Transportation Research Part A 96 (2017) 168–189

Contents lists available at ScienceDirect

Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

The vehicle purchase tax as a climate policy instrument

Lasse Fridstrøm [*], Vegard Østli

Institute of Transport Economics (TØI), Oslo, Norway

ARTICLE INFO

Article history:
Received 24 March 2015
Received in revised form 8 December 2016
Accepted 20 December 2016

Keywords:
Passenger cars
Greenhouse gases
Fiscal incentives
Electric vehicles
Modelling
Policy scenario

ABSTRACT

Since 2007, the Norwegian vehicle purchase tax includes a large CO_2 emission component. At the same time, generous tax exemptions and privileges are granted to battery electric vehicles. Continued application of the purchase tax instrument may induce large-scale penetration of electric cars into the passenger car stock, thus halving the fleet's fossil fuel consumption and greenhouse gas emissions within two or three decades. The main tangible cost of this low carbon policy is the extra cost of acquiring novel products with currently small economies of scale. This cost difference will decline over time. The main benefits consist in reduced energy consumption and greenhouse gas emissions.

We calculate the gross and net tangible cost of the low carbon policy in a long-term perspective, i.e. towards the 2050 horizon. A crucial cost determinant is the speed at which the manufacturing costs of battery and plug-in hybrid electric vehicles will fall. Under moderately optimistic assumptions about impending economies of scale, net tangible costs by 2050 come out in the range €48 to 278 per tonne CO_2, depending on the discount rate and on battery replacement costs.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

More often than not, transport generates external costs, i.e. costs borne by someone else than the decision-making traveller, shipper or operator. Such externalities include environmental impacts, noise, accidents, congestion, infrastructure wear and tear, as well as visual intrusion and barrier effects.[1]

In principle, externalities may be neutralized through the application of appropriate taxation or pricing systems, such as emission allowance trading, congestion charging, or fuel tax (Pigou, 1920; Baumol and Oates, 1988). The degree to which such measures are applied to transport varies, however, widely between jurisdictions, and between different types of transport occurring within the same jurisdiction (Santos et al., 2010b).

Environmental impacts encompass a wide variety of local, regional and global effects, most notably reduced local air quality due to NOx, black carbon and particulate matter emissions, as well as habitat degradation and climate change. The latter problem has given rise to a massive international research effort, as summarized by the United Nations' Intergovernmental Panel on Climate Change (IPCC, 2013, 2014a). According to Stern (2007: xviii), 'climate change is the greatest market failure the world has ever seen'.

Responsible governments and supranational bodies worldwide are considering how to limit and reduce greenhouse gas (GHG) emissions sufficiently to avoid a development adjacent to any of the higher 'Representative Concentration Pathways' –

---

* Corresponding author.
E-mail address: lef@toi.no (L. Fridstrøm).

[1] See, e.g., Verhoef (1994), EC (1995), Maddison et al. (1996), Mayeres et al. (1996), de Borger and Proost (2001), Hensher and Button (2003), Quinet (2004), Proost (2011), Delucchi and McCubbin (2011), Friedrich and Quinet (2011), Santos et al. (2010a), Korzhenevych et al. (2014).

http://dx.doi.org/10.1016/j.tra.2016.12.011
0965-8564/© 2016 Elsevier Ltd. All rights reserved.

RCP6.0 or RCP8.5 – drawn up by the IPCC (2014b). Through the Paris agreement, all nations have expressed their commitment to limit the increase in the global average temperature to less than 2 °C above pre-industrial levels (United Nations, 2015).

In the European Union (EU), an estimated 19 per cent of all greenhouse gas (GHG) emissions originate from transport.[2] Roughly one half of these emissions come from private cars.

In the EU as well as in North America, certain policy measures to combat GHG emissions from cars are already in place. Among regulatory measures, emission standards are the most important. Economic policy measures consist mainly of emissions trading schemes and of various fiscal incentives, such as excise taxes, subsidies, and tax credits.

The Corporate Average Fuel Economy (CAFE) regulation requires that passenger cars and light trucks produced for sale in the USA obey, on average, certain minimal fuel economy standards depending on the vehicle's 'footprint', defined as the product of the vehicle's width and its wheelbase. For passenger cars with a footprint below 41 square feet, the 2015 standard is at least 39 miles per gallon (mpg), translating into a CO_2 emission rate of at most 140 g per kilometre (gCO_2/km) for a petrol driven car. For cars with a footprint of over 56 square feet the limit is 30 mpg, or 182 gCO_2/km. For light trucks the standards are more lenient – 33 and 24 mpg, or 165 and 277 gCO_2/km, respectively, although these vehicles are also to a large extent used for passenger transport (NHTSA, 2010).

The European Union (EU, 2014) has mandated maximum CO_2 emission targets for new passenger cars sold in 2015 and 2021, respectively. The targets are 130 gCO_2/km in 2015 and 95 gCO_2/km in 2021, as averaged over all vehicles brought to the EU market. More lenient standards apply to manufacturers producing heavier than average vehicles (ICCT, 2014).

To meet the targets, automobile manufacturers are introducing a widening range of battery and plug-in hybrid electric vehicles (BEVs and PHEVs). Special accounting rules make sure that vehicles with a CO_2 emission below 50 gCO_2/km give rise to 'super-credits' towards the EU targets for 2020–2022.

In addition to regulatory measures, fiscal incentives are being used. In the USA, new plug-in electric vehicles are eligible for a tax credit of up to $ 7500, depending on the battery capacity.

In Europe, the incentives vary between countries. In France, the government has implemented a feebate system, whereby new passenger cars emitting less 110 gCO_2/km receive a subsidy (bonus), whereas a purchase tax (malus) applies to vehicles with type approval CO_2 emissions above 135 gCO_2/km (D'Haultfoeuille et al., 2013).

Most countries in the European Economic Area (EEA)[3] levy an excise tax on fossil fuel, with per litre rates that typically add 100 per cent on top of the pre-tax value. In Norway, e. g., the 2014 rates for petrol and diesel were approximately € 0.69 and € 0.53 per litre, respectively, before 25 per cent value added tax (VAT). In North America, fuel tax levels are generally much lower.

A considerable scientific literature exists on the respective merits of vehicle and fuel taxation.[4] Sterner (2007) finds that 'Had Europe not followed a policy of high fuel taxation but had low US taxes, then fuel demand would have been twice as large.' Parry and Small (2005) conclude that '…the optimal gasoline tax for the United States is more than double its current rate, while that for the United Kingdom is about half its current rate'. They add, however, that '…the fuel tax turns out to be a rather poor means of controlling distance-related externalities like congestion because it is too indirect, causing greater shifts in fuel economy than in amount of travel. A direct tax on amount of travel (vehicle-miles) performs far better…'

Thus, although no general consensus exists, many economists would argue that a pigouvian fuel tax, or a carbon cap-and-trade system encompassing road transport, would constitute a near-optimal way of internalising the costs of exhaust emissions generated by fossil fuel combustion. A fuel tax would not, however, correctly internalise all other marginal external costs, such as road wear, congestion, noise, accidents, or particulate matter released from tarmac or brake pads. For these externalities, electronic road pricing would be more appropriate.

Also, since households generate no external costs simply by owning a vehicle, only when they use it, most economists would argue that taxing the vehicle as such would be misguided. Some studies have, however, emphasized the apparently greater GHG abatement potential of fiscal incentives directed towards vehicle purchase and ownership.[5]

The remarkable market uptake of low and zero emission vehicles in Norway, brought about by national fiscal and regulatory incentives, has drawn international attention.[6] Starting, in Section 2, by an examination of the Norwegian experience, we go on to discuss its most important costs and benefits in Section 3. To assess the net costs in relation to the GHG abatement effects obtained, we present, in Section 4, a set of scenario projections on to the 2050 horizon. In Section 5, we discuss the interpretation of results and the possible limitations affecting our study. Conclusions are drawn in Section 6.

2. The Norwegian experience

As an EEA[3] member, Norway is bound by the great majority of EU regulations. But since the country is not a full member of the EU, reduced CO_2 emissions from new cars registered in Norway do not count towards the EU mandated targets faced by car manufacturers.

---

[2] Source: Eurostat.

[3] The European Union plus Norway, Iceland and Liechtenstein.

[4] See, e.g., Newbery (2005), Parry and Small (2005), Kuhnert and Kuhfeld (2007), Sterner (2007), Small and van Dender (2007), Ryan et al. (2009), Santos et al. (2010b), Fu and Kelly (2012), Mabit (2014).

[5] Johnstone and Karousakis (1999), Greene et al. (2005), Rogan et al. (2011), Brand et al. (2013).

[6] See, e.g., http://en.wikipedia.org/wiki/Plug-in_electric_vehicles_in_Norway and references therein.

Download English Version:

https://daneshyari.com/en/article/4929134

Download Persian Version:

https://daneshyari.com/article/4929134

Daneshyari.com