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Auctions vs Grandfathering

A Concept Economics Briefing Paper

This paper discusses the proposal by the Garnaut Climate Change Review to auction (rather than grandfather in whole or in part) permits for an emissions trading scheme. While economic theory would suggest that how permits are allocated will have no effect on market outcomes in a frictionless world, the existence of real-world imperfections suggest that there is a risk that the auctioning of permits will adversely affect structure and conduct in the affected industries, particularly in the electricity sector. While these risks might be offset, to some extent, by the scope to use revenues from an auction to reduce distorting taxes, it is not clear from the Review's documents to date that any auction revenues raised would indeed be put to effective use. Finally, the auction process itself, intended to be inclusive of a broad range of industries, will almost certainly be costly for all parties involved, and exposes participants to material financial risks if emissions quantities and therefore permit prices cannot be forecast with any degree of certainty. Those risks are a real cost to the economy, as are the resources participants would have to devote to seeking to manage them.

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1. AUCTIONS VERSUS GRANDFATHERING OF EMISSIONS PERMITS

The Garnaut Climate Change Review's February 2008 Interim Report has recommended the introduction in Australia of an emissions trading scheme (ETS) whereby emitters would have to hold permits to offset emissions. Garnaut recommends that permits should be auctioned, rather than 'grandfathered' or issued free. Some revenues from auctioned permits will be transferred to certain industries (trade-exposed, emissions-intensive industries, TEEIIs). In addition, auction revenues would be returned to Australians in various forms, including payments to households, to 'declining communities', to encourage new technologies, and to finance public infrastructure.

1.1. Permit allocation, market structure and conduct

The ETS Discussion Paper argues that the decision whether permits should be auctioned or issued free to emitters is not primarily an issue of economic efficiency.[1] Rather, the impact of an ETS on the prices of goods and services, including on electricity generators, is said to be independent of the approach adopted for allocating permits.

The assumption that prices will be the same, irrespective of how permits are allocated, follows from the observation that once an emitter has a permit, the marginal cost of using that permit is the implied tax on carbon. This is simply because the emitter faces a choice between using the permit itself and emitting one unit of carbon, or selling the permit to someone else (thereby obtaining payment of the price for emitting one unit of carbon). The opportunity cost of using the permit is therefore the carbon price, and so that carbon price will enter into the emitter's output and pricing decisions, regardless of whether it originally paid for the permit or was gifted it. As a result, if the carbon price is positive (i.e. if there is a tax on carbon), then emitters' prices will rise to reflect the opportunity cost of using permits, quite regardless of how they came to obtain those permits.

While this reasoning is correct, it rests on a number of assumptions.

To begin with, it assumes that the method of allocation has no effect on market structure and conduct – in other words, that the relationship between prices and marginal costs is unchanged by the method of allocation. However, this is not necessarily the case. There are some circumstances where auctioning might change the behaviour of emitters in their respective output markets relative to gifting. These effects are complex and depend on the specific industry context. However, given the economic importance of key emitting industries such as the electricity supply industry (ESI), they cannot be dismissed lightly.

The price bid for permits may act as a signal of pricing behaviour in subsequent periods (i.e. the process of auctioning creates an "equilibrium selection" effect).

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1 "Garnaut Climate Change Review, Interim Report to the Commonwealth, State and Territory Governments of Australia", February 2008, page 32.

In an oligopolistic industry setting there is usually no unique 'equilibrium' pricing outcome. For instance, the existence of multiple theoretical equilibria is a well-known phenomenon in electricity wholesale markets, such as the Australian National Electricity Market (NEM), in which electricity generators sell their output.[2] It is then relevant that in such an industry context, some experimental studies have found that auctions create upward pressures on prices.[3]

There are some limitations to the extent to which these studies, which essentially model the effects that the auctioning of mobile phone licenses potentially have on consumer prices, can be compared to permit auctions.[4] Mobile phone licenses are essentially up front entry fees that constitute a sunk cost (though conceivably, such a license could be resold, or more likely, the spectrum rented, in whole or in part, to third parties). Furthermore, differences in the cost structure between firms were ignored, so that the effect that more efficient firms might bid more for licences is ignored. Nonetheless, two studies by Offerman and Potters find a clear a positive relationship between entry fees and consumer prices when licenses are allocated via an auction process as opposed to being 'gifted'. Specifically the authors found that:

- In the short term, where licenses had been auctioned, 'players' charged significantly higher prices than if they had been gifted.
- Over the long term, when the entry licenses had been re-allocated a couple of times, the difference in average price levels tended to become much smaller, but the positive correlation between entry fees and prices remained.

The authors conclude that the size of the entry fee may serve as a selection principle guiding the players toward the equilibrium of collusive pricing. The intuition behind this result is that (in the absence of differences in cost structures) an auction will select the entrants with the highest profit expectations. Profit expectations will partly depend on the players' beliefs about the scope to collude. Bidders who are optimistic about the prospects for collusion will expect to make higher profits than those that expect to enter a very competitive market. An auction may then have the effect of selecting the more optimistic bidders, and, to the extent that these are also the more collusive entrants, this may have an upward effect on prices.

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2 CSEMWP-122 Natalia Fabra, Nils-Henrik von der Fehr, and David Harbord, "Designing Electricity Auctions" (February 2004).

3 Offerman, Theo and Potters, Jan J.M., "Does Auctioning of Entry Licenses Affect Consumer Prices?: An Experimental Study" (May 2000). CenTER for Economic Research Working Paper No. 2000-53. Theo Offerman, Jan Potters (2006), "Does Auctioning of Entry Licences Induce Collusion? An Experimental Study", Review of Economic Studies 73 (3) , 769–791.

4 It is interesting to note that this research was stimulated by the practical observation that there appeared to be a relatively clear link between the prices paid in the course of spectrum auctions and subsequent prices charged to consumers.

The authors then conclude that, for efficiency purposes, it may be more prudent to choose an allocation mechanism which retains the positive selection properties of an auction (that licenses are allocated to the most efficient firms), but leaves the surplus as much as possible with the bidders, for instance by designing auctions that minimise rather than maximize expected revenue or relying on a mechanism that redistributes the auction revenue to the winning bidders.

These issues associated with the impact of auctions on post-auction performance are particularly important when the auction mechanism itself is complex. For example, it seems likely that auctions of permits would be relatively frequent events, as the Government "topped up" (or perhaps at times, bought back) permits. However, sequential auctions invite strategic behaviour in which bidders, in devising their strategy in the immediate, take account of long run behaviour. This can result in inefficient outcomes, including collusion.

The need to finance the purchase of permits may affect the financial structure of emitters and change their investment and output decisions.

It is uncertain what prices permits would attract in the course of an auction. If firms must take on greater levels of debt as a result of buying permits, their investment and output decisions would be expected to change. The effects of leverage on firm behaviour are complex and not fully understood. That said, there are models in which higher levels of leverage induce more collusive pricing behaviour. One intuition underpinning these outcomes is that firms that are more indebted have more to lose from a price war. As each firm knows that, high price equilibria prove more durable than would otherwise be the case.

More generally, the introduction of a carbon price will alter the value of firms' assets, with that change in asset values translating into a change in shareholders' equity (as the value of other balance sheet items, such as debt, is presumably fixed in nominal terms). Even absent payment for permits, this will, so long as everything else is unchanged, weaken the balance sheet position of net losers – which in some industries may be the majority, if not the entirety, of the firm population. Unless that weakening is offset, these balance sheet effects could themselves alter firm behaviour, including through the effect of corporate financial structure on the extent of price rivalry.

The up-front payments required to obtain permits may induce early exit of some capacity, or bring about a change in industry structure as more liquidity constrained emitters are sold to less liquidity constrained emitters.

It is widely expected that the introduction of an ETS will result in profound structural changes in industries such as the ESI.[5] At the same time, the initial price that will be set in the auctions is uncertain. The experience in EU ETS markets, for instance, suggests that the projections upon which allocations were based embodied far more uncertainty than was acknowledged, resulting in unexpected and 'wild' swings in permit prices.[6] As a result, it is entirely possible that an auctioning process in which the prices of permits turn out to be significantly higher than anticipated will induce rapid changes to the current structure of the Australian ESI.

In the absence of a detailed understanding of the financial position of industry players and their longer term strategies, the effects of such structural changes cannot be anticipated in advance. However, such changes could affect competitive outcomes, in the ESI for instance as a result of profound changes in the generator "merit order". To the extent that existing fuel contracts will need to be renegotiated, consequent knock-on effects could also be expected for upstream coal and gas industries.

Overall impacts of structural and behavioural changes

The overall effect of these changes is readily seen using a standard formula for the price-cost mark-up in oligopoly. That formula says that the Lerner index (the ratio of the price-cost mark-up to price) is equal to the product of the Herfindahl-Hirschman Index (HHI) of concentration, multiplied by 1 plus the parameter of conjectural variation ν, divided by the absolute value of the elasticity of demand:[7]

$$\left(\mathrm{P} - \mathrm{MC}\right)\Big/_{\mathrm{P}} = \left[\mathrm{HHI} \times \left(1 \oplus \nu\right)\right]\Big/_{\mathrm{e}}$$

If the method of allocation alters the HHI or ν – which it may well do if the industry consolidates or if the introduction of a permit system results in a new bidding paradigm – then it will affect pricing and output behaviour. Specifically, if auctioning increases the HHI, say because higher emitters leave the market, and ν rises (as a result of equilibrium selection effects), then this will increase price-cost margins and impose some welfare cost.

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5 For instance, a study for the National Generators Forum concluded that even under idealised least cost conditions, deep cuts in emissions to 96 Mt per annum in 2050, the total production from existing coal plants in 2050 is projected to drop from 144 TWh to 25 TWh. CRA International, "Analysis of Greenhouse Gas Emissions in the Australian Electricity Sector", Report To National Generators Forum, September 2006.

6 Hepburn, C. & Grubb, M. & Neuhoff, K. & Matthes , F. & Tse, M., 2006. "Auctioning of EU ETS Phase II allowances: how and why?," Cambridge Working Papers in Economics 0644, Faculty of Economics (formerly DAE), University of Cambridge.

7 The Herfindahl-Hirschman Index or HHI, is a measure of the relative size of firms in a market. The conjectural variation v captures central assumptions about firms' competitive behaviour in an oligopolistic setting. v = 0 indicates Cournot competition (i.e. competition on volume), v = -1 Bertrand competition (i.e. competition on price). For an individual firm, the coefficient of conjectural variation can be interpreted as its belief as to the partial derivative of all other firms' output with respect to a change in its own output.

1.2. Revenue effects

Auctioning will raise greater government revenues than would be obtained under grandfathering. In a (second best) best case scenario (i.e., given that taxes represent a significant distortion in many markets and in particular in labour markets) those revenues can be used to reduce other distorting taxes in the economy (for example, the corporations tax and the higher marginal rates in the income tax scales). Reducing those taxes (the so-called "revenue recycling effect"), in particular taxes on labour, creates welfare gains since the wedge between the gross and the net wage is reduced and employment increases.

It is in fact unclear if what Professor Garnaut has in mind is to reduce rates on distortionary taxes. Instead, what appears to be proposed (in addition to the payments to TEEIIs) are a range of payments to specific groups, including households, "*declining communities*", and subsidies "*to correct market failures in relation to new technologies*". Such spending can only produce a significant efficiency gain if the social benefits per dollar of additional spending are well in excess of a dollar.[8] Given the poor track record of governments in identifying welfare enhancing projects and the significant distributional element that the proposed payments appear to entail, these uses of the funds could reduce, rather than enhance aggregate welfare. Whether that is so obviously depends on the broad uses to which the revenues will be put and the mechanism by which those uses will be selected.

1.3. The auction process

Professor Garnaut devotes little attention to the mechanics of the proposed auction process (other than suggesting that auctions should be held on a fixed schedule). The ETS paper notes (at page 27) that coverage of an ETS should be as broad as possible, so as to provide an incentive for emissions reductions in all relevant sectors, including stationary energy, transport, fugitive emissions from fuels, industrial processes, agriculture, waste, and land use change and forestry. However, it is not apparent whether the Garnaut review has considered how such an auction process could successfully be implemented in practice, given that it would seem to pose significant risks.

8 This is because the opportunity cost of using a dollar of revenue in this way is the foregone opportunity to cut the most distorting tax rates. As the marginal social cost of those most distorting tax rates is likely to be high (so that raising a dollar in revenue costs well more than a dollar), foregoing that opportunity costs more than $1 per dollar.

To begin with, the sheer transactions and administrative costs that would be involved in undertaking an auction are likely to be especially high in the approach the Garnaut Review has proposed to date. If very wide coverage is to be sought of the ETS, several hundred firms, all of them dependent on obtaining a sufficient number of permits, may need to engage in the auction process. All of these firms would have to invest in trying to estimate what a sensible level of bids would be, and would likely have to engage agents to undertake the actual auction. Additionally, the institution responsible for conducting the auction would equally face costs in dealing with each bidder, for instance in terms of ensuring compliance with capital adequacy provisions in the case of intermediaries. Not only could the total costs involved be high, but at least some of these costs would largely amount to waste – for example, the costs that each firm invested in trying to "outsmart" rival bidders, or acquiring for itself information that has public good attributes (so that each firm is merely duplicating information-acquisition efforts made by rivals).[9] While some commentators have proposed establishing 'primary dealers' who can bid on their own account on behalf of clients, allowing third parties to aggregate and thus creating powerful bidding groups creates new concerns about potential market manipulation. Moreover, even the existence of primary dealers would not release each firm from formulating their bids and monitoring the conduct of the primary dealers.

The difficulties associated with relying entirely on an auction for the initial allocation would be expected to be even more acute when there is great uncertainty about the desirable volume of permits. While uncertainty in this respect can cut both ways, it is not easy to see how potential purchasers of permits could hedge their position in an initial auction, given the lack, at that point, of a deep secondary market. The European experience with permit trading offers ample evidence that mistaken projections of emissions reductions will make a nonsense of any price forecasts. Hepburn et al, for instance, note that in the EU allocations exceeded emissions by close to 100MtCO2, that this gap could easily have been even bigger, and that retrospective estimates of emissions as late as in Spring 2006 turned out to be completely wrong. As Hepburn et al conclude:[10]

> *The uncertainty in the original projections upon which NAPs had been based was, of course, far wider still. This gives some indication of the uncertainty inherent in predicting emissions and abatement responses – and hence, of prices and costs.*

9 These are instances where the points made by Hirshleifer and Barzel about the difference between the private and the social value of information would seem to apply.

10 NAP refers to 'National Allocation Plan'. Hepburn et all, aaO, Page 143.

In addition to uncertainty about emissions estimate (and their effect on price), and given the wide range of sectors that would be covered by an ETS scheme, buyers' valuations would, of course also be expected to vary widely. In short, the eventual prices established in a permit auction could either significantly fall below or exceed advance estimates. The former outcome implies an auction failure (since revenues will be low), while the latter places significant risks on participants. Although the Commonwealth could deal with this issue by capping the initial price (thereby reducing the risk to which bidders were exposed), setting such a ceiling would in turn alter the character and effects of the scheme, and would make it more similar to a carbon tax. (Of course, this begs the question of why an ETS had been chosen in preference to such a tax in the first place, all the more so given that such a tax would be considerably easier to introduce and would be more transparent in its effects.) More generally, the introduction of new parameters in an auction design tends to open new possibilities for gaming and further complicates what is already a complex sales process.

It may well be that these costs – in terms of the considerable advance uncertainty and associated transactions costs – would decline over time, as the development of a secondary market for the permits allowed price discovery to occur. However, what these considerations also suggests is that it may be more efficient to rely on an administrative allocation for at least an *initial* quantum of permits, thus avoiding the costs identified above (though obviously incurring the costs of determining and effecting that administrative allocation).[11] As those permits become traded on a secondary market, it would then be easier to conduct auctions for additional permits, as the secondary market provided both information that could guide expectations in the auction and allowed bidders to manage their risks. Neither of these functions could occur were the initial allocation to be determined by an auction.

1.4. Conclusions

In a world with zero transactions costs, the methods by which property rights (including the right to emit carbon) are allocated would only have distributional effects. Reality, however, is not frictionless, so that different ways of allocating rights can impact on the level of output, as well as on its distribution, over the longer term, both by direct impacts on those who need permits and through revenue recycling effects.

11 Those costs include costs of rent-seeking, i.e. of efforts to seek to influence the outcome of an administrative allocation in a particular constituent's favour. However, this is an argument in support of clear guidelines and transparent processes, rather than necessarily ruling out such a solution.

On closer inspection, a number of the claimed advantages of an auction process are not so clear cut. Specifically, there is some evidence from mobile phone auctions that higher auction revenues translate into higher prices charged of consumers, a result that has been confirmed in an experimental setting. More generally, there are good reasons for thinking that abrupt changes in firms' financial structures will change the competitive dynamics in established industries; this is all the more likely if established industry structures themselves are no longer sustainable under an ETS. Similarly, while advocates of auctions point to the welfare-enhancing effect of revenue recycling, such an outcome is by no means assured, since it relies on:

- Auction revenue being used to either eliminate distortionary taxes or to finance unambiguously net beneficial projects; and
- Significant auction revenues being achieved in the first place.

The initial auction process then becomes the focal point of a new ETS regime, in that it encapsulates the considerable uncertainty about the potential value (and therefore cost) of permits. At a minimum, such an auction will impose considerable transactions costs on what is likely to be a significant number of firms who will be required to purchase allocations in the absence of a clear understanding of their value and irrespective of what the eventual price outcome might be. Indeed, it would be expected that the pricing and rapid structural effects discussed above would be compounded if there is a significant risk that permit prices will turn out to be 'too high', while permit prices that turn out to be 'too low' will merely result in volatile (and therefore meaningless) permit prices, as has been the case in Europe.

The net effect of these various types of impacts cannot be determined a priori, so that it is not possible to say, merely starting from first principles, which approach to allocation is likely to be superior. That said, it is apparent that the risks of a failed auction process are considerable, both for participants, but also more generally for consumers and taxpayers. The option of allocating at least a share of initial permits via an administered process would then seem to constitute a legitimate approach to reduce the inherent uncertainty of an auction and mitigate potentially drastic impacts on the affected industries.