

# ESRI Research Bulletin

## *Carbon Tax Scenarios and their Effects on the Irish Energy Sector*

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# Carbon Tax Scenarios and their Effects on the Irish Energy Sector

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**\*Valeria Di Cosmo and Marie Hyland<sup>1</sup>**

In this paper we estimate new energy demand equations for Ireland, updating our estimates of the responsiveness of demand to income and price changes. Using annual time series data from 1960 to 2008 we estimate the long run price and income elasticities underlying energy demand in Ireland. We forecast Irish energy demand by sector and by fuel type out to 2025 using the estimated price and income elasticities. The share of electricity in the Irish fuel mix is predicted to grow over time, as the share of carbon intensive fuels such as coal, oil and peat, falls. The share of electricity in total energy demand grows most in the industrial and commercial sectors, while oil remains an important fuel in the residential and transport sectors.

Having estimated the baseline energy demand forecasts, two different carbon tax scenarios are imposed upon the model and the impact of these scenarios on energy demand, carbon dioxide emissions, and government revenue is assessed. The first carbon tax scenario assumes that the price of carbon will follow the same trajectory as the price of carbon permits under the EU's Emissions Trading Scheme, as projected by the futures price of these permits. Under this scenario, the carbon tax will rise from €21.50 per tonne CO<sub>2</sub> in 2012 (the first year forecasted) to €41 in 2025. Results show that under this scenario total emissions would be reduced by approximately 861,000 tonnes of CO<sub>2</sub> in 2025 relative to a zero carbon tax scenario, and that such a tax would generate €1.1 billion in revenue in the same year. The second carbon tax scenario is what we refer to as

<sup>1</sup> Valeria Di Cosmo and Marie Hyland, 2013, "Carbon Tax Scenarios and their Effects on the Irish Energy Sector", Energy Policy, <http://dx.doi.org/10.1016/j.enpol.2013.03.055>

the “high tax” scenario. Under this scenario the carbon tax would gradually increase to €50/tonne in 2025, resulting in greater reductions in CO<sub>2</sub> emissions and increased tax revenue.

Our research highlights the benefits of a carbon tax in terms of increased tax revenue and lower CO<sub>2</sub> emissions. It is, however, also important its potential negative effect on the macro economy. The macroeconomic effects of a carbon tax were examined using HERMES, the ESRI's medium-term macroeconomic model. The results from HERMES show that a carbon tax of €41 per tonne CO<sub>2</sub> would lead to a 0.21 per cent contraction in GDP and a 0.08 per cent reduction in employment when the proceeds are used to repay the deficit. This use of the carbon revenue is the most likely in the current economic and international environment. A higher carbon tax would lead to greater contractions in output. On the other hand, as we assumed that the revenue from the carbon tax would be used to reduce Ireland's deficit, having a higher carbon tax would make a positive contribution to the balance of payments: in the ETS-level scenario, the balance of payments surplus (relative to GNP) in 2025 would be 0.93 percentage points higher than in the no-tax scenario, and, in the same year, under the higher tax scenario it would be 1.13 percentage points higher<sup>2</sup>.

Our research shows that the effects of the carbon tax would be predominately negative when the proceeds of the tax are used to repay the deficit; the negative macroeconomic impacts of imposing a carbon tax would be offset by only a modest reduction in emissions. However, in our model we are estimating only the first-order effects of the carbon tax on emissions; thus some of the potential benefits of carbon tax, such as incentivising research and development in carbon-saving technologies, may be realised in practice but are not captured in our model. Furthermore, research on the Irish economy by Conefrey *et al.* (2012)<sup>3</sup> has shown that, as a revenue-raising instrument, the negative impact of carbon

<sup>2</sup> We thank Dr. Adele Bergin for implementing the runs with the different carbon tax assumptions in HERMES.

<sup>3</sup> Conefrey, T., Fitzgerald, J.D., Malaguzzi Valeri, L., Tol, R.S.J., 2012. The Impact of a Carbon Tax on Economic Growth and Carbon Dioxide Emissions in Ireland. *Journal of Environmental Planning and Management*, Volume 56, Issue 7, 2013, pp. 1-19.

taxes on the macro economy is less than that of labour taxes. Therefore, as shown by Conefrey et al., if the revenue were to be used to lower labour taxes, the net macroeconomic effect would be positive.

Two arguments in favour of the ETS-level carbon tax emerge from our research. Firstly, a carbon tax already exists for certain sectors of the economy, and it has been argued (see Tol *et al.*, 2008<sup>4</sup>) that the economically-efficient way of reducing CO<sub>2</sub> emissions is to set a uniform price on carbon regardless of its emission source. Thus a carbon tax set at the level of the futures price of ETS permits would, as noted by Tol *et al.* (2008), ensure that the carbon tax would be in line with the expected permit price. Secondly, to comply with our emission-reduction obligations, Ireland must cut its CO<sub>2</sub> emissions. Our research shows that a carbon tax will bring us closer to our emission-reduction targets, and that setting it at the ETS level would limit the negative macroeconomic consequences that will result from this tax.

<sup>4</sup> Tol, R.S.J., Callan, T., Conefrey, T., FitzGerald, J.D., Lyons, S., Malaguzzi Valeri, L., Scott, S., 2008. A Carbon Tax for Ireland. ESRI Working Paper (No. 246).