MAKING THE POLLUTERS PAY, IN THEORY AND PRACTICE

by

Matthew Sinclair

Reprinted from

ENERGY &
ENVIRONMENT

VOLUME 20 No. 5 2009

MULTI-SCIENCE PUBLISHING CO. LTD.
5 Wates Way, Brentwood, Essex CM15 9TB, United Kingdom

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INTRODUCTION

Calls for green taxes on activities that create emissions of greenhouse gases have been widespread. All major British political parties have supported new green taxes at some point. The Government have increased taxes on flights, cars and landfill and put in place new regulations that push up the cost of electricity from conventional power plants. Conservative Shadow Chancellor George Osborne has called for "pay as you burn, not as you earn",[1] though the Conservatives have since retreated on this position.[2] The Liberal Democrats are campaigning for a 'Green Tax Switch'.[3] Economists such as Greg Mankiw, a former chairman of President George W. Bush's Council of Economic Advisers, support a carbon tax.[4] Even executives from fossil fuel industries have come out in support of green taxation. Rex Tillerson, the Chief Executive of Exxon Mobil, supports a carbon tax as a "more direct, a more transparent and a more effective approach" to cutting emissions, particularly compared to cap and trade.[5]

There is a simple and initially persuasive logic to Pigovian taxation but there are some important theoretical critiques that, in the case of Britain at least, appear to have been vindicated. This paper will examine whether green taxes – particularly those designed to limit greenhouse gas emissions, though some green taxes have other objectives and those will be kept in mind – live up to their theoretical promise to align private incentives with the social good.

PIGOVIAN TAXES

Green taxes are often intellectually justified by the need to correct for negative externalities.

Any activity pursued by an individual within an economy will have positive and negative effects on others that they are not charged or compensated for by the market. Someone going to university will pay a certain fee and gain a certain reward in the form of skills they can exchange for a higher income. They may also produce positive social effects they cannot charge for, though. Their education may make them better citizens who are more able to hold politicians to account through the ballot box. That would mean there was a positive externality to going to university. By contrast, someone who burns petrol in order to power their car will pay a price for the petrol and the car and will get a certain return in the form of greater mobility. They will also create carbon dioxide emissions though, and these are thought to contribute to climate change which is expected to have negative effects on wider society. That means there are negative externalities to burning petrol in order to drive.

If Government intervenes and places a tax on an activity that creates a negative externality, or provides a subsidy to an activity that creates a positive externality, then it can theoretically improve efficiency by better aligning private incentives with the social good. The taxes or subsidies should be equal to the harm or benefit that is placed on society so that each individual's actions reflect the costs and benefits to society. People should then produce an efficient amount of the positive or negative externality.

Ronald Coase introduced the key intellectual criticism of this theory in 'The Problem of Social Cost'.[6] He established that, in a hypothetical world with zero transaction costs, the market would perfectly correct for externalities. If someone suffered from a negative externality they would offer to pay the person creating it to stop. If they placed a greater value on preventing the externality than the person producing the externality did on pursuing the activity that created it, then they would pay the person producing the externality enough that they would stop. On the other hand, if the value they placed on stopping the activity was less than the value the person creating the externality placed on being able to continue to do so then they would not offer enough, and the externality would continue to be created.

Coase identifies the limits of this reasoning himself. The 'Coase Theorem', as his theory has since become known, only works in a world of zero transaction costs. There are innumerable reasons why it is often extremely difficult, if not impossible, for the rest of society to pay someone for producing a public good or not producing a negative externality. Global warming offers a clear example. The potential harms to each individual created by another individual burning a litre of petrol are infinitesimally small, but the externality is significant on a global scale. It would be utterly impractical for everyone to club together and put in their fraction of a penny in order to pay someone to drive less.

However, attempts by Government to correct for externalities are also subject to transaction costs. There are a variety of reasons why Government might get interventions intended to correct for externalities wrong. It has to work out the correct extent of the tax or subsidy needed; it needs to ensure the intervention itself is efficient (administering the tax may be costly, for example); it may need to balance a series of positive and negative externalities created by a single activity; rent seekers may distort an intervention so that it serves their private good rather than the social good. Such problems suggest that Government should try to assess whether its actions can reduce transaction costs, not rush to intervene in order to subsidise every public good and tax every negative externality.

GREEN TAXES IN THEORY

While the logic of public goods and negative externalities has been applied to many spheres of human activity, the particular concern of this paper is those taxes designed to reduce greenhouse gas emissions. Taxes meant to align people's private incentives with a social interest in limiting potential global warming. The Intergovernmental Panel on Climate Change (IPCC) has acknowledged that economic theory implies "if taxes were used, then they should be set equal to the SCC [social cost of carbon]."[7] It is important to note at this stage that the term 'social cost of carbon' does not mean

that only carbon dioxide is considered. Other greenhouse gases are also significant, and many contribute considerably more to the greenhouse gas effect for a given volume of gas. For that reason, the social cost of carbon is normally expressed as an amount of money per ton of carbon dioxide or carbon equivalent.[8]

Establishing the correct social cost of carbon is extremely important, as this determines the size of the price that should be imposed on those who produce carbon dioxide emissions. Get the social cost of carbon too high and a tax set equal to it will create an unfair and inefficient distortion in the market. Set it too low and too much carbon dioxide will be emitted and society will face a greater global warming risk than is desirable. For that reason, the social cost of carbon has been studied very frequently. Dozens of studies have produced hundreds of estimates varying from the extremely low to the extremely high. Fortunately, several studies have worked through the different estimates and calculated averages which represent a reasonable guide to the middle ground in the debate over the social costs of greenhouse gas emissions.

The IPCC included, in their 2007 report, a review of the existing peer-reviewed literature which found a mean social cost in 2005 of $12 per ton of CO_2-equivalent.[9] The IPCC report suggests that it is 'very likely' this is an underestimate of the true value as non-quantifiable impacts of global warming will be missed. However, there is little evidence of such a bias in the peer reviewed literature. On the contrary, there "is a downward trend in the estimates of the social cost of carbon – even if the IPCC would like to believe the opposite".[10] If further study is leading, on average, to lower estimates of the social cost of carbon then it is hard to sustain the idea that the true value should be expected to be significantly higher unless we think the literature is somehow appreciating the full spectrum of potential harms from global warming less over time. A more recent analysis of 211 estimates from 47 studies by Richard Tol suggests a mean, with a risk premium, of $6.28 per ton of CO_2-equivalent.[11]

As well as these surveys of the academic literature, there are two particularly noteworthy estimates. William Nordhaus has been described as the "father of climate change economics"[12] and the model that his most recent estimate is based on has been refined over 30 years. Nordhaus' study suggests a social cost of carbon of around $8.19 per ton of CO_2-equivalent.[13] An estimate has also been produced by the British Government's Department for the Environment, Food and Rural Affairs (DEFRA) – before its responsibilities for responding to climate change were handed to the new Department for Energy and Climate Change – which builds on the work of the Stern Review but attempts to provide an estimate better suited to policy appraisal. The DEFRA 'Shadow Price of Carbon' in 2007 is £25.50 per ton of CO_2-equivalent.[14]

The social cost of greenhouse gas emissions is widely expected to rise over time as the quantity of existing greenhouse gases in the atmosphere rises. For that reason, DEFRA quote different social costs for different years. Converting the 2005 estimates to pounds using the 2005 exchange rate of $1.82:£1[15] and then adjusting to 2007 at the same ratio as the DEFRA report (assuming just that the DEFRA report correctly assesses the relationship between different years) yields the following estimates of social cost in 2007:

	IPCC	Tol	Nordhaus	DEFRA
Social Cost of Carbon Dioxide, 2007, £	£7.22	£3.77	£4.45	£25.50

These social cost estimates can be used not just to assess new policies, but also to test existing policies to see whether they meet the Pigovian standard of aligning private incentives with the social good. This has been the foundation of two TaxPayers' Alliance reports in 2007 and 2008.[16] An identical method has been used by the Department of Transport in its assessment of aviation taxes. The Department for Transport's report summed up the method as follows:[17]

"The steps involved are:

- *take the most recent available Greenhouse Gas Inventory estimates of UK carbon dioxide emissions from all domestic flights and departing international flights;*
- *indicatively account for the non-CO2 climate change effects of air travel, applying a multiplier value of 1.91. To reflect the degree of uncertainty around this value, a sensitivity range of 1 to 4 will also be presented; then*
- *multiply this by the appropriate monetary value based on the Government's Shadow Price of Carbon, again using a sensitivity range to reflect the uncertainty; and*
- *compare this range of values with the air passenger duty/aviation duty and aviation gasoline duty receipts for the year concerned."*

This method is not entirely uncontroversial. In response to the more recent of the two TaxPayers' Alliance reports Paul Ekins wrote for the Green Fiscal Commission that:[18]

> *"The argument in the TPA report that any environmental tax in excess of the best estimate of environmental damage is 'excessive' is simply wrong. It is in principle as legitimate to raise revenues from green taxes (above their 'optimal' rate) as it is from any other taxes, and whether or not to do so is one of the more complex judgements of tax policy."*

In a trivial sense this is clearly correct. There is no reason why the Government can't tax motor fuel, home energy use or anything else at any level if they choose to do so for reasons entirely unrelated to their impact on potential climate change. Even if those taxes are levied on emitting activities in addition to other taxes such as Value Added Tax, as they generally are. What they can't do, though, is legitimately justify those new taxes as a Pigovian 'green taxes'. If green taxes are charged at a level greater than the social cost and are therefore pushing private incentives further from the efficient level then their other qualities would have to outweigh the inefficiencies of moving the economy away from the socially optimal level of greenhouse gas emissions. As will be discussed later in this report, most green taxes have pernicious economic or social effects and it seems unlikely they would pass muster as a major source of revenue if their effect on the level of emissions has become a source of inefficiency.

If emitting activities are serially overtaxed, that suggests that – in the UK at least – Government has proved incapable of effectively delivering Pigovian taxation. Jim Manzi has noted many of the factors that might undermine attempts to have Government efficiently deliver a socially optimal price on greenhouse gas emissions.[19]

Essentially, setting a policy that delivers a neutral (taxing all different sources of greenhouse gas emissions equally) price on carbon without causing major unwanted economic side effects is extremely difficult.

It is difficult to avoid making a mess of the neutrality of any scheme by stepping in to assist some of the losers. If the Government put a price on driving high emission cars but then step in to bail out Jaguar Land Rover, for example, then the scheme has already become more a tax on the politically expendable than on emissions themselves.[20] The Climate Change Agreements that are used to reduce the impact on vulnerable industries of the Climate Change Levy are another example of Government stepping in to try and tailor the results of what should be a simple intervention in the market.[21] These kinds of subsidies create distortions in the market and are likely to create particular advantages for incumbents over new competitors, making the market less competitive to the detriment of productivity growth and the interests of consumers.

Beyond that, the price is highly contentious. While the estimates shown above are a reasonable guide to the mainstream and two are based on wide-ranging surveys of the peer-reviewed literature, there is a large range of estimates in the academic literature. It is entirely possible that Government, choosing a particular price, gets it badly wrong. After all, a carbon price of zero is far closer to the estimate of the social cost from the "father of climate change economics" (£4.45) than the price that the British Government is supposed to base policy on (£25.50). A result closer to the social optimum could be obtained simply by leaving the market well alone. Things are further complicated if other externalities – positive and negative – are brought into the picture and need to be balanced by Government. The price is just as likely to be set on the basis of an emotive debate as on a clinical analysis of the likely social costs of emissions.

Even the most enlightened and disinterested would struggle to get Pigovian taxation right. Yet, with so much at stake it is likely that any scheme to try and address climate change would be highly warped by the lobbying of both environmentalists and emitters.

It is possible to test Britain's green taxes against the economic theory that justifies them, and in doing so test whether Pigovian taxation has survived the political process in this case.

EXCESSIVE GREEN TAXES

Motorists are charged significant amounts of tax. Despite significant and ultimately effective protests in 2000,[22] taxes still account for over two thirds of the price of petrol.[23] Vehicle Excise Duty also raises several billions. Between the two taxes, motorists were charged £30.5 billion in 2007-08.[24] That is just over five per cent of total government revenue. By contrast, tobacco duties raised £8.1 billion, duties on alcohol £8.2 billion and taxes on air travel £2 billion.[25] Of the taxes designed to intervene in the economy and reduce the amount a particular activity is pursued, taxes on motoring are by some margin the largest.

While Fuel Duty may not have been conceived as a green tax, it has been understood to be one throughout the period in which it became a major part of the tax

system. In 1993 Fuel Duty was charged at 28.32 pence on a litre of unleaded petrol. At that stage an 'escalator' was introduced which saw the rate rise significantly above inflation for some years. By 2008 the rate had nearly doubled to 50.35 pence per litre.[26] This followed Ken Clarke's announcement in a statement to the House of Commons in 1993:

> *"I have now decided to strengthen the March commitment by increasing road duties on average by at least 5 per cent in real terms in future Budgets. This will complete Britain's strategy for meeting our Rio commitment."*

Similarly, increases in Vehicle Excise Duty were justified on the basis of road transport's contribution to carbon dioxide emissions.[27]

Earlier studies have attempted to justify high motoring taxes by bringing in a range of other externalities including noise and air pollution, road injuries and fatalities and most importantly, congestion. This approach has been used by the Department for Transport in assessing the external costs of various forms of transport.[28] This table shows one account of the externalities associated with driving:[29]

Externality	Low estimate (pence/vehicle km), 1998	High estimate (pence/vehicle km), 1998
Operating costs	0.42	0.54
Accidents	0.82	1.40
Air pollution	0.34	1.70
Noise	0.02	0.05
Climate change	0.15	0.62
Congestion	9.71	11.16

However simply adding externality after externality in an attempt to arrive at an optimal total tax on petrol has a number of problems.

Many of the externalities in the list above are already controlled by other regulations. Noise and air pollution are created by a vast spectrum of industrial and commercial activity from factories to night clubs. They are controlled by regulation which limits acceptable levels of noise and particulate emissions in different geographical areas. New roads are subject to planning controls based on the amount of traffic they are likely to carry and many developments are subject to planning controls based on the amount of traffic they will create. Equally, emissions standards for new vehicles and the requirement to fit catalytic converters control particulate emissions.

There is clearly extensive regulation designed to control road traffic accidents: driving tests, speed limits, speed cameras and installations such as speed bumps. Many of these impose substantial costs on drivers and others are paid for as part of the process of building and maintaining roads.

With most of the costs controlled in some other manner, motorists would need to be unfairly singled out for other, localised externalities to be subject to taxation as well. Factories, for example, need to control noise and particulate emissions along

with other externalities to safe levels but are not taxed as well. To correct twice for the same externality just in the case of motorists would be disproportionate and unfair. Pigovian taxes and regulation are substitutes as different methods of achieving the common objective of controlling externalities. To put both in place is to arbitrarily burden motorists.

The costs of congestion, except for the cost of building and maintaining roads, are internalised within the body of road users and create an incentive to use other methods of travel or travel less. Fuel Duty is also probably not the best measure to correct for the externality of congestion. Evidence to the Mirrlees review described it as a "very blunt instrument" for addressing the problem of congestion.[30] Congestion is by far the biggest element in high estimates of the social cost of driving, but it is far from clear that it is fair or effective to respond to congestion with taxes, particularly on motor fuel.

Studies that aim to comprehensively assess the external costs of driving also tend to focus purely on the negative externalities and ignore the positive externalities associated with driving. These positive externalities include the fact that motorists reduce the strain on overcrowded public transport networks. Trains only account for seven per cent of passenger travel and buses and coaches six per cent, against 85 per cent who travel by car or van.[31] If motorists all decided to leave their cars at home there is no way even a massively upgraded public transport network could cope. By relieving congestion on public transport motorists do a significant public good.

Motorists also encourage the development of greater road transport infrastructure. While motorists may be inconvenienced by other drivers when they create congestion on the roads they also depend on them. If there were fewer motorists the broad network of service stations, mechanics, driving instructors and other services that support driving would be less comprehensive. This network effect is the converse of the problem of congestion and can be just as important.

Finally, motorists allow economic activity to be more dispersed. The ability to drive to work quickly from a huge range of places means that homes, places of work and services do not need to be concentrated on top of each other. This eases pressure on public services such as water and sewerage.

If cars are taxed on the basis of an incomplete attempt to assess every externality they create or, worse, just an account of every conceivable negative externality then the final result will be a deeply inefficient intervention in the market that could easily make things worse, rather than better.

There is a particular problem with trying to control greenhouse gases to safe levels as each individual car, or a number of cars on a given road, will always be at a 'safe' level and potential problems only arise with the cumulative effect of millions of cars around the world. That makes a Pigovian tax a plausible response. Also, driving necessitates public spending to build additional roads, in order to alleviate congestion and repair wear and tear. That spending is an externality that motorists can reasonably expect to pay for.

In 2007-08 the Government spent £8.8 billion on road building and maintenance.[32] Road transport emitted 120.3 million tonnes of CO_2 in 2006, after being adjusted down by two per cent to reflect the fall in overal emissions in 2007 this can be multiplied by

the various social cost per ton estimates. Comparing the social cost of road transport related carbon dioxide emissions and road building and maintenance with the amount raised in tax yields the following result:

	IPCC	Tol	Nordhaus	DEFRA
Motoring taxes	£30.5 billion	£30.5 billion	£30.5 billion	£30.5 billion
Less Social Cost of road transport CO_2 emissions, 2007, £	£0.85 billion	£0.44 billion	£0.52 billion	£3.01 billion
Less spending on road building and maintenance	£8.8 billion	£8.8 billion	£8.8 billion	£8.8 billion
Excess motoring taxes	£20.8 billion	£21.3 billion	£21.2 billion	£18.7 billion

This suggests that Fuel Duty is being charged far in excess of the social cost it purports to address. Evidence to the Mirrlees Review came to a similar conclusion; that "road fuel duty is much higher in the UK than the environmental cost of vehicle emissions would appear to justify".[33]

Motoring is a particularly chronic example of how many activities can be overtaxed. If taxes on motoring were set at the cost of maintaining roads – if the green tax were set at zero – then the price on greenhouse gas emissions would be closer to mainstream estimates of the social cost. The distortion from the socially optimum level of road transport greenhouse gas emissions would be significantly less than it is with government intervention.

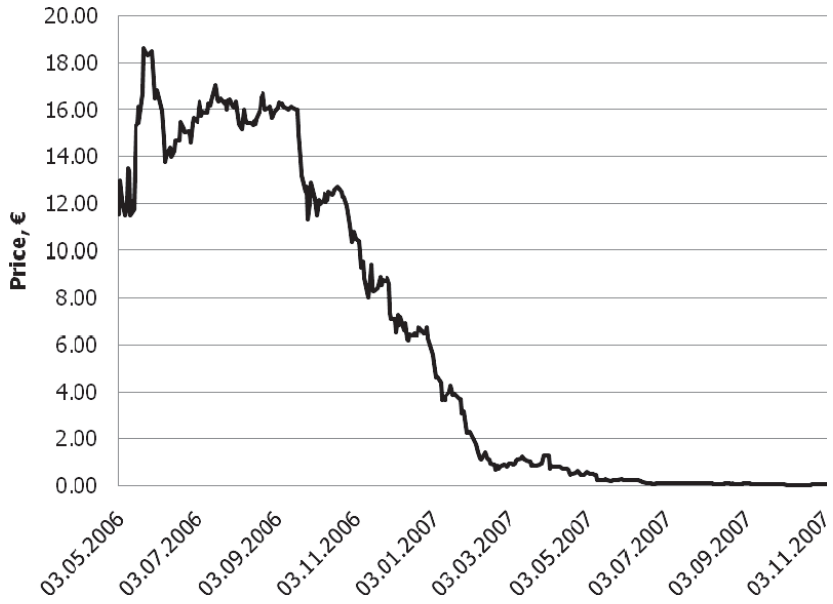
Other sources of emissions are also overtaxed. Researchers at the Department for Transport found that, after the Government's doubling of aviation taxes, flights were overtaxed by £100 million.[34] Evidence to the Mirrlees Review also found that the "UK landfill tax has been raised to levels much higher than the environmental costs of landfill justify."[35]

It is possible to look at the aggregate picture, comparing all green taxes with the UK's aggregate greenhouse gas emissions.

Aviation taxes are left out as the effects on greenhouse gas emissions at high altitudes are quite different to those on the ground, the Department for Transport uses a multiplier of 1.9 to reflect this.[36] Aviation emissions are best considered separately and this has already been done by the Department for Transport, using the highest estimate of the social cost of CO_2 of those cited in this study.

Most of the taxes are quite simple and the amounts raised can be found in the Budget.[37] However, many regulations place a considerable price on carbon and the cost of these to emitters can be more complicated to assess.

The European Union Emissions Trading Scheme (ETS) is promoted as "the EU's key tool for cutting CO2 emissions cost-effectively"[38] and is designed to put a price on emissions. Similar schemes in the United States are discussed as a comprehensive response to potential climate change,[39] and therefore an alternative to green taxation. The scheme has been undermined by the same kind of price volatility seen before with similar schemes, though.[40] The graph below shows how the price varied during the scheme's first phase:[41]



Similar volatility has been seen in Phase II, corporations and individuals cannot take account of such an unstable price. That has led to demands from environmentalist campaigners that the price be fixed.[42] Doing so would leave the ETS effectively operating as a carbon tax, and an extremely inefficient one. So long as the price is as volatile as it has been recently, the effect of the ETS in putting a price on greenhouse gas emissions can be discounted.

The Renewables Obligation places a significant burden on users of fossil fuel energy. It requires energy companies to source a certain percentage of their energy from renewable sources, buy 'Renewables Obligation Certificates' (ROCs) from renewable energy companies or pay 'buy out' fees (which are then redistributed to those who did present ROCs). The value of the Renewables Obligation can be estimated by multiplying the buyout price by the size of the obligation. In 2007-08 the buyout price was £34.30 and the obligation was 25,477,265 MWh.[43] This suggests that the value of the obligation was £873.9 million.

That leads to the following estimate of total green taxes:

Green tax/charge	Revenue/Cost, 2007-08, £ billion
Fuel Duty	£24.9 billion
Vehicle Excise Duty	£5.6 billion
Landfill Tax	£0.9 billion
Climate Change Levy	£0.7 billion
Renewables Obligation	£0.9 billion
Sub-total	£33.0 billion
Less spending on roads	£8.8 billion
Total	£24.2 billion

This can be compared to the social cost of Britain's 2007 emissions:[44]

	Nordhaus	IPCC	Tol	DEFRA
Social Cost of Carbon Dioxide (per ton), 2007, £	4.45	7.22	3.77	25.50
Emissions, 2007, Mt CO^2-equivalent	639.4	639.4	639.4	639.4
Social cost of UK emissions, 2007, £ billion	2.8	4.6	2.4	16.3
UK Green Taxes, 2007, £ billion	24.2	24.2	24.2	24.2
Excess Green Taxes, 2007, £ billion	21.4	19.6	21.8	7.9

This suggests that on balance, and by some margin, British green taxes are already excessive. That is even before the addition of the EU ETS which could, in the years to come, add a significant amount to the price placed on greenhouse gas emissions.

Of course, this aggregate excessive taxation could conceal a pattern whereby certain activities suffer excessive taxation while others are taxed less than Pigovian theory implies. As discussed earlier, taxes on motoring, aviation and landfill – in particular – appear to be excessive.

The other major emitting activities are industrial energy use (particularly electricity generation), residential energy use (particularly heating) and agriculture (particularly enteric emissions from livestock).

Agriculture is subsidised under the Common Agriculture Policy. Discussing the complex reasons why agriculture is supported, rather than taxed as the methane emissions it is responsible for might imply, would be a topic for another entire paper. Regardless, it is rarely discussed as a target for green taxation as agriculture's status as a favoured industry is not in question. This further supports the notion that green taxes are not applied neutrally but to those industries without adequate political support.

While industrial and domestic energy use may be taxed less than the theoretical Pigovian ideal, this is almost certainly due to the significant social and economic costs taxing those activities creates.

TAXING INDUSTRIAL ENERGY USE

Industrial energy use bears a significant burden under Government climate change policies, the Renewables Obligation, the EU ETS and the Climate Change Levy. The Department for Business, Enterprise and Regulatory Reform (BERR) estimates that those policies now make up 21 per cent of the average industrial electricity bill.[45]

Energy bills are often a substantial part of a firm's costs. Substantial increases in business energy bills will make it more difficult for firms to compete. A survey by Morgan Stanley found that, in early 2008, the price of petrol in China was 79 cents per litre and in the United States $1.04 per litre but in Britain drivers were paying over $2 per litre. Firms in rapidly developing economies such as India and China face no equivalents of the EU ETS, the Renewables Obligation or the Climate Change Levy. Even among European Union member states, Britain stands out as the country that imposed by far the biggest burden on its industry through the ETS.[46] This has undoubtedly contributed to the net loss of more than one million manufacturing jobs in Britain since 1997.[47]

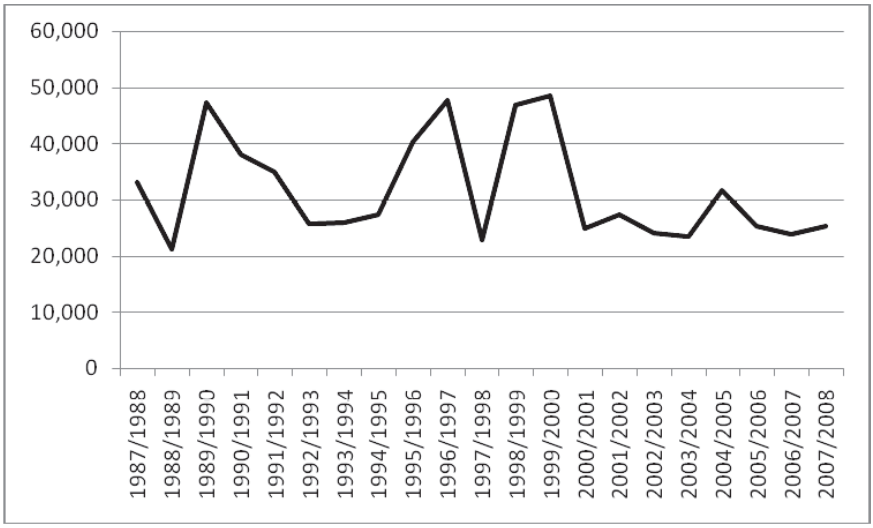
Britain's choice to put a price on greenhouse gas emissions unilaterally, while other countries have refused to act without their industrial competitors facing a similar bind,[48] has not just cost the country jobs and prosperity. It has also proved ineffective at reducing greenhouse gas emissions. If manufacturing activity relocates to China for example, as a result of British climate change policy, then that may actually increase emissions as the developing country has less energy efficient industry. The gap between Britain's Consumer Emissions (those emitted producing goods for British consumers) and UNFCCC reported emissions (those emitted in Britain) has increased significantly in recent years.[49] Unilateral climate change policy appears to be proving both costly and ineffective.

TAXING RESIDENTIAL ENERGY USE

Climate change policies make up 14 per cent of the average domestic electricity bill and 3 per cent of the average domestic gas bill.[50] This burden falls hardest on the poorer income deciles.[51]

The poorest ten per cent spend more than three times as large a portion of their income on electricity, gas and other fuels as the richest ten per cent. This confirms that energy is a necessity good.

Energy is particularly important to the vulnerable elderly as they need to keep their home warm. Excess winter mortality claims thousands of lives every year:



Excess winter mortality has been both high and persistent over decades. Other prominent health concerns such as alcohol are responsible for significantly fewer deaths; there were 8,724 alcohol-related deaths in 2007.[52] People adjust quite quickly to frequent heat waves and mortality drops due to "adaptations: increased use of air conditioning, improved health care, and heightened public awareness of the biophysical impacts of heat exposure."[53] That excess winter mortality has persisted at high levels over a number of decades suggests that there are no easy adaptations that mitigate the health risks posed by winter cold.

One measure of the extent that people struggle to afford to heat their homes is the number in 'fuel poverty'. That is the number of people who have to spend 10 per cent of their income or more in order to keep their homes at an adequate temperature. This not only endangers people's health but can also have a wider impact on their wellbeing, for example elderly people are reported to be staying in bed in order to minimise their heating bills.[54] In 2006 there were 3.5 million households in fuel poverty, an increase of one million households since 2005.[55]

The main Government responses to the issue of fuel poverty are energy efficiency grants such as the Warm Front scheme and Winter Fuel Payments. Warm Front grants support the installation of energy saving measures such as loft insulation.[56] The Winter Fuel Payments scheme provides between £125 and £400 to all pensioners depending on age and circumstances.[57]

The room for further improvements of the sort installed under Warm Front appears to be limited. 95 per cent of households suitable for loft insulation already have it. 84 per cent of the housing stock has double glazing. 94 per cent of households with a hot water tank have it insulated. Only cavity wall insulation appears to have significant room for growth, with just 39 per cent of suitable properties known to have it installed.[58] Given that those facing fuel poverty are, on balance, likely to be the first to be targeted for government assistance most probably have affordable energy efficiency measures installed already.

The Winter Fuel Payment does not provide specific support for pensioners paying their energy bills but supports their income. At up to £250 for someone between the ages of 60 and 79 it is a marginal component in pensioner incomes, though. It is less than the £365 weekly income of a pensioner in 2006-07.[59] While the payment will still be welcome, as a component of overall pension income and spending the winter fuel payment only makes a small difference. Many rising bills significantly outweigh the Winter Fuel Payment. For example, council tax has been increased by £575 per year on a Band D bill since 1999-00.[60] The Winter Fuel Payment is not an efficient means of making energy bills more affordable and is poor compensation for the significant burden of climate change policies, which may mean the Government is doing more harm than good with respect to fuel poverty.

CONCLUSIONS

Certain green taxes are charged significantly in excess of the level implied by Pigovian theory. Motorists, in particular, appear to be facing a massive burden of green taxes, yet there are still plans for increases in road tax and costly new regulations on car makers. Other emitting activities, such as agriculture, are subsidised. Green taxes are clearly not neutral between different sources of emissions and are putting a price on being politically expendable more than on greenhouse gas emissions.

Even leaving aside the considerable uncertainty over the true social cost of carbon, politicians appear unable to deliver green taxes that fit within the range of estimates of social cost produced by mainstream academics and institutions. The British Government imposes green taxes, at the aggregate, far beyond the level implied by the

Income decile	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Spending electricity, gas and other fuels, £, weekly	£11.00	£13.20	£14.00	£15.40	£16.30	£17.30	£18.80	£19.50	£21.00	£25.20
Gross income, £, weekly	£116.00	£199.50	£230.90	£260.90	£315.90	£442.70	£527.00	£575.80	£636.60	£816.30
Spending on electricity, gas and other fuels as a percentage of gross income	9.5%	6.6%	6.1%	5.9%	5.2%	3.9%	3.6%	3.4%	3.3%	3.1%

Pigovian logic used to justify them. That situation is likely to get significantly worse as new policies start to take effect, like a more robust EU ETS.

When Britain acts unilaterally to curb emissions it hurts the competitiveness of British industry and manufacturing jobs are lost. Things aren't improved by working through supranational institutions. The European Union Emissions Trading Scheme has been chronically ineffective at establishing a stable price on greenhouse gas emissions, while costing British firms £500 million a year in Phase I. Clearly there are problems with the international co-ordination of putting a price on greenhouse gas emissions that have yet to be resolved.

Green taxes are being imposed that create significant social costs of their own, most notably by contributing to fuel poverty. Subsidising energy efficiency measures and providing Winter Fuel Payments does not adequately address this issue. Given the large numbers of lives at stake this is a very considerable side effect of current climate change policies.

Despite all this, greenhouse gas emissions in Britain have not fallen since the early nineties dash for gas. Between 1997 and 2006 emissions have increased by 1.6 per cent. If even excessive green taxes cannot force desired changes in behaviour, that suggests a shift away from fossil fuel energy is not yet economically feasible.

The failure of British politics to deliver efficient, neutral and proportionate Pigovian taxation has to raise questions about whether the theory can be effectively translated into practice. Politicians should instead focus on building an economy that is prosperous and flexible enough to adapt to a changing climate. At the same time, policy could clearly intervene directly to support the development of technologies that promise to provide an economical way of cutting emissions that the failure of green taxes suggests doesn't exist right now.

British green taxes provide a classic example of how governments can make a mess of interventions recommended by economic theory that fails to recognise the limits of politics.

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