Introduction to personal carbon trading

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What is personal carbon trading?

Personal carbon trading is the name given to proposed emissions trading schemes under which emissions rights are allocated to and can be traded by individuals. There are a number of proposed personal carbon trading schemes and the one on which my research has focused is known as Domestic Tradable Quotas (DTQs).[1] DTQs cover emissions from energy (fuel and electricity) use and under the scheme, emissions rights are allocated to individuals and organizations and surrendered whenever they purchase fuel or electricity.

How would a DTQs scheme work?

There are three elements to DTQs: (1) setting the carbon budget (2) surrendering emissions rights and (3) acquiring emissions rights for surrender. Of course, emissions rights must be acquired before they can be surrendered but it's easier to explain things in this order.

Setting the carbon budget

The carbon budget is the maximum quantity of greenhouse gases that can be emitted from energy use in a given year and is reduced year on year in line with national emissions reduction targets. (*Note*: Emissions trading schemes are sometimes referred to as "cap and trade" schemes and the carbon budget is what constitutes the "cap".)

Surrendering carbon units

In DTQs-speak, emissions rights are referred to as "carbon units" and a carbon unit is defined as the right to emit 1 kg of carbon dioxide equivalent. In order to understand the surrender of carbon units, it's necessary to introduce the concept of "carbon rating". The carbon rating for a particular fuel is the quantity of greenhouse gases (measured in carbon units) emitted by the combustion of a unit of fuel. For example, the carbon rating for petrol is 2.3 carbon units/litre. The carbon rating for electricity is the quantity of greenhouse gases (measured in carbon units) emitted by the generation of a unit of electricity and this rating will vary with the generation mix.

Whenever individuals and organizations purchase fuel or electricity from a retailer, they are required to surrender carbon units that cover the quantity of fuel or electricity purchased. For example, if you were to put 10 litres of petrol into your car, the number of units you'd have to surrender would be equal to the carbon rating of petrol (2.3 units/litre) multiplied by quantity purchased (10 litres), in this case 23 units.

Acquiring units for surrender

Each year, a quantity of carbon units equal to that year's carbon budget is allocated by government to individuals and organizations. The proportion of total units allocated to individuals is equal to the proportion of total emissions from energy use resulting from individuals' purchase of fuel and electricity. (In the UK, this proportion is currently around 40%.) A key feature of DTQs is that carbon units are allocated to adult individuals *free* and on an *equal per capita basis*.

On the other hand, organizations must purchase the units they require on the national carbon market. Units enter onto this market from two sources. First, the government auctions onto the market the units not allocated to individuals. (Today, this would be around 60% of units.) Second, those individuals who emit at a level below that permitted by their allocation ("below-

[1] Environmental writer, David Fleming who formulated DTQs now calls them Tradable Energy Quotas (TEQs). However, as my work to date has used the term DTQs, for continuity, I use that term here.

allocation individuals"), and who have, thus, not surrendered all their units, can sell their surplus onto the market. Alternatively, below-allocation individuals might choose to save their surplus units for future years when their allocation will be smaller. They could even gift their surplus to a relative or friend. Those individuals who wish to emit at a level above that permitted by their initial allocation ("above-allocation individuals") must buy additional units on the market. Visitors to the UK are not allocated units and so, along with organizations and above-allocation individuals, must purchase them on the market. (*Note*: it is this buying and selling of carbon units that constitutes the "trade" component of the DTQs cap and trade scheme.)

How does the government auction work?

A small number of intermediaries or "market makers", which would include high street banks and the Post Office, would buy carbon units at auction (and from below-allocation individuals) and sell them on to organizations and above-allocation individuals. Market makers would make their money by selling on units at a higher price than they bought them (the so-called "bid and offer spread").

Surrendering units seems complicated. How would it work for a train journey?

The bad news is that calculating your emissions arising from a train journey is rather complicated as it depends on the number of others on the train, the length of their journeys, whether the train is diesel or electric and, if electric, on the generation mix. But the good news is that, under DTQs, this calculation is not required. For under DTQs, carbon units are surrendered only when energy is purchased and as you're not purchasing energy when you buy a train ticket, you don't have to surrender units. The energy to power the trains is, instead, purchased by the train company and so it's they that have to surrender the units.

Because surrender is limited to the purchase of fuel and electricity under DTQs, the process is straightforward. Think about your bank account. With it you can pay your gas or electricity bill by direct debit, which, once you've set it up, is an automatic and painless process. Similarly, you could surrender carbon units by direct debit when paying your utility bills. The government would open an electronic carbon account for all adults into which it would deposit carbon units, say on a monthly basis, and utilities could simply debit units from this account.

When you pay for petrol or diesel with your debit card, inserting the card into the card reader allows the petrol company to move the required sum of money from your bank account into theirs. Along with a carbon account, you'd receive a carbon card, which, when inserted into the card reader, would, similarly, allow carbon units to be debited from your account.[2] Again, a painless way of surrendering units. And with card readers already present in petrol stations, much of the technology for running a DTQs scheme is already in place.

What if there are no carbon units in my account when I come to pay for petrol?

The answer's actually fairly straightforward. Let's say you go to the petrol station and put 10 litres of petrol in your car. You need to surrender 23 units but have none in your account. In this case, the petrol company purchases 23 carbon units on the national market and charges the cost to you. Your petrol receipt will show not only what you've paid for petrol but the number of carbon units paid for and the cost.

Though, in this case, you're not surrendering units from your account, the transaction is nevertheless referred to as surrender because, in paying the petrol company for the units, you're effectively buying them from the company and then surrendering them straight back. Hence, there are two types of surrender: (i) surrendering units from your account and (ii) buying units at the point of sale.

[2] As an alternative to a stand-alone carbon card, a surrender capability could be built into existing credit/debit cards.

And what about my gas or electricity bill? Do I get cut off if I've no units to surrender?

Well you could be cut off, but this is really no different from the situation that exists today. Let's imagine that under DTQs, you receive your quarterly gas bill and that, because you had no units in your account at the time of billing, your gas company had to purchase units on the national market to cover your gas use. Hence, your total bill consists of the cost of your gas plus the cost of these carbon units. Now, if you were a *non-vulnerable* customer and you either couldn't or wouldn't pay this bill, then, just like today, your gas provider could cut you off. But, if you were a *vulnerable* customer, then, just like today, your gas company wouldn't do so.

What happens if I want to sell my surplus units?

Before leaving the buying of units, it's worth mentioning that as well as buying them at the point of sale you can also buy them from market makers – which, as I've mentioned, would include your bank and the Post Office. You could purchase units online, over the phone or over the counter – all familiar transaction channels. And, equally, these three channels could also be used for selling your surplus units.

But why would I buy from my bank when I can simply buy units at the point of sale?

The answer is that you might do so for accounting purposes. This is an important point when it comes to assessing the overall benefits of DTQs.

Let's go back to your bank account. Every time money enters or leaves your account, it's recorded on your bank statement. Well, exactly the same would be true of your carbon account. Every time units entered your account (either as a result of the government depositing them there or you buying them from a market maker) and every time they left (as a result of you surrendering them or selling your surplus to a market maker) the transaction would be recorded on your carbon statement. And as with a bank account, those with internet access could view their carbon unit transactions and balance online at any time. Those without (a proportion of the population likely to shrink over time) could check their balance and their most recent transactions by phone or over the counter at the bank or Post Office and, perhaps, via an ATM. A full statement could be posted to their home address.

Let's say that, when you buy fuel or electricity, you *always* surrender units from your account, either by direct debit to your utility and by carbon card at the petrol station. If you're a below-allocation individual, then this will be revealed on your carbon statement which will tell you how many surplus units you have. And if you sell your surplus, this sale will also appear on your statement. Alternatively, let's say that, by keeping an eye on your balance and statements, you realize you need more carbon units than you've been allocated. But, rather than buying them at the point of sale, you buy them in advance from your bank, which deposits them in your carbon account. This transaction and your subsequent surrender of these units will also appear on your account so you'll know exactly by how many units you're above allocation.

Contrast the situation where you always surrender from your account with one where you *never* do. Under DTQs, you could quite legitimately set up an arrangement whereby, immediately the government deposits units in your account, your bank automatically buys them from you at the going market rate, making payment directly into your bank account. Under this arrangement, you'd have no carbon units left in your account and so whenever you bought fuel or electricity, you'd simply buy units at the point of sale. This way, you wouldn't need to use your carbon card, look at your carbon statement or, if you're an above-allocation individual, buy units from market makers.

This all sounds very convenient, but the downside of this approach is that you can't easily tell whether your emissions are above or below allocation, the reason being that the units you buy at the point of sale don't appear on your carbon statement. Take the example we discussed earlier

of the 23 units necessary to cover your purchase of 10 litres of petrol. If you were surrendering units from your account, they'd move from there across to the account of the petrol company and this transaction would appear on your statement. However, as you don't have the units in your account, the petrol company has to buy them from a market maker. In doing so, the units move to their account from that of the market maker. Your account isn't involved and so the transaction doesn't appear on your statement.

It seems to me that under DTQs, many people will be (very) keen to know if their energy emissions are above or below allocation. However, by buying all their units at the point of sale, the only way for them to know is to make sure they save all their petrol receipts and utility bills and to go through them adding up the various carbon units they've purchased.

But won't it be very expensive to build a computer able to hold everyone's carbon account and to post out a statement to everyone?

In my view, DTQs are technologically feasible. Petrol stations already have card readers, an important component of the scheme, and the technological know-how exists with regard to the rest of the required hardware (for example a central database and carbon cards) and the accompanying software. However, though the scheme may be technologically feasible, how much will it cost to set up and run? This is research that has not yet been done so the best I can do is to outline elements of the scheme that will need to be costed.

The hardware costs of a central database are not likely to be significant. However, there is also the cost of populating the database. Every eligible adult will need to be provided with an electronic account within the database and this will, presumably, involve verifying everyone's identity to ensure that they can't fraudulently open multiple accounts. The cost of enrolling into the scheme the 45 million plus individuals in the UK who are 18 or over by verifying their identity, opening them a carbon account and issuing them with a carbon card will not be insignificant.

The cost of posting out a regular carbon statement to the home address of all participating individuals will also not be insignificant. However, it could be reduced by making a paper statement "opt in", those people with internet access being strongly encouraged to forgo receiving one.

Now a question on fairness. Can DTQs really be fair when they seem a way of simply allowing the rich to carry on polluting?

The aim of any cap and trade system is, over time, to reduce the cap to a level where the permitted emissions don't cause further pollution in the form of further global warming. So the charge that DTQs provide a licence to pollute doesn't really hold.

Generally, the poor have lower energy emissions whilst those of the rich are higher and under DTQs, the rich could afford to buy the additional carbon units necessary to maintain their higher emissions. But, equally, under a carbon tax, the rich could afford to pay the tax and maintain their higher emissions. The simple truth is that the additional spending powers of the rich means that, under any taxation or emissions trading regime, they can afford to emit more!

Some have argued that personal carbon trading constitutes the trading of nature, that such trading is wrong, and that carbon units should therefore be *non-tradable*. Three points can be made in response. First, most, if not all trade involves the exchange of a processed or unprocessed part of nature. Second, and as I've just mentioned, setting a cap under DTQs is designed to protect nature. And third, disallowing trading under a cap would penalize the poor.

If emissions rights were allocated on an equal per capita basis and made non-tradable, the emissions of rich and poor would not necessarily be equal, for whilst the rich could afford to buy the energy permitted by their allocation, some of the poor could not. Those who could not would, of course, have surplus units, but because these would be non-tradable, selling would not be an option. However, as the units under DTQs are tradable, those poor with surplus units could make money from their sale.

If you want to put an end to the rich having higher emissions under the various schemes, then you probably need to put an end to richness *per se*, but clearly this is not something DTQs can be expected to achieve!

But is allocating equal shares of carbon units really fair? For example, shouldn't people on home dialysis receive more units?

There is a sizeable section of the environmental movement that supports the idea of equal shares and the justification usually put forward is that the atmosphere is a *commons*. However, when one looks closely, there is considerable disagreement in the literature over just what is meant by the term. For example in that famous phrase "the tragedy of the commons", the term refers to a part of nature that is *unowned*. However, conversely, the term is also used to refer to a part of nature that is *jointly and equally owned*. For example, when environmental writer, Peter Barnes, describes the atmosphere as "the ultimate commons", he sees it as an entity subject to "equal and universal ownership".[3]

If the atmosphere is a commons in this latter sense, justification for equal shares is straightforward: equal ownership of the atmosphere gives owners the right to emit equally into it. However, contemporary philosophers are generally sceptical that the atmosphere is a commons in the sense of being jointly and equally owned. How, then, might a justification for equal shares be derived from the starting point of an atmosphere that is a commons in the sense of being unowned? One might argue that, in order to tackle climate change, the state should assume control of the atmosphere and then grant all citizens an equal share of carbon units. However, as Richard Arneson neatly explains, contemporary philosophers do not generally support the proposition that everyone should receive an equal share of resources.

> The norm of equality of resources stipulates that to achieve equality…everybody [should receive] a share of goods that is exactly identical to everyone else's and that exhausts all available resources to be distributed. A straightforward objection to equality of resources so understood is that if Smith and Jones have similar tastes and abilities except that Smith has a severe handicap remediable with the help of expensive crutches, then if the two are accorded equal resources, Smith must spend the bulk of his resources on crutches whereas Jones can use his resource share to fulfil his aims to a far greater extent. It seems forced to claim that any notion of equality of condition that is worth caring about prevails between Smith and Jones.[4]

Broadly speaking, Arneson's point is that what we should be concerned about equalizing between people is not resources but wellbeing, and that bringing about *equal* wellbeing (to the extent that this is possible) often means providing people with an *unequal* quantity of resources. Which is where your dialysis example comes in. To equalize (as much as possible) the wellbeing of those with renal failure and those without, the former require dialysis which is an energy-intensive process and thus should be entitled to more energy. And as more energy means more emissions, it can be argued they should be entitled to more carbon units.

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[3] Barnes, P (2001) *Who Owns the Sky? : Our Common Assets and the Future of Capitalism*, Washington DC: Island Press

[4] Arneson, R (1989) Equality and Equal Opportunity for Welfare, *Philosophical Studies*, 56, pp77-93.

And there are other examples. People who live in colder parts of the country, and, indeed, those people who really feel the cold, require more energy to heat their homes, whilst people who live rurally often need to drive further, and thus need more energy, to live their lives. And, if these people require more energy to equalize their welfare, again it can be argued that they should be entitled to a greater quantity of carbon units. If *in theory* one holds that they should, then the only justification for an equal allocation is that adjusting it for factors such as where people live and their susceptibility to the cold would be too difficult or costly for government. In this case, equal shares would be the fairest share that could be achieved *in practice*.

Even if equal shares is the fairest approach in practice, aren't there cheaper ways of achieving it, for example by levying a carbon tax and sharing out the revenue equally?

An important question, a variation of which would be to ask why government doesn't auction emissions rights to the small number of fossil fuel suppliers (an "upstream" auction) and share out the revenue equally. The argument here is that receiving an equal share of tax revenue or an equal share of the revenue from the sale of emissions rights is just as fair as receiving an equal share of emissions rights themselves…only cheaper.[5] A DTQs scheme, with its identity verification requirements, its database, its carbon cards and carbon statements would be costly to set up and administer. In contrast, and as policy researcher, Simon Dresner, argues, a carbon tax or upstream auction would cost little to implement and allocating the tax or auction revenue on an equal per capita basis could also be done at little cost.

> Now we have a largely integrated tax and benefits system, an ecobonus [carbon tax revenue allocated on an equal per capita basis] or the equivalent from an upstream emissions auction can be delivered just by increasing the personal tax allowance, benefits and tax credits by a certain amount. It could be made more explicit and popular by making it an additional item shown in everyone's benefits or a credit in the calculation of their tax. Either way, the marginal administrative costs are virtually zero because you're using systems that already exist. And because it's collected upstream, the administrative costs of tax collection or an upstream auction are very low...[6]

I think the only response is to say that if there are greater *costs* associated with DTQs, then there can be a case for considering it as a policy option only if it brings with it greater *benefits*.

And what might these be?

I think that where DTQs may have benefits over and above those of other instruments is in the psychology of emissions reductions. Under a carbon tax or upstream auction, individuals are confronted by a *price* signal in the form of higher prices for carbon. By contrast, under DTQs, individuals are confronted with a very clear *quantity* signal, namely their allowance of carbon units. It can be argued that by receiving an actual allowance of carbon units, surrendering units from their carbon account and seeing their transactions listed on their carbon statement, individuals will become more focused on the issue of emissions and emissions reduction than under other instruments. Or as some people put it, DTQs may result in greater "carbon consciousness" among the population. With greater carbon consciousness and a greater focus on emissions reduction, people may more fully seek out and, thus, discover a greater number of cost-effective emissions-reduction opportunities. And, hence, emissions may be reduced more efficiently (that is, at lower cost) than under other instruments.

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[5] In an upstream auction, the revenue from the sale of *100%* of carbon units would be allocated equally, whereas under DTQs only around *40%* of units are allocated equally. An equal per capita allocation of the revenue from the auction of the remaining units under DTQs would make the two schemes equivalent.

[6] Dresner, S (2005) Distributional, Practical and Political Implications of Carbon Taxing and Trading. Paper presented at *Taxing and Trading: Debating Options for Carbon Reduction, Oxford, 3-4 Nov 2005*. Available at http://www.ukerc.ac.uk/Downloads/PDF/T/TandT_Simon_Dresner_economic_implications.pdf.

Of course, under DTQs, the quantity signal can be converted into a price signal. Remember we discussed how people could arrange to automatically sell their units to their bank immediately the government deposited them in their account and then buy all their units at the point of sale. By doing so they would, instead of surrendering from their account, simply be dealing in cash, the price paid for units at the point of sale being similar to a carbon tax and almost identical to the increase in the price of energy that would occur under an upstream auction. So, if, at the extreme, everyone decided to sell their units immediately they were deposited in their account, then it could be argued that DTQs would simply be an expensive, and therefore inefficient, way of implementing a carbon tax or upstream auction. However, as I argued earlier, there are accounting benefits to surrendering from ones account and so, clearly, research is needed to try and establish what percentage of people would surrender from their account as opposed to buy at the point of sale.

Even assuming the cost-benefit analysis suggested that, in theory, DTQs were the way to go, is there room, in practice, for the scheme within the current policy landscape?

Another important question. Currently, the European Union Emissions Trading Scheme (EU ETS) covers around 50% of the UK's CO_2 emissions. The proposed Carbon Reduction Commitment, a UK cap and trade scheme for large commercial and public sector organisations, would cover around another 10% of CO_2 emissions and the proposed Supplier Obligation, which might take the form of a cap and trade scheme for utilities, could cover around another 15% of CO_2 emissions. The European Commission has proposed the inclusion of aviation emissions within Phase 3 of EU ETS and the UK government has proposed that emissions from surface transport also be included. Therefore, it is entirely possible that in the near future the majority of UK emissions will be captured under a patchwork of cap and trade schemes. So, if DTQs were implemented too, the majority of UK emissions would be covered by two different schemes. In other words there would be a very considerable degree of what is known as "double counting".

Given that EU ETS looks like it's here to stay, it would seem that the only way to implement DTQs and avoid such double counting is to modify the allocation rules of EU ETS so that it is permissible to allocate emissions rights *downstream* to the final purchasers of fuel and electricity. (Currently, under EU ETS, emissions rights in the electricity sector must be allocated to generators and it is proposed that surface transport be incorporated into EU ETS by allocating emissions rights *upstream* to fuel suppliers.) Hence, if the cost-benefit analysis for DTQs is favourable, then, arguably, efforts should be made at the EU level to create the flexibility within EU ETS to implement a DTQs scheme.

We've certainly covered a lot of ground. How would you sum up?

DTQs raise a whole host of issues, not all of which we've had time to cover, for example, the question of how fuel poverty might complicate the implementation of DTQs or, for that matter, other instruments. With regard to those issues we have covered, I'll limit myself to three points. First, I think the more obvious arguments against DTQs – that the scheme's not technologically feasible or that it's a licence for the rich to pollute – don't succeed. Second, I think DTQs bring to the fore deep issues about equity that are important whether it's DTQs, a carbon tax or an upstream auction that's implemented. And third, I think the two crucial questions regarding DTQs are whether the cost-benefit analysis comes out more favourably than for other instruments and, if so, whether a policy space can be found for the scheme.