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The distributional implications of a carbon tax in Ireland

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ABSTRACT

We study the effects of carbon tax and revenue recycling across the income distribution in the Republic of Ireland. In absolute terms, a carbon tax of €20/tCO_2 would cost the poorest households less than €3/week and the richest households more than €4/week. A carbon tax is regressive, therefore. However, if the tax revenue is used to increase social benefits and tax credits, households across the income distribution can be made better off without exhausting the total carbon tax revenue.

1. Introduction

Climate policy necessarily increases the price of energy, either explicitly through taxes or tradable permits or implicitly by mandating the use of different fuels from those that a free market would choose. As energy is a necessary good, climate policy is regressive: it will disproportionally harm poorer households.[1] Therefore, there should be an additional policy reform to offset the negative effects of climate policy on the distribution of income. This paper investigates the issue for a carbon tax and revenue recycling for the Republic of Ireland.

The *Programme for Government* 2007–2012 states that "[a]ppropriate fiscal instruments, including a carbon levy, will be phased in on a revenue-neutral basis over the lifetime of this Government."[2] Details of the carbon tax will not be decided before late 2009, but it seems likely that the carbon tax would be levied on carbon dioxide emissions only,[3] and on emissions that are not already regulated by the European Union Emissions Trading Scheme (EU ETS), and that the tax would be roughly equal to the expected permit price in the EU ETS. We will work on these assumptions.

In contrast to the other policy instruments, a carbon tax has the distinct advantage that it generates tax revenue that can be used to even out undesired side-effects of greenhouse gas emission reduction. The purchasing power of households can be targeted through income taxes and, as the negative effects of a carbon tax are concentrated in the lower income groups, social welfare payments. This is essential for the political acceptability of a carbon tax. The previous attempt to introduce such a tax in Ireland was abandoned (in 2004) at least partly due to distributional concerns,[4] although concerns about the competitiveness of Irish exports also played a role.

This paper is not the first to look at these issues, as shown by the literature review in Section 2. However, there are only a few papers, and none on Ireland using recent data. As each country is idiosyncratic in its taxes and benefits, this paper does add useful information. Section 3 discusses the distributional implications of a carbon tax, using data from the latest Household Budget Survey. Section 4 shows the results for income recycling, using a detailed model of direct taxes and transfer payments. Section 5 concludes.

2. Previous literature

The impact of energy and carbon taxes on household income distribution has been investigated in a number of studies, although almost all of them refer exclusively to developed

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[1] At the same time, the long-term benefits of climate policy will be reaped by poorer countries. However, this paper is focussed on domestic distribution.

[2] http://www.taoiseach.gov.ie/attached_files/Pdf%20files/Eng%20Prog%20for%20Gov.pdf.

[3] Note that Ireland has substantial methane emissions, and fast-growing halocarbon emissions. These emissions originate in export-oriented sectors which will probably be exempt from the carbon tax. However, even if they would be subject to the carbon tax, this would hardly affect consumers in Ireland Tol (2007).

[4] http://www.rte.ie/business/2004/0910/carbon.html.

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economies. This is arguably the case because in developed economies "green" taxes have been implemented more extensively and because the consumption of CO_2-related fuels is more even across the population, which fact is at the root of the equity problem.[5] In fact, the literature on developed economies suggests that energy and carbon taxes tend to be regressive, whereas for developing economies it has been concluded that such taxes are either neutral or progressive.[6] Here follows a brief review of the literature on developed economies, with a focus on the studies that concern Ireland.

Among the earliest works is one by Poterba (1991), who analyses the distributional effect of a gasoline tax in the US. Using the data from the US Consumer's Expenditure Survey, Poterba (1991) calculates the fractions of household income and expenditure that are devoted to gasoline purchase.[7] He finds that the tax is only slightly regressive, especially when expressed as a share of expenditure. On the other hand, Safirova et al. (2004) find that the burden of congestion falls disproportionally on the rich (in and around Washington, DC), so that road pricing or fuel taxation would be strongly regressive.

With a view to the project of a European carbon tax, Pearson and Smith (1991) estimate the distributional impact of the tax in seven European countries, namely France, Germany, Italy, Netherlands, Spain, the UK and Ireland. Augmenting Poterba's approach by including price elasticities (although they do not estimate any demand system), they find that in the first five countries the tax would be weakly regressive, whereas it would be significantly regressive in the UK and strongly regressive in Ireland. By means of a substantially more comprehensive model (the E3ME model, a sectoral, regionalized, econometric model of the EU), Barker and Köhler (1998) upgrade Pearson and Smith's work and draw similar conclusions,[8] although they also point out that the outcome would be progressive if the yield were recycled as lump-sum transfers.

A study for Canada was conducted by Hamilton and Cameron (1994), who use an input-output model of the economy to translate the carbon tax into all consumer prices and then apply Statistics Canada's micro-simulation model to assess the distributional impact of the price increases.[9] The simulated tax turns out to be moderately regressive. Similarly, Cornwell and Creedy (1996) investigate the distributional impact of a carbon tax in Australia. Again, the approach adopted is a combination of input-output analysis and estimation of the demand response of consumers, in this case based on the Australian Household Expenditure Survey. Cornwell and Creedy (1996) find that "The carbon tax involves an increase in total tax revenue and a reduction in the degree of progressivity, with an increase in inequality" (p. 35). In contrast, in a computable general equilibrium analysis of the Susquehanna River Basin, Oladosu and Rose (2007) find that a carbon tax is progressive, because changes in the structure of the economy, higher transfer payments, and reduced profits more than offset the regressive direct effects.

More studies have been conducted with reference to European economies. Labandeira and Labeaga (1999) explore the effect of a carbon tax on Spanish household income. The authors use an input-output demand model to calculate the price changes induced by the tax, and then simulate consumers' response via an almost ideal demand system (AIDS) estimated with the data from the Spanish Household Expenditure Survey. In contrast with other studies (in addition to those previously mentioned, see Symons et al., 2000), they do not find that a carbon tax in Spain would be regressive.

Tiezzi (2001) simulates the welfare effects of the carbon tax implemented (*de facto* only for one year) in Italy in 1999. Such effects are calculated using True Cost of Living indices and compensating variation; the parameters are obtained by estimating an AIDS with household consumption data. Surprisingly, Tiezzi (2001) finds that the Italian carbon tax is not regressive, but explains that this might be due to the fact that the tax mainly hits transport fuels because of the way it has been conceived. Indeed, in developed economies the pattern of household spending on transport fuels typically increases with income, as opposed to that of heating fuels, which is relatively flat instead.

Brannlund and Nordstrom (2004) analyse consumer response and welfare effects due to changes in energy or environmental policy in Sweden, where a carbon tax has existed since 1991. Thus, the authors are able to estimate an econometric model for the demand of non-durables (a quadratic AIDS). They then assume a doubling of the Swedish carbon tax and compare the outcomes of two alternative recycling options, namely a lower general VAT and a lower VAT on public transport (equivalent to a subsidy to public transport). Both reforms are found to be regressive, although the second one also has a regional distributional effect, in the sense that households living in less populated areas would carry a larger share of the tax burden.

Wier et al. (2005) assess the distributional impact of the Danish carbon tax. The method is standard, as it combines an input-output model and national consumer survey, but the data nicely "incorporate" the substitution effects, since the tax was introduced in 1992. The tax is found to be regressive, particularly to the disadvantage of rural households. Kerkhof et al. (2008) find that a carbon dioxide tax is regressive in the Netherlands as well, and that a tax on all greenhouse gases is less regressive.

Van Heerden et al. (2006) is probably the most advanced study, using a detailed computable general equilibrium model with multiple households for South Africa. The authors compute the marginal excess burden by income class, and find a triple dividend for selected ecological tax reforms: certain mixes of increased energy taxes and reduced food taxes reduce emissions, increase economic output, and reduce the income gap between rich and poor.

Finally, one relatively recent study has been devoted to Ireland,[10] where the tax has been on the government's agenda for a few years. Using the data from the Irish Household Budget Survey, Scott and Eakins (2004), updating earlier work by Scott (1992) and O'Donoghue (1997), derive the pattern of household consumption of CO_2-related fuels and calculate the distributional impact of a €20 tax per metric tonne of carbon.[11] The result is that

[5] The difference between developed and developing countries can be explained not only by the difference in household expenditure patterns: Shah and Larsen (1992) argue that "[in developing countries] factors such as market power, price controls, import quotas, rationed foreign exchange, the presence of black markets, tax evasion, and urban–rural migration, may cast doubt on the regressivity of environmental policies" (p. 8).

[6] Boyce et al. (2005) find, however, that the burden of a carbon tax in China would be borne more by rural households than urban ones. A study worthy of mention, especially for its innovative approach, is the one by Yusuf and Resosudarmo (2007) on the distributional effects of a carbon tax in Indonesia.

[7] The implicit assumptions in this approach are that (a) the tax is fully translated into the price of the fuel, and (b) the price elasticities of demands for fuels are zero. In addition, the supply side of the economy is not considered. Thus, this method is suited for the analysis of the so-called first-round effects.

[8] "The most regressive impact is on West Germany, the UK and Ireland, although the impact is weak" (p. 400).

[9] Actually, as the first step they determine the tax level that would bring about a given CO_2 emissions cut. This is calculated by means of a computational general equilibrium (CGE) model of the Canadian economy.

[10] For a comprehensive macroeconomic analysis of an Irish carbon tax, see Bergin et al. (2004). Also, one may want to consult the earlier work by Fitz Gerald and McCoy (1992), inspired by the project (never realised) of a European carbon tax.

[11] No input-output model of the Irish economy is used. This means that the "indirect" effect of the tax, which operates through the price changes of all goods other than fuels, is not captured.