

# Property transfer tax reform – a game changer for energy efficiency retrofits?

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## Abstract

The selling and purchasing of a home is a critical trigger point for making refurbishments to a property. Buying a property is usually associated with paying a Property Transfer Tax (PTT), which can amount to significant costs to the purchaser. In this paper, we explore the potential for linking PTT to the energy performance of the building that is being sold and/or any energy efficiency improvements carried out after purchase. To our knowledge, such a mechanism currently does not exist anywhere in the world and, if designed carefully, it could provide an important demand driver and financing mechanism for energy efficiency. An energy efficiency PTT would need to strike the appropriate balance between stimulating demand amongst consumers, while also ensuring the scheme is revenue neutral to the finance ministry. In the paper, we investigate how PTT would need to be designed in order to achieve both aims.

We use two case studies (Germany and the United Kingdom) to illustrate how an energy efficiency PTT could work in practice. The two countries have very different PTT mechanisms in place, although the volumes of revenues are similar. In Germany PTT levels are set at the regional level by the Länder whereas in the UK England, Wales & Northern Ireland set the same rates but Scotland uses different rate bandings.

Based on the two case studies, we present ideas for as well as the potential and the challenges of a PTT reform that is based on the energy efficiency of sold properties. We also set out further research needs and policy recommendations to put this concept into practice.

## Introduction

The selling and purchasing of a home is a critical trigger point for making refurbishments to a property. Buying a property is usually associated with paying a Property Transfer Tax (PTT), which can amount to significant costs to the purchaser. In this paper, we explore the potential for linking PTT to the energy performance of the building that is being sold and/or any energy efficiency improvements carried out after purchase. To our knowledge, such a mechanism currently does not exist anywhere in the world.

There are, however, some examples of policies that require energy efficiency minimum standards at the point of sale. For example, the Berkeley Residential Energy Conservation Ordinance (RECO), adopted in 1987, required homes to install up to 11 energy savings measures. The regulations applied to all residential properties and were triggered by the sale or transfer of the property and major renovations (City of Berkeley 2017).

Because PTT incentives apply at the point of sale they could have a profound impact on the perception of the energy performance of buildings. If designed carefully it could provide an important demand driver and financing mechanism for energy efficiency. An energy efficiency PTT would need to strike the appropriate balance between stimulating demand amongst consumers, while also ensuring the scheme is revenue neutral to the finance ministry. In this paper, we investigate how PTT would need to be designed in order to achieve both aims.

We use two case studies (Germany and the United Kingdom) to illustrate how an energy efficiency PTT could work in practice. The two countries have very different PTT mechanisms in place, although the volumes of revenues are similar. In Germany PTT levels are set at the regional level by the Länder whereas in the UK England, Wales & Northern Ireland set the same rates but Scotland uses different rate bandings.

In the UK, an incentive mechanism using PTTs has been proposed well over a decade ago by Boardman et al. (2005), Dresner and Ekins (2004), Kilip (2008), Lees (2005), and, more recently, by Adams (2016), Energy Saving Trust (2002), Howard (2016), Rosenow and Sagar (2016), and the UK Green Buildings Council (2013). In Germany, a discussion about PTTs and energy efficiency is just emerging with proposals for introducing PTT-based incentives for energy efficiency from Jahn and Rosenow (2016) and Thamling et al. (2015).

In this paper, based on the two case studies, we present ideas for as well as the potential and the challenges of a PTT reform that is based on the energy efficiency (improvements) of sold properties. We also set out further research needs and policy recommendations to put this concept into practice.

## Policy options

In both Germany and the UK there are two principle tax mechanisms affecting domestic properties directly which could be used as the basis for an incentive mechanism. First, there is an annual tax on the property depending on its value and location (Germany: Grundsteuer, UK: Council Tax). In addition, when domestic properties are sold they attract a PTT (Germany: Grunderwerbsteuer, UK: Stamp Duty). A PTT can be set for all property transfers at a specific tax percentage level (e.g. Germany), or it can differentiate between cheaper and more expensive properties with lower PTT-rates for lower property values (e.g. UK, Portugal). In theory, both mechanisms could be used for the purpose of incentivising energy efficiency improvements.

### PREFERRED TAX MECHANISM

We use a number of criteria to assess which of the two options appears to be more promising as a basis for an incentive mechanism. The rationale for the selection of criteria is to establish whether or not one or the other approach is more practical and has more scope for triggering action. Admittedly, this is a somewhat subjective exercise but in the absence of meaningful data we have chosen to analyse the options based on high-level criteria we deemed useful:

- **Affects those responsible for the property:** For the incentive to be effective it needs to be relevant to the person who is able to make decisions about energy efficiency improvements in the property.
- **Coverage:** This criterion encompasses the reach of the tax mechanism in terms of how many properties are affected by it.
- **Scale to provide substantial incentive at once:** The overall level of the tax at a specific point in time determines whether or not the scale of the potential adjustment is sufficient to provide a substantial incentive for funding retrofits. A tax incentive that applies to a relatively low tax paid multiple times has a different effect. Most likely, house prices would differentiate more depending on energy performance.
- **Time of intervention associated with “trigger points”:** The selling and purchasing of a home is a critical trigger point for making refurbishments to a property (Fawcett 2013). The extent to which the tax mechanism is aligned to those trigger points is important for its effectiveness.

- **Ability to pay of taxed individuals:** In order to be able to invest in energy efficiency upgrades the individual facing the tax to be adjusted need to have sufficient financial resources. While the PTT incentive would provide some of the investment cost, not all of the cost can realistically be covered and a contribution from the beneficiary of the incentive would be necessary.
- **Complexity:** The administration of a property tax-based incentive programme can potentially be quite complex. It involves not only to apply the incentives in line with the specification but also the prevention of fraud and compliance checks.

Table 1 presents the different options evaluated against the criteria chosen. Our analysis of the different options shows that:

1. A fundamental difference between the two options is that the property tax consists of relatively modest amounts paid multiple times whereas the PTT has to be paid once (after purchase). This means the potential incentive would be need to be spread in case of the property tax but could be offered as a one-off incentive in case of the PTT.
2. The number of potentially eligible properties is much larger for the property tax option than for the PTT. This means that the complexity of administering a property tax incentive would be higher than for the PTT option.
3. For the property tax, the main problems are that this tax is not related to the ability to pay and that those living in rented accommodation cannot make energy efficiency improvements affecting the structure of the building.
4. In both cases the Property Transfer Tax best meets the criteria and, in particular, it targets those responsible for the property at the time of “trigger points”.

### DESIGN OPTIONS FOR A PTT INCENTIVE

There are at least two options for a PTT incentive:

- **Option 1:** The PTT could be readjusted so that more efficient properties pay a lower PTT and less efficient properties attract a higher PTT so that overall the scheme is revenue neutral.
- **Option 2:** There could be a rebate for those properties where energy efficiency improvements are being made after purchase of the property say within 6 months.

Option 1 would reward owners of energy efficient properties regardless of whether or not they implement energy efficiency measures whereas Option 2 is conditional of actual improvements.

In theory, both options could be combined: Those purchasing a building would be incentivised to a) buy a more efficient building in the first place and b) make improvements to the building within a defined time period after purchase.

#### Option 1: Energy performance-based PTT differentiation

Option 1 would result in the differentiation in terms of house prices as properties with a higher energy efficiency performance attract a lower PTT (Table 2). The change in PTT is chosen purely as a means to illustrate how such a mechanism

Table 1. Comparison of possible taxation mechanisms to encourage energy efficiency improvements.

Evaluation criterion	UK		Germany	
	Property Tax (Council Tax)	Property Transfer Tax (Stamp Duty)	Property Tax (Grundsteuer)	Property Transfer Tax (Grunderwerbsteuer)
Affects those responsible for the property	No, needs to be paid by tenants	Yes, has to be paid by the purchaser	No, usually paid by tenants (passed on from landlord)	Yes, has to be paid by the purchaser
Coverage	All residential properties except those with occupants fitting exemption criteria (potential discount if property is unoccupied)	Only those properties sold with a value exceeding £125,000	All residential properties except listed buildings and reduced tax in case of unoccupied properties	Only those properties sold
Scale to provide substantial incentive at once	Moderate, typical Council Tax is ~€1,700/year/property	Large, average Stamp Duty paid ~€7,000/property)	Small, typical Grundsteuer is ~€260/year/property	Large, average Grunderwerbsteuer paid ~€9,000/property)
Time of intervention associated with “trigger points”	No, Council Tax is usually paid every month.	Yes, Stamp Duty is paid at the point of sale, a time when refurbishment is regularly considered.	No, Grundsteuer is paid every year.	Yes, Grunderwerbsteuer is paid at the point of sale, a time when refurbishment is regularly considered.
Ability to pay of the individual facing the PTT incentive	Moderate	High, purchasing a property typically requires high ability to pay but first-time buyers’ budgets might be stretched	Moderate	Relatively high, purchasing a property typically requires high ability to pay but first-time buyers’ budgets might be stretched
Complexity	Very high, all domestic buildings are covered and Council Tax is usually paid monthly. Administration is decentralised at local authority level.	Moderate, Stamp Duty only applies to buildings that are sold and Stamp Duty is paid at point of sale. Administration is centralised at government department level.	High, most domestic buildings are covered and Grundsteuer is usually paid every year. Administration is decentralised at local authority level.	Moderate, Grunderwerbsteuer only applies to buildings that are sold and Grunderwerbsteuer is paid at point of sale. Administration is centralised at Länder department level.

might work. It does not indicate the ‘right’ level of incentive nor does it represent a proposal.

There is already evidence that more energy efficient properties both in Germany (Kholodilin and Michelsen 2014) and the UK (Fuerst et al. 2015a) can command higher purchase prices, a result of the benefits (such as increased comfort and lower bills) that a more efficient property provides. Thus, more energy efficient properties pay a *higher* PTT opposed to those properties with a low energy performance. Introducing an energy performance-based PTT would reinforce the price differentiation. The proposed standard would need to strike the appropriate balance between stimulating demand amongst consumers, while also ensuring the scheme is revenue neutral to the public (unless there is a willingness for the scheme to have a net-cost<sup>1</sup>). As there are uncertainties around the scale of the response to the new incentives, it would be sensible to gradually increase the financial differentiation until the desired response takes place.

1. Even if an energy efficiency programme has a direct net-cost, the fiscal benefits can more than offset those costs (Rosenow et al. 2014).

#### Option 2: Energy efficiency improvement-specific PTT rebate

Option 2 is more akin to a standard rebate programme whereby property owners can apply for rebates for specific technologies installed in the property. Most rebate programmes determine the size of the rebate based on the technologies installed. Alternatively, rebates can be provided depending on the level of energy performance reached (e.g. kWh/m<sup>2</sup>/year or Energy Performance Certificate rating). The home owner would need to prove that energy efficiency improvements have been made after the purchase (for example through presentation of an updated Energy Performance Certificate) and could apply for a cash-rebate within a defined period (e.g. 12 months).

#### PTT IN GERMANY AND THE UK

##### Germany

In 2014, around 900,000 properties worth €191 billion (of which €131 billion in the housing market) were sold (Arbeitskreis der Gutachterausschüsse und Oberen Gutachterausschüsse in der Bundesrepublik Deutschland 2016).

Until 2005, a federal PTT of 3,5 % generated a total revenue of €4,8 billion (DIW 2014). As mentioned above, since 2006 the PTT and its level is the responsibility of the Länder. Today

**Table 2. Fictitious illustration of energy performance-based PTT differentiation.**

Value of the property	€300,000		
Current PTT of 4 %	€12,000	€12,000	€12,000
Energy performance (Energy Performance Certificate rating and kWh/m <sup>2</sup> )	A (40 kWh/m <sup>2</sup> )	D (100 kWh/m <sup>2</sup> )	G (200 kWh/m <sup>2</sup> )
Change in PTT	-60	0 %	+60 %
PTT after adjustment	€4,800	€12,000	€19,200

Source: based on Howard (2016) and Jahn and Rosenow (2016).

PTT ranges from 3,5 to 6,5 % with a total revenue of €11,2 billion (including non-housing buildings) in 2015. Therefore, the average PTT in Germany appears to be around 5,8 % in 2015. The ownership structure in Germany differs much from most other EU states, on average only 40 % of all houses and apartments are owned by their users (Bundesinstitut für Bau-, Stadt und Raumforschung 2016). Because more than 70 % (13 million) out of all 17 million single/double family houses<sup>2</sup> in Germany are owner-occupied (dena 2012), the apartment sector is mostly driven by professional housing firms and landlords. This means that in case of an ownership transfer of an apartment house with multiple leased flats does not contain the same window of opportunity for energy efficiency improvements as the owner-occupied single family houses we are focusing on within this paper.

The average value for a single house is only about €101,802 in rural areas (Immobilienmarktbericht 2016), the PTT to be paid is close to €6,000. The value of single family houses varies by region and will be significantly higher in urban areas or in the neighbourhoods of growing cities. We assume that the property transfer rate in suburbs is higher and, as a result, the average PTT volume is much higher, too.

## UK

In 2014–15, a total number of 1,2 million residential properties were sold in the UK (HMRC 2015a). The total amount of PTT from residential property transactions in the UK was ~€9 billion (HMRC 2015b).

Table 3 provides a breakdown of the PTT revenue by Stamp Duty rate which is determined depending on the value of the sold property. Note that data is only available for the old Stamp Duty regime and official statistics do not yet report PTT revenue for the new Stamp Duty regime (which has different bands) that was introduced in December 2014 (see Table 4). The data shows that for a large share of the properties sold no Stamp Duty was due as they were below the threshold at which Stamp Duty is charged (£125,000).

## Potential reach of a PTT incentive

In order to estimate the potential reach of a PTT incentive, we calculate the number of properties per year that could benefit from different levels of PTT incentives. The rationale is that the incentive needs to be significant enough in order to trigger en-

ergy efficiency improvements (for example, an incentive of €50 would clearly not be sufficient to trigger works that cost €1,000 or more). We model different levels of incentives (provided as a portion of the PTT paid) and show the distribution of the potential financial support across all properties sold. In order to do this, data on the distribution of transactions by PTT rate and property value are required. We could not identify such data for Germany as PTT is collected by the Lander and there is no national statistic providing sufficient granularity. We therefore use PTT data from the UK for the purpose of illustrating the potential reach of a PTT incentive.

### STEP 1: ADJUSTMENT OF PTT DATA TO NEW PTT RATE REGIME

One complication in calculation the amount of Stamp Duty in different price bands arises from a fundamental change in PTT levels introduced in December 2014. PTT receipts are still reported on following the pre-December 2014 structure (Table 3).

We calculated the PTT receipts and transactions according to the new price bands assuming a linear distribution of properties in the price brackets >€300k which have been changed recently (Table 4). This is of course not entirely accurate but was the best assumption we could make in the absence of published data on the distribution even in the old bands.

### STEP 2: FINANCIAL SUPPORT PROVIDED BY DIFFERENT PTT INCENTIVE LEVELS

This data allows us to model the financial support provided by different incentive levels. We modelled the financial support that could be made available under scenarios for a 100 %, 50 %, 25 % and 10 % rebate (either as a grant or reduction in PTT payable). We did not model this for different levels of energy performance as this data is not readily available. Instead, for each scenario, we then calculated the rebate for all property values assuming a linear distribution within each value bracket according to the data presented in Table 4. Our analysis (Figure 1) demonstrates that a very small rebate of 10 % would provide financial support of more than €1,000 to 221,072 properties per year. A 100 % PTT rebate would provide the same incentive level to more than three times as many properties per year.

This first step of the analysis merely provides an estimate of the volume of finance that could be provided through a PTT incentive, it does not indicate how many properties could receive specific energy efficiency measures. This analysis is carried out in the next step. Because we did not take into account the energy performance of the properties yet, a portion of those properties that could attract a rebate purely based on the amount of PTT paid has a limited potential for energy efficiency upgrades, especially those in EPC bands A and B. Currently, only 1 % of

2. Most German statistics count houses for one family and for two families in one category.

all homes in England fall into the two top EPC bands A and B. Even if we exclude all homes in EPC band C this still leaves 77 % of all homes with potentials for energy efficiency improvements (DCLG 2015).

### STEP 3: ESTIMATING THE POTENTIAL NUMBER OF ENERGY EFFICIENCY IMPROVEMENTS

The next step of the analysis involved an estimate of how many typical energy efficiency measures could be funded by such a programme to get a better understanding of the potential impact in terms of energy efficiency improvements.

First, we calculated the potential for insulation measures such as cavity wall insulation, loft insulation, and solid wall in-

sulation. Using data on the remaining potential in the domestic building stock (DECC 2016a) we assumed the potential to be proportional within those properties sold every year. This may well be inaccurate and those properties changing hands more frequently and which are vacated more often might be receiving more energy efficiency measures (Fuerst et al. 2015). However, in the absence of precise data and because the calculations below are illustrative we work with the simplistic assumption that those homes sold reflect the average energy performance of the total housing stock.

Second, we calculated the number of properties receiving different levels of financial support through a 25 % PTT incentive for each of the selected energy efficiency measures. Based

Table 3. Stamp Duty in 2014–15.

Value of property	Old Stamp Duty Rates	Transactions	Stamp Duty paid	Average Stamp Duty paid
<€150k	0 %	367,000	–	–
€150k–€300k	1 %	513,000	1,092,000,000	2,129
€300k–€600k	3 %	252,000	3,120,000,000	12,381
€600k–€1,200k	4 %	67,000	2,118,000,000	31,612
€1,200k–€2,400k	5 %	14,000	1,122,000,000	80,143
>€2,400k	7 %	5,000	1,464,000,000	292,800

Source: authors' calculations based on HMRC (2015a, 2015b).

Table 4. Expected PTT receipts and transactions under new Stamp Duty rate regime

	Stamp Duty rates	Transactions	Assumed average property value	Total PTT receipts
<€150k	0 %	367,000	0	–
€150k–€300k	2 %	513,000	212,865	1,092,000,000
€300k–€1,110k	5 %	308,950	508,011	5,238,000,000
€1,110k–€1,800k	10 %	17,050	1,212,500	1,108,250,000
>€1,800k	12 %	12,000	2,677,857	2,851,114,285

Source: authors' calculations based on HMRC (2015a, 2015b).

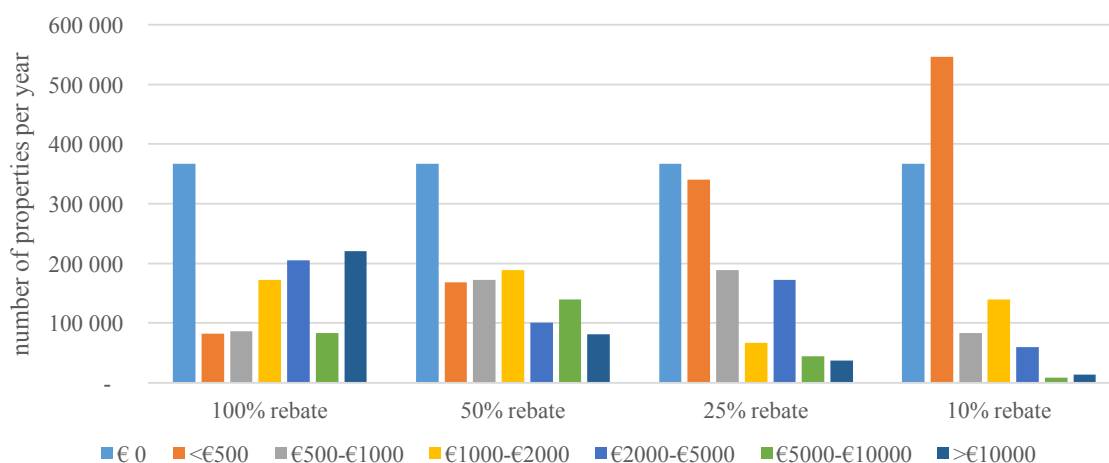


Figure 1. Number of properties eligible for rebates depending on the size of the rebate given. Source: authors' calculations based on HMRC (2015a, 2015b).

on the cost of the measures we have been able to estimate the number of fully fundable measures per year (Table 5). In total, we estimate that close to 350,000 measures could be fully funded. If we assume that only 50 % of the costs of the measures needs to be funded then up to 380,000 measures could be delivered. In total, the cost of the PTT incentive would amount to €1,9 billion per year. A 50 % incentive is typical for energy efficiency programmes such as Energy Efficiency Obligations (Hoffman et al. 2015; Rohde et al. 2015). This is also a similar level of incentives as offered through the Green Deal Home Improvement Fund in 2014 (DECC 2014) which attracted large numbers of applicants.

#### STEP 4: ESTIMATING TAKE-UP RATES

In practice, not all property owners would take up the incentives offered to them. For Option 2 (the rebate option), the actual response rate could be well below 20 as analysis from Element Energy (2009) suggests - only a relatively small share of home owners are willing to invest in energy efficiency unless the payback period is less than 3 years. Even if that is the case there are multiple barriers preventing home owners from taking up energy efficiency measures. Consumer research on the potential response to a 100 % upfront grant for more efficient heating systems concludes that only 4 would decide to install such technologies (Ipsos MORI and the Energy Saving Trust 2013). While such figures are inherently uncertain they do suggest that take-up could be relatively low. Hence, we would not expect the number of properties benefitting from the PTT incentive to exceed 100,000 properties per year even under a funding regime that allows 100 % of the costs to be covered by the incentive. This would amount to a total incentive of around €0,5 billion per year (lower if measures not fully funded).

Without piloting, it remains unknown to what degree property owners would respond. Experience from new finance schemes for energy efficiency shows that it takes a while to build the momentum and get significant uptake. Depending on the uptake, the amount of financial resources needed to provide the incentive varies significantly.

For Option 1 (the differentiated PTT) the effects on house prices due to the differentiation in PTT payments is difficult to model. However, we would expect that the differences in PTT would, at least to some degree, be reflected in the purchase

price. This could have a more dynamic effect on the housing market and result in long-term incentives for homeowners to upgrade their homes so that they can attract a higher price for their property. In the UK, homeowners consciously make improvements to their properties such as adding new kitchens or bathrooms in order to increase the property value. A differentiated PTT is likely to lead to a different perception of energy efficiency but the extent to which this would result in energy efficiency improvements is difficult to estimate and would require much more sophisticated modelling.

## Discussion

#### SIGNIFICANCE OF A PTT-BASED INCENTIVE FOR ENERGY EFFICIENCY

Whilst a PTT-based incentive clearly has a number of advantages, particularly that it is aligned with important trigger points and that it could be designed in a revenue-neutral fashion, there are limitations to such an approach.

First, the relatively small number of property transactions compared to the housing stock (~4,5 % in the UK and 2 % in Germany) means that using a PTT-based incentive as the only mechanism to support energy efficiency is insufficient to achieve retrofit at the scale required to meet the carbon targets in both Germany and the UK. Hence, PTT-based incentives can only be seen as complementary to other policies and have to be seen as part of the policy mix rather than a standalone policy option.

Second, even when significant reductions of PTT are offered, high cost measures such as solid wall insulation could only be funded to a limited degree. In case of the UK, only about 25 % of all properties that require external wall insulation could be funded through a PTT-based incentive (assuming 50 % support is required and offered rather than 100 %).

#### RELIABILITY OF ENERGY PERFORMANCE BENCHMARKS

In the UK, getting consistent energy performance benchmarks has long been a problem, even for the same property when assessed by different installers. Jenkins et al. (2015) show that this continues to be a problem. Their study got Energy Performance Certificate ratings from 4 different assessors for 29 properties and then compared the range of these results, and also with their own Computer Aided Design models for that property.

Table 5. Distribution of potential energy efficiency improvements by level of financial support for a 25 % PTT incentive.

Measure*	Total housing stock	Within properties sold	Level of rebate							Cost of measure (Euro)	Fully fundable
			€0	<€500	€500–€1,000	€1,000–€2,000	€2,000–€5,000	€5,000–€10,000	>€10,000		
CWI ETT	300,000	13,533	4,078	912	958	1,915	2,285	930	2,456	735	57,786.89
CWI HTT	2,900,000	130,822	39,419	8,816	9,257	18,514	22,086	8,986	23,745	1,840	7,839.72
LI ETT	6,300,000	284,200	85,633	19,152	20,110	40,219	47,981	19,522	51,583	442	181,651.62
LI HTT	1,700,000	76,689	23,107	5,168	5,426	10,853	12,947	5,268	13,919	1,200	36,475.40
SWI	7,500,000	338,333	101,944	22,800	23,940	47,880	57,120	23,240	61,409	12,780	61,409
Total											345,163

Source: based on DECC (2016a, 2016b), Element Energy and Energy Saving Trust (2013) and HMRC (2015a, 2015b).

\* CWI ETT: cavity wall insulation hard-to-treat; CWI HTT: cavity wall insulation hard-to-treat; LI ETT: cavity wall insulation hard-to-treat; LI HTT: loft insulation hard-to-treat; SWI: solid wall insulation (including internal and external insulation).

The results demonstrate that, despite the use of standardised models, methodologies, and assessor training, the conclusions arrived at from the assessment process varied significantly with each assessment.

For this reason, Rosenow and Sagar (2015) have called for a review of existing metrics and to propose a more accurate measurement of energy performance. Such a review should also assess the most effective way to communicate such a metric to the consumer, in order to produce a more understandable and attractive alternative.

#### SOCIAL EQUITY

It is advisable to cap the total amount of PTT incentive provided. Some single house properties command very high amounts of PTT amounting to several hundred thousand Euros. Buyers of properties costing several million Euros clearly have the capital to invest in energy efficiency improvements and do not require a large incentive. For equity reasons, it is also fair to limit the amount of tax the public forgoes or offsets by increasing PTT for other, inefficient properties. In addition to an upper limit for the incentive, under Option 1 an upper limit for the potential 'malus' PTT payment would need to be considered to protect those households on low incomes. Without deeper analysis it is impossible to determine the severity of this potential issue.

In addition, in the UK 30 % of all properties do not attract any PTT because of their relatively low value (see Table 3). It can be expected that this category of homes is occupied predominantly by households on lower incomes including those in fuel poverty. Therefore, a standalone PTT incentive would not be sufficient to support households within the low-income bracket and additional policy instruments are required to ensure that support is not just offered to those living in more expensive homes.

#### LEGAL BARRIERS

There might be some legal barriers to use PTT as a tool to drive energy efficiency investments. The German constitution delegated the PTT setting responsibility including the chances and risks of its revenues to the Länder under the condition of a single PTT-rate. This could be significant to Germany, because one of the PTT reform options we discuss in this paper requires a differentiation of the PTT into several levels and this may require a change in the German constitution. Within other jurisdictions such as the UK or Portugal different PTT rates are already established due to other policy objectives, e.g. to incentivise property ownership social equity.

#### FISCAL BARRIERS

In both Germany and the UK, the PTT provides a significant revenue stream. It is likely that there is resistance to modifying the PTT alongside policy design Option 1, which involves an adjustment of the PTT paid according to the energy performance of the building sold (UK Green Buildings Council 2013). Whilst in theory such an adjustment can be revenue neutral to the finance ministry, there are of course risks involved in modifying the existing PTT regime in that it is difficult to predict the precise effect the energy performance-based adjustment will have on the PTT revenue in future years. For those reasons, we expect there to be fiscal barriers to Option 1 that are not trivial to overcome.

#### POTENTIAL FOR FRAUD

Given the wide scope of a PTT incentive there is risk of potential fraud, for example through providing inaccurate Energy Performance Certificates or certifying specific energy efficiency improvements (Howard 2016). To avoid fraudulent behaviour, independent sampling checks of properties need to be performed.

Option 1 (adjustment of PTT levels) would require that every transaction where PTT is due would have to be checked for fraud on a sampling basis. The advantage of Option 2 (PTT rebate) is that only those properties receiving rebates would need to be checked (again on a sampling basis). This means the administrative burden of Option 2 would be greatly reduced.

#### Conclusions

Our analysis shows a redesigned PTT can potentially become an effective instrument to incentivise energy efficiency investments making use of a unique window of opportunity when properties are being transferred. However, our preliminary assessment of the potential reach of a PTT indicates that this mechanism on its own is unlikely to be able to provide sufficient resources to increase renovation rates to the required levels. This means that a PTT reform can only operate in concert with other, complementary instruments.

While a differentiation of PTT levels according to energy performance would be relatively complex, a simple PTT rebate based on the improvements undertaken provides an easier option for making use of the trigger point that is the purchase of a house. Tying in an incentive for energy efficiency upgrades with the purchase of the property makes logical sense and further consideration should be given to this type of policy instrument.

Further research and piloting differentiated PTT rates according to energy performance levels is needed in order to get a better understanding of the long-term dynamic impacts on the housing market. Potentially, such a system could be a game changer and lead to a change in perception of energy efficiency improvements.

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