC has been reached, the distribution of measures cannot be determined.

However, the analysis showed that due to lack of scrutiny which allowed energy suppliers to act according to their interest, measures might have been unjustly allocated for the benefit of certain groups and for the loss of others. The reasons why suppliers tended to act according to their interest was in part because both schemes were very complex, and that the task of the ECO to reduce carbon emissions and tackle fuel poverty simultaneously has risen tensions due its potential regressive impact. Consequently, these difficulties made suppliers more likely to focus on achieving the schemes' objectives as easily as possible which resulted in the unjust allocation of grants. This study has found that due to suppliers' interest to deliver measures efficiently and reduce administrative costs, the ECO scheme was more likely to be allocated to:

- households that were willing to self-identify and that were not reluctant to accept the "stigma" associated with a grant like the ECO (older people are in particular prone to be afraid of stigmatisation) (Jago 2015);
- households that were more likely to contribute and be financially able to contribute to the costs of measures (Citizens Advice 2015, National Audit Office 2016);
- households that wanted to install low-cost measures, over households that needed more costly measures, such as whole-house retrofits, or who wanted to refurbish hard-to-treat properties (Citizens Advice 2015);
- urban areas over rural areas, there are less hard-to-treat properties in urban areas (Jago 2015, Hough and Page 2015);

- social housing providers over individuals renting privately, as it is more efficient to deal with one association than dealing with several individuals (Tersch 2016).

3. *Injustice in access to schemes resulting from not addressing communication and trust barriers, and behavioural issues*

Due to their complexity and the lack of clear communication, the schemes could not reach everybody. Especially low income households with less educated residents were subject to exclusion because, as it has been described before, they are more likely to be adversely affected by informational problems. The lack of clear communication, the lack of available information and the consequent confusion and mistrust which surrounded the Green Deal impeded customers to make decisions without being subject to bounded rationality and heuristic decision-making. Therefore, the Green Deal failed to address individuals by taking into account the differences in their personal utilisation functions. As Age UK (2015) argues, neither the Green Deal nor the ECO differentiated their marketing to people in different circumstances, such as being in different life stages. Moreover, especially the Green Deal, was only marketed as financial proposition and failed to take into account the multiple factors that motivate people, such as well-being, health and comfort. For this reason, the schemes were less likely to engage with older generations, as their perceptions are shaped by discourses born in scarcity and thus they see, for example, replacing inefficient household devices as wasteful.

4. *Injustice in reaching valued capabilities due to the exclusion of deep retrofits*

None of the schemes individually or combined were able to provide finance for deep retrofit projects which would be necessary for households to permanently escape energy poverty. The Green Deal failed to address retrofits due its golden rule because it restrained the scheme's focus on low-cost measures. In theory, the ECO should have been able to fix this by offering additional non-refundable finance, as it has been designed with this intention in mind. However, in reality energy providers had interest in providing finance for measures with better cost/benefit ratio, than whole-building retrofits. While this shortcoming affects both energy poor households and households not in energy poverty, it is a more serious obstacle for energy poor households. Using the capabilities approach this means that although the resources were equally available for all households, those who are in energy poverty did not have the same capabilities as non-energy poor households. It is because they could not convert the available resources into valuable capabilities and thus into functionings (e.g. keeping their homes warm), because for them reaching those capabilities would require a more comprehensive refurbishment of their building. On the contrary, smaller energy efficiency measures would not pull them out of energy poverty. Moreover if they financed those measures by using the Green Deal and the initial calculations that defined the costs and savings were incorrect, they would also become subject to additional expenses on their energy bill.

5. *Injustice in access to finance due to high interest rates and unattractive conditions*

The most significant issue related to the Green Deal is that could not offer cheap loans with attractive conditions. It is shown by the fact that of the 575,000 Green Deal assessments that have been undertaken, only 2% of the properties received an actual Green Deal plan, while many households decided to take out a loan from a different source. The failure of the Green Deal can illuminate a contradiction of contemporary capitalism, namely, that the poorer the person who receives a loan, the more expensive the loan becomes.

The Green Deal Financing Company's results show that, despite the fact that it was not successful and only a small number of people benefited from it, it was the most popular among people at a certain income range. As the Energy Efficiency Trust (2015) argues, this measure is the most suitable to benefit the “near fuel poor” households that cannot access other sources of finance.

The reasons for this can be twofold. At first, it is because households with the lowest income were excluded, due to not being creditworthy, and secondly, because those households that had high enough incomes could find loans with better conditions. What this means essentially is that more affluent people had many options to choose from, and thus to benefit from the "cheap money" offered by other sources through the record low mortgage interest rates[7].The less wealthy “near fuel poor” people could not access those other sources, therefore they could only rely on the more expensive finance provided by the Green Deal, whereas the least affluent people were completely excluded from all sources of finance.

It is important to realise that this injustice in access to finance occurs due to the practices of finance. It can be explained by the fact the very characteristics that intended to make the Green Deal available and safe for lower income households are those that are responsible for its high interest rates (i.e. being unsecured, the golden rule, the long repayment period, and the fixed interest rate).

The example of the Green Deal has also illuminated, those who already possess capital in the form of a property have better opportunities to access cheaper capital because they can use their property as a collateral and get loans with better conditions. Whereas those who do not own a property have to rely solely on unsecured loans which have higher interest rates than mortgage based loans. Considering Forrest and Hirayama's (2015) argument that homeownership becomes less and less an option for the middle class, it can be seen how inequality in terms of access to capital is becoming more and more persistent with the assistance of the finance industry.

Moreover, the extent of inequality in access to cheap finance is exacerbated by the expansionary monetary policy which intends to revive the economy from the financial crisis of 2008. By following the logic of the neoliberal ideology, central banks are lowering base interest rates in an attempt to enhance lending activity and thus stimulate economic growth. The lower base rates offered by central banks result in lower interest rate loans offered for individuals. However, as the example of the Green Deal shows, these loans with “record low“ interest rates are not available for all. Even those who were eligible for the Green Deal could not fully reap the benefits offered by overall economic climate, as the cost of the loan did not reflect this because it also captured expected increases in base rates, due to expecting the normalisation of economy.

Consequently, although low base interest rates could present an opportunity to offer cheap loans that could be used to finance energy efficiency measures, it does not mean that everyone can benefit from this opportunity. The example of Green Deal has shown that low base interest rates provided by central banks do not necessarily translate into equal access to cheaper loans for all, thereby it has little potential to contribute to alleviating fuel poverty.

[7] Naturally, one could argue that although more affluent people can access loans lower interest rates by using their properties as collateral, by that they also expose themselves to the risk of losing their property which to some degree compensates for their access to cheaper money. However, this thesis studies the injustices in access to finance and due to its limitations it cannot take these factors into account.

7 Conclusion

This thesis intended to explain some of the fundamental assumptions in finance and link those with the profession of urban planning through energy efficiency investments and climate change mitigation. This research has been conducted in order to investigate the consequences of neoliberal practices in relation to energy efficiency in the residential sector as a part of the climate change mitigation agenda which is playing a more and more important role in contemporary urbanism. Therefore, its main objective was to break with the custom what Dr Joan Clos, the Executive Director of the UN-Habitat programme, calls *"a naive ignorance of the economic reality that drives urbanisation"* (Clos 2016).

Two different schemes, namely the Green Deal and the ECO, were analysed that were recently in use in the UK. Both were market-based schemes that were designed to help households in financing energy efficiency measures and both were believed to have the potential to contribute to alleviating energy poverty. While the original focus of the thesis was on loans, I realised that considering loans alone is not enough, after finding out that only around 3% of the total 1 million energy efficiency measures have been delivered through loans offered by the Green Deal. Therefore analysing both of these schemes can be complimentary to each other and help understand why the Green Deal has failed. Providing loans with low interest rates can help households in overcoming the problem of capital constraints in financing energy efficiency measures. Although, low interest rates loans have the potential to provide significant help for households, there is a certain threshold in household income below which households simply cannot afford to take out a loan. Consequently, to answer the research question, the analysis needs to also consider grants, because offering grants is essential to tackle to problem of fuel poverty.

The thesis have sought to answer the research question *'What effects did the neoliberal practice of improving the energy efficiency of residential buildings by using financial measures had regarding alleviating energy poverty as a matter of social justice in the UK?'*.

In order to answer the research question, the thesis used the capabilities approach. The theoretical framework, at first, conceptualised energy poverty as an injustice and secondly conceptualised financial measures' relation to alleviating energy poverty. In this context, loans and grants provided through financial measures are *resources* that individuals can convert into valuable *capabilities* and achieved *functionings* (e.g. washing clothes, preparing food, maintaining a good health). Therefore the capability approach illustrates the whole "process" of financial measures which allows the analysis of a measure's justness by also taking into account that the same resources can be utilised differently by different people.

Therefore, at first, interpersonal differences between households had to be determined in order to allow the utilisation of the capabilities approach and thus the evaluation of the justness of the schemes based on individuals' ability to utilise the available resources. It has been found that income, education and age play a major role in determining individuals' ability to utilise grants and loans and convert them into valuable capabilities and achieved functionings. Individuals that are either elderly, are less educated or have lower income (or any of these combined) are more likely to be hindered by capital constraints; lack of access to credit; informational problems; bounded rationality and heuristic decision-making.

After considering these differences between households' ability to use the loan provided by the Green Deal or the Grant provided by ECO, it has been found that the schemes have failed to take into account these interpersonal differences in several ways and generated unjust outcomes:

1. The energy efficiency measures have been unjustly distributed. It is because the Department of Energy & Climate Change has not specified and measured the schemes' objectives appropriately and has given too much authority to energy suppliers which allowed them to act according their interests resulting in an unjust preference of certain customers for the loss of others.

2. The complexity of the schemes and the lack of clear communication has resulted in an unjust access to the grants and loans. The Green Deal and the ECO have failed to take into account the different circumstances and motivations of individuals which have prevented certain people, such as the elderly, to benefit from the schemes. Furthermore, the schemes have not addressed the issue that vulnerable people, such as people with low income, less education, and the elderly are more likely to be exposed to informational problems and bounded rationality, which has potentially affected these groups adversely.

3. The schemes could not offer finance for deep retrofits which is unjust for households being subject to energy poverty when judged by using the capabilities approach.

4. The Green Deal could not provide a just access finance, because it excluded the most vulnerable people with the lowest incomes and imposed high interest rates on those who were eligible for the loan. However, imposing high interest rates on the eligible people is not simply an injustice resulting from the scheme but rather a contradiction of capitalism, i.e. the poorer the person who receives a loan, the more expensive the loan becomes.

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List of appendixes

Appendix 1:

Transcript of interview with Nadia Ameli, Senior Research Associate at University College London Energy Institute, on the 8th of April 2016
http://www.bartlett.ucl.ac.uk/people/?school=sustainable&upi=NAMEL06

Throughout the thesis referenced to as: (N. Ameli 2016)

00:00 Introduction of her study 'Determinants of household's investment in energy efficiency and renewables'

09:30 They have concluded in the paper that (1) the owners of the house are more likely to invest in energy efficiency, (2) a correlation between income and willingness to invest: *"if you make more money […] you are more likely to invest"*

14:00 If you are high income than the policies don't really affect you, also on the other end of the spectrum, below a certain threshold households cannot afford to invest in energy efficiency

17:00 "*Income is a crucial factor when talking about investments. There is of course a difference between high income and low income households […] There are some thresholds."* Above a certain level of income you are not interested in saving energy because you just don't care, unless you are a very environmentalist person.

19:00 *"People are risk averse in general, but the level of risk averseness can change according to your income. You can be really risk averse and you don't want to take the risk of loans if you are really poor, compared to one person that is more in the middle range."*

20:00 Explanation of discount rate
"How can you assess the future value of the money that you have today? There are several factors but you should compare the interest rate that alternative investments provide for the same level of risk and cost."

The idea behind the discount rates to calculate what is the interest rate that you should apply. Time has a value, because you can take this money and you can invest elsewhere.

25:00 When asked people about what expectations they had about energy efficiency investments they usually overestimated the potential gains. These expected interest rates were even higher among people with lower income. According to the literature it is partly because of their lower education compared to middle income people. Otherwise, there is also a reason that if you earn less the same amount of money has a higher value for you compared to someone who earns more. That's why you expect more gains from the same amount that you spent.

28:30 People do not assess the calculations properly and what has been found is that low-income people expect unbelievably high interest rates that are absolutely out of the market whereas people on higher incomes still expect higher than what is attainable.

31:00 Peer effect – you tend to do what people around you and people you trust do.

32:00 If you don't make enough money the investment seems really huge to you. It's a big barrier to your budget if you are really below a certain level of income. So it's really hard to help low income households to take up this investment. It's hard to target these people.

34:00 People are afraid of loans because of the recent events of the 2008 financial crisis.

36:00 *Loan attached to the meter instead of the mortgage*
California launched a similar scheme to the Green Deal, called PACE. Here you don't have to pay upfront costs and the payments are attached to the property taxes. So the payment is not attached to the person but to the tax – so it's similar to the Green Deal's approach of attaching

the loan to the meter. It was successful because Americans mobility is really high and they really like to move which is made easier by the loan being attached to the property.

38:30 In the UK one of the issues was the interest rate which was high.

40:00 People don't want to be responsible for something over 20 years and thanks to this aspect they feel more flexible.

43:00 Experiment in the UK – the government proposed a cleaning service so they realized that people were reluctant to start an energy efficiency measure because of the other "troubles" that are involved with it.

47:00 Loans are not seem to work very well for poor people.

47:50 Concessional loans are loans where the interest rates are below the market rates or they have a long repayment period. One solution [to address low and middle income households simultaneously] is to have concessional loans with different level of interest rates.

It has to be always a subsidized interest rate below the market interest rate but you can have different levels according to your income.

49:00 Another interesting idea is to have a package of policies. If you try to understand what are the priorities of very low income households you will realise that energy is not on the top. So one idea was to attach the energy measure to another kind of service. So first you have to understand what the priorities of low income households are and if we attach this incentive to energy policies we might observe some changes.

51:30 What we know is that those energy loans even if they have been target to low income households they don't seem to reach those households.

57:00 Regarding collecting data from banks on loans and limited disclosure: she suggests that I should try to ask about trends.

- What is the typical characteristic/profile of households that take these loans?
- Since the implementation of the policy how many loans have you provided?
- Can you see some income levels/threshold?
- Macro trends

1:01:00 Clarification of the difference between the Green Deal and other loans offered by banks.

The Green Deal is a policy set up by the Government. The Green Investment Bank is physically a bank that delivers energy loans and they do not only provide debt loans. There are two kinds of loans – equity instruments and debt instruments.

Debt instruments – when you get a loan or a bond (basically it is an obligation) and you repay the money with a fixed interest rate

Equity instruments – the offers a loan for a company in return for equity in the company, it is basically an investment in the company

1:05:00 The Green Deal was targeted on households, whereas the Green Investment Bank tries to target different actors – households and companies.

1:07:00 Energy efficiency investments are not that expensive for a bank (10,000 pounds). For a low income household it can be a huge amount of money but in general it's not that big. If you have a very long term loan and your time horizon is 15 years, it's kind of risky. Because the longer the time horizon the riskier the investment because many things can happen during that time.

1:09:30 From an economic point of view, if you take a loan for a longer period of time, the bank has to raise its interest rate because during that time frame many things can happen which makes the investment riskier.

A tricky problem – if you have a low income you need longer time to repay your loan, but if the bank needs to lend you money for a longer time than it needs to raise the interest rate because by that the investment becomes riskier. In finance you have a limited amount of resources and time has a value. Therefore you have to balance longer term investments with higher interest rates.

1:13:00 When you talk about finance there always has to be an economic model behind it.

Appendix 2:

Transcript of interview with Keith Von Tersch , Energy Consultant at Capita Property and Infrastructure; representative of the Mayor of London's RE:NEW programme, on the 8th of April 2016

Throughout the thesis referenced to as: (Tersch 2016)

00:00 Overview of the RE:NEW programme. It started as an area-based programme in 2009 when it had a focus on individual households.

"It used to be much more of an area-based programme where they actually had people delivering on the ground and going out door-knocking on people's houses and trying to get them to take up energy efficiency measures like loft and cavity wall insulations."

1:00 After 4-5 years, it grew over and ran across London in every local council. *"Then there were quite a lot of changes made to the major funding available for those types of measures which comes mainly through the energy suppliers." "In response to that GLA decided, as they were applying for money from the European Investment Bank, that they should probably refocus that, because they felt like trying to engage individual households is probably going to become a lot more difficult with less funding available and they could help to target them […] and now, it is much more of a consultancy offered to people"*

02:10 In theory it is available across all housing tenures (social housing, private sector and the private rented). *"In practice we are pretty focused on social housing because it is a lot easier to work with them in terms of you've got a single owner for the house and they can make decisions on behalf of a large number of properties."*

03:00 Q: Are social housing providers come to you to ask for consultancy?

A: It's mainly us sort of promoting it but the RE:NEW brand is fairly well-known in London so occasionally also some people come and ask for their help.

03:40 Describing their customers in the social housing segment. There are a lot of people to engage with in the social housing sector.

04:20 *"We can work with the private sector, but we don't tend to ever work individually with householders. We hadn't set a certain service up for that. In that way it would be very cost intensive."* – it is more effective to target social housing

05:20 There isn't anything that is specifically targeted at individuals except for the energy company obligations.

06:00 Energy Company Obligations (ECO): *"They've got an obligation that you have to save a certain amount of carbon in households, how they actually achieve that isn't specifically defined by government but they've got a system using energy performance certificates to assess how much carbon is saved at a given property." "So it means that they are offering a funding based on lifetime savings."*

08:00 They have 3 distinct categories that they have to fulfil.

1. Carbon emissions reduction obligation – general one, focusing on solid wall insulation
2. Carbon saving communities – targeting poor neighborhoods (index of multiple deprivation)
3. Home heating cost reduction obligation – more focused on fuel poverty

08:50 *"RE:NEW is a carbon saving and a fuel poverty programme but fundamentally it's supposed to be about carbon savings. We don't always engage as much on the fuel poverty side."*

11:30 The Green Deal didn't make a lot of sense for a social housing provider. It created a new charge on their property that was separate to any of finance they already had in plans.

12:30 *"It was decided before the government withdraw the funding that it wasn't a cost effective way for RE:NEW to support people. So ECO is the main thing we are focusing on."*

13:00 We are in regular contact with the six largest suppliers and we are trying to understand what they need in terms of energy efficiency measures. They often offer for the general public but they may also have a small team dedicated for social housing.

14:30 So we are trying to get projects and contracts. We help them in putting together a project and can help with the procurement of the project as well and in identifying the partners.

15:20 *"The biggest issue generally with the Green Deal was around the cost of finance, so the interest rate that you need to be paying back for the money. It was quite high and there were probably a lot of situations where social housing providers could access cheaper finance than what you'd get through the Green Deal."*

"But it also often introduced a different charge on their property. You know, they would already probably have a in a lot of instances outstanding debts that they had to pay on their properties and this would have introduce another layer of debt for them from a different lender which would have created potential issues."

"It just created a big risk for them. They worried what would happen if there were problems with the installation. They would have a lot less control over what was being done because in a lot of instances that would mean signing away your rights to what you would do with that property because it was all packaged up with somebody providing the finance and the installer to do that work. They would take warranties and guarantees of course but it created a loss of control for the housing associations."

17:30 Social housing association relation to the ECO scheme.

18:30 They are often looking for an offer when they would get the money from the energy supplier and they would be responsible for the administrative tasks and finding the contractors. Also there is a lot of compliance elements to insure that you meet standards required for the funding. That way the supplier is only responsible for the funding which gives housing associations a lot more control than in the case of the Green Deal.

19:30 The Green Deal was a loan, whereas the ECO is a grant. You can use the GD to pay for all the work, while in the case of the ECO only finances a proportion of the costs, but there are no further obligations – no strings attached.

21:00 Explanation of political discussions around the energy company obligations.

23:00 ECO ran for a year in 2013 before the government reduced the scale of the programme so installations started to reduce from April 2014.

They've renounced the energy company obligations – it will end in next April but the general assumption is that there will be a follow up programme. So now they are refocusing the ECO towards the fuel poor. There will probably be a year of transition when they keep the 3 categories but then they will raise the target for what needs to happen under the affordable warmth side and lower the targets for the carbon savings side of obligations.

27:00 Explanation of on-bill financing.

Green Deal did make finance available for people who probably wouldn't been able to get that finance through other sources but this is what have pushed up the interest rates.

30:00 There should have been a big kind of awareness raising to make people understand that this is a different approach that this finance isn't as risky, your house will not be repossessed. Central government did some work to promote it.

32:00 The other probable reason for the low take up was the lot of administrative and compliance elements and costs related to those with had actually nothing to do with the installation itself. Particularly using energy performance certificates.

33:30 ECO scheme and social housing associations.

34:00 The biggest problem is data – knowing what needs to be done to properties. Assessment are not sufficient enough, there's a big gap. Finding the properties can be difficult which adds another layer of costs to it.

35:00 Another problem is about who should have the control over the process.

36:00 Households can choose which offer they are willing to take, so they are not tied to their own energy supplier which is good because in theory it pushes down prices because of the competition between the different suppliers. However, comparing these offers can be quite difficult for households.

----- The rest of the audio file has lost its quality during the conversion and is hardly audible. -----

Appendix 3:

Transcript of interview with Antoni Michael and Amanda Webb, senior associates at the Office of Gas and Electricity Markets (Ofgem) responsible for the delivery of the Energy Company Obligations (ECO) scheme, on the 8th of April 2016

Throughout the thesis referenced to as: (Michael and Webb 2016)

The audio file of the interview has been lost therefore the appendix contains only what I have written down during the interview. These are:

- There are problems with the availability of the data. Different datasets belong to different authorities and access to them is limited due to personal rights issues (e.g. the department responsible for energy (and thus alleviating energy poverty) cannot get access to data belonging to the department that is responsible for alleviating poverty)
- Some households are reluctant to accept the grant offered through the ECO scheme, probably because they do not want to admit that they require help, however this topic is not well researched.
- According to the critics, the ECO scheme is unjust because energy companies pay for the obligations by raising the energy bills for all. It is a bit controversial because while it offers grants for those who are in need, it increases the energy bills for all households including those who are taking the grant.