Taxing carrots and sticks: Incentivising efficiency through property taxes

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Abstract

The introduction of building energy labelling provides a mechanism by which domestic property taxes can be varied by the energy performance of the home, creating both a carrot and a stick to drive improved efficiency. An Energy Efficient Property Purchase Tax (EEPPT) would see the rate of tax payable upon property purchase reduce as the efficiency of that property increases. As efficient properties become lower tax properties (and hence more attractive on the market), energy efficiency becomes embedded in the value of a home in a way that energy labelling alone has thus far failed to deliver.

Previous analysis has shown that such an EEPPT in the UK could make it cost-effective for 44 per cent of properties to increase their energy performance by one efficiency band: the cost of the improvements being less than the reduction in tax. Since this original proposal, interest in an EEPPT has focussed on its potential to help increase take-up of energy efficiency financing mechanisms that remove upfront costs but otherwise reduce the ongoing benefits of improved efficiency.

This paper builds on the initial findings by exploring how the EEPPT can integrate with a financing mechanism, extending the approach to an energy efficient municipal tax (EEMT) and modelling the impact on tax revenues under different tax differentials. The aim is to understand the magnitude and impact of the incentive that an EEPPT or EEMT can produce, and the resulting change in the underlying (non-efficiency) component of the tax, assuming that any amendments to the tax system would be revenue neutral.

Introduction – efficiency, financial barriers and solutions

Improving the energy efficiency of existing homes will be essential to achieve the UK's carbon reduction targets and security of supply objectives in the most cost-effective manner. Yet, despite energy efficiency representing one of the least cost (often negative cost) options for carbon reduction, there remains a great potential for improvement[1]. Public policy will be key to delivering this improvement.

This paper assesses what lies behind the key financial barriers to delivering energy efficiency improvements to the existing housing stock, and how two approaches –finance and property tax incentives – could be used to create carrots and sticks to address the issues.

WHAT'S BEHIND THE BARRIERS?

In 2012 the European Commission consulted on the availability and effectiveness of financial support for energy efficiency in buildings[2]. The response to this consultation[3] identified two of the key financial barriers as being the high upfront investment costs and the long payback times.

1. Committee on Climate Change, Meeting Carbon Budgets – 2012 Progress Report to Parliament, June 2012, http://hmccc.s3.amazonaws.com/2012%20Progress/CCC_Progress%20Rep%202012_bookmarked_singles_1.pdf.

2. European Commission, Consultation Paper: "Financial Support for Energy Efficiency in Buildings", 2012, http://ec.europa.eu/energy/efficiency/consultations/doc/2012_05_18_eeb/2012_eeb_consultation_paper.pdf.

3. European Commission, Consultation Report: "Financial Support for Energy Efficiency in Buildings", 2012, http://ec.europa.eu/energy/efficiency/consultations/doc/2012_05_18_eeb/20120912_financial_support_for_energy_efficiency_in_buildings_consultation_report.pdf.

These findings echo the concepts presented by these authors in a previous paper[4], summarised in Figure 1. However, in themselves, the Commission's findings fail to explore some of the reasons why these barriers arise for energy efficiency: notably that energy efficiency or energy costs are not reflected in property values [whilst some might point to evidence that Energy Performance Certificates are helping efficiency to impact property values in Europe (e.g.[5],[6]), the same has not been seen to date in the UK (see [7],[8])], and that the asymmetry between property occupancy and measure lifetimes requires occupants to implicitly apply high hurdle rates to energy efficiency investment decisions due to the high risk that they will not recoup the capital costs during their tenure. Both of these factors act to stem the delivery of 'negative cost measures' i.e. technologies that simple net present value calculations show to be cost effective at current prices and typical discount rates.

These two factors link together to make energy efficiency a risky investment for homeowners: the risk of selling a home before investment costs are recovered would be mitigated if the energy efficiency improvement led to an increase in property value. The lack of impact upon property value would not be critical if measure repayments could be spread beyond the period of assumed or actual occupancy at the time of investment. Ideally both barriers would be removed: energy efficiency investments would trigger an increase in property value, whilst the investment cost could be spread over the full life of the measures (i.e. consecutive occupancies).

The UK is currently at a transition point in energy efficiency policy, moving from programmes that see energy efficiency measures delivered through obligations upon energy suppliers and Government funded programmes (e.g. CERT, CESP, Warm Front[9]), to the provision of a financing solution that aims to see energy efficiency measures being delivered by a wider market (albeit with some energy company support). To maximise the chance of this transition resulting in wholesale change, it will be important for Government to assess these factors and consider supporting measures to overcome them. This paper assesses the opportunities for using property taxes – Stamp Duty Land Tax (SDLT) or Council Tax (CT) in the UK – to help drive the market for energy efficiency measures in the context of the Government's flagship financing programme, the Green Deal.

OVERCOMING THE FINANCIAL BARRIERS

Solution 1: Energy Efficiency Finance

Whilst many households are already able to access finance for energy efficiency via conventional loans, the uncertainty for households over their length of occupancy in the property they wish to improve makes this route unattractive. Energy efficiency finance approaches therefore have to allow the occupant to withdraw from their repayment obligations if they vacate the property, thus removing this risk. Repayments should transfer to the new occupant now benefitting from the installations. Such approaches have been trialled across the US.[10]

In the UK, the Coalition Government recently introduced a 'Green Deal' policy based on this model: a household can install a package of measures in their home and repay the capital sum through the fuel bill savings that accrue. The nature of the energy efficiency measures that make up the package must be such that the expected (i.e. modelled) fuel bill savings exceed the repayment charge (a principle known as the 'Golden Rule'). Under Green Deal Finance (GDF) the repayment charge is tied to the property rather than the occupant, i.e. it passes to the next occupant with the deeds or new tenancy.

Whilst beyond the scope of this paper to fully critique GDF, there are aspects of its specific design, and financing approaches generally, which raise questions over whether it will deliver the level of uptake suggested by Government: to improve up to 14 million homes by 2020[11]. By its very nature financing removes one cost (energy bills) and displaces these with another (repayments). In many cases, due to high interest rates and potentially substandard installations, the net benefit to the occupant in financial terms will be limited until the full costs have been repaid. The mechanism creates a rather complex finance, billing and risk structure, with the involvement of energy companies to add the repayment charge to the bill, installers, high-street companies to market and advertise the scheme, financers to raise capital, and insurance companies to manage risk. Whilst Green Deal represents an innovative approach to address one key factor in the delivery of energy efficiency measures, several studies suggest that GDF on its own is not sufficient to deliver the level of uptake required[12], whilst the lack of transition afforded by Government puts a lot of pressure on the programme from the outset[13].

Instead GDF should be thought of as an enabling mechanism; important to allow households to avoid upfront costs, but

4. Darryl Croft, *Addressing Key Barriers in the Delivery of Domestic Energy Efficiency — Improvements the Case for Energy Efficiency Property Purchase Taxes*,in Energy Efficiency First: The Foundation of a Low-Carbon Society (presented at the eceee Summer Study 2011, Belambra Presquîle de Giens: eceee, 2011), 1163—1172.

5. Nils Kok and Maarten Jennen, The Value of Energy Labels in the European Office Market, n.d., http://old.czgbc.org/The_Value_of_Energy_Labels_in_the_European_Office_Market.pdf.

6. Dirk Brounen and Nils Kok, On The Economics of Energy Labels in the Housing Market, August 2010, http://urbanpolicy.berkeley.edu/pdf/BK_Energy_Labels_NK082410_wcover.pdf.

7. Fuerst, F., Ekeowa, B., and McAllister, P, The Impact of Energy Performance Certificates on the Rental and Capital Values of Commercial Property Assets: Some Preliminary Evidence from the UK, February 2011, http://www.reading.ac.uk/REP/fulltxt/0111.pdf.

8. Consumer Focus, As Easy as EPC?, 2011, http//www.consumerfocus.org.uk/files/2011/06/Easy-as-EPC-WEB.pdf.

9. CERT (Carbon Emission Reduction Target) and CESP (Community Energy Saving Programme) are two energy supplier obligations in the UK that ended in 2012. CERT was based on the delivery of cost-effective energy efficiency measures, whilst CESP trialled support for more expensive technologies, whole house solutions, and area-based delivery. Warm Front was the tax-payer funded fuel poverty programme targeting vulnerable households. The programme closed in March 2013.

10. Merrian Fuller, "Enabling Investments in Energy Efficiency: a Study of Residential Energy Efficiency financing Programs in North America," in Act! Innovate! Deliver! Reducing Energy Demand Sustainabl, 2009, http://www.eceee.org/conference_proceedings/eceee/2009/Panel_2/2.146/paper.

11. Greg Barker, "Check Against Delivery" (presented at the Green Deal and Big Society Event, Royal Society, June 2011), http://www.decc.gov.uk/en/content/cms/news/gd_bigsoc/gd_bigsoc.aspx.

12. Darryl Croft et al., Access for All: Making the Green Deal a Fair Deal (London: ACE, CSE and EST for Consumer Focus, 2011), http://www.consumerfocus.org.uk/files/2011/11/Access-for-all.pdf.

13. Jan Rosenow, Darryl Croft, and Nick Eyre, "Transitions Between Energy Polices: Evidence from the UK Reforms to Energy Supply and Demand," in Rethink, Renew, Restart, In Draft.

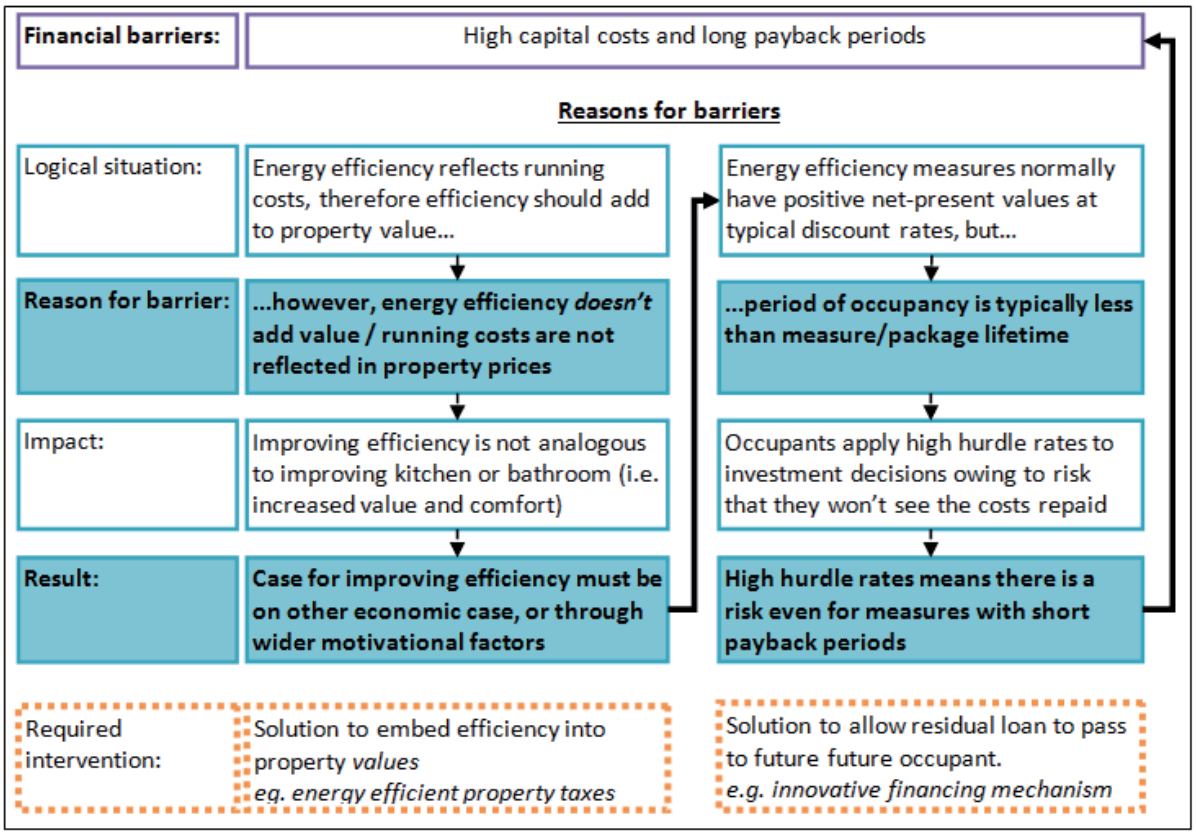


Figure 1. Summary of the rationale for why capital costs and payback periods are key financial barriers.

probably insufficient in itself to deliver a step-change in energy efficiency uptake.

Solution 2: Energy efficient property taxes

If financing alone proves insufficient to drive take up of energy efficiency, alternative or complimentary interventions will be required. These authors have previously argued for an energy efficient SDLT in order to address the first of the factors identified above – that improving efficiency doesn't add value to the property[14].

Improving the kitchen or bathroom of a home is generally considered to add value to a property. Energy efficiency improvements – which deliver fuel bill savings, greater comfort, and health benefits – should do the same. Yet, whilst Governments can work with property surveyors to encourage the accounting of energy efficiency in property valuation, ultimately the market determines house prices. Until homeowners both understand and value the reduction in fuel bills that energy efficiency improvements create, it will be difficult for improvements to generate increased property value. As such, there is a role for Government intervention.

These authors have previously rejected the concept of using property tax rebates to stimulate efficiency for various reasons including their narrow focus, and because they fail to address the fundamentally structural issue with valuing efficiency. Rather than a system of rebates, we propose an approach to incentivising efficiency through an adjustment of the rate of property tax by the energy efficiency of the property in question: high efficiency homes are subject to low taxes, thus making them more attractive on the market.

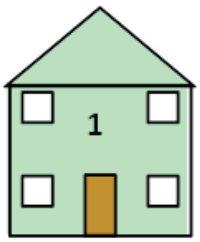
We consider two taxes for this approach in the UK: Stamp Duty Land Tax (SDLT), a property purchase tax paid at the point of purchase and set at a percentage of the purchase price; and Council Tax (CT), a municipal tax paid annually based on the notional value of the property. Figure 2 illustrates the concept.

Two semi-detached properties, 1 and 2, are situated in the same street, each worth €300,000, and identical aside from their energy efficiency ratings: property 1 has a 'B' rating on the EPC, whilst property 2 is rated 'E'. SDLT on these properties would be charged at 3 % were they to be sold, whilst in our example CT is charged at €2,000.

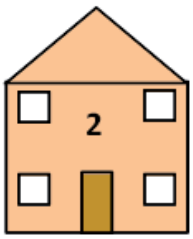
We illustrate a situation where the Government introduces a SDLT modifier that sees the rate of SDLT adjust with the energy efficiency rating of the property, as measured by the A–G rating on the EPC. The modifier ranges from a 1.5 percentage point increase on those properties rated G, to a 1.5 percentage point reduction on those properties rated A, with 0.5 percentage point difference per band. Alternatively, the Government might introduce a CT modifier that adjusts the rate of CT by 10 % per EPC band, with D rated properties remaining at the underlying rate.

In the example, were both properties placed on the market, property 1 would invoke a SDLT of €6,000 rather than

14. See 4.



€300,000



	EPC Band **B**	EPC Band **E**
Energy Efficient SDLT		
Standard SDLT:	3%	3%
EE Adjustment:	-1%	+0.5%
Final Rate:	2%	3.5%
EE-SDLT Cost:	€6,000	€10,500
Energy Efficient CT		
Standard CT/a:	€2,000	€2,000
EE Adjustment:	-20%	+10%
EE-CT Cost/a:	€1,600	€2,200

Figure 2. Illustration of how SDLT & CT could alter between properties of equal value but differing efficiency.

the €10,500 for property 2. To those looking to purchase the properties, property 2 involves paying €4,500 more in tax than property 1. As a result, property 1 could increase its asking price by anything up to €4,500, knowing that the net cost of the home would still be lower than property 2. Since efficiency now impacts the property value, occupants have the motivation to improve their home immediately and benefit from additional fuel bill savings rather than delay improvements to the point of sale. The same is true for the EE-CT, with property 1 benefiting from a €600 lower CT payment, and an immediate impact on the occupants.

The energy efficient property tax concept is therefore built on the premise that the property's energy efficiency impacts the tax liability, and hence the attractiveness of the property, embedding efficiency within the market. Confidence is created that investment in reducing energy consumption can increase the value of the home, meaning that measures are no longer installed solely on the basis that they 'pay-back' – they also add value.

Modelling and Analysis – deploying finance and incentives in unison

The two solutions discussed so far could be implemented in combination. In theory, a SDLT or CT incentive would stimulate interest in efficiency as a value-adding activity, since improving efficiency would reduce the future or immediate tax liability on the home. Financing then becomes the mechanism by which this value can be extracted at no/low upfront cost. The incentive may encourage households to go beyond a conservative baseline offered by the Green Deal 'Golden Rule' and maximise the potential efficiency gains on offer through twinning with their own investment. This approach is modelled as set out below.

MODELLING APPROACH:

The English House Condition Survey (EHCS) represents the entire housing stock in England, containing detailed and specific information on physical characteristics of dwellings, including loft insulation levels, wall types and insulation, heating systems and fuels, as well as property dimensions. This data can be used to determine the potential for, and applicability of, different improvement measures, such as insulation, heating and renewables.

We use the 2007 EHCS for this study despite it not being the latest published dataset for two reasons: firstly, the data on the evaluation of property value is based on a qualified surveyors assessment, whereas more recent surveys either used an estimate based on location and property type or failed to collect the information; secondly, the Centre for Sustainable Energy (CSE) recently completed a project[15] whereby values for household energy consumption were imputued to the 2007 EHCS – further research would therefore be able to compare energy 'consumption' to published energy 'requirement', showing those households that may access the Green Deal but fail to make the expected savings.

CSE's 'Housing Assessment Model' (HAM) has been used to determine a household's baseline energy requirements i.e. the energy required to heat a home to the standard heating regime as per DECC's Fuel Poverty Handbook methodology[16]. For every property represented in the dataset the model produces a baseline assessment of household energy requirements and associated CO_2 emissions and fuel costs.

15. Preston I et al, Fair and Effective or Unjust and Weak? Implications of the Distribution of Emissions for Domestic Energy Policy (JRF, 2013).

16. DECC, "Fuel Poverty Methodology Handbook," 2010, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66018/614-fuel-poverty-methodology-handbook.pdf.

The HAM has then been used to examine which households in England could benefit from measures under the Green Deal and the ECO Carbon[17]. Based on the specified policy parameters the model calculates the best combinations of energy efficiency, heating and renewable energy measures that could be applied to improve the thermal efficiency and sustainability of each dwelling under a given optimisation criteria. A full list of the measure selection criteria applied in HAM is shown in Table 1. Measures can be combined into 'packages', with each package containing up to ten different measures, creating 20,000 viable packages for each dwelling.

The model calculates the change in household energy requirement, SAP rating[18], CO_2 emissions and expenditure on fuel as a result of applying the measures identified. The process of evaluating each package involves a calculation that takes account of: total package costs (including the level of subsidy available from any given policy); individual costs of each measure; the change in SAP rating and thus associated (reduction in) household energy requirements, energy bill and CO_2 emissions.

The financial and carbon savings associated with deploying improvement measures as appropriate to all properties in the database are calculated by HAM. The annual savings of each measure are calculated taking into account comfort, in-use, performance and accessibility factors and used to determine the annual and monthly savings from a complete package of measures. The maximum funding available from Green Deal finance is calculated using this monthly bill savings, a maximum loan period of 25 years and an annual interest rate of 7 %. In addition to Green Deal finance, potential funding available through the ECO Carbon is also calculated. Where a package of measures meets the 'Golden Rule', only Green Deal finance is used to pay for the measures. If the 'Golden Rule' is not met by Green Deal finance alone but can be met by including some or all of the available ECO carbon saving finance then this is used to bridge the funding gap. Finally, the annual Green Deal loan repayments required to pay back the Green Deal finance taken are calculated.

Where a property is allocated an improvement package containing two or more measures, the individual contribution of each measure to bill savings and CO_2 emissions reductions is determined. The lifetime savings of each measure are then calculated and used to determine the total package bill savings and carbon reduction on both an annual basis and lifetime basis, taking into account the lifetime of each individual measure.

In modelling uptake of measures, two scenarios have been developed:

Scenario 1 – 'GD 12yr' – 12 year repayment term: determines the package of measures that produces the largest bill saving that could be financed through a Green Deal over 12 years. This scenario excludes ECO carbon financing as in the model this is only funded if the golden rule cannot be met through a 25 year term[19]

Scenario 2 – 'GD Max' – Theoretical Green Deal potential: the second scenario selects the package of measures which can obtain the maximum Green Deal finance plus any required ECO carbon saving finding that is required over a 25 year period.

The same assumptions are used in each of the Green Deal uptake scenarios relating to the loan interest rate (7 %) and ECO carbon value (£3,000 per tCO_2 saved annually). In addition, if the required funding falls short by a small margin (set at £500 or less[20]) then it is assumed that the Green deal provider will cover these costs and any customer contribution below this threshold is deducted from the total costs and Green Deal calculations.

POTENTIAL GREEN DEAL TAKE-UP

The potential impact of the Green Deal when twinned with an incentive will depend on the nature of the Green Deal in terms of the scope of the financial package on offer. Here the interest rate, view of the housing market to a Green Deal charge, requirements for a comfort margin, and warrantees on products will affect the package.

Figure 3 illustrates the number of English homes within each Energy Performance Certificate (EPC) band before improvements, and once the two Green Deal packages have been applied to homes. The Green Deal packages see fewer homes in the lower energy efficiency bands, increasing the proportion rated D to A.

Based on these scenarios, we can also see the impact on the average household bill. As shown in Figure 4, the average energy bill falls from £1,560 before intervention to £1,200 under GD 12yr and £862 under GD Max. In these final two scenarios, the bill reductions are displaced in part by a Green Deal charge, giving a total bill of around £1,470 in each case. This goes some way to explaining the concern of some that Green Deal in itself will not prove enticing: whilst the bill reductions on offer are significant, they are largely displaced by the repayment charges. We believe a further incentive will be required to drive take-up.

STAMP DUTY LAND TAX (SDLT)

SDLT is charged on all transactions of property in the UK. For residential buildings, the tax is set as a percentage of the property value, with the percentage increasing with the value of the property. The rates paid are not marginal – the same rate is paid on the whole purchase price. Table 2[21] shows SDLT bands as they apply to residential transaction in the UK in 2012/13.

Modifications to SDLT have previously been used to help deliver policy objectives. To address concerns over access to home ownership, in 2010 the zero percent rate for SDLT was extended to properties worth up to £250,000 for first time buyers. It has also been used to encourage environmentally conscious purchases of new homes. In the 2007 Budget, the Government announced that all new 'Zero Carbon' homes would be fully exempt from SDLT for the initial purchase. Whilst both of these interventions have been withdrawn recently, they give

17. The 'ECO' is the UK supplier obligation introduced alongside the Green Deal. 'ECO carbon' requires energy suppliers to meet carbon reduction targets via more expensive measures such as solid wall insulation. Where possible, suppliers will look to twin ECO support with the Green Deal to maximise cost-effectiveness.

18. Standard Assessment Procedure (SAP) is the UK national methodology for calculating the energy performance of buildings. It is used to demonstrate compliance with building regulations and to provide energy ratings for dwellings.

19. Currently this is believed to be the most likely way in which the ECO Carbon Saving element and the Green Deal will interact.

20. In modelling the relative contribution to the cost of measures, for the purpose of selecting the combination that requires "no financial input" from the customer, any customer contribution of £500 or less is taken to be zero.

21. HM Revenue & Customs:, "Stamp Duty Land Tax rates and thresholds," 2012, http://www.hmrc.gov.uk/sdlt/intro/rates-thresholds.htm#1.

Table 1. Potential improvement measures and selection criteria applied in HAM.

Measure	Criteria for installation of measure
Cavity wall insulation	The property has an unfilled cavity wall
Loft insulation – top up	Loft insulation is less than 200 mm
Loft insulation – full installation	There is no loft insulation
Internal wall insulation	The property has an un-insulated solid wall
External wall insulation	The property has an un-insulated solid wall
Gas condensing boiler	Existing gas boiler is < 80% efficient or the property < 25m from mains gas grid network
Oil condensing boiler	The heating system is not fuelled by mains gas
Biomass boiler	The heating system is not fuelled by mains gas
Air source heat pump	The heating system is not fuelled by mains gas
Ground source heat pump	As above, plus the property has adequate external space for heating coils
Heating controls upgrade	The heating system does not already have thermostat and radiator valves
Solar water heating	The property has a medium sized south facing roof that is pitched
1 kW PV	The property has a medium sized south facing roof that is pitched
2 kW PV	The property has a large south facing roof that is pitched

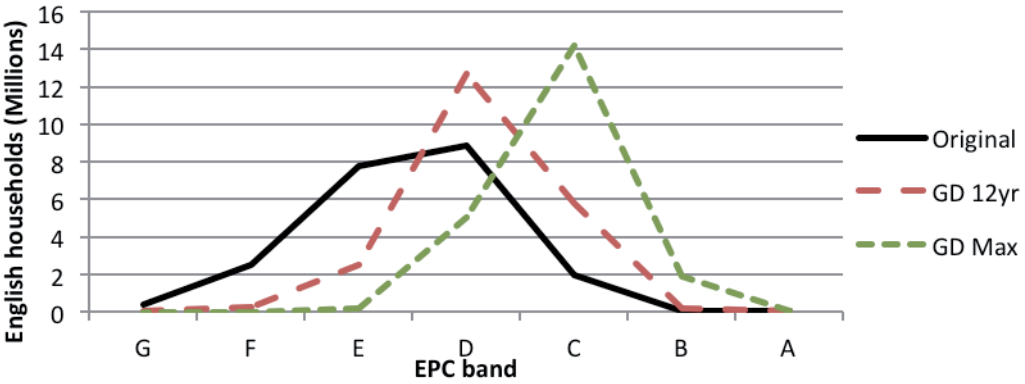


Figure 3. Number of English households within each EPC band at present, and under two scenarios.

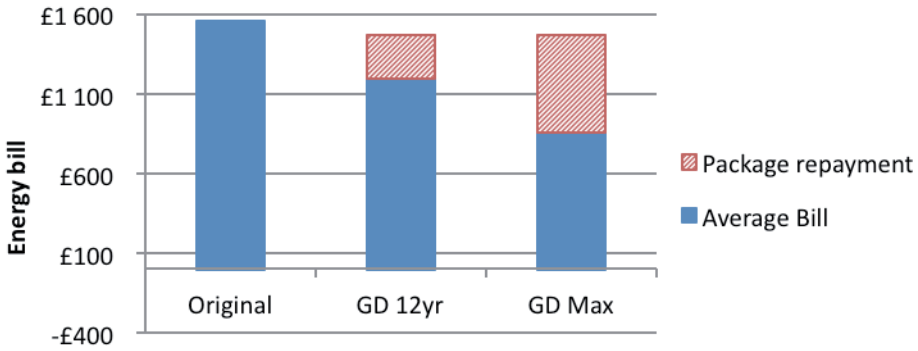


Figure 4. Average energy bill & repayment charge at present and under Green Deal scenarios (£1 ≈ €1.15).Below we set out our approach to modelling an energy efficient SDLT and CT – two options for creating an incentive to improving energy efficiency.

Table 2. Rates of SDLT for residential properties in 2012/13 (£1 ≈ €1.15).

SDLT Rate	Property price
0%	£0 – 125,000
1%	£125,001 – 250,000
3%	£250,001 – 500,000
4%	£500,001 – £1,000,000
5%	£1,000,001 – £2,000,000
7%	Over £2,000,000

a precedent to using SDLT to influence purchasing decisions, though as yet SDLT has not been used to promote energy efficiency improvements in existing homes.

Modelling an energy efficiency SDLT

To model the impact of an energy efficiency SDLT we deployed two scenario variants: firstly in SDV1 we adjusted rates of SDLT by half a percentage point per EPC rating for the property being sold. The second SDV2 scenario saw rates vary by one percentage point per band. Under both scenarios the rate of SDLT for a property rated 'D' on the EPC scale was held constant.

Figures 6 and 7 illustrate the distribution of SDLT liabilities for English properties based on the existing regime, the proposed regimes in the two scenarios above (SDV1_0 and SDV2_0), and these same two scenarios once all the measures under the GD 12yr and GD Max variants are applied.

At the outset, the proposed regimes result is a wider spread of tax rates reflecting the range in property efficiency at present. If all properties were to then implement the GD packages there would be a general shift into lower tax bands. This is most dramatic under the SDV2_Max scenario, where over 13 m homes would enter the 0 % band.

Cost of SD reduction

Changing SDLT will change revenues for HM Treasury[22]. To assess the cost of the scenarios, we identified properties within the EHS which would be 'sold' in any one year. As shown in Figure 8[23], we were able to match the distribution of property values sold to those sold across England and Wales in 2011.

Figure 9 illustrates the likely revenues if the identified homes were sold under (a) the existing regime, (b) the SDLT variants v1 and v2, and (c) these variants with all these properties improved as under GD 12yr and GD Max.

It is clear that, in the absense of efficiency improvements, an energy efficiency SDLT will increase revenues for Government, largely reflecting the poor energy efficiency of the existing housing stock. Interestingly, if all the 12yr Green Deal packages are installed, the effect is to return HM Treasury revenues to a level commensurate with the present.

Only the deployment of the GD Max packages would see a significant reduction in revenues. To counter this reduction in income, underlying SDLT rates would have to increase by 0.45 % for v1 of the EE-SDLT, and 0.9 % for v2. In other words a move to an EE-SDLT would:

- Increase revenue for HMT in the short term.
- Alongside Green Deal, make it more beneficial for households to improve the efficiency of their homes.
- If successful in this to the extent that *all* the maximum GD packages are delivered, require an uplift of 0.45–0.9 percentage points on the base rates of SDLT (including the 0 % band).

There are however drawbacks to using SDLT as an incentive. These include:

- That as a direct incentive, SD only acts on those selling or purchasing a home, therefore limiting the exposure each year. However, these authors believe that the indirect incentive – that an efficient home becomes a lower tax, more valuable home – would see efficiency gains encouraged throughout the stock, and across all tenures (though perhaps to a more limited degree in the social housing stock).
- Around one third of homes are worth less than £125,000, and are therefore not subject to any SDLT at present. Whilst under our proposal those homes rated above 'D' on the EPC band would be liable for some SDLT, there would be no incentive for a property of less than £125,000 with an efficiency rating of D or better to improve their home.

CT INCENTIVE

Council Tax (CT)

CT was introduced in 1993 by the Local Government Finance Act 1992, as a successor to the unpopular Community Charge. CT is a property tax charged annually, which also contains some household based adjustments i.e. discounts for single households or disabled people. Dwellings in England are placed in one of the eight bands A to H, based upon their 1991 valuation. Tax is paid according to a series of ratios compared to the Band D rating, as shown in Table 3, with Band H paying double the Band D rate.

Modelling an energy efficiency CT

An energy efficiency council tax (EE-CT) could see these underlying rates adjusted again by energy efficiency band. We proposed two variants, one where the rate varies by 5 % per EPC band and a second that varies by 10 %. A band D EPC property would not see their rate adjusted.

For CT v1, combining the different CT and EPC bands gives adjustments to the Band D (both CT and EPC) property ranging from a factor of 0.57 for an A rated value *and* EPC property, through to a factor of 2.3 for an H rated property on value and G rated EPC home. Under CT v2, the factors range from 0.46 to 2.6 for the same properties.

To replicate CT within the EHS, the change in average house price within each EHS area between 1991 and 2007 was used to create a set of 1991 property values. The current average Band D CT rate was used in combination with the derived 1991 values to create a present day CT band and rate for each region.

22. Her Majesty's Treasury (commonly known as HM Treasury) is the United Kingdom's economics and finance ministry.

23. HMRC, "Residential and Non-residential UK Property Transactions Count," 2012, http://www.hmrc.gov.uk/statistics/transactions/val-40000-or-above.xls.

EPC band:	A	B	C	D	E	F	G
	SDLT Adjusted based on EPC rating						
SD V1:	-1.5	-1.0	-0.5	0%	+0.5	+1.0	+1.5
SD V2:	-3.0	-2.0	-1.0	0%	+1.0	+2.0	+3.0

Figure 5. Illustration of the impact of the two scenarios SDV1 and SDV2.

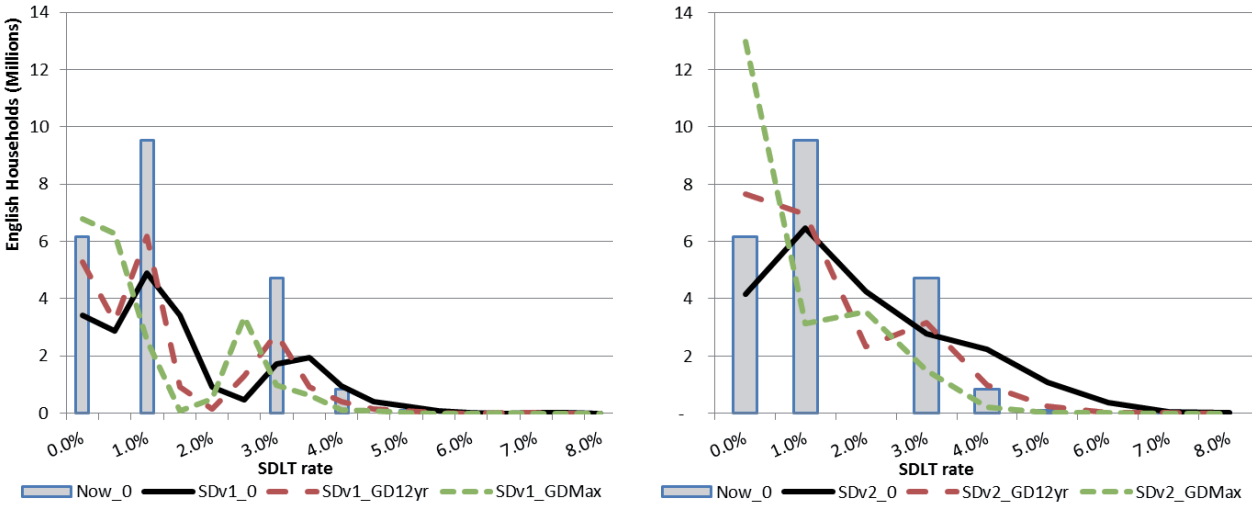


Figure 6 and 7. Distribution of SDLT liabilities for English properties based on the existing regime, the proposed regimes with revised rates of SDLT, and those same two scenarios once all the measures under the GD 12yr and GD Max variants are applied.

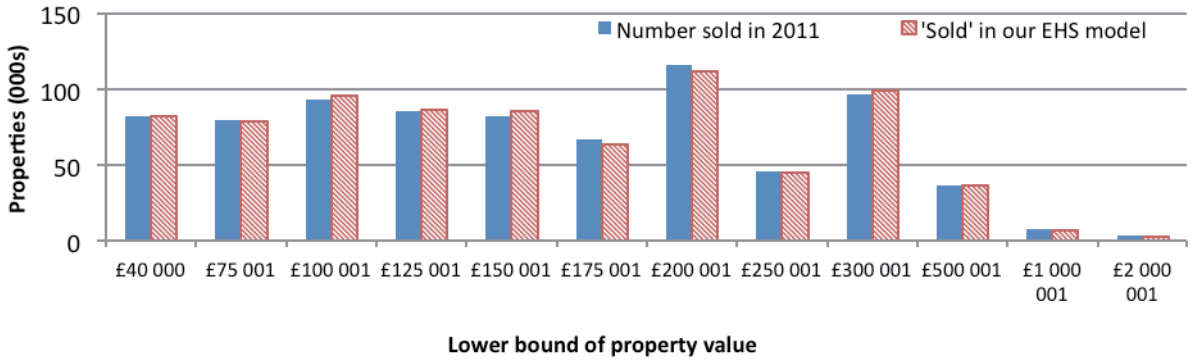


Figure 8. Properties sold in England in 2011 and 'sold' in our EHS model.

Figures 11 and 12 illustrate the distribution of CT payments based on the current rates, the proposed variants without efficiency improvements, and once efficiency improvements have been triggered under both the 12yr and GD Max scenarios. Under CT v1, there is a less clear impact upon the distribution of CT, aside from under the GD Max scenario which sees a higher proportion of properties with the lowest CT rates. The impact is clearer under CT v2, where before energy efficiency improvements are applied, a smoother distribution of costs is witnessed, followed by a more dramatic reduction in CT under the GD 12yr and GD Max scenarios.

Figure 13 shows the total CT revenues under each of the scenarios modelled. As was the case with SDLT, a transition to an EE-CT on the basis we propose would initially increase revenues due to the higher proportion of inefficient properties. Implementing a full suite of GD 12yr packages would give

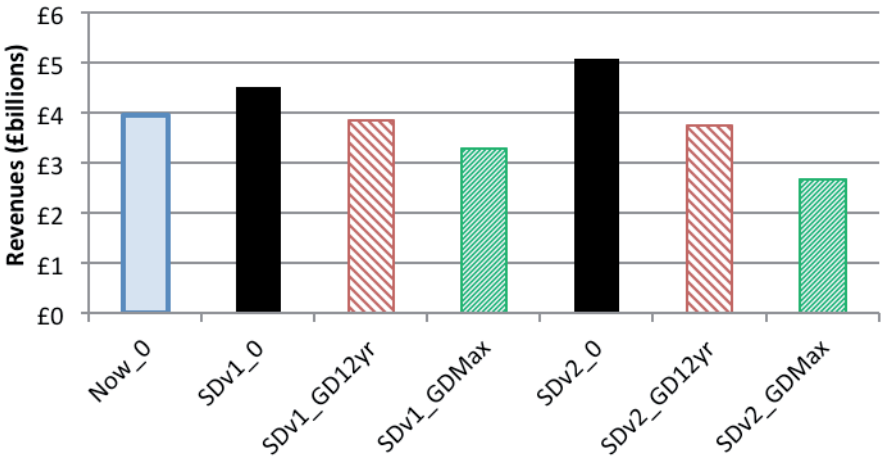


Figure 9. Government revenues if the homes were sold under different scenarios (£billion) (£1 ≈ €1.15).

Table 3. CT rates for property bands A–H.

CT band	A	B	C	D	E	F	G	H
Proportion of Band D rate:	2/3	7/9	8/9	1	1 2/9	1 4/9	1 2/3	2

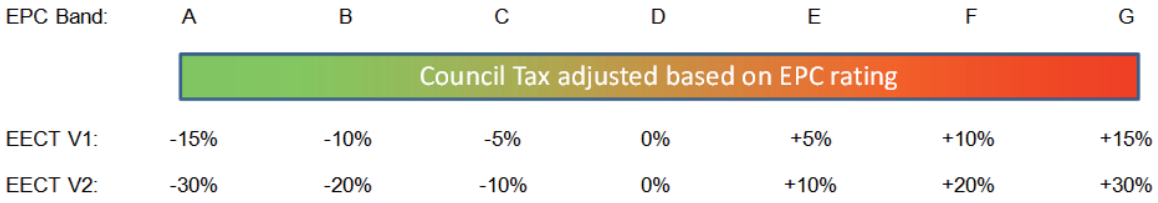


Figure 10. Illustration of the impact of the two scenarios EE-CT V1 and V2.

revenues close to those at present. Only the GD Max scenarios would erode revenues significantly.

The lost revenues under the GD Max scenarios could be made up for by a 5 % (v1) or 10 % (v2) increase in underlying CT rates. By comparison, the average Band D CT rate increased by 3.5 % per year since 2003/4.

Discussion

The previous section analyses the impact of revenues to HM Treasury if SDLT and CT were developed into energy efficient variants, and how those revenues would change if this precipitated widespread takeup of energy efficiency via the UK's Green Deal financing scheme. In such a way, the energy efficient property taxes represent both a carrot and a stick (i.e. improve your efficiency or fail to benefit from higher property value) to energy efficiency take up at no upfront cost. There are two key issues to address before such a concept could be implemented, concerning first the equity impacts and secondly the practicalities.

EQUITY

When assessing the equity impact of the energy efficiency property tax concept, it is important to consider both whether all households have equal access to improvements, in this case through Green Deal finance, and whether the nature of the tax changes would have an equal impact on households.

As discussed, many have identified Green Deal finance as an unsuitable mechanism for vulnerable households given the likely requirement to pay for an initial assessment; the financing nature that may prove anathema to those on low incomes; and the fact that there is no guarantee that savings exceed repayments for those that under-heat their homes. Many of these households require interventions that would give an absolute reduction in fuel bills rather than simply displacing fuel costs with a replacement charge. As such, we cannot assume that all

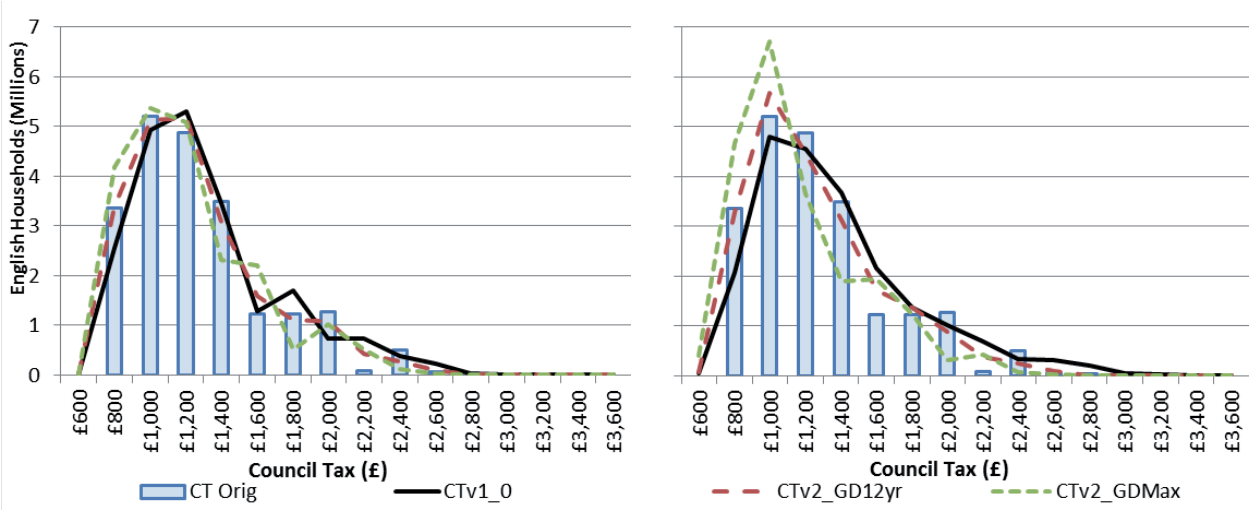


Figure 11 and 12. Distribution of CT rates for English properties based on the existing regime, the proposed regimes with revised rates of CT, and those same two scenarios once all the measures under the GD 12yr and GD Max variants are applied.

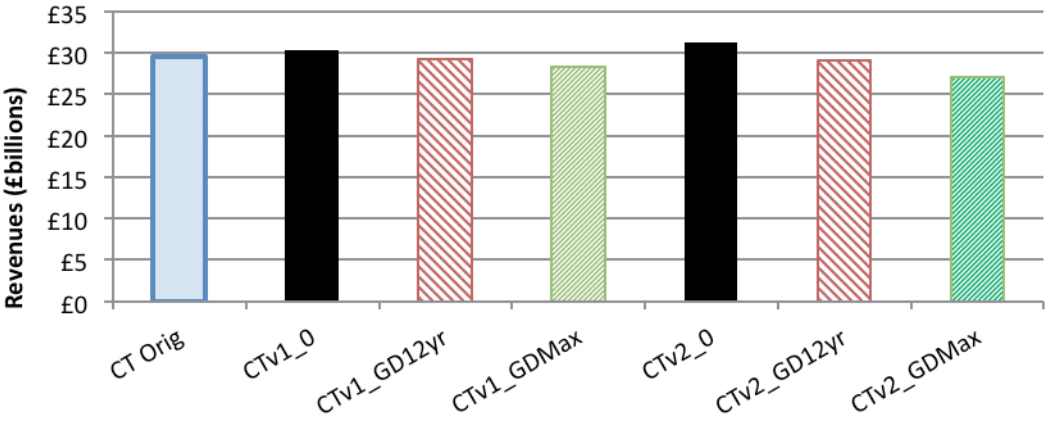


Figure 13. Government revenues if the homes were sold under different scenarios (£billions) (£1 ≈ €1.15).

households are able to respond to the tax incentive in the same way. Whilst energy inefficient homes are in no way progressive, changes to the tax code that penalise vulnerable households without the means to invest in improvements should be avoided, or these negative impacts must be alleviated through supplementary interventions. These authors call for a dedicated (and ideally taxation funded) programme of targeted energy efficiency support for vulnerable and low income households living in inefficient homes that would be disadvantaged by an energy efficiency property tax.

Regarding the equity of the tax changes, the concept has been designed to give an equal relative impact on the level of taxation. However, as we set out below for the EE-SDLT and EE-CT, each tax sees different households exposed to different extents.

EE-SDLT

Those in properties currently liable for the zero per cent SDLT rate (below £125,000) would see a muted impact, with no driver at all for properties rated 'D' or better. Equally, social or private renters would be reliant on the house price impact feeding through to landlords, though it is worth noting that minimum standards of efficiency will be introduced to the private rented sector in 2018[24], creating an additional incentive for these properties to be improved.

Conversely, affluent households, more likely to be owner-occupiers, could see a great deal of benefit from an EE-SDLT. More able to afford the initial assessment, more comfortable with financing, and with greater energy consumption making the Green Deal 'add up', these households would find the Green Deal attractive given the incentive. In addition, because they will live in more expensive homes, they would have greater absolute tax savings (due to the higher property prices) from improving their energy efficiency. To counter this, one solution would be to cap the level of tax reduction possible, or to recate-

24. HMG, "Energy Act 2011," 2011, http://www.legislation.gov.uk/ukpga/2011/16/pdfs/ukpga_20110016_en.pdf.

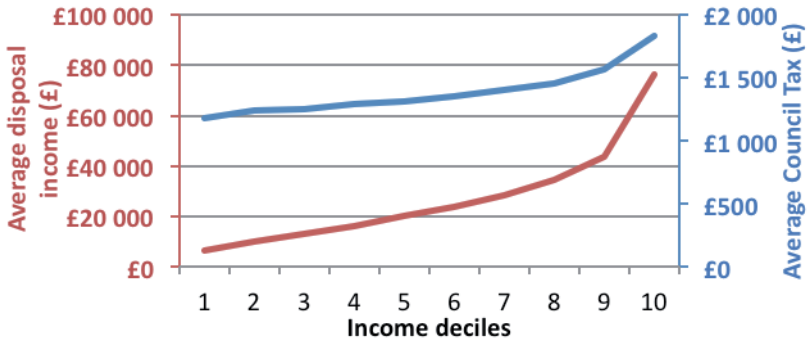


Figure 14. Relationship between income decile, disposable income and CT. CT is a much larger proportion of income for low income households.

gorise rates to higher base-bands if more expensive properties were systematically becoming more efficient on average. It will be important to balance the environmental benefits from such improvements with the social repercussions.

EE-CT

Before assessing the potential distributional impacts of a change to CT, we must first consider the fairness of the existing system. CT payments represent a significantly higher proportion of income for poorer households when compared to the more affluent (see Figure 14). Currently many low income households receive CT support; however, in 2007 there were 2.9 million low income households who didn't receive any support at all, and the level of support provided to claimants is likely to fall as powers of administration are decentralised[25]. Any further changes that unduly impact on low income households are compounding an already regressive form of taxation.

Unlike an EE-SDLT, an EE-CT would impact directly on all households and as such remedial measures would need to be implemented to ensure low income households could make the improvements to mitigate the revised charges by improving their energy efficiency.

PRACTICALITIES

Proposals to tie the level property tax to the energy efficiency of the property have become feasible since the introduction of Energy Performance Certificates (EPCs) in the UK, as required under the Energy Performance of Buildings Directive. Since October 2008 EPCs have been required whenever a building is built, sold or rented. This raises an immediate issue for the deployment of an EE-CT: how to treat those properties currently without an EPC? One option would be to set the default EE rating to 'Band G', though this could exacerbate the equity concerns for those vulnerable households who might struggle to afford an energy efficiency assessment needed to recategorise their property.

A further issue is that the adjustment of a tax on the basis of the EPC rating, whilst relatively understandable, requires that the rating is accurate and consistent. There are concerns over this in the UK[26], where a plethora of training and accreditation bodies oversee EPC implementation. Government have reviewed EPCs in the context of the Green Deal where they will now form the basis of independent recommendations for households; they clearly believe EPC process is rigorous and produces reliable results. In turn they are proposing to base additional interventions on the EPC rating, including preventing the renting of F and G rated homes. However, it is fair to assume that basing the rate of tax payable on such an assessment, and one with discrete boundaries, will increase pressure on the assessment process.

The discrete boundaries within the energy efficiency property taxes could introduce both incentives for gaming and a degree of unfairness: properties on the margins of energy efficiency bands could see a large difference in their tax exposure were they to be on the other side of the margin; equally the discrete nature of energy efficiency bands means that two properties could receive the same tax deduction for improvements of radically different magnitudes were one to move from the beginning of one band to the end of a second, whilst the other move from the end of one band to the beginning of a second.

The relative simplicity of the EPC approach will therefore need to be considered against the potential incentives for gaming at the margins, and against the differing rewards presented. An alternative, albeit more complex, approach would be to have a sliding scale of tax adjustment based on the SAP rating that underpins the EPC bands. An improvement of 15 SAP points could result in, say, a 7.5 % reduction in CT or a 0.5 percentage point reduction in SDLT.

EE-SLDT OR EE-CT?

This paper has considered approaches to incentivising energy efficiency through energy efficient SDLT and CT. Each proposal has its merits. An EE-SDLT has a direct impact at the point of sale, with the considerable sums involved likely to make a real difference to the value of a home. As a result, all households would know that improving energy efficiency would add value. In combination with the Green Deal, the EE-SDLT should also outweigh the potentially perceived negative impact of a Green

25. As a result of the Localism Act local authorities will be responsible for setting rates locally.

26. Consumer Focus, Filling the Gaps, 2012, http://www.consumerfocus.org.uk/files/2012/01/Consumer-Focus-Filling-the-gaps.pdf.

Deal charge on the deeds of a property; a significant tax reduction would outweigh a small repayment charge (which in itself should be lower than the bill savings of the property).

However there are drawbacks to an EE-SDLT. Whilst our proposal is based on the direct impact on the housing market feeding through to incentivise all households to improve their efficiency, there is no certainty that this would happen. Particular issues might be faced by those in rental accommodation for whom the incentive for increased property value would need to filter through to landlords. In addition, around a third of properties are currently zero rated for SDLT. For these properties the signal is fairly muted, with only the inefficient properties increasing their tax rate, and only an improvement up to 'D' being required to retain the zero rate.

In contrast the EE-CT directly affects a much greater proportion of households. Whilst the sums involved are smaller than the large one-off payment associated with SDLT, these sums are liable each year in perpetuity. As with the EE-SDLT, the lower tax liable would likely offset the perceived negative impact of a Green Deal charge.

A potential issue arises regarding tenants: whilst landlords might view improving energy efficiency as a way to reduce CT and thus improve the desirability of their property, if the CT is not a large driver of property choice then many landlords might allow their tenants to simply face the higher rates due. This risk reduces somewhat with the regulations being introduced by Government to prevent the rental of the most inefficient properties. However, there is a practical concern with the EE-CT: the ability for councils to offer rebates or reduced rates for efficient homes is constrained by the nature of councils' central funding. They are free to offer discounts, but these are viewed as a reduction in the tax-base, resulting in a reduction in central grant. There are no provisions at present for councils charging specifically higher rates for energy inefficient homes – this would require a referendum as per the Localism Act 2012.

Conclusions

This paper explores how solutions (property purchase taxes twinned with financing) that could overcome the factors underpinning financial barriers to energy efficiency take up (lack of influence of energy efficiency on property prices, and the incongruity between measure lifetimes and occupancy periods) could be combined to deliver a step change in progress. The premise is that an energy efficiency property tax would see efficient properties taxed at a lower rate, therefore hold increased value on the market, and thus encourage the adoption of improvement measures (in the UK via the Green Deal financing scheme). As a result, measures could be installed at no upfront cost, with repayments spread over their full economic lives with no financial risk to households.

In order to model the potential impact on the efficiency of homes in England, we use CSE's 'Housing Assessment Model' which computes the baseline energy requirements and optimal improvement packages under a given scenario. Two improvement scenarios are adopted, each of which must comply with the Green Deal 'Golden Rule' – whereby fuel bill savings exceed financing repayments – though with different constraints on the length of repayments: 'GD 12yr' which optimises a package that meets the 'Golden Rule' and fully repays the capital cost within twelve years; and 'GD Max' which also meets the Golden Rule, but allows repayments over 25 years with some additional support through the new UK supplier obligation, the ECO. As would be expected, applying the financing improvements to the English housing stock improves its efficiency, particularly under the 'GD Max' scenario. The average net energy bill reduces by under £100 in each case, with large fuel savings offset by repayment charges.

The primary objective of the analysis is to model the potential costs to HM Treasury of introducing energy efficient property taxes. To model an energy efficient property purchase tax – SDLT in the UK – we semi-randomly select English homes within our survey that were 'sold', reflecting the spread of property values in homes actually sold in England in 2011. To model an energy efficient municipal tax – CT in the UK – we apply regional average rates of CT and back-calculate 1991 property values regionally in order to ascertain CT bands. Based on these assumptions we calculate SDLT revenues from residential property sales at £3.9 billion (≈€4.5 bn), and CT revenues from residential property at £29.5 bn (≈€33.9 bn).

We then adapt the taxes to incorporate energy efficiency, with two variants for each tax. The energy-efficient SDLT sees EPC Band D properties face the conventional level of taxation. However, under variant 1 (SDv1) rates of SDLT are adjusted by half a percentage point upwards for each EPC band below D, and downwards for each EPC band above D. Variant 2 (SDv2) sees the same principle but with a one percentage point change per band. Without improvement, SDv1 would increase SDLT revenues from domestic properties from £3.9 billion to £4.5 billion, whilst SDv2 would see revenues exceed £5billion – a reflection of the fact that at present there are more properties rated below 'D' in England than are rated above.

These two variants are twinned with the improvement scenarios. If all feasible improvement packages with payback periods of twelve years or under were installed, total revenues to HM Treasury would be commensurate with those under the existing regime. Only in the most extreme case of 'GD Max' would revenues be significantly reduced – to £3.29 billion under SDv1 and £2.68 billion under SDv2. In these latter cases, the underlying base-rates of SDLT would need to be increased by 0.45 and 0.9 percentage points respectively in order to preserve revenues.

As with SDLT, the energy-efficient CT sees EPC Band D properties face the conventional level of taxation. Under variant 1 (CTv1) rates of CT are adjusted 5 % upwards for each EPC band below D, and downwards for each EPC band above D. Variant 2 (CTv2) sees the same principle but with a 10 % change per band. These adjustments have a less pronounced proportional impact on revenues: without improvement, CTv1 would increase revenues from domestic properties from £29.5 billion to £30.4 billion, whilst SDv2 would see revenues reach £31.3 billion.

Also as with SDLT, when twinning with the improvement scenarios, it is only under 'GD Max' that revenues are significantly reduced, to £28.2 billion under CTv1 and £27.0 billion under CTv2. In these cases, the underlying base-rates of CT would need to be increased by 5 % and 10 % respectively in order to preserve revenue – matching the level of reductions.

These findings should be of interest to policy-makers. Only if the policy is highly successful with full deployment would

revenues be significantly curtailed. However, policy-makers need to consider some of the consequences of energy efficient property taxes as proposed and how they can be addressed. These include how to protect vulnerable households living in inefficient homes who might not be suited to financing solutions (we suggest a comprehensive taxpayer or supplier funded support scheme to assist with efficiency measures here), how to introduce an EE-CT without universal provision of EPCs, and how to ensure that the system is based on robust information and is resistant to gaming (with an alternative being that adjustments are based on the EPC rating on a score of 1–100 rather than a discrete EPC A–G band).

Both an EE-SDLT and EE-CT have their merits and drawbacks. The EE-SDLT represents a high value tax that only impacts directly on a limited number of households each year, therefore having the benefit over an EE-CT that it wouldn't see an immediate tax increase for the majority of households. It also acts at the point when a Green Deal charge is most visible, and thus when it's most likely to affect the property price adversely (without an EE-SDLT). However, its impact on those not selling their properties is indirect, whilst many properties are zero-rated for SDLT, muting the impact and removing it entirely for those rated 'D' or better.

In contrast the EE-CT directly affects a much greater proportion of households. Whilst the sums involved are smaller than the large one-off payment associated with SDLT, these sums are liable each year in perpetuity. As with the EE-SDLT, the lower tax liability would likely offset the perceived negative impact of a Green Deal charge. However, there is a practical concern with the EE-CT: the ability for councils to offer rebates or reduced rates for efficient homes is constrained by the nature of councils' central funding; if they offer discounts, these are viewed as a reduction in the tax-base resulting in a reduction in central grant. Further, there are no provisions at present for councils charging specifically higher rates for energy inefficient homes – this would require a referendum as per the Localism Act 2012.

Ultimately the choice of either approach should come down to the relative expected effectiveness and acceptability. This paper indicates that the concepts need not cost Governments large sums unless the policies are breathtakingly successful, and in any event can easily be designed to be revenue-neutral. As such, these authors call for further research into energy efficiency property taxes that focuses on the effectiveness of the trigger they present for action, particularly in the presence of a financing mechanism.