Carbon Taxes and the Oil Market

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We recently argued[1] that a carbon tax at the level normally considered – in the range $40 to $100 per ton CO_2 – will have little impact on **oil** consumption. Here we are providing some intuitive background to our conclusions. First note that we argue that a carbon tax in the above range **will** have a major impact on the consumption of coal and to a lesser degree natural gas: in fact, it is likely to drive at least coal completely out of its major market, power generation. There are two reasons for this. One is that the implied carbon tax relative to the current market price is much higher for coal and natural gas, making them less competitive relative to other fuels (see Table 1, page 35). The second is that both are subject to intense competition from wind and solar power, which can now undercut them, and that there is little scope for the tax to be passed on to consumers. Such a tax **will** have an impact on CO_2 emissions: it will greatly reduce those from coal and natural gas.

Oil is different for two reasons. One is that the marginal extraction cost of oil from many oilfields is low relative to the price (see Figure 1 page 30): the price is in the region of $65 and a lot of oil can be extracted for a marginal cost of below $20, leaving an operating margin of $45. A carbon tax of $40 per ton CO_2 translates to about $14 per barrel of oil, so that even if all the tax were paid by the oil producer, this oil would still be profitable. But it is unlikely that all the tax would be paid by the producer: there is almost no competition for oil in its main use, transportation, so that producers will probably be able to pass on much of the tax (75% initially according to our model, though much less later). The tax would raise the price of oil now and up to about 2080 (see figure 3 on page 32 of our paper) but thereafter the price of oil would be lower than in a no-tax scenario, reflecting the fact that with less consumption prior to 2080, the supply of oil would be greater than otherwise after that date.

The key point here is that if the consumption of oil in the next two decades is reduced, the oil that is not consumed does not go away: it remains in the ground and increases the amount available at future dates. In this respect oil – or any exhaustible resource - is very different from manufactured goods. And if at a later date that oil still has a marginal extraction cost below the market price, it will be profitable to produce it. This is the insight that Hotelling's model of exhaustible resource markets gives us.

The only way in which a carbon tax can reduce oil consumption is if it is big enough that the for some deposits extraction cost plus tax exceeds the market price, so that the cash flow from extracting these deposits is negative, and they will not be produced. If oil has a marginal extraction cost of $30 then at present the tax needs to be greater than $35 per barrel for this to be true, which means great than $100 per ton CO_2. To eliminate $10 oil we would today need a tax of $157/ton CO_2. If, as our model suggests, prices rise over time with increasing scarcity, then the taxes would have to be higher in the future. Clearly oil deposits with the highest marginal extraction costs will be driven from the market first by a carbon tax. Another factor that that will lower oil consumption is if alternative fuels (e.g., solar + electric cars) become cheaper, effectively limiting how high the price of oil can rise.

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[1] NBER Working Paper 26086, "Coase, Hotelling and Pigou: The Incidence of a Carbon Tax and CO_2 Emissions," https://www.nber.org/papers/w26086 or https://ceep.columbia.edu/sites/default/files/content/papers/n6.pdf