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Impacts of an emission based private car taxation policy – First year ex-post analysis

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ABSTRACT

This paper assesses the impacts of a targeted policy designed to influence car purchasing trends towards lower CO_2 emitting vehicles. Vehicle registration tax and annual motor tax rates in Ireland changed in July 2008 from being based on engine size to emissions performance of cars. This paper provides a one year ex-post analysis of the first year of the tax change, tracking the change in purchasing trends arising from the measure related to specific CO_2 emissions, engine size and fuel, and the implications for car prices, CO_2 emissions abatement, and revenue gathered. While engine efficiency improvements had been offset by purchasing trends towards larger and generally less efficient cars in the past, with the average MJ/km remaining constant from 2000 to 2007, this analysis shows that in the first year of the new taxation system the average specific emissions of new cars fell by 13% to 145 g/km. This was brought about, not by a reduction in engine size, but rather through a significant shift to diesel cars. Despite an unexpected reduction in car sales due to a recession in 2008, the policy measure has had a larger than anticipated impact on CO_2 emissions, calculated to be 5.9 ktCO_2 in the first year of the measure. The strong price signal did however result in a 33% reduction in tax revenue from VRT, in financial terms amounting to a drop of €166 million compared to a baseline situation.

1. Introduction

Private car transport is a key component of rising transport energy demand, accounting for 46% within the European Union (EC, 2008). Technological improvements have led to a rise in vehicles' fuel economy, but trends towards heavier and larger engine sized cars has offset these benefits (Ó Gallachóir et al., 2009; Van den Brink and Van Wee, 2001). Fiscal policies have sought to counter these trends and internalise the negative externalities associated with increasing energy use and emissions from cars by incentivising the purchase of lower emitting cars (Mandell, 2009).

This paper analyses one such policy introduced in Ireland in 2008 which targeted car purchasing trends by changing the vehicle registration tax (VRT) and annual motor tax (AMT) system in order to ensure that the efficiency gains achieved by private car manufacturers are not offset by purchasing trends. Private car taxation changed from being based on the engine size of cars (in terms of swept volume inside the cylinders, in cm^3 [cubic centimetres, cc]) to the CO_2 performance of cars (in terms of specific CO_2 emissions, g/km). The paper builds on and extends previous analysis (Ó Gallachóir et al., 2009) that showed the rationale for the policy, namely the failure of efficiency improvements to lead to an improvement in the weighted average performance of new cars entering the Irish private car fleet.

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The paper provides a one year ex-post analysis of the first full year of the policy change, tracking the change in purchasing trends arising from the measure, in terms of specific CO_2 emissions, engine size and fuel, and the implications of these changes for car prices, CO_2 emissions abatement, and revenue gathered. To date, there have been a number of studies that have outlined possible policy responses to the transport energy challenge (Poudenx, 2008; Stanley et al., 2009) and other studies that have discussed or modelled the impact of specific policy types such as vehicle miles travelled (Moore et al., 2010) or fuel efficiency standards (Shiau et al., 2009). However, only a few studies have been specifically ex-post (Sterner, 2007) and none have assessed a car taxation policy aimed at reducing emissions. Furthermore, since Ireland is not a car manufacturing country, it has had to focus its transportation policies on the consumer side rather than on the manufacturing side. While this policy is therefore most relevant to other non car-manufacturing countries, it is relevant to any country where consumers purchase automobiles and where there is a need to address rising transport energy and emissions.

Transport related energy demand in Ireland has risen steeply in the past number of years. Between 1990 and 2007, there was a 182% (6.3% per annum) growth in energy-related CO_2 emissions from the transport sector (Howley et al., 2008), with transport accounting for 36% of energy-related CO_2 emissions in 2007 and 47% of greenhouse gas (GHG) emissions in the non-emissions trading (non-ETS) sectors (Howley et al., 2009a). From 1990 to 2007, the stock of cars more than doubled to over 2.4 million (Howley et al., 2007). In 2007, private car transport accounted for 60% of road transport and 43% of all transport energy excluding fuel tourism.[1] Despite this increase, private car ownership in 2007 was 545 per thousand adults, which remains below the EU average (592 in 2007 for EU-15) suggesting there is further scope for continued growth. Arising from EU Decision 406-2009 on non-ETS GHG emissions effort sharing, Ireland must reduce non-ETS GHG emissions by 20% below 2005 levels by 2020. In the two year period between 2005 and 2007, transport energy-related emissions in Ireland grew by 13%, indicating the scale of the challenge.

This paper is organized as follows: Section 2 outlines the background to this paper, providing the context for and detail of the policy change. Section 2 also reviews the use of ex-post analysis, providing a basis for its application in this paper. Section 3 describes the methodology used: how data sets were combined and how the impacts of the policy measure were quantified. Section 4 presents the results, tracking both the changes in purchasing trends arising from the new policy and the impacts of these changes. Section 4 also discusses the level of uncertainty in the results. Section 5 presents the conclusions of the paper.

2. Background

2.1. Emissions-based car taxation policy

As outlined in Ó Gallachóir et al. (2009), car purchasing trends in Ireland offset technological efficiency improvements over the period 2000–2007. Fig. 1 shows the average specific energy consumption of new private cars in Ireland, which remained flat for the 2000–2007 period. Also shown in Fig. 1 is the European target specified in Regulation 443-2009 to achieve average specific emissions of 130 g/km for new cars by 2012. This revised target was put in place after a review of existing EU legislation concluded that the previous target of 120 g/km could not be achieved without additional policy (EC, 2007).

In December 2007,[2] the Irish government announced that vehicle registration tax (VRT) and annual motor tax (AMT) were to change with effect from 1st July 2008. New cars registered between 1 January 2008 and 30 June 2008 would have their motor tax charged on the basis of engine size but if it was beneficial for these cars to switch to the CO_2 based system, this would be effected on the first renewal of motor tax after 1st July 2008 (DEHLG, 2010).

The new system would be based on specific CO_2 emissions rather than engine size. This type of policy is one of the three main pillars of policy that can focus on reducing energy related emissions, the other two being the labelling guidelines and consumer information campaigns and the voluntary commitments of the European, Japanese and Korean associations of auto manufacturers (Frondel et al., 2010). The impact of the new VRT and AMT policy in Ireland has attracted international interest from the EU ODYSSEE network (Howley et al., 2009b) and the International Energy Agency (Howley and Gallachóir, 2009).

The VRT and AMT rates in place before the change are shown in Table 1. There were three distinct engine-size bands with different VRT rates, applied as a percentage of the market value, or open market selling price (OMSP) of the car. The AMT was applied as a fixed annual tax depending on engine size. The new system, shown in Table 2, links the tax rates directly to specific CO_2 emissions (in g/km). This was intended to influence the purchasing decisions of consumers towards more energy efficient and less CO_2 emitting cars. The wide range of rates applied across the emissions bands indicated the strength of the purchasing signal. A car with a market value of €30,000, for example, will have a VRT rate of €4200 (and AMT of €104) if it is in Band A, compared with a VRT rate of €10,800 (and AMT of €2100) if in Band G.

In addition to significantly affecting the purchase price, there is also a strong price signal with respect to the running cost of a car. Assuming an annual mileage of 20,000 km per annum (Howley et al., 2009a) vehicles in the highest emissions band consume more than double the petrol and diesel of the cars in the lowest emissions band. Tables 3 and 4 show the total an-

[1] Fuel tourism refers to transport fuels purchased in one jurisdiction and consumed in another, generally associated with price differences. In 2007, it is estimated that fuel tourism accounted for approximately 11% of Ireland's transport energy.

[2] http://www.budget.gov.i.e./2008/financialstatement.html#_Toc184577380.