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Will a radical transport pricing reform jeopardize the ambitious EU climate change objectives?☆

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ABSTRACT

This paper examines the effects of replacing current fuel taxes by a system of taxes that account better for all the different external costs of the different transport modes. One of the important implications of this reform is that current fuel taxes are decreased to a level of 80 euro/ton of CO_2 but that the mileage related taxes on car and truck use increase. Using the TREMOVE model for the transport sector of 31 European countries, one finds that the volume of transport will decrease because current taxes on transport are too low compared to overall external costs. Overall CO_2 emissions will decrease slightly. Using the MARKAL–TIMES model for the Belgian energy sector, putting all sectors and technologies on equal footing shows that a fuel tax reform makes that it is not cost efficient to require large CO_2 emission reductions in the transport sector and that traditional car technologies will continue to dominate the car market in 2020–2030.

1. Introduction

Among economists and policy makers more generally, the fuel efficiency standard for cars and the fuel tax have been the subject of extensive debate. The major benefits of stricter fuel efficiency standards and higher fuel taxes are the reduction of greenhouse gas emissions and the reduced oil dependence. The major costs are the increased production cost, the reduced comfort and the negative impact on mileage related externalities (congestion, accidents) due to the rebound effect.

The GHG reduction ambitions differ strongly in the world. In this contribution we focus on the EU. The EU has very ambitious overall GHG emission targets (up to −50% in 2030 compared to 1990 level). The role of the transport sector emission reductions in the overall target is the subject of heated debates.

The EU has high automotive fuel taxes that are not named carbon taxes but act as a high carbon tax of 200–300 euro/ton CO_2. This level of taxes is way beyond the expected permit prices of 10–30 euro/ton CO_2 that will be imposed on the other big emitters. The high fuel taxes also make the planned fuel efficiency standards either redundant when they are set at a relatively lax level (as fuel taxes determine the fuel efficiency) or very costly when they are really effective because they push the fuel efficiency beyond the already high level generated by the high fuel taxes.

Proponents of high efforts in the transport sector point to the high external costs that characterize the European transport sector, with high accident rates, high traffic congestion levels as well as high conventional pollution levels. Another argument in the hands of the proponents of high emission reduction efforts in the transport sector is the potential myopia of the car consumers. However, the limited empirical evidence available for Europe does not point to large inefficiencies in the decision making of European consumers.[1]

High fuel taxes are clearly an imperfect instrument to address all types of externalities simultaneously. For that reason the European Commission is also planning a major reform of the taxation of the use of cars and trucks. The main idea is to have the user prices in line with the corresponding external costs. Starting with trucks and following the technological developments in metering technology, all transport will have to pay its marginal external costs. This implies moving away from fuel taxes to vehicle use taxes differentiated by time, place and vehicle characteristics.

In this paper we examine what will be the implications for welfare and CO_2 emissions of such a drastic reform of transport

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[1] See Verboven (2002).

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pricing policies. The first research question is what welfare gains can be expected from this reform and will this welfare gain come at the expense of smaller reductions in GHG emissions? The second research question is what this new form of pricing transport modes and vehicles implies for the selection of car transport technologies in the long term? The third research question is whether the EU will ultimately be able to reach its overall GHG emission reduction targets given that the transport sector will undergo a dramatic policy shift?

Section two tackles the first research question using the TREMOVE II model that represents the EU transport sector. This model is able to trade-off the different modes and the different types of externalities, and this as well for passengers as for freight transport. Will there be a reduction in the overall transport volume? What modes will gain market share and how does this effect the overall emissions of GHG? We assess for the year 2020, the effects of replacing the current transport pricing system (mainly fuel taxes) by a combination of a carbon tax and a kilometer tax that closely matches the different marginal external costs. In other terms, what are the effects of having the different transport options pay their full marginal external costs?

Section three addresses the second research question. This question requires a model with more technological detail as one needs a more precise representation of the different vehicle technologies and their full implications in terms of GHG emissions. We use the MARKAL–TIMES model for Belgium that represents the whole energy system and thus all sources of CO_2 emissions. This model focuses on the choice of the optimal technologies in the different energy-using and producing sectors in the long term (2020–2050). For the transport sector the focus is on the selection of car technologies, taking the full supply chain of the fuel into account. What are the advantages of hybrid cars, electric cars, CNG and hydrogen cars compared to the conventional gasoline and diesel cars once they are put on the same footing with regard to all externalities?

As this model represents all sources of CO_2 emissions, the model is also used to answer the third research question: what is the contribution one can expect from the transport sector in reaching the ambitious European GHG reduction targets?

Climate change is a world issue, the costs and benefits for any region to reduce emissions in the transport sector or in other sectors, depend in the end on whether one's effort is part of an international agreement. In our concluding section we discuss the perspectives for an international climate agreement and its implications for the development of transport technologies.

In this contribution we use two types of numerical model analysis that are put in perspective in Table 1. The two types of modelling exercises are internally consistent. First they all use similar exogenous assumptions on economic growth and oil prices. Second, the carbon values that result from the exercise at the energy sector level are of the same order of magnitude as the exogenous carbon value used in the model for the transport sector.

Table 1
Frameworks of analysis used in this paper.

Research questions	Scope	Model used
1. Effect on welfare and CO_2 emissions of pricing all modes of transport in function of their external costs.	Transport sector with its different modes in 2020 (year per year runs up to 2030) Carbon price is exogenous	TREMOVE-II Partial equilibrium model of the transport sector Applied to EU-27+4 countries.
2. What is the effect of transport pricing reform on selection of car technologies?	All energy use in a country 2005–2050	MARKAL–TIMES Partial equilibrium model of the energy sector, representing all energy production and a use of technologies
3. What is the potential contribution of the transport sector to a cost efficient reduction of CO_2 emissions in a country?	Carbon price is endogenous	Applied to Belgium

2. Where does Europe go in terms of pricing and regulating emissions: moving from fuel taxes to km charges

2.1. The issues

There is a long standing debate in the EU on the need to introduce new policy instruments in the transport domain. Starting with the fair and efficient transport pricing doctrine launched in 1998, there has been an emphasis on a pricing reform that makes all modes pay their full external costs. Here external costs include climate change damage, other air pollution and noise damage, accidents and external congestion costs.

This is exactly what many economists have been advocating for years and also what has been at the core of the fuel efficiency standard debate. In the fuel efficiency debate, the effects of stronger standards on the CO_2 emissions, but also on the mileage related externalities (accidents, congestion), were an important consideration. An important drawback of a stricter fuel efficiency standard is the rebound effect. The rebound effect is the increase in transport volume due to the decrease in operating costs associated with a more fuel efficient vehicle. When a transport activity is priced below marginal social cost, this increase in volume is not beneficial. Indeed, the private willingness to pay and value of car use is then lower than the marginal social cost. The marginal social cost consists of external cost of climate and air pollution externalities that are being reduced but also contains congestion and accident costs that have not been reduced by opting for more fuel efficient vehicles. Abolishing the fuel efficiency standard and the high motor fuel excises and replacing them with instruments better targeted to address externalities looks like the obvious way forward.

What can we expect in the larger EU, if there is a full internalization of all the external effects as economics prescribes? A recent exercise by the GRACE research consortium[2] is probably one of the most complete analyses of the effects of such a policy change.[3] The TREMOVE model was used to examine what the effects would be on emissions (CO_2 and conventional air pollution) and on other externalities of a drastic change in pricing policy. The model runs year per year from 1995 to 2030 and represents the transport market equilibrium. It is to be considered a medium term model as it keeps track of the vehicle stock turnover and takes location as given. The alternative pricing scenario (CO_2 tax+km charge) is defined in Table 2. The analysis is

[2] More information on the GRACE consortium work can be found on www.grace-eu.org.

[3] Earlier exercises of this nature can be found in Proost et al. (2002) and ECMT (2003).