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This year's (2011) series of Beesley lectures was opened by Dieter Helm's wide ranging examination of the UK government's Electricity Market Reform (EMR) proposals and closed by Paul Dawson's focused dissection of the carbon price support policy that has been developed alongside the EMR programme.

The opening lecture and the discussion that followed it illustrated the rather unusual state of affairs that exists in energy policymaking at the moment: there appears to be a consensus among leading economists familiar with the energy sector that the EMR proposals are badly flawed, and that they can be expected to fail. The only questions in doubt in the 'pre-mortems' that could be written right now appear to be precisely how and precisely when the failures will eventuate.

Meanwhile, politicians of all stripes appear determined to plough on regardless; a phenomenon that can be regarded as rather more normal than the emergence of a consensus among economists: *Wooden headedness, the source of self deception, is a factor that plays a remarkably large role in government.* [3]

As the two lectures indicate, however, there is more variety of views among economists on the effectiveness of alternative approaches to today's energy and environmental policy challenges; and one area of disagreement concerns the likely efficacy of carbon taxes in general (usually assessed relative to a cap and trade alternative such at the European Union Emissions Trading System (EU ETS)), and of the UK government's carbon price floor proposals in particular.

For reasons to be explained later, I believe that the merits of carbon taxes have been over-sold in recent policy debates, largely in consequence of that most ubiquitous of mistakes in economic assessment, reliance on an over-abstract economic model that simply ignores some of the key aspects of the relevant factual context. This is linked with an excessive propensity among economists to declare 'market failure' when reality does not appear to fit with the chosen model or theory, rather than to follow the intellectually more respectable path of starting with 'theory failure' (i.e. with the possibility that the model is wrong) as the prime suspect when there is a divergence between theorising and evidence.

Taxes and policy credibility

Before looking at the weaknesses of the carbon support mechanism, let me first take note of one of the weightier arguments in its favour. It is that cap-and-trade schemes lack credibility because the supply of carbon allowances is politically determined and, by virtue of the nature of the political processes involved, the number of allowances made available will tend to be

[1] Chairman, Regulatory Policy Institute, Oxford.

[2] Based on the Chair's response to Paul Dawson, *Achieving efficient carbon reduction: is the carbon price floor the answer?*, Beesley Lecture, 10th November 2011, Institute of Directors, London.

[3] Barbara Tuchman, *The march of folly: From Troy to Vietnam* New York: Ballantine Books, 1984.

'too large'. In consequence the price of carbon determined via trading of allowances will be 'too low'. In particular, as a result of this problem, cap-and -trade schemes will provide inadequate incentives for investment and innovation in carbon-saving technologies.

Arguably, carbon taxes, including those aimed at establishing floor prices, have less of a credibility problem. We all know what happens when politicians are gifted a tax base and the ability to vary rates: taxes tend to rise over time. Hence, on this argument, we can confidently look forward to steadily increasing carbon taxes and prices, and we will all therefore have stronger incentives to take steps to avoid the higher tax rates that can be expected in the future, by getting on with the investment and innovation in de-carbonisation that will reduce our exposure to them.

This 'political economy' point does, I think, have some merit; but it is far from being decisive. Taxes do usually go up, but there is at least some evidence that, if a tax is silly or dysfunctional enough, even cash-hungry governments may abolish it. The Selective Employment Tax of the 1960s is a case in point. Admittedly, the silliness/ dysfunctionality threshold for tax abandonment is high, but it is not infinite. Moreover, in relation to the policy choice under discussion, it is relevant that, when allowances are auctioned, cap-and-trade schemes can themselves bring in government revenues: abandoning a carbon tax does not, therefore, imply that all revenue yields from carbon emitting activities are lost.

Negative effects of a UK carbon price floor

In the case of carbon price support, there are two major problems with the tax. First, given the existence of the EU ETS, such support has no substantive rationale in terms of reducing global emissions of carbon dioxide (see further below). To the contrary, there are good reasons for thinking that the overall effect of the policy will turn out to be perverse, i.e. that it will tend to increase the aggregate level of EU emissions. A corollary of this is that, at bottom, carbon price support, in the relevant economic and political context, is simply a redistributive tax.

Second, it is a highly regressive redistributive tax. Among households, it will be lower-income groups who will suffer the largest disproportionate falls in disposable income in consequence of the higher electricity prices that the support mechanism can be expected to cause. In addition to the Exchequer, the principal beneficiaries will be *existing* low carbon electricity generators, particularly nuclear generators, since they will benefit from higher electricity prices but not have to bear the tax.

Over the last few years the politics of energy supply has become somewhat detached from 'affordability' issues, and party leaders have tended to focus on climate change and security of supply priorities. That is now changing as a result of the burdens imposed by the persistence of macro-economic debt problems and by higher energy prices, although the adjustment in priorities has perhaps been slower than might have been anticipated (one reason for which may be that it was a Labour administration that set energy policy on the path that has led to the EMR and the carbon price floor proposals, and the 'ploughing-on' tendency may continue to be influential within HM Opposition).

A relevant comparator for evaluating current political leaderships might be Macbeth: *"I am in blood stepped in so far that should I wade no more, Returning were as tedious as go o'er."* The sentiment is a familiar one in virtually all decision making processes, and, when it bubbles up, there is worse advice than that of Lady Macbeth, which was roughly 'sleep on it, and think again'. [4]

Thus far, the only steady and consistent voice in Westminster that has taken affordability issues seriously is that of Simon Less and his colleagues at Policy Exchange, in the emphasis they have given to what should be the obviously compelling proposition that policy should seek for *efficient* de-carbonisation, so that, at a minimum, end consumers do not pay more for their energy than is necessary (given other policy objectives). If such advice is not heeded, Macduff potentially awaits in the form of the electorate.

Returning to the main theme of my remarks, two principal factors combine to make carbon price support a dysfunctional approach: (a) the establishment of a target carbon price floor is a UK-only measure, and (b) it is being done in the context of an already existing set of arrangements targeted on carbon abatement. A direct effect will be to raise carbon prices in the UK to a level in excess of the rest of the EU, thereby segmenting and distorting the 'single carbon market' created by the EU ETS.

It will, of course, be far from the only distortion of that market, and one justification for the policy is that it might have the effect of offsetting other major distortions, in particular the heavy subsidisation of wind power and other renewable technologies.[5] Here we see a familiar pathology of dysfunctional regulation in which one policy distortion begets others, which in turn beget further 'corrections'; potentially leading to byzantine policy structures in which the prime purpose of the bulk of interventions and regulations can become that of offsetting unwanted consequences of other policy interventions and regulations. As David Henderson pointed out some time ago, in his Reith Lectures on 'do-it-yourself economics', the overall effect is to create uncertainty and disorder in the market (which is particularly damaging in relation to the capacity to form expectations about the prospects for new investment) rather than the order that is claimed to be intended.

Negative effects on EU-wide de-carbonisation

In any event, a direct consequence of a higher carbon price in the UK electricity sector is that there will be a reduced demand for EU ETS carbon allowances in the UK, which will tend to depress the EU carbon price to a level where the market is cleared *at the same allowance volume as before*. The latter point follows immediately from the fact that, in any period, the total market volume of EU carbon allowances is fixed. The effect of the reduced UK demand for allowances, therefore, can be expected to be a re-allocation of allowances (and therefore emissions) from UK producers to producers in other EU member states, with no impact on total EU-wide volumes. Put slightly differently, any UK de-carbonisation that might result

[4] "You lack the season of all natures, sleep." Act 3, Scene 4, Lady Macbeth.

[5] It can be noted in passing that divergence between UK and EU carbon prices is not the only distortion *caused* by carbon price support. It will, for example, have discriminatory effects on the electricity sector in comparison with other sectors and activities that are covered by the EU ETS.

from carbon price support can be expected to be fully and immediately undone by adjustments in the EU carbon market. Since climate change is a function of global emissions, not UK emissions, this is a rather serious defect in the policy.

Worse than this, as Paul Dawson has so clearly shown, by creating a divergence between UK and rest-of-EU carbon prices for electricity generators, carbon price support tends to promote cost inefficiency in de-carbonisation.[6] That is, the total (EU-wide) costs of meeting the emissions target embodied in the EU ETS will be increased, In the longer term, I believe that this will be negative for carbon reduction because most resource allocation systems share the feature that, if some activity becomes more expensive, the activity level will tend to fall, *ceteris paribus*. Ultimately, inefficient de-carbonisation is likely to be associated with less de-carbonisation.

Given these points, why do carbon price floors tend to attract the support of some economic commentators? One reason, I think, is that the kind of substitution effect just described would not occur if a price floor were introduced at an EU-wide level, for example via agreed reserve prices in carbon allowance auctions. That, however, would be a different policy to the UK carbon price support that is under discussion, and the fact that doing something different would be less harmful than doing what is proposed to be done is obviously no justification for doing the latter.

Carbon taxes versus cap-and-trade systems

A second possible reason may be a continuing belief that, in relation to climate change policy, carbon taxes are preferable to cap-and-trade approaches, and that introducing an element of 'hybridity' to the EU ETS by introducing taxes, as well as allowances, will somehow improve overall system performance. For example, the Stern Review [7] noted that *"... it is often argued that a tax is superior to a quota as an instrument of climate change policy in the short run"*, and the discussion in Chapter 14 of Stern (*Harnessing Markets for Mitigation – the role of taxation and trading*), particularly where it draws on a paper by Hepburn [8], indicates the basis for such arguments. Later contributors to the debate may have taken this as sufficient authority to repeat the conclusion, without noticing the explicit caveats in the Stern Review itself. Thus, immediately after the above citation from Chapter 14, Stern warns that the curves in the (one-period/static) diagram about to be presented have to be treated *"with great care"* because their positions depend upon the dynamics of the problem, including policy settings in earlier and later years.

As a general proposition, the argument that taxes are generally superior to cap-and-trade approaches to de-carbonisation is simply wrong: it is an intellectual error. The argument is based on the observation that carbon is a stock pollutant – the harm caused is a function of

[6] Subject to the caveat that, if the inefficiencies caused by other policies are sufficiently great, it is possible that, in some circumstances at least, the introduction of a distortion between market valuations of carbon in the UK relative to the rest of the EU might, by mitigating other distortions, actually improve things.

[7] *Stern Review: The Economics of Climate Change*, HM Treasury, 2006.

[8] C. Hepburn, "Regulating by prices, quantities or both: a review of instrument choice", *Oxford Review of Economic Policy*, vol. 22 no.2, 2005.

the total stock of the pollutant in the atmosphere, not on the level of emissions in any one year – and that emissions in any one year are only likely to add marginally to that stock. Hence, so the argument goes, the marginal benefit of abating emissions (alternatively the marginal damage caused by emissions) in any one year will be roughly constant. At this point, the reasoning adopts the results of a seminal article by Weitzman [9], which shows that, in the presence of uncertainty about the marginal costs and marginal benefits of abatement of some activity which is desired to control, the relative merits of the two approaches depend upon the shapes of the cost curves and the benefit curves. Specifically, uncertainty about costs coupled with a relatively flat marginal benefits curve points to the superiority of controlling prices (via taxes) rather than quantities (via caps). A simple intuition for this result is that, if marginal benefits are roughly constant, for example at around 30 euros per tonne say, then imposing a carbon tax at this rate would lead to the approximately right level of abatement in the period: abatement would be higher or lower than the central projection depending upon whether the marginal costs of abatement turned out to be lower or higher.

The general problem in this reasoning is that the Weitzman results are based upon a specific set of modelling *assumptions*, and that adoption of the results without further ado implies, in effect, the adoption of those assumptions. Unfortunately, Weitzman's original assumptions are not appropriate for the policy issues to be analysed, and that is the point that is implicit in Stern's caveat about the reasoning when it is applied in a climate change context. What is being observed in this case is, therefore, is an example of the assessment failure identified at the beginning of this note, reliance on an over-simplified (overly abstract) theoretical framework when analysing a complex issue.

The perceived marginal benefits of carbon abatement in any one period depend, *inter alia*, on expected levels of emissions in future. Given this, a change in information about future abatement costs will, via its impact on emissions in future periods, affect the marginal benefits of abatement today. Recognition of this feedback loop implies that, whilst it may be right to argue that today's marginal benefit curve is relatively flat, its position cannot be regarded as fixed. In particular, uncertainties in marginal abatement *costs* will, by creating uncertainties about the time profile of emissions, imply uncertainties about the position of the marginal benefits curve in any given period; and once the effect is recognised the general result – that taxes are to be preferred to caps – disappears.

To illustrate, suppose that, after the tax rate has been set for this year, there is an upward revision in estimates of how costly it will be to reduce carbon emissions in the future. In the adopted version of the Weitzman model, this will be assumed to have no effect on the initial marginal benefit curve that has been used to set the tax rate. In reality, however, higher costs tomorrow tell us that it would, with hindsight (i.e. after the new information is discovered), have been better than we thought it would be (when setting the tax rate) to have done more today. The marginal benefit of abatement today has, in the event, turned out to be rather higher than anticipated, and the tax has therefore been set at an inappropriately low level. By the same token, a technological breakthrough leading to downward revisions in future

[9] M. Weitzman, "Prices vs. Quantities", *Review of Economic Studies*, vol.44 no. 4, 1974.

abatement costs would tend to imply that today's carbon taxes had been set at too high a level.

In summary, once these feedback effects are taken into account, the claimed, general superiority of price controls (taxes) over quantity controls (caps) disappears, and the relative merits of the instruments can only be determined by detailed investigation of the relevant factual matrix for the policy problem. Since this is just about always the case in economics, the result is not surprising; but a more formal account of the reasoning can be found in a recent paper by Parsons and Taschini. [10]

Carbon taxes, cap-and-trade systems and price volatility

There is one further point worth making at this stage, since it leads naturally into a discussion of price volatility, a matter that seems to have greatly exercised the minds of the authors of the EMR proposals, for reasons that continue to remain rather vague and undeveloped. The original Weitzman framework is static, so that, when adopted for the analysis of climate change policy, it implies, if used without modification, that carbon allowances are good for one period, and for one period only.

In technical terms, this makes such allowances a 'perishable' good. If the allowance is not used within a given time period, it becomes worthless. The description 'perishable' comes from ordinary language usage in relation to products such as fresh foods, but the technical definition covers a much wider range of possibilities. Thus, seats on scheduled air flights are 'perishable' since, if the plane takes off with seats empty, the economic value of those seats, on those particular flights has fallen to zero (the value perishes at the moment beyond which it is impossible to make any more sales).

In Phase 1 of the EU ETS, carbon allowances were indeed perishable in the sense that unused allowances could not be carried forward to Phase 2. It is to be recalled that the carbon price collapsed to zero at the end of Phase 1, leading to much criticism of the system, and to a familiar chorus of cries that the market had 'failed', including on the ground that EU ETS prices were too volatile to provide meaningful long term signals for investment.

The zero prices did indeed reflect a failure, but it was a failure of market design that was relatively easy to correct, and that subsequently has been corrected. By making allowances 'bankable' from Phase 2 onwards (meaning that unused allowances can be carried forward from one phase to another), carbon prices that are perceived to be temporarily low can now be expected to lead to 'inventory' purchases of allowances to be held to meet demand in future periods, when prices might be expected to be higher. Given that 'borrowing' (of allowances) options are also available to some extent (although there are more difficulties here, connected with maintaining policy credibility), improvements in market design have significantly reduced the inter-temporal market segmentation that characterised Phase 1 of the scheme; with the expected effect of greatly reducing that part of price volatility that

[10] J.E. Parsons, "Stocks and shocks: a clarification in the debated over price vs. Quantity controls for greenhouse gases", *Centre for Climate Change Economics and Policy Working Paper No. 54 and Grantham Research Institute on Climate Change and the Environment Working Paper No. 43, March 2011.*

simply reflected flaws in what was, at the time, an innovative and necessarily experimental policy development.

In particular, banking of allowances prevents the kind of total price collapse that was seen at the end of EU ETS Phase 1. For reasons just given, the ability to buy allowances today to cover emissions tomorrow tends to put a floor under prices today in circumstances where prices are expected to rise tomorrow. To the extent that the carbon support mechanism was intended to prevent temporary periods of excessively low carbon prices, therefore, it might be said to share another of the common characteristics of much poor policy making: it is a heavy-handed intervention to address a problem that has already been solved, or that is well on its way to being solved, by other means (in this case, bankability of EU ETS carbon allowances).

In my view, once banking and borrowing of carbon allowances is possible, the balance of arguments tilts towards cap-and-trade approaches. Inter-temporal substitution of abatement activities made possible by trading can be expected to provide incentives to seek out more cost-efficient abatement paths. If abatement costs are expected to increase in the future, this will tend to drive up carbon prices today, and hence stimulate more abatement activity today. If a cost-reducing technological advance occurs, carbon prices today will tend to fall even though the innovation may take a number of years to accomplish, associated with some deferral of abatement activity to periods when it can be done at lower cost.[11]

The most important message of the analysis stimulated by Weitzman's question (price control or quantity control?) is not that taxes are preferable to caps, but that the performance of cap-and-trade approaches can be significantly improved by facilitating inter-temporal substitution/trading of/in carbon allowances, thereby enabling the time profile of abatement activity to adapt and respond to changes in relevant information and knowledge, as and when that information becomes available.

There will, of course, be volatility in the carbon price under cap-and-trade systems; but that is as it should be. It is efficient for prices to respond to changes in information, whether in response to the latest science concerning climate change, or to new discoveries relating to prospects for carbon-reducing technologies. Suppression of such signals would simply reduce the ability of the economy to adapt to changing circumstances: it would imply a more wooden-headed, less flexible, less adaptive approach to changes in available information and evidence.

This is not to say that all types of price volatility are desirable, and there are two sources of volatility that it is sensible for public policy to try to reduce:

- *Flaws in market design.* The right response to this is usually to work to improve market rules, not to abandon them; and, as economic circumstances change, this type of improvement work is a never-ending task for policymakers and regulators.

[11] Although, as indicated earlier, there may be more frictions associated with borrowing than with banking, in which case the inter-temporal substitution effects, including lower carbon prices today, may be somewhat damped in this second scenario.

Changes to the EU ETS rules in relation to banking and borrowing of allowances are good illustrations of the approach.

- *Regulatory and political uncertainty.* By this I mean a situation in which market participants are unable to form reasonably reliable expectations about the future course of public policy decisions that will have material effects on the market concerned (and, in particular, that can be expected to have material implications for the values of investments made). Regulatory and political uncertainty is a major problem because the volatility it creates is the type of volatility that markets have the greatest difficulty in handling.

Like other forms of price controls, a carbon price support mechanism may, on the surface, look as if it will have the effect of reducing volatility in carbon prices, but, particularly given the improvements in carbon market design, it may have the opposite effect. The reason is simple: it can be expected to add to the political and regulatory uncertainty that is already chilling investment in the energy sector. There is, for example, no clear and firm, long term commitment on levels of carbon taxation, which will be decided on a year to year basis (and a long term commitment would, in any case, be problematic in so far as it would tend to make carbon prices less responsive to new information).

In this (a likely contribution to increased volatility and disorder in the energy sector) the carbon price support mechanism is like the wider EMR proposals, and it is ironic that 'reducing price volatility' is often given as one of the objectives of energy policy. The inconsistency is also understandable: that regulation frequently has effects that are close to the opposite of those that it is claimed were intended is one of the basic findings of what is now a reasonably large collection of empirical studies of the impacts of public regulation in all its forms, in different historical periods. Unfortunately for the public, the frequency of the research finding tends to be matched by the frequency with which its implications are ignored by policymakers.