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## Comment      Lawrence H. Goulder

Output-based emissions allowance allocation (OBA) has been proposed in climate policy discussions as a way of avoiding international emissions leakage and of preserving the competitive position of energy-intensive, trade-exposed firms. The OBA differs from allocation based on auction-

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ing or grandfathering in that it awards allowances to firms in proportion to the level of their regular output. As a result, OBA effectively subsidizes the output of the qualifying firms.

As Meredith Fowlie's chapter indicates, there have been several prior studies of the potential impacts of OBA on firms' competitive position and on international emissions leakage, but virtually no studies of the implications for efficiency. Her chapter stands out in assessing the efficiency implications of OBA relative to the alternatives of auctioning or grandfathering. The analysis is very clear and carefully done. Fowlie has a knack for taking the elements of a complex system, distilling them, and arriving at very clear analytical expressions showing the equilibrium aspects of the system. The analysis is deceptive: it is so cleanly performed that the analytical problem seems easier to solve than it is!

The efficiency results derived in her chapter are correct (subject to a few qualifications mentioned later). Beyond showing the efficiency impacts, the chapter examines the eligibility criteria for OBA under recent legislation, and compares these criteria with those that would be consistent with economic efficiency. Interestingly, the chapter reveals that the eligibility criteria used by recent legislation are essentially the reverse of what efficiency would call for.

In these comments I will first lay out and comment on Fowlie's results, taking as given the assumptions of her model. Later I will discuss how alternative assumptions might influence the results and offer some broader perspectives.

### **Efficiency Implications of Output-Based Allocation**

#### **The Autarky Case**

Fowlie examines the efficiency impacts in an autarkic setting, that is, a setting where there is no international trade and thus no potential for emissions leakage outside of the domestic economy. The model assumes pure competition, no preexisting tax distortions, and fixed marginal abatement costs for firms not qualifying for the output-based allocation. Fowlie finds that, under these circumstances, social welfare is lower than under auctioning or grandfathering. Her results are correct, given the assumptions of the model.

I feel the analysis would be a bit clearer if it decomposed the welfare impacts more. I would recommend decomposing the difference between OBA and the other forms of allocation as follows:

1. Gain in producer and consumer surplus to qualifying firms
2. Loss of taxpayer surplus (under auctioning) or in value of free allowances received by qualifying firms (under grandfathering)
3. Increase in abatement costs to non-qualifying firms

Fowlie's chapter does not separate factors (1) and (2). It considers only the combination, which is described as the "net change in producer and consumer surplus." It took me a bit of work to figure out what is in this net change. It seems clearer to keep factor (2) separate from factor (1)—especially in the case of auctioning, where the loss of taxpayer surplus applies to individuals other than the consumers or producers associated with production by the OBA-eligible firms.

The fundamental reason for Fowlie's (correct) bottom-line result—that moving from auctioning or grandfathering to OBA involves a loss of efficiency in the autarkic case—is that OBA leads to too much output and emissions by the qualifying firms (from an efficiency point of view) and eliminates the equality of marginal abatement costs between qualifying and nonqualifying firms. The abatement costs of nonqualifying firms are higher than the costs of avoiding emissions by forgoing the extra output and emissions that qualifying firms generate under OBA.

#### The Case with International Trade

Fowlie shows that the efficiency impacts differ in the presence of international trade. In this setting OBA has the potential to increase efficiency relative to other forms of emissions allowance allocation. Her analysis indicates that in this situation there are two other influences on efficiency:

4. Avoidance of environmental damage stemming from international production
5. Transfer of surplus from foreign to domestic producers (as share of domestic market served by foreign imports declines)

The chapter claims that both of these factors contribute positively toward the relative efficiency of OBA.

Factor (4) represents the fact that, by leading to lower foreign-generated emissions (relative to the amount under the other forms of allocation), the domestic policy promotes a larger worldwide reduction in emissions and the environmental damage associated with global emissions.

Factor (5) represents the fact that OBA transfers demand (and surplus) from foreign to domestic firms. This item seems to deserve qualification. Over the longer term, it might not affect efficiency. Balance of payments considerations imply that changes in the value of imports are accompanied by equal-value changes in exports or in international capital inflows. In this case, the overall efficiency impact of item (5) disappears.

The overall efficiency impact—the combined impact of factors (1) through (5)—reflects two fundamental and opposing economic considerations. On the one hand, the basic finding from factors (1) through (3) is that OBA hurts efficiency by removing the equality of marginal abatement costs across domestic firms and leading to too much production by OBA-eligible firms relative to other firms. On the other hand, it supports efficiency by lowering

international emissions leakage and the associated environmental damages (factor [4]). Which of the two effects is stronger depends on parameters. The chapter makes an important contribution by showing that, other things equal, as the relative efficiency impact of OBA increases, the *lower* is the emissions intensity of the qualifying firms. This suggests that, if efficiency is the goal, it is the low-emissions-intensity firms that should qualify for OBA. Yet, as nicely demonstrated in the chapter, the climate bill passed by the US House of Representatives in June 2009 provides OBA to the firms with the *highest* emissions intensity. As indicated in the chapter, this seems to be a case where distributional considerations (and associated political factors) are much more powerful than efficiency concerns.

### Qualifications and Extensions

How robust are the results from Fowlie's analysis? Here are some additional factors that could influence the results.

*Differences between the allowance price and marginal environmental damages.* Fowlie's analysis assumes that the market price of allowances ( $\tau$ ) is equal to the marginal environmental damage. If in fact the cap-and-trade system is less (more) stringent, so that the allowance price is lower (higher) than the environmental damage, then the relative efficiency of OBA would be greater (lower) than that in Fowlie's analysis. The reason is that the environmental benefit from reducing international leakage and foreign production would be higher (lower) than that captured in the model.

*Preexisting distortionary taxes.* Fowlie acknowledges that preexisting distortionary taxes could affect the results. The OBA leads to lower output prices than the other allocation methods. Fischer and Fox (2007) have shown that this mitigates the costly "tax interaction effect" of prior taxes, and thus is an advantage of OBA.

*Terms of trade effects.* If the domestic economy has monopsony power on international markets, then the OBA-induced reduction in demand for foreign goods could lead to a reduction in the relative price of imports. (See, for example, Neuhoff, Martinez, and Sato 2006.) This would buttress the efficiency impact of OBA.

*Rising marginal abatement costs for ineligible domestic firms.* This would attenuate the potential efficiency gains from OBA.

### Broader Perspectives

This chapter makes an important contribution by laying out the efficiency implications of OBA—and showing that the overall impact depends on competing forces. Additional considerations not captured by the model also work in opposite directions and the overall efficiency impact cannot be determined analytically. It becomes an empirical matter.

As noted in the chapter, much of the support for OBA reflects concerns about international competitiveness and leakage rather than efficiency. Fowlie's analysis might offer comfort to the more efficiency-minded, since it indicates that OBA need not be inferior to the alternatives on these grounds.

The chapter also provides hints as to what sort of policy might be more efficient than OBA in addressing leakage. Border taxes are another way to address the leakage problem, and such taxes in principle can avoid distorting domestic abatement efforts (thus avoiding the net cost of factors [1] through [3]) while yielding the benefit from factor (4). Thus border taxes might have an efficiency advantage over OBA. However, it is not clear whether border taxes would violate World Trade Organization rules; furthermore, such taxes might invite retaliatory actions by foreign governments more than OBA would.

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