

The impact of tax reform on new car purchases in Ireland

Hugh Hennessy^a, Richard S.J. Tol^{a,b,c,d,*}

^a Economic and Social Research Institute, Dublin, Ireland

^b Institute for Environmental Studies, Vrije Universiteit, Amsterdam, The Netherlands

^c Department of Spatial Economics, Vrije Universiteit, Amsterdam, The Netherlands

^d Department of Economics, Trinity College, Dublin, Ireland

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ABSTRACT

We examine the impact of recent tax reforms in Ireland on private car transport and its greenhouse gas emissions. A carbon tax was introduced on fuels, and purchase (vehicle registration) and ownership (motor) taxes were switched from engine size to potential emissions. We use a demographic model of the car stock (by age, size, and fuel) and a car purchase model that reflects the heterogeneous distribution of mileage and usage costs across various engine sizes. The model shows a dramatic shift from petrol to diesel cars, particularly for large engines. The same pattern is observed in the latest data on car sales. This has a substantial impact on tax revenue as car owners shift to the lower tax rates. The tax burden has shifted from car ownership to car use, and that the overall tax burden on private car transport falls. As diesel engines are more fuel efficient than petrol engines, carbon dioxide emissions fall modestly or, if we consider the rebound effect of travel costs on mileage, minimally. From the perspective of the revenue, the costs per tonne of carbon dioxide avoided are (very) high.

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1. Introduction

Private car transport accounted for approximately 12% of total CO₂ emissions in Ireland in 2006 (O'Gallachoir et al., 2009). This represented a significant increase over time, both in absolute terms and in terms of its share of total emissions. Transport,¹ as a whole, accounted for around 36% of total CO₂ emissions in this period. The transport sector was identified as a serious cause for concern to policymakers due to its unsustainable dependence on oil and its negative environmental impacts. The National Climate Change Strategy Ireland (NCCSI, 2007) forecasted that this sector would account for the largest increase in emissions by 2010 if no policy measures were taken. This, along with concerns over the long-term supply of oil, provided some of the background for policy intervention in 2007. One such policy objective is improving the efficiency of the car fleet by incentivizing purchase of more fuel efficient cars. This can be done by incentivising the purchase of diesel cars, which are more energy efficient and have lower running costs than comparable petrol cars.

The number of private cars in Ireland has risen significantly in the last two decades. This has led to a noticeable convergence in

the number of cars per thousand between Ireland and its European counterparts. This is a crude measure for comparing levels of car ownership across countries. Although a deep recession has delayed many of the negative trends in private car transport, this does not mean that private car transport has become more sustainable. The recent depression led to a collapse in new car sales, but new car sales have now started to recover. Government policy can significantly influence this purchase decision through taxation (Mayeres and Proost, 2001; Verboven, 2002; Ryan et al., 2009).

Private car transport produces many negative externalities, particularly in relation to the environment (Mayeres and Proost, 2001). This provides a further rationale for government intervention. Taxation can achieve a reduction in this negative externality (Baumol, 1976). This can be done in terms of a tax, which taxes emissions directly or indirectly through a differential taxation regime on purchase. The EU have set emission targets for new cars that enter the car fleet. They have adopted a target of 130 g/km CO₂ for weighted new car sales by 2015 and 110 g/km CO₂ by 2020 (EC, 2002, 2005). As noted in Kunert and Kuhfeld (2007), Ryan et al. (2009), and Mandell (2009), there is a European consensus to move away from purchase taxes and move towards use taxes, which are differentiated by emissions. The European Commission also proposes abolishment of registration taxes. Ireland has no indigenous car manufacturing industry and is thus a technology taker. Because it is such a small market, tax changes in Ireland will have a negligible effect on the design of cars.

* Corresponding author at: Economic and Social Research Institute, Whitaker Square, Sir John Rogerson's Quay, Dublin 2, Ireland.

E-mail address: richard.tol@esri.ie (R.S.J. Tol).

¹ This refers to the two digit NACE code 36, which covers all aspects of transport including freight.

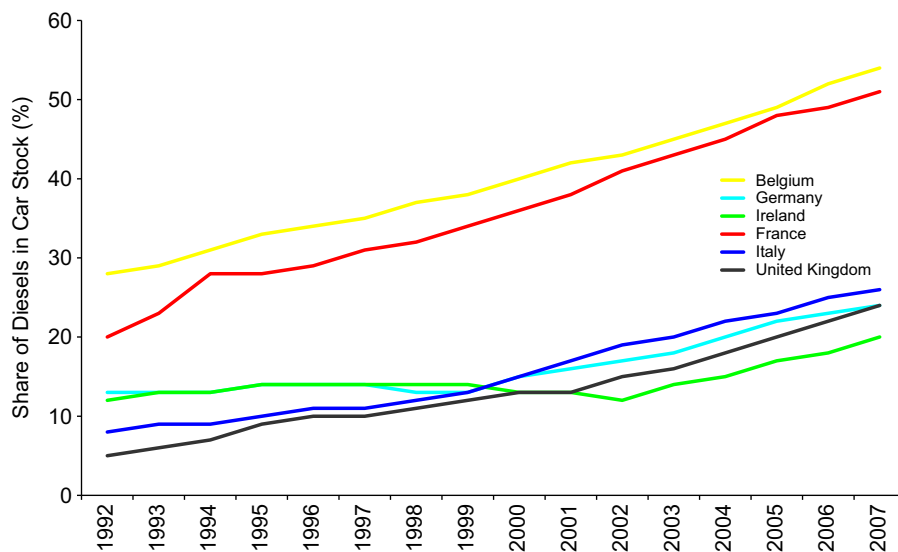


Fig. 1. The share of diesel across Europe.

However, car manufacturers will respond to a coordinated policy change across the entire European Union.

In July 2008, the car tax structure was changed in Ireland. Taxation on new private cars is now based on (potential) emissions per kilometre rather than engine size. This change affects both the purchase price and the ownership costs of new private cars but has no effect on the usage costs. The impact on carbon dioxide emissions is therefore indirect. A more carbon efficient fleet will result in lower emissions, although there may be a change in mileage that partly offsets these gains.

Similar schemes exist in many other European countries. In 2002, the UK introduced a carbon-differentiated vehicle taxation policy. This policy was also accompanied by a modified benefit-in-kind tax policy on company cars to encourage purchase of more efficient vehicles. However, this policy only impacted on the ownership cost per year and had no effect on initial purchase cost. The difference between the tax bands was substantially smaller compared to the Irish system. This taxation system changed again in April 2010. Although there still remains only one type of vehicle tax, the revamped tax further encouraged the purchase of low emitting vehicles. 'First-year taxes' are such that low emitting cars are exempt from vehicle tax in the first year in contrast to high emitting vehicles that are penalised heavily in the first year. Sweden has previously utilised a car taxation policy similar to that of Ireland. Although they have no direct purchase taxes, Sweden has offered a subsidy ($\sim\text{€}1000/\text{car}$) to encourage the purchase of environmentally friendly cars. This policy was used in conjunction with carbon-differentiated ownership taxes, which had the effect of encouraging the purchase of cars with emissions of under 120 g/km. This system was intended to remain in operation until 2010 but was amended in 2009 due to the unexpectedly large sales that it caused (Mandell, 2009). The subsidy was replaced by a five year exemption from motor tax.

There are various reasons for adopting a new tax regime that switches tax incidence onto emissions rather than engine size. As we show in the paper, there is not perfect correlation between engine size and emissions and thus this tax change has significant effects for the market share of each fuel type. This also means that the tax change will create a structural break when projecting emissions from private car transport.

In this paper, we present a methodology to explain the significant effect the recent tax change has had on the fuel share of new car sales in Ireland. Section 2 surveys the relevant literature.

Section 3 discussed the data used in the analysis. Section 4 presents the methodology. Section 5 discusses the results. Finally, Section 6 offers conclusions.

2. Previous research

Since the late 1980s, the share of diesel cars has increased steadily across Europe (Pock, 2010). However, the environmental benefit of diesel cars over petrol cars is contentious (Verboven, 2002; Mayeres and Proost, 2001). In terms of CO₂ emissions, diesel cars are superior due to their higher fuel efficiency. However, diesel engines produce higher NO_x emissions and also produce particulates (North et al., 2006). Improvements in the diesel engine, like the introduction of turbo and direct injection, have helped to reduce the gap considerably between petrol and diesel cars in important physical attributes like acceleration and speed (Verboven, 2002; Mayeres and Proost, 2001). This has had the effect of making the two fuel types closer substitutes in terms of consumer preferences. However, these two fuels are treated very differently across the European countries in terms of taxation policy. These heterogeneous taxation policies largely explain the different penetration rates of diesel in the European Union (Ryan et al., 2009).

The share of diesel sales varies considerably across the European countries (see Fig. 1). There are three types of taxation that affect the car purchase decision—purchase, ownership, and usage. The rates applied to these vary significantly. Kunert and Kuhfeld (2007) examine these various rates across the EU.² They find that Ireland has the 3rd highest tax burden on petrol and diesel car ownership within the EU 25. They conclude that the structure of vehicle taxes should be rebalanced with CO₂ not being the sole focus. Verboven (2002) examines the diesel tax policies in Belgium, France, and Italy. He concludes that these differential tax rates have led to a certain degree of price discrimination in the diesel car market. He also finds that when controlling for engine size, annual mileage is the main determinant factor in the fuel choice decision. Verboven (2002) focuses

² See also Mayeres and Proost (2001) for an account of the various taxation policies towards diesel fuel in the European Union. The European Commission reports (COWI, 2002 and TIS, 2002) also give a full account of the various fiscal treatments in 2002.

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