Transportation Research Part A 77 (2015) 137–153

Contents lists available at ScienceDirect

Transportation Research Part A

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

Six years of CO_2-based tax incentives for new passenger cars in The Netherlands: Impacts on purchasing behavior trends and CO_2 effectiveness

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ARTICLE INFO

Article history:
Received 15 November 2014
Received in revised form 3 March 2015
Accepted 14 April 2015
Available online 16 May 2015

Keywords:
Transport policy
Passenger cars
CO_2 emissions
Purchase tax
Road tax
Company car tax

ABSTRACT

There is growing evidence that consumers respond more effectively to upfront price signals, such as vehicle purchase taxes and feebate policies, and to tax incentives that are more salient than others, such as company car taxes graded by CO_2 emissions. This paper examines tax changes in The Netherlands, which are among the most stringent and most salient in Europe, and assesses the ex-post purchasing impacts and CO_2 effectiveness of six years of CO_2-based tax incentives for low-carbon cars in The Netherlands. Dutch tax incentives resulted in 13 g/km, or 11% lower average CO_2 emissions in 2013. The Netherlands has moved from the 12th position before the tax changes in 2007 to become Europe's number one in terms of the lowest average new car CO_2 emissions and highest share of electric vehicles in 2013. Tax incentives for new cars sold between 2008 and 2013 have resulted in 4.6 million tons of potential lifetime CO_2 abatement at the cost of a drop in tax revenues of 30–50%. However, when corrected for the Dutch policy-induced increasing real-world fuel-economy shortfall and leakage of carbon reduction potential through vehicle export of low-carbon cars, only 3.5 million tons or 75% of the CO_2 reduction remains. CO_2-based tax incentives for company cars seem to have contributed the most to the observed turnaround in purchasing behavior towards lower CO_2-emitting passenger cars.

1. Introduction

1.1. Background

Reducing carbon dioxide (CO_2) emissions from passenger cars is an important policy goal, both at a national and EU level. The influx of new cars into the existing car fleet is an important leverage for eventually changing CO_2 emissions for the entire car fleet. With respect to new cars and their proportionally related fuel efficiency and CO_2 emissions, many countries have witnessed a seemingly endless upward spiral in consumer preferences for buying bigger, heavier and more powerful cars, which has largely offset any fuel-efficiency gains from technological advances in the past (Cuenot, 2009; Knittel, 2011; Kwon, 2006; Ó Gallachóir et al., 2009; Sprei et al., 2008). Although the upward trend in car size, weight and power has long

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http://dx.doi.org/10.1016/j.tra.2015.04.009
0965-8564/

absorbed the CO_2 emissions reduction potential of new vehicle technologies, recent developments show stagnation and even a decline in these consumer amenities (Kok, 2013; Schipper, 2011; Sprei and Karlsson, 2013). Since 2007 a number of European countries including The Netherlands have implemented targeted tax changes to influence car purchasing trends towards lower CO_2-emitting vehicles. Although tax incentives based on type-approval CO_2-values may potentially have a large impact on purchasing behavior and CO_2 emissions, only a limited number of ex-post evaluations are as yet available, see for example Klier and Linn (2012), Rogan et al. (2011), Ryan et al. (2009) and Zimmermannova (2012). Besides, most of the literature is focused on assessing the effect of pricing and taxation of fuel and car use, whereas there is a growing evidence that consumers respond more effectively to up-front price signals, such as purchase taxes and feebate policies, and tax incentives that are particularly salient, such as company car taxes graded by CO_2 emissions and tightened over time (Brand et al., 2013; Klier and Linn, 2012).

1.2. Aims and objectives

The turnaround in Dutch consumer preferences is expected to be explained largely by CO_2-based fiscal incentives. Therefore, this paper examines tax changes in The Netherlands and assesses the impacts on consumer purchasing behavior and the CO_2 effectiveness of tax incentives for low-carbon cars. This paper makes several contributions to the existing literature on CO_2 policies for new passenger cars. First, whereas only a small body of ex-post literature exists and mostly covers only first-year effects, this paper covers a six-year ex-post evaluation of the gradual implementation of a CO_2-based purchase tax and CO_2-based tax incentives for road tax and company car tax. Second, the case of The Netherlands is of particular interest since Dutch fiscal incentives are probably the most stringent, most salient and most comprehensive in Europe. Third, the time frame being considered is from 2008 to 2013 and coincided with the implementation of mandatory targets for the sales-weighted average CO_2 emissions of car manufacturers based on NEDC-tested type-approval values[1] in Europe (see EC, 2007, 2009, 2012, 2014). This paper is one of the first that specifically examines the impact of the increasing gap between type-approval values and real-world CO_2 emissions on the effectiveness of tax policies. Fourth, the existing literature on the individual impact of company cars and company car taxes on the average new car CO_2 emissions is very limited. This paper contributes to a better understanding of the impact and effectiveness of tax incentives for company car sales as compared to private cars. Finally, also new in the literature is that the impact of the export of (heavily) subsidized lower CO_2-emitting cars before their end-of-life on the effectiveness of tax incentives is being examined.

2. Methods and data

In order to assess whether changes in car purchasing behavior, tax revenues and average CO_2 emissions can be explained by the gradual implementation of the tax reform and incentives, two types of counterfactual baseline scenarios have been developed. The first type of counterfactual baseline scenarios is based on extrapolation of trends, as observed in the pre-policy period 2000–2007, into the period 2008–2013. They describe how purchasing and emission trends would have evolved most likely in the absence of the actual policy reform and interventions (e.g., tax exemptions, CO_2-based tax reform, changing average tax burden, tightening of CO_2-limits) during the six-year period under investigation after 2007. The evolution of purchasing behavior and CO_2 emissions in the time frame 2008–2013 can consequently be compared with and without the Dutch tax reform (see also Hennessy and Tol, 2011; Mabit, 2014; Rogan et al., 2011). The second type of counterfactual baseline scenarios is based on trends as observed in other European countries. These trends enable to isolate the country-specific trends from other exogenous and Europe-wide trends.

More detailed methods and results of various types of analyses to estimate and elaborate on the impact of Dutch tax incentives on new car purchasing behavior and the CO_2 effectiveness are presented in Section 4. The research objectives, methods and data used are summarized in Table 1. The CO_2 emissions in this paper include only direct tailpipe, or tank-to-wheels (TTW), emissions. The indirect, or well-to-tank (WTT),[2] emissions are not covered, see discussion in Section 5. The primary data for The Netherlands' new car sales was obtained from the Dutch Road Authority and includes all approximately seven million new car sales between 2000 and 2013 per make-model variation available and their corresponding technical–environmental specifications as measured for type approval (RDW, 2014). Other data sources include CBS (2014a, 2014b, 2014c, 2014d, 2014e), EEA (2014), ICCT (2013), ICCT et al. (2013, 2014), T&E (2008, 2014a, 2014b) and TNO (2014), as shown in Table 1.

3. Tax incentives for low-carbon cars in The Netherlands

This section describes the three primary[3] vehicle tax-based policy instruments in The Netherlands, which have been subject to a gradual implementation of CO_2-based tax incentives and reform since 2007.

[1] Type approval is the confirmation that production samples of a design will meet specified performance. Standards and is consequently accepted for sale in all EU member states. Each make-model-technical variation that has been approved has a unique, tested fuel consumption and CO_2 emissions value based on the New European Driving Cycle (NEDC).

[2] WTT-emissions incorporate emissions from the feedstock or fuel production and processing and fuel delivery or energy transmission, and is also called the "upstream" stage.

[3] Other vehicle taxes, such as the fuel excise duty, MIA, KIA, and VAMIL are not examined in detail.