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Is It All About CO2 Emissions? The Environmental Effects of Tax Reform for New Vehicles in Norway

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Is it all about CO2 emissions? The environmental effects of a tax reform for new vehicles in Norway.*

Alice Ciccone†

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Abstract

In 2007, the Norwegian government reformed the vehicle registration tax in order to reduce the CO2 emissions intensity of the new car fleet by incentivizing the purchase of more fuel efficient cars. This paper identifies the impact of the new tax structure on four dimensions: 1) the average CO2 emissions intensity of new registered vehicles, 2) the relative change between low and high polluting cars, 3) the market share of diesel cars and 4) the average weight of the fleet. A Difference in Difference approach is employed to estimate the short run effects on each outcome variable of interest. The results show that, as a consequence of the tax reform, the average CO2 intensity of new vehicles was reduced in the short run by at least 6 gCO2/Km, which is about half of the overall reduction observed when including supply effects. This reduction is the result of a 12 percentage points drop in the share of highly polluting cars and of an increase of about 23 percentage points in the market share of diesel cars. Lastly, the mass of the average fleet increased by at least 10 Kg.

Keywords: CO2 emissions intensity, New vehicles, Vehicle registration tax, Tax reform, Norway, Diesel.

JEL: H25, L62, Q51, Q53, Q54, Q58, R48.

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1 Introduction

Reducing automobile pollutant emissions is a crucial step in the attempt to mitigate climate change. According to IEA (2009), road transport is the second largest sector of energy consumption in OECD countries, and it is the only sector, together with air transport, with a still growing energy demand. Today, in Norway, emissions derived from road transport are reaching levels that are almost 30% higher than those of 1990, making this sector one of the fastest growing source of emissions (Statistic Norway).[1] This level of emissions is the result of increased stock of private cars and mileage driven. However, thanks to the presence of more energy-efficient vehicles as well as the blending of biofuel and hybrid cars, Norway is well in line with the CO2 intensity reduction target set by the European Commission.[2]

In order to reduce emissions from road transport in Europe, mainly two approaches have been used. The European Commission has set CO2 emissions targets for manufacturers specifically directed to new passenger cars to improve fuel efficiency through technological development.[3] On the other hand, EU-Member States have independently addressed the issue by implementing diverse fiscal measures to encourage the purchase of new vehicles with the lowest CO2 emissions available.[4] The use of instruments such as feebates, vehicle registration tax, circulation tax or fuel taxes is very heterogeneous and evidences of their economic and environmental effects are complex and sometime conflicting (Mandell (2009)). Some studies argue that, since purchasing decisions are usually more influenced by prices than by the lifetime costs of the car, the most responsive policies are those implemented upfront as they can correct for myopic behavior (Allcott and Wozny (2012), COM (2005), Kågeson (2005), TiS (2002)). Also, fuel taxes can provide smaller reductions in the average CO2 of new cars compared to the implementation of vehicle taxes (COWI (2002)). In contrast, fuel prices have been proven to have an important impact on CO2 emissions and fuel efficiency (Ryan et al. (2009) and Goodwin et al. (2004)). What is generally agreed upon is that differentiated CO2 emissions taxation provides quite large emissions reductions regardless of the type of tax, which it is applied to (COWI (2002)). Unlike an increase in fuel taxes, CO2-differentiated taxation and feedbates

[1]Statistic Norway www.ssb.no (SSB: Statistisk Sentralbyrå)

[2]The target is to reduce CO2 emissions intensity by 40% compared with the level of 2007 by 2020. For more details see the Regulation (EC) No 443/2009 and No 333/2014 of the European Parliament. Also see Fig 10 for a graphical comparison of Norway with other European countries.

[3]Target are: 130 gr of potential CO2 per Km for the average new car fleet by 2015 and 95 g of potential CO2 per Km by 2021. Regulation (EC) No 443/2009 and No 333/2014 of the European Parliament.

[4]See van Essen (2012) for an overview of carbon based vehicles taxation schemes in the EU.

can improve political acceptance because of its potential revenue neutrality (Brand et al. (2013), Greene et al. (2005) and Adamou et al. (2010)).

This paper studies the effectiveness of a recent policy intervention designed to influence the purchasing trends towards lower CO2 emitting vehicles. In 2007, the Norwegian government reformed the registration tax system for new vehicles. The official objective of this reform was to reduce the CO2 intensity of the average car fleet by incentivizing the purchase of more fuel-efficient cars. This has been carried out by linking the tax paid at the moment of purchase directly to the potential CO2 emissions rates of the vehicle, instead of calculating it based on the size of its engine. A Difference in Differences (DID) approach is used to deliver estimations of the short-run impact of the reform on four dimensions: 1) the average CO2 emissions intensity of new registered vehicles, 2) the relative change between low and high polluting cars, 3) the market share of diesel cars and 4) the average weight of the fleet.

My results suggest that the change in the tax structure has induced a reduction between 6 and 8 gCO2/km in the average CO2 performance of new cars in a year where the average CO2 intensity was about 160 gC2/km. The estimated causal effect corresponds to about half of the overall reduction observable in Figure 1 which include exogenous factors such as fuel efficiency improvements associate with the supply side of the market. This reduction in the average CO2 intensity is the result of a shift in demand toward greener vehicles and an increase in the market share of diesel cars. Specifically, the tax reform caused a reduction of about 11-12 percentage points in the share of high polluting vehicles, i.e. those emitting more than 180 gCO2/Km, and an expansion between 22 and 24 percentage points of the share of diesel cars within the year of the reform. The penetration of diesel vehicles have also caused an increase between 10 and 13 Kg in the average fleet mass.

The present work belongs to the relatively small literature on new vehicles and on the ex-post evaluation of the CO2-differentiated taxes that have been recently introduced in Europe (Klier and Linn (2012), Rogan et al. (2011), Zimmermannova (2012) D'Haultfoeuille et al. (2014), Giblin and McNabola (2009), ICCT (2014) and Mandell (2009)). I implement a reduced-form approach which offers a clear and simple identification of the response parameters of interest and it is particularly suited at establishing causality (Timmins and Schlenker (2009)).[5] Furthermore, the choice of method is particularly appropriate because of the quasi-experimental nature of the phenomenon of interest. Other papers that have used reduced form models to investigate

[5]My contribution is a complement, rather than a substitute, of the large body of literature that makes use of structural models such as Bresnahan (1987); McCarthy (1996); Berry et al. (1995). These models do not generally incorporate vehicle taxes their complexity can often make results less transparent and understandable for policy maker.

similar problems are Klier and Linn (2012), Klier and Linn (2013), Klier and Linn (2010), Hastings (2004) and Busse et al. (2006).

The paper is organized as follows: a descriptive analysis of the main variables along with the background information specific for Norway is presented in the next section. The Norwegian tax system and the structure of the registration tax together with its reform are outlined in Section 3. The data are described in Section 4 while Section 5 discusses the empirical approach and the identification strategy for the four outcome variables of interest. Finally results and conclusions are provided at the end of the paper.

2 Institutional Background

As a result of the oil revenue, Norway is one of the wealthiest economies in the world. This is not reflected in a very high level of car ownership and one of the reasons behind it probably lies in the high share of taxes which makes up for almost half of the total price for private cars. Nevertheless, the stock of private cars is recently increasing mostly due to a steady growth in disposable income.[6] Because of the increase in transport volume, total emissions from road transport are increasing. However, Norway has taken preventive actions to meet the CO2 reduction target for new cars set by the European Commission.[7]

Since Norway does not have a car manufacturing industry, the fuel efficiency of the new cars introduced in the market cannot be significantly affected by any internal policy. Hence, to achieve the emissions reduction mandated by the European Commission, Norway could only deal with the demand side by reforming its vehicle taxes. In order to incentivize the purchase of more fuel-efficient cars, the government decided to change the vehicle registration tax in 2007. From being calculated on engine size, it became directly linked to the potential CO2 emissions rates of the vehicle.

2.1 CO2 intensity of new vehicles purchased

In October 2006, the Norwegian Ministry of Finance presented the proposal for the national budget for 2007, which included the suggested change for

[6]The strict correlation between demand for private vehicles and GDP is generally well known, and Norway is not an exception. Fig 9 shows the GDP compared with the number of new vehicles sold in recent years.

[7]see Fig 10 for a comparison of the average CO2 intensity reduction in Norway with other European countries.

the tax system.[8] Right after that, some degree of public discussion took place creating a quite high level of anticipation behavior around November and December 2006. This announcement effect is identifiable in Figure 1 by a drastic increase in average CO2 intensity in November and December 2006 followed by a slump from January 2007. The CO2 intensity is the first outcome variable considered in this study. It is a measure based on the expected grams of CO2 that a vehicle will produce per kilometer driven. The overall decline of the trend illustrated by Figure 1 is mostly due to the exogenous improvements in fuel efficiency of the new cars introduced every year in the market. However, the sharp discontinuity in the months around January 2007 correspond with the reform of the registration tax.

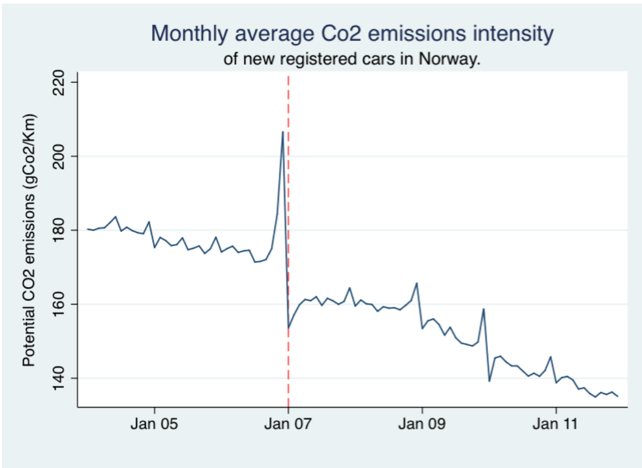

Figure 1: Monthly average CO2 intensity of new vehicles registered in Norway between January 2004 and December 2011. The spike of December 2006 is the effect of the high number of very polluting cars sold before the introduction of the reform probably due to the announcement of the reform.

2.2 Low versus high pollution vehicles

To better understand what has happened in the months around the reform of 2007, it is interesting to take into consideration the purchase of different classes of vehicles. In particular Figure 2 shows the market share of the new car purchased by CO2 bands. It is clear that the discontinuity observed in the CO2 intensity trend is an intertemporal substitution between high and low polluting cars. In fact the spike of December 2006 in CO2 intensity trend observed in Figure 1 is the effect of the high number of polluting cars sold in the months prior to January 2007. Consequently, the fall in trend right after the reform is caused by the extraordinary high number of greener cars

[8]Stortingsproposisjon nummer 1 (2006-2007) http://www.statsbudsjettet.no/Statsbudsjettet-2007/

registered. This differentiation is clearly visible in Figure 2, where the three dashed lines whose trend decline before January 2007 represent the share of vehicles which have CO2 intensity below 180 g CO2/Km. On the contrary, the line whose trend peaks exactly in December 2006 and decrease sharply in January 2007 are the shares for the cars with potential CO2 emissions higher then 180 g CO2/Km. Figure 12 plots only the share of "dirty" cars (more than 180 g CO2/Km) registered, relative to medium-low vehicles. The market share of "dirty" cars goes from more than 40% at the beginning of 2004 to less than 10% in 2011. This is going to be the second outcome variable of interest.

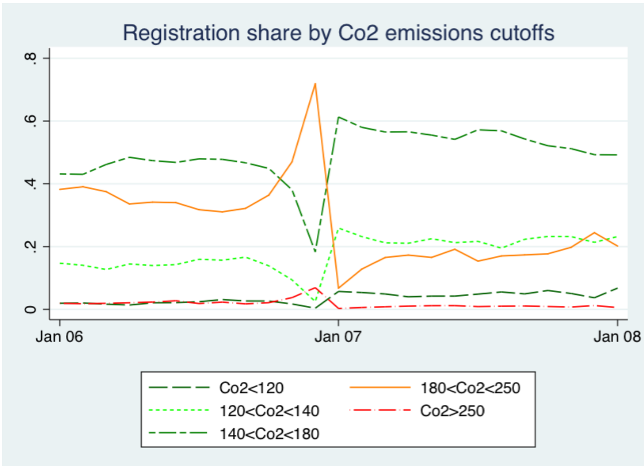

Figure 2: Share of new vehicles registered by CO2 intensity category. The categories are made by taking into account how the Co2 component of the tax is structured.

2.3 Diesel powered vehicles

Given the correlation between CO2 emissions and the specific fuel type, this paper also look at the effect of the reform on the market share of diesel cars. In Norway, as in most European countries, the share of diesel cars is rising, as Figure 3 illustrates. An important part of this change is hereafter shown to be the result of the registration tax reform of 2007. Generally, the reason behind this trend lies in the fact that the diesel engine offers higher performance in terms of fuel consumption and require less expensive fuel due to a favorable tax treatment (Verboven (2002)). In Norway, fuel prices and fuel taxes are indeed lower for diesel than for gasoline (Figure 14), but vehicles taxes seem to favor gasoline cars. For instance, the annual circulation tax implies a higher price for diesel-fuelled vehicles since 2008. Also the vehicle registration tax appears higher for diesel cars. This difference is not created by artificially differentiating the registration tax by fuel, but it results from the peculiar characteristics typical of diesel vehicles (Figure 13). Specifically, diesel powered vehicles produce a lower quantity of CO2 and has higher fuel economy (Fig. 15 and 16). However, the inferior CO2 performance is normally offset by higher weight (Fig. 4), higher power (Fig. 17), and higher engine size (Fig. 18) associated with diesel vehicles. Hence, even if the CO2 intensity of the fleet is lowered by increasing the share of diesel cars, the overall emission may even rise.

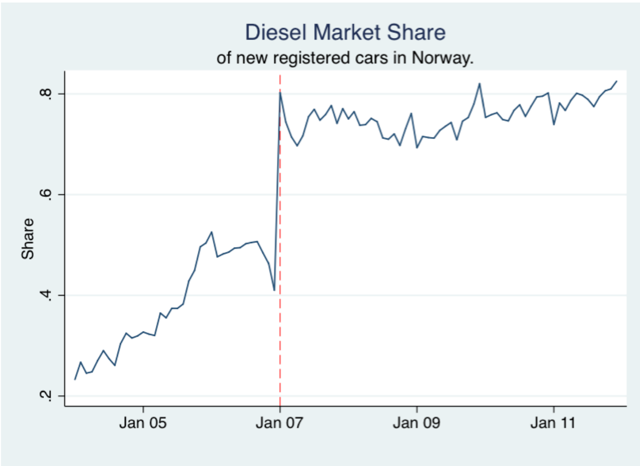

Figure 3: Diesel share from January 2004 until December 2011: increase from about 30% to about 80% in 5 years (2005-2010).

Furthermore, diesel vehicles are responsible for emitting other harmful pollutants. Among those, the Nitrogen Oxides (NOx) and particulate matter (soot). These particulates are known carcinogens and, unlike CO2 emissions, they do not stock up in the atmosphere, but remain at a local level. Hence, they are not considered harmful for the global environment, but they are a burden for local governments. Some options to reduce externalities from Diesel cars are available, for example it is possible to add the diesel particulate filters (DPF), a porous ceramic soot filter, to the vehicle. On the contrary, NOx remain a concern, as current diesel emit more NOx than the gasoline cars.

Some have argued that increasing the share of diesel-powered vehicles in the market is a possible transition strategy toward a more sustainable transportation system with lower CO2 emissions (for instance, Zervas (2006), but the author does not include NOx emissions in the study). On the contrary, Mayeres and Proost (2001) studies the rationale for tax differentiation of gasoline and diesel cars recently observed in Europe. Using a general equilibrium model, they find that the environmental costs of diesel cars have higher social costs that than those of gasoline cars and that by increasing the taxation of diesel it is possible to achieve welfare improvements.

2.4 Weight

Given the strong increase of the share of diesel fuelled cars, it is important to wonder whether these vehicles have some particular characteristics that differentiate them from the average fleet. As Figures 17 and 18 show, both engine size and power of diesel cars are higher compared to those of gasoline cars.An important difference is the weight. Generally, diesel vehicles are on average 270 Kg heavier than gasoline fuelled cars (Figure 4). In the long run we can see that, while the weight of diesel cars remain almost constant, the new gasoline vehicles introduced in the fleet are getting lighter. This is reflected in the overall trend showed in Figure 5. The average weight relative of new cars purchased is increasing until it stabilize after 2009 because of the introduction of lighter gasoline cars.

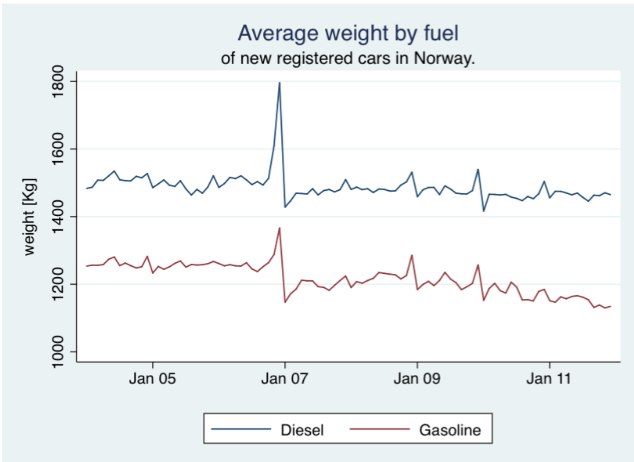

Figure 4: Weight of new registered vehicles by fuel type.

To conclude, the descriptive analysis in this section reveals some important insights. Between 2004 and 2011 a reduction of more than 20gr/Km in average CO2 intensity of the new car fleet took place, both at the aggregate level and by individual market segments (Figure 1 and Fig 11). This reduction is partly due to improvements in fuel efficiency of the vehicles available on the market and partly by a shift in the demand side. Demand-side responses by the Norwegian consumers include a shift toward less polluting cars and toward diesel fuelled cars. The share of cars emitting more than 180 gr CO2/Km has decreased more than 30 percentage points within a six years period, while the share of diesel cars has increased from about 30% in 2004 to about 80% in 2011. The following sections are going to estimate how much of these changes are associated with the tax reform of 2007.

Finally, the overall average weight of the new fleet is increasing in the short run because of the penetration of diesel cars and then stabilizing afterward

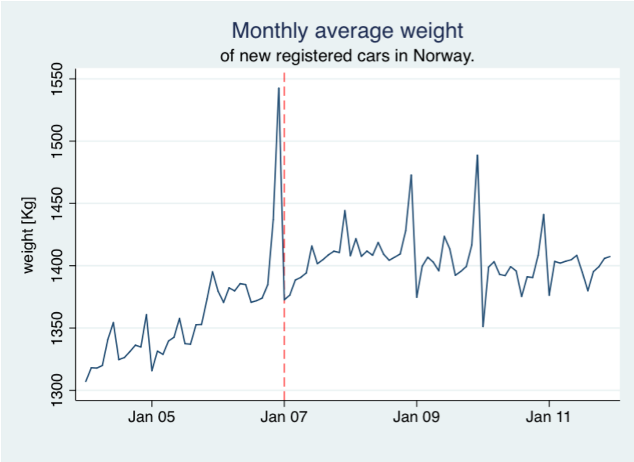

Figure 5: Average weight of new registered.

thanks to the introduction of lighter gasoline vehicles. The next section goes through the details of the Norwegian tax system and its reform.

3 Registration Tax

There are many externalities associate with road transport, for instance air pollution, noise, accidents, congestion and wear and tear of the infrastructures. Each of these external effect need different instruments or a combination of them to be internalized. Generally, there are three types of taxation that affects car purchase and usage decisions: purchase, ownership and usage tax. In Norway, this tax system consists of four elements. (1) The registration tax for new vehicles is a one time fee paid at the moment of purchase; (2) the annual circulation fee for all passengers cars consists of a flat rate which was differentiated by fuel type in 2008, (3) the reclassification fee applies only to used vehicles and it is based on the vehicle's age and weight; and (4) fuel taxes are partially linked to the CO2 content. Historically, the first three were mainly levied for state revenue while fuel taxes have always attempt to reflect road use, accidents and other environmental costs. Recently, also the registration tax was set to internalize the externalities of car ownership to the environment and to the society.

This paper focuses on the registration tax literally translated "One-time fee" (Engangsavgiften) and its peculiarities. Initially, the vehicles registration tax, was a pure value added tax until 1982, when a component related to the weight of the vehicle was added. In 1996 the system changed and the tax became proportional to three characteristic of a vehicle: the weight in Kilograms; the engine size, expressed in cm3, which refers to the cylinder capacity of the vehicle; and the engine power, generally expressed in kilowatt or horsepower. There is a positive correlation between cylinder capacity and engine power, but they both are quite rough proxies for emissions levels (van Essen (2012)). On the contrary, weight is highly correlated with CO2 intensity of the vehicle.[9] As Table 12 shows, a 10% increase in mass increases the CO2 emissions per km by about 7.5%. In 2007, the component relative to engine displacement was substituted with the CO2 emissions factor expressed in grams per kilometer. In conclusion, from January 2007 the upfront tax on purchase of private vehicles is a stepwise proportional function of weight (Kg), power (KW), and CO2 intensity (g/Km). Table 13 shows the tax band for each component used for the calculation of the tax in different years.

In order to understand the implications of this change in the vehicle registration tax structure, it is possible to look at each component separately. Figure 19 shows the scatter plot of the weight and the power components for different years. The weight component of the tax has not change significantly during the years, while the engine power component was strengthen in 2007. This implies that buying a car with engine power higher than 130 KW will result in higher taxes after 2007. Because of the substitution between engine size and CO2 intensity, the total registration tax has not increased or decreased in its absolute terms. Comparing the CO2 intensity component introduced in 2007 with the engine size component of 2006, it is visible that the tax calculated over the CO2 emissions factor is steeper (Figure 20), leading to higher returns for higher emitting vehicles and lower return for greener cars that we would have had calculating it on the base of engine size. However the two measures are not directly comparable for different types of vehicles, hence Figure 6 plots the total registration tax in 2006 and in 2007 to see its dependence on the CO2 intensity. It is clear how the reform has increased the correlation of the registration tax with the CO2 intensity.

As illustrated before, diesel cars have on average higher engine size (Fig. 18), but lower CO2 intensity then gasoline cars (Fig. 15). Hence, when the registration tax was calculated based on the engine size in 2006, diesel fuelled vehicles became more expensive than their gasoline equivalent. In 2007, because of the substitution of the engine size component with the CO2 emissions intensity, diesel cars have become much cheaper to buy (Figure 13). In fact the difference in registration tax between diesel and gasoline cars decreased from an average of 56 thousand NOK in 2006 to an average of 32 thousand NOK in 2007.

[9]Note: the limit value curves for the CO2 emissions standards for new cars (i.e. the 95 g/km targets for 2020) are based on vehicle mass. See DG CLIMA http://ec.europa.eu/clima/policies/transport/vehicles/cars/docs/study_car_2011_en.pdf

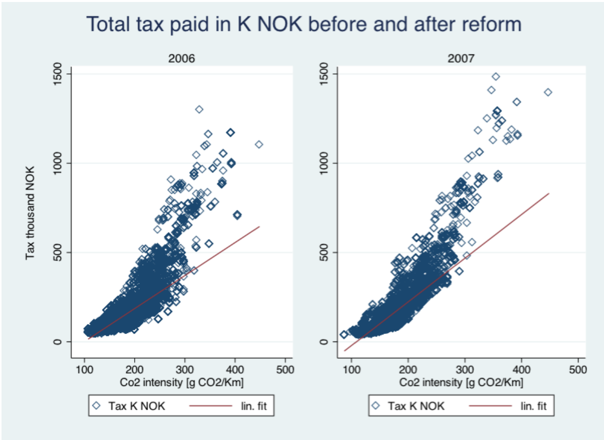

Figure 6: The two panels show how the CO2 intensity affects the registration tax paid in 2006 and in 2007.

To evaluate the change in tax paid before and after the reform of 2007 it is possible to cluster vehicles by market segments. Table 1 illustrates the averages tax paid in 2006 by market segments together with the most sold make and model, while in Table 2 the changes in tax between 2006 and 2007 are summarized. Small and compact cars, which are correlated with lower emissions, weight and power, report a 15% reduction of the total tax paid in 2006. For instance, on average, buying a mini car such as the Toyota Aygo in 2007 will cost 8 150 NOK less than in 2006 (Table 2). On the contrary, for larger cars, such as SUV, consumers spent an average of 215 000 NOK to register a new car (Table 1). From 2007 they will have to add on average 72 540 NOK to buy Suzuki Vitara, i.e. about 34% more (Table 2).

Table 1: **2006 Registration tax by segment.**

	mean	sd	min	max
Mini (Toyota Aygo)	51.89	3.47	43.64	80.52
Small (Toyota Yaris)	69.35	9.81	53.84	197.20
Compact (Toyota Corolla)	103.79	27.31	62.77	413.56
Medium (VW Passat)	141.81	37.73	76.47	788.83
SUV (Suzuki Vitara)	214.86	105.60	67.98	1169.91
MPV (Ford S-Max)	191.96	68.71	118.64	761.69
Large (Volvo V70)	241.40	69.83	128.30	968.64
Other (VW Transporte)	275.34	182.46	75.38	1297.41

The tax is expressed in thousand NOK (2012 currency) and the make and model of the most sold vehicle in the specific market segment in 2006 is in parenthesis. "Other" include vans, sport and luxury cars.

Table 2: **Change in tax (K NOK) from 2006 to 2007 by segment**

	mean	sd	min	max
Mini	-8.15	4.20	-18.06	-1.42
Small	-11.35	7.42	-28.30	7.99
Compact	-11.12	26.75	-190.65	30.72
Medium	-4.82	23.07	-60.15	45.55
SUV	72.54	83.28	-34.51	367.75
MPV	25.52	32.45	-6.47	101.13
Large	35.67	87.92	-70.55	257.45
Other	57.37	108.11	-306.99	291.47

The tax is expressed in thousand NOK (2012 currency).
"Other" include vans, sport and luxury cars.

An alternative way to see how the reform affected the final registration tax is to evaluate its change by CO2 bands. This bands are the same used in Table 13. For a vehicle that emits less than 120 gr CO2 per Km a buyer will save an average of 15 080 NOK after January 2007 (Table 4), which correspond to the 23% of the average tax paid in 2006 (Table 3). However, for a car whose CO2 intensity is higher than 250 gr/Km the price will raise on average by 137 570 NOK after 2007, which is about 32% of the average tax paid in 2006 (Table 3).

Table 3: **2006 Vehicles registration tax by CO2 categories (KNOK).**

	mean	sd	min	max
less than 120 grCO2/Km	64.52	11.69	43.64	99.74
120-140 grCO2/Km	87.24	16.95	43.64	119.07
140-180 grCO2/Km	116.17	39.24	54.44	283.17
180-250 grCO2/Km	180.73	70.76	65.85	683.56
more than 250 grCO2/Km	429.51	178.84	164.73	1297.41

Source ofvas.no

Table 4: **Change in vehicle registration tax by CO2 categories.**

	mean	sd	min	max
less than 120 grCO2/Km	-15.08	5.67	-21.57	-3.44
120-140 grCO2/Km	-18.59	9.70	-48.96	-5.69
140-180 grCO2/Km	-12.23	21.55	-190.65	30.72
180-250 grCO2/Km	20.92	38.56	-182.91	127.83
more than 250 grCO2/Km	137.57	113.14	-306.99	367.75

Source ofvas.no

4 Data

The data used in this study were provided by the Norwegian Road Federation OFVAS[10] and contain detailed information on almost 900 thousand new passengers cars sold in Norway between the years 2004 and 2011. Specifically, I hold yearly cross section data with monthly registrations by vehicle specification in each municipality of Norway.[11] Specification is defined by brand, model, weight, engine displacement (cylinder volume ccm), power (KW), potential CO2 emissions (g/Km), fuel type, number of doors and transmission type (manual or automatic). Vehicles specific taxes have been calculated on the basis of this characteristics following the scheme provided by OFVAS. Information regarding population size and income for the Norwegian municipalities were provided by Statistic Norway (SSB).[12] Fuel prices and fuel taxes for both Petrol and Diesel were provided by the Institute of Transport Economics (TØI).[13] See summary statistics for the main technical characteristics in Table 5.

[10] Opplysningsrådet for Veitrafikken AS (OFV AS) http://ofvas.no/
[11] Norway counts 428 municipalities (kommuner) in 2013.
[12] Statistisk Sentralbyrå, www.ssb.no.
[13] www.toi.no

Table 5: **Most sold model, total number of new vehicles registered each year and mean of the main vehicles' characteristics.**

Year	Top sold model	Tot cars sold	CO2 int. (g/Km)	Weight (Kg)	Power (KW)	Diesel Share
2004	Toyota Av.	115393	180.7	1331.96	85.3	28%
2005	Toyota Cor.	109392	176.1	1347.9	85.2	39%
2006	VW Passat	108463	177.9	1399.9	89.8	49%
2007	VW Passat	127636	160.0	1400.95	87.04	75%
2008	VW Golf	108487	159.97	1416.4	90.06	74%
2009	VW Golf	96464	152.5	1412.1	89.8	74%
2010	VW Golf	124061	142.8	1395.4	87.8	77%
2011	VW Golf	132277	137.3	1398.65	88.4	79%

Source: www.ofvas.no

5 Empirical Method and Identification.

To evaluate the effect of a treatment, such as the tax reform of 2007, it is useful to compare the outcome variable of interest before and after the reform. For instance, the average CO2 intensity of the new vehicles purchased shortly before (six months periods) the reform is about 12 gr of CO2 per kilometer higher than the vehicles bought in the same months after the reform. Unfortunately, considering only this simple difference will provide a biased estimation of the real change in the average CO2 intensity of the new fleet, as long as the time trend is non-zero. Further, we cannot exclude a priori that some external factor could possibly affect our outcome variable. In fact, as discussed previously, the reduction in CO2 intensity is due to both a supply and a demand effect. What we are interested in, is the causal effect of the reform of 2007 on the demand.

By using the Difference in Difference (DID) estimator we are able to exclude the exogenous improvement in fuel efficiency, seasonal effects and control for external factor which are potentially relevant for the outcome variables. Formally, the DID estimator is defined as the difference in average outcome in the treatment group before and after the treatment, minus the difference in average outcome in the control group before and after treatment. Normally, this method is used to evaluate the impact of a treatment on an outcome variable over a population and, generally the population is divided in two groups: those who receive the treatment, the treated, and those who do not, the control group. In this way there is a direct comparison, under specific assumption, between the control and the treated group.

In this paper, the tax reform was applied to all vehicles in the market, hence there is no optimal control group in the standard sense. Luckily, when dealing with cross sectional data, it is possible to solve the lack of control group by employing previous observations in time, which are assumed to be independent from the ones of interest. In order to isolate the causal impact of the reform, observation of the outcome variables in previous years, in which no reform took place, are used as a control group. Hence, two periods of six months each in 2006 and 2007 are used for the treatment group, while the control group is identified by the corresponding six-months periods in 2004 and 2005. Specifically observations from April to September 2006 and April to September 2007 are used to calculated the first difference in the treatment group, while observations from April to September 2004 and April to September 2005 are used to calculated the second difference in the control group. Similar strategies have been done by Schönberg and Ludsteck (2012), Lalive and Zweimüller (2009), Lalive et al. (2010) and Ekberg et al. (2013).

As introduced in the previous section, in around October 2006 the tax reform was announced. From Figure 1 it is clear how the announcement of the reform have led to a quite high level of anticipation behavior which created a substitution between highly polluting vehicles and greener ones. Since threats to identification can arise when individuals change their behavior as a consequence of the treatment, or in anticipation of it, the months between October 2006 and March 2007 are discarded from the analysis.

Following a standard Difference in Difference procedure, equation (1) is estimated for four outcome variables ($Y_{r,t}$): the average potential emissions and the weight derived from new vehicle registration, the share of high polluting cars and the share of diesel introduced in the market. The level of aggregation used to calculate the averages is municipalities $r = 1, 2, ..., R$[14] and months $t = \{t_1, t_2, t_3, t_4\}$. Where

- t_1 identifies the months between April and September 2004,
- t_2 is equal to one for observations between April and September 2005,
- t_3 identifies the months between April and September 2006 and
- t_4 identifies the months from April to September 2007.

The regressor $Reform_t = 1 \ for \ t = \{t_3, t_4\}$ is a dummy variable indicating which observations belong to the years of the treatment, namely t_3 and t_4. The variable $After_t = 1 \ for \ t = \{t_2, t_4\}$ identifies the periods after the treatment in the year of the reform and in control group. i.e. it takes value 1 for the months between April and September 2005 and from April to September 2007 and zero otherwise. $After_t \cdot Reform_t = 1 \ for \ t = \{t_4\}$ is the interaction term identifying the six-months period after the treatment.

[14] The total number of municipality included in the analysis is about 400.

Lastly, $C'_{r,t}$ is a vector of control variables such as gross income at the municipality level and monthly fuel prices, while $\epsilon_{r,t}$ is a random, unobserved error term.

$$Y_{r,t} = \alpha + \overbrace{\beta}^{\text{Group effect}} Reform_t + \overbrace{\gamma}^{\text{Time effect}} After_t + \overbrace{\delta}^{\text{Treatment eff.}} (After_t \cdot Reform_t) + \mu C'_{r,t} + \epsilon_{r,t} \tag{1}$$

In order to have an unbiased estimation of the treatment effect δ, there are some assumptions that need to be verified. The model need to be correctly specified and the error term need to be uncorrelated with the variables in the equation. The most important assumption that needs to be discussed is the Common Trend Assumption (CTA). Assuming a counterfactual reality where the reform never happened, we should be able to see the outcome variable for the treatment and control groups having the same trends. Unfortunately this assumption is, in principle, untestable. Nevertheless, a testable implication can be used as a substitute: the pre-intervention trends in the control and treatment group need to be parallel. This assumption is graphically verified in for the CO2 intensity outcome variable in Fig 24, where it is immediate to see that the fitted values lines imply no significant difference between the pre-treatment trends in the control and in the treatment periods. Similar conclusion can be drawn for the share of dirty cars showed in Figure 25 and the share of diesel cars illustrated in Figure 26. Therefore, the estimation procedure appears to be correctly identified.

The similarity in trends, which allows the CTA to be verified, lies in the seasonality of the car market. In fact, the comparability between the months close to the reform and those of the previous year is reasonable given the regularity in the production cycles for cars. In the European market, one cycle correspond to a calendar year, hence, vehicles characteristics are constant for 12-month period (Klier and Linn (2011)). Hence, it is enough to consider the difference in trends, for instance in fuel efficiency, between different years as an exogenous factor intrinsic with the supply side, and exploit the same months of the previous year as a feasible control group. This guarantee the causal effect of the reform to be identified as the gap between the trends before and after the reform.

To visually verify the seasonal regularity of the car market, a comparison of the treatment group and control group is visible in Figure 7 for the variable CO2 intensity. If we exclude the months immediate before and after the reform, the trends in the years of interest are analogous. Therefore, the sales in 2004-2005 are well comparable with those of the 2006-2007. Similar figures are reported for the other outcome variables in Figure 21, 22 and23.

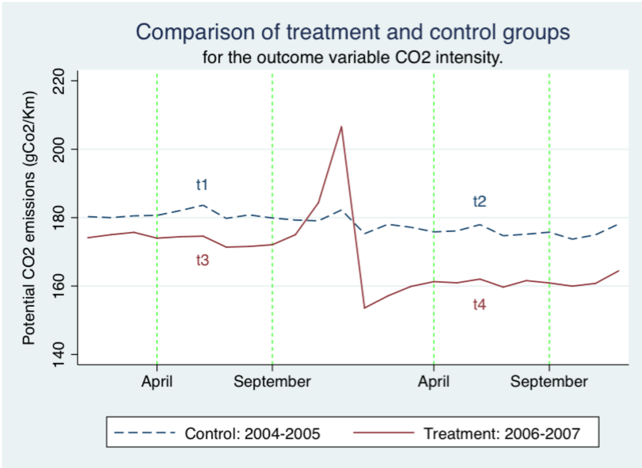

Figure 7: Control and treatment group comparison. $Control = t_1, t_2$ and $Treatment = t_3, t_4$, where t_1 is April-September 2004, t_2 is April-September 2005, t_3 is April-September 2006 and t_4 is April-September 2007. The car market in Norway has fixed seasonal cycles over a calendar year.

6 Results

This section present and discuss the overall findings of the paper. To evaluate the causal impact of the registration tax reform of 2007, the treatment effect is estimated on each outcome variable of interest $Y_{r,t}$ following a Difference in Difference approach.

6.1 CO2 intensity

In this paper, the treatment effect δ for each outcome variable of interest $Y_{r,t}$ is estimated with equation 1. However, it can also be calculated in a more direct and intuitive way by following the definition of the DID estimator as Table 6 exemplifies for the outcome variable CO2 intensity. As defined before, the DID method calculates the difference between the pre and post reform averages in the year of the intervention (treatment group) minus the difference between the same time intervals in the control group, which in our case is the year before the intervention.

$$\hat{\delta} = \overbrace{(\overline{Y}_{r,t_4} - \overline{Y}_{r,t_3})}^{\text{changes in treatment group}} - \underbrace{(\overline{Y}_{r,t_2} - \overline{Y}_{r,t_1})}_{\text{changes in control group}}$$

As previously discussed, if we only looked at the simple difference before and after the reform we would have found a reduction of almost 12 gr of CO2

Table 6: **Treatment effect for the CO2 intensity variable calculated by applying the DID definition.**

$\overline{Co2}$	Post-Reform	Pre-Reform	**Diff**
Period 2	$\overline{Y}_{r,t_4} = 161.08$	$\overline{Y}_{r,t_3} = 173.01$	-11.93
Period 1	$\overline{Y}_{r,t_2} = 175.925$	$\overline{Y}_{r,t_1} = 181.14$	-5.215
Diff	-14.85	-8.13	-6.72

per km within the year of the policy reform. This result would be biased as this total reduction is partly due to improvements in fuel efficiency of the vehicles available on the market and partly by a shift in the demand side. Using the DID approach we learn that the causal impact of tax reform on the demand is more than half of the overall reduction found in the same period. Specifically Table 6 reports a reduction of 6.72 grCO2/Km. This simple calculation can be compared with the results of the OLS estimation for the outcome variable CO2 intensity, which are presented in Table 7. The advantage of using OSL is that it allows the introduction of control variables and simplify the handling of standard errors. In Table 7, each column, referred as Model(), has slightly different specifications to show robustness of the results.

The results reported in Table 7 have been calculated by regressing the average CO2 intensity calculated for each car sold in each municipality in the months exploited in the analysis. All models are weighted on the number of car sold and have standard errors clustered on municipalities to account for similarities in demand in different time periods within the same municipality. Model (2) and (3) include control variables: model (2) controls for gross income at municipality level, while model (3) controls for the income and the ratio between diesel and gasoline fuel prices.

Table 7: **Dep. variable: Co2 intensity.**

	(1) CO2 int.	(2) CO2 int.	(3) CO2 int.
Treatment eff	-6.806***	-6.861***	-7.894***
	(0.468)	(0.479)	(0.460)
Group effect	-8.086***	-8.569***	-8.117***
	(0.350)	(0.348)	(0.372)
Time trend	-5.174***	-6.245***	-5.812***
	(0.293)	(0.595)	(0.582)
Gross Inc.		0.0401**	0.0400**
		(0.0133)	(0.0133)
Diesel/Gas price ratio			-10.98***
			(3.109)
Constant	181.1***	169.4***	179.0***
	(0.934)	(3.435)	(3.587)
Observations	9217	9217	9217
R^2	0.514	0.547	0.548

All models have std errors clustered on municipalities.
Model (1), (2) and (3) are weighted on number of car sold.
Model (2) controls for income.
Model (3) controls for income and fuels price ratio.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The treatment effect is highlighted in the first row of Table 7 and it is highly significant. Its absolute value is estimated to be between 6 and 8 gCO2 per Km, which is about 4.4% of the yearly average CO2 intensity, and it accounts for about 20% of the overall standard deviation. This can be interpreted as: the new vehicles registered in Norway in the same calendar year of the change in the registration tax (six months: April-September 2007) had an average CO2 intensity of at least 6.8 gCO2/Km less than they would have had without the implementation of the reform.

6.2 Market share of highly polluting cars

To understand the mechanism behind the estimated reduction of CO2 emissions intensity of the car fleet, this paper also looks at the share of highly polluting vehicles relative to medium and green vehicles. In fact, demand-side responses by the Norwegian consumers include a shift toward less polluting cars and toward diesel fuelled cars. Table 8 presents the results of estimation for the outcome variable market share of "dirty" cars, i.e. those vehicles that emit more than 180gr CO2 per Km. Each column, referred as Model() has slightly different specifications. All models have been estimated clustering the standard errors on municipalities and are weighted on the number of sold cars in each municipality in the period of interest. Model (2) controls for gross income at municipality level, while model (3) controls for income and ratio between diesel and gasoline fuel monthly prices.

Table 8: **Dependent variable is the share of dirty cars.**

	(1) High emis.	(2) High emis.	(3) High emis.
Treatment eff	-0.112***	-0.113***	-0.122***
	(0.006)	(0.006)	(0.006)
Group effect	-0.0901***	-0.0955***	-0.0915***
	(0.004)	(0.004)	(0.004)
Time trend	-0.0565***	-0.0684***	-0.0646***
	(0.005)	(0.007)	(0.008)
Gross Inc.		0.000443***	0.000443***
		(0.000)	(0.000)
Diesel/Gas price ratio			-0.0964*
			(0.043)
Constant	0.440***	0.311***	0.395***
	(0.010)	(0.035)	(0.049)
Observations	9217	9217	9217
R^2	0.456	0.477	0.477

All models have std errors clustered on municipalities.
All models are weighted on number of sold cars.
Model (2) controls for income.
Model (3) controls for income and fuels price ratio.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 12 shows that the share of highly polluting cars has decreased from 40% to less than 20% in less than 5 years. What we find from the estimations reported in Table 8 is that the reform of 2007 have caused about 50% of this reduction within the same year of implementation of the reform. Specifically the tax reform has caused a reduction, in the short run, of at least 11 percentage points for the market share of vehicles emitting more than 180 gCO2 per Km.

6.3 Market share of diesel cars

Part of the reduction in CO2 intensity seems to be due to the large increase of diesel share which is associated with lower CO2 emissions. In Section 2 we saw that the share of diesel cars has increased from about 30% in 2004 to about 80% in 2011. By taking the simple difference between diesel share before and after the reform, we find that the increase is about 30 percentage point.[15] How much of this increase was brought about from the reform of 2007? The estimated treatment effect reported in the first row of Table 9 is highly significant and it is between 0.226 and 0.239 which is more than 76% of the overall change within the same period when we include external factors. This increase has occurred because of the substitution between the engine size component and the CO2 intensity component. In fact, given the higher engine size and the lower CO2 emissions associated with diesel vehicles, the overall tax makes diesel cars cheaper in 2007 compared to 2006 levels (Figure 13). The remaining part of the trend can be associate for a specific taste for diesel powered vehicles which have on average a much higher fuel economy than gasoline cars (Figure 16) and run on a cheaper fuel (Figure 14).

Table 9: **Dependent variable is market share for diesel cars.**

	(1) Diesel	(2) Diesel	(3) Diesel
Treatment eff	0.226***	0.227***	0.239***
	(0.007)	(0.007)	(0.008)
Group effect	0.174***	0.185***	0.180***
	(0.006)	(0.008)	(0.008)
Time trend	0.069***	0.094***	0.089***
	(0.004)	(0.005)	(0.006)
Gross Inc.		-0.001***	-0.001***
		(0.000)	(0.000)
Diesel/Gas price ratio			0.121**
			(0.046)
Constant	0.092***	0.355***	0.250***
	(0.007)	(0.037)	(0.060)
Observations	15928	15928	15928
R^2	0.321	0.338	0.338

All models have std errors clustered on municipalities.
All models are weighted on number of registrations.
Model (2) controls for income.
Model (3) controls for income and diesel gasoline fuel price ratio.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9 shows the results of estimation for the outcome variable market share of diesel cars. The estimated treatment effect associated with the tax reform report an increase, in the short run, of at least 22 percentage points of the market share of diesel cars. All models have been estimated clustering

[15]The diesel market share reaches an average of 25% in the period April-September 2006 and an average of 55% in the period April-September 2007

the standard errors on municipalities and are weighted on the number of registrations. Model (2) controls for gross income at municipality level, while model (3) controls for income and ratio between diesel and gasoline fuel monthly prices.

6.4 Weight

Because diesel fuelled vehicles are associate with higher weight, this last outcome variables has also been taken into consideration and Table 10 shows the results of estimation. All models have been estimated clustering the standard errors on municipalities and are weighted on the number of registrations. Model (2) controls for gross income at municipality level, while model (3) controls for income and ratio between diesel and gasoline fuel monthly prices.

Table 10: **Dependent variable is weight.**

	(1) Weight	(2) Weight	(3) Weight	(4) Weight
Treatment eff	13.06***	13.00***	10.91**	10.12**
	(3.518)	(3.481)	(3.620)	(3.718)
Group effect	45.17***	44.65***	41.73***	46.45***
	(2.851)	(3.058)	(2.635)	(2.946)
Time trend	11.78***	10.62**	10.17***	13.00***
	(2.150)	(4.023)	(1.958)	(2.375)
Gross Inc.		0.0432		
		(0.0963)		
diesel			15.41***	
			(2.632)	
Diesel/Gas price ratio				-31.25
				(26.67)
Constant	1332.7***	1320.2***	1328.5***	1359.9***
	(4.890)	(25.20)	(5.489)	(22.36)
Observations	15928	15928	15928	15928
R^2	0.218	0.220	0.233	0.219

All models have std errors clustered on municipalities.
All models are weighted on number of registrations.
Model (2) controls for gross income.
Model (3) control for the share of diesel cars.
Model (4) controls for diesel-gasoline fuel price ratio.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The treatment effect reported in the first row of Table 10 is highly significant and imply that the tax reform led to an increase in weight between 10 and 13

Kg. This is not a very high increase since it account for less than 1% of the average weight. However the correlation between mass and CO2 potential emissions is almost one to one, so an increase of 1% in the car fleet mass is associate with about 0.75% increase in CO2 intensity, i.e. 1 gCO2/Km (Table 12).

7 Robustness check

To ensure the robustness of the results, the estimation for the outcome variable CO2 intensity is carried out lagging forward the post reform periods. This is done to ensure the announcement effect and its consequences are completely eliminated. Specifically, the post treatment months now are those between July and December 2005 and July and December 2007. The Common trend assumption is verified also in this case and it is reported in Figure 8.

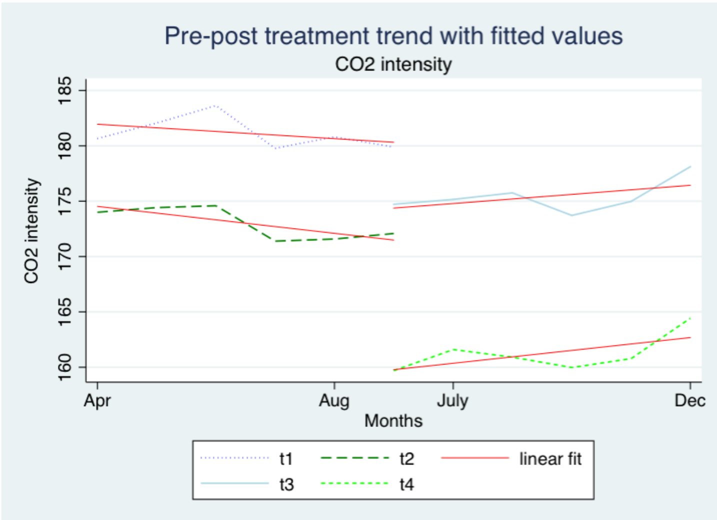

Figure 8: Four six-months period employed in the estimation.

The results of the estimation is reported in Table 11

The estimated effect of the policy change is a reduction in average potential emissions of around 6 gr per Km.

Table 11: **Dep. variable: Co2 intensity.**

	(1) Avg. CO2	(2) Avg. CO2	(3) Avg. CO2
Treatment eff	-6.251***	-6.278***	-6.317***
	(0.414)	(0.418)	(0.402)
Treatment group	-8.086***	-8.629***	-8.603***
	(0.350)	(0.335)	(0.341)
Time trend	-5.673***	-6.879***	-6.850***
	(0.332)	(0.609)	(0.585)
Gross Inc.		0.0450***	0.0450***
		(0.0110)	(0.0110)
PDratio			-0.635
			(2.638)
Constant	181.1***	168.0***	168.5***
	(0.934)	(2.775)	(2.957)
Observations	9171	9171	9171
R^2	0.498	0.539	0.539

All models have std errors clustered on municipalities.
All models are weighted on number of car sold.
Model (2) controls for income.
Model (3) controls for income and fuels price ratio.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

8 Conclusions

This paper analyses how a recent policy intervention has affected the main characteristics of the car fleet in Norway. In 2007 the structure of the vehicle registration tax was changed. Taxation for new private cars is now based on expected CO2 emissions per kilometer rather than engine size. This reform was implemented with the formal goal of reducing the average CO2 emissions intensity of the fleet in accordance with the standards imposed by the European Commission. However, this reform has affected other dimensions which have not been completely anticipated. Using observational data provided by the Norwegian Road Federation (OFVAS) on cars' purchases, I estimate with a Difference in Differences approach the short run effect of the 2007 reform on four dimensions: 1) the average CO2 intensity of new registered vehicles, 2) the relative change between low and high polluting cars in the market, 3) the market share of diesel cars and 4) the average weight of the fleet.

The change in the tax structure indeed results in an important reduction of the average CO2 intensity. The treatment effect estimated is at least 6 gr of CO2 per km less that we would have had without the reform. This reduction accounts for about half of the overall reduction in CO2 intensity when including exogenous fuel efficiency improvements associated with the supply side of the market. The observed improvement in CO2 performance is the result of a shift in demand toward greener vehicles and of an increase of the diesel market share. My results show how the share of very polluting vehicles has dropped by at least 12 percentage points thanks to the policy reform within the same year. Further, because of the substitution between the engine size component and the CO2 intensity component, the overall tax became cheaper for diesel cars. Hence, the estimated change is an increase of about 23 percentage point in the diesel market share. This increase accounts for more than 76% of the overall change within the same period when we include external factors such as a specific consumers taste for diesel cars.

Even though, the increase of diesel cars has helped to reduce CO2 emissions intensity, these cars are generally associated with higher weight. Therefore, this study includes an estimation of the causal change in mass of the average fleet after the tax reform. The results show an increase of at least 10 Kg in the short run which accounts for less than 1% of the average weight of the fleet in the same year. Although, this result seems rather small, the correlation between mass and expected CO2 emissions is almost one to one, hence, an increase of 1% in the average weight is associate with about 0.75% increase in CO2 intensity, i.e. 1 gCO2/Km.

Appendix A: Figures

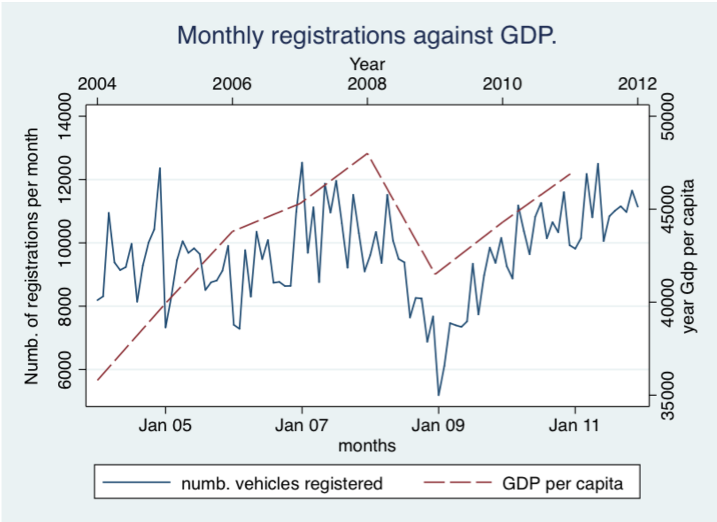

Figure 9: Graphic correlation between demand for private vehicles express in the number of new vehicles registered per month and GDP in Norway between 2004 and 2011. The slump in 2009 is probably due to the economic crisis, which had a mild effect on the Norwegian economy. The sales of vehicles in fact, recover strongly right after that with a relative growth of 29.5% in 2010 and 8.3% in 2011.

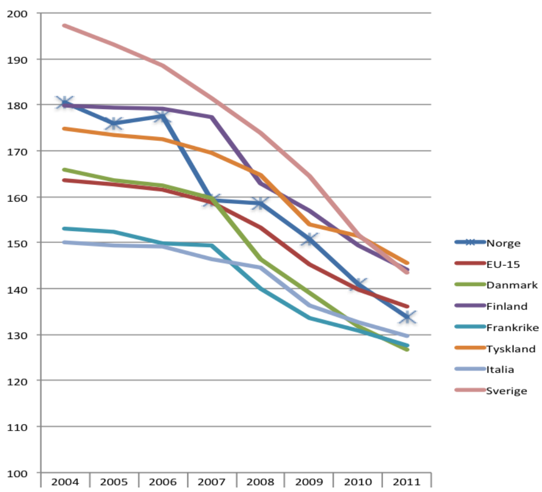

Figure 10: CO2 intensity of new registered vehicles: a comparison between European countries. Norway (Norge in the graph) is well in line with the CO2 reduction for new cars carried out by the European Union. Figure from OFV AS and Vista Analyse AS (Rapport 12/42) http://www.regjeringen.no/pages/38231042/vista_rapport2012.pdf

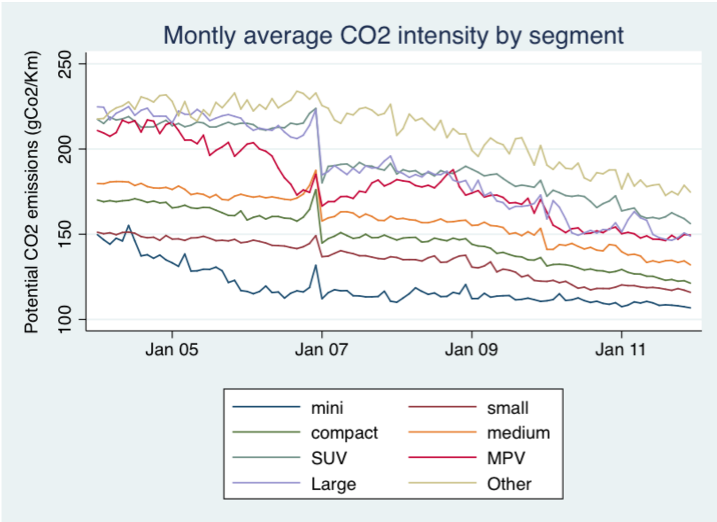

Figure 11: Monthly average CO2 intensity of new vehicles registered in Norway by segments. "Other" contains luxury and sport cars.

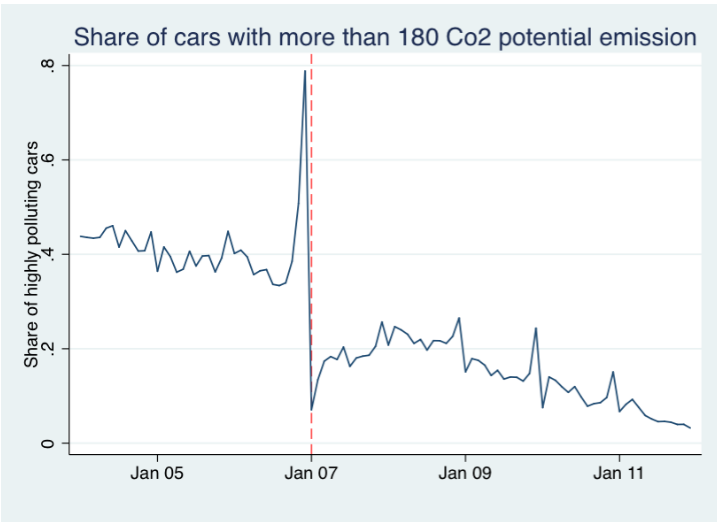

Figure 12: Market share of new registered vehicles with more than 180 gr per Km of CO2 intensity.

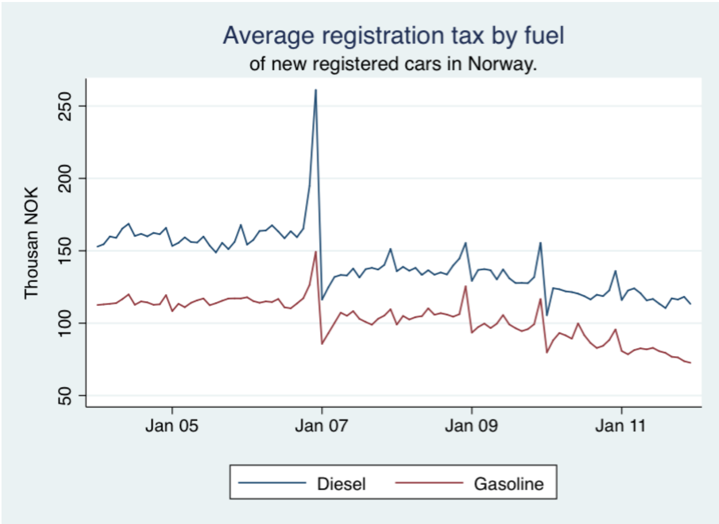

Figure 13: Average vehicle registration tax by fuel type.

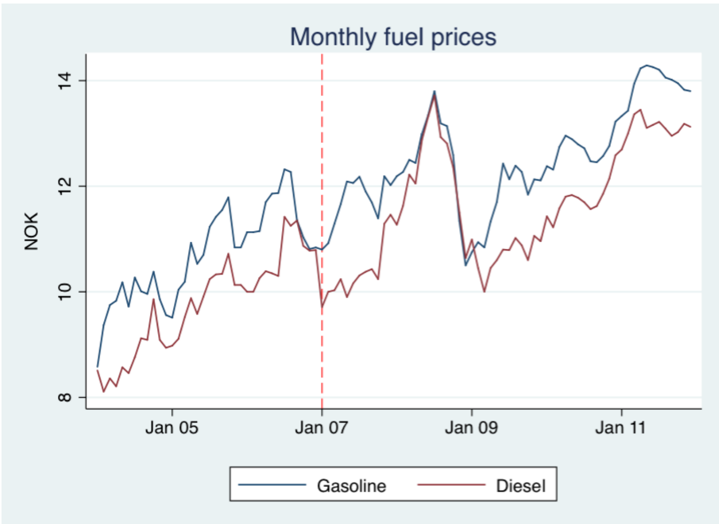

Figure 14: Monthly fuel prices including taxes.

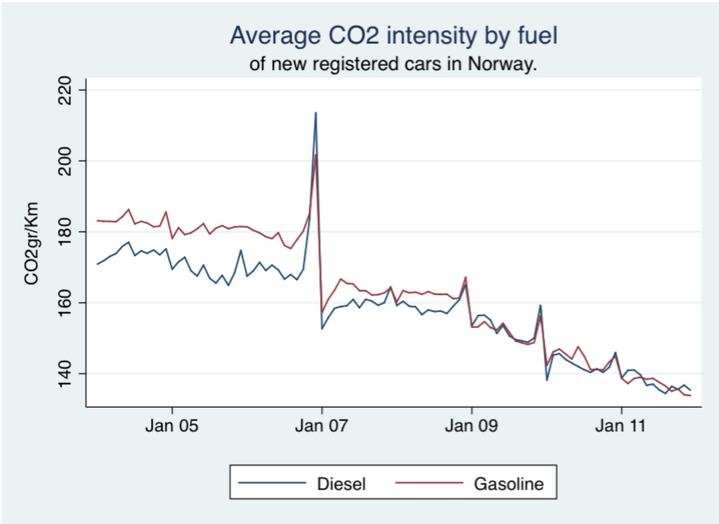

Figure 15: CO2 intensity of new registered vehicles by fuel type. Because of technological development the emission performance gap between diesel and gasoline powered vehicles has shrunk during the years.

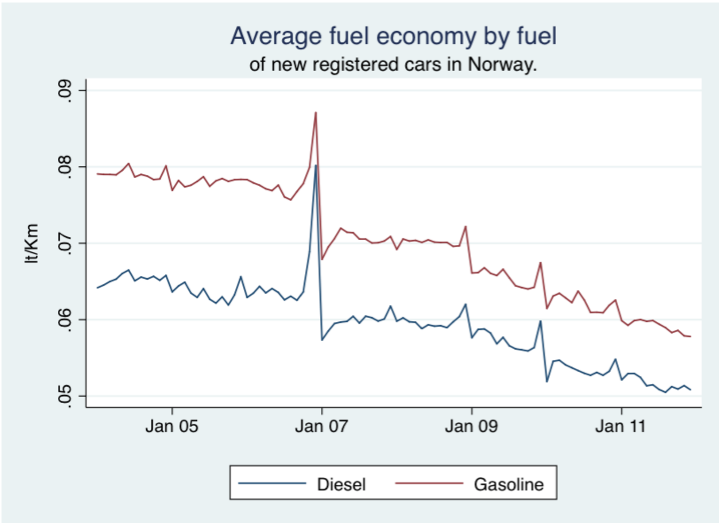

Figure 16: Fuel economy of new registered vehicles by fuel type. Diesel cars have much lower fuel economy than gasoline.

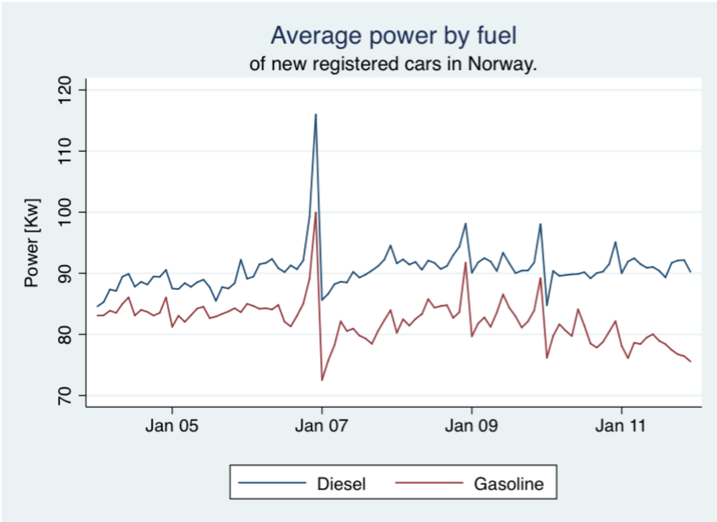

Figure 17: Power of new registered vehicles by fuel type. Even though the difference in power between diesel and gasoline cars is small the gap between them is increasing.

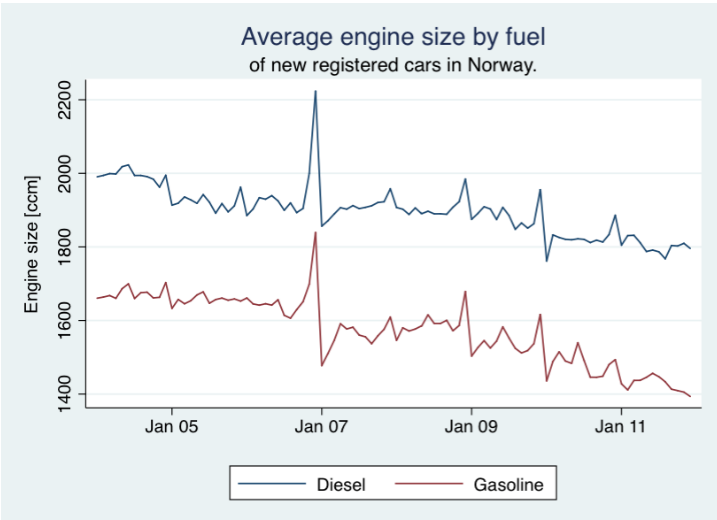

Figure 18: Engine size of new registered vehicles by fuel type. There is a small general reduction on engine size due to technological development, but the gap between diesel and engine fuelled cars is increasing.

Registration Tax

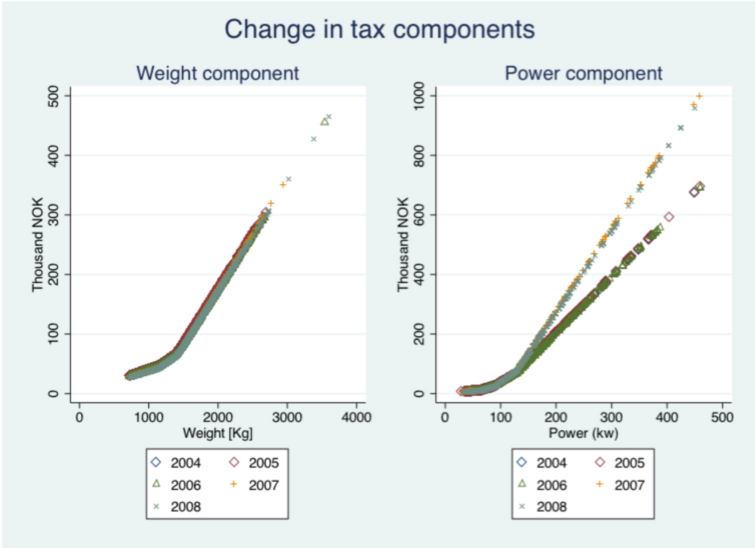

Figure 19: Registration tax: The weight and power components are plotted in different years. While the weight component is almost fix, the power component of the registration tax is also changed during the reform of 2007.

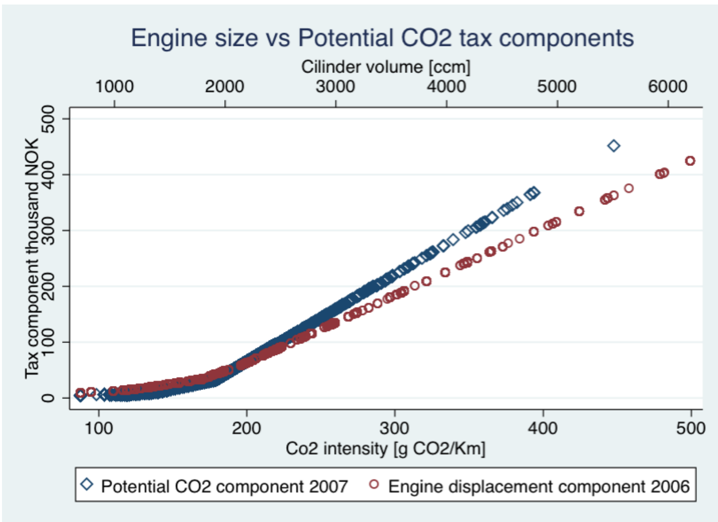

Figure 20: Registration tax: reform of 2007. The red round scatter plot represent the amount in thousand NOK of the tax component calculated over the engine displacement in 2006. The blue diamond scatter plot represent the amount of tax paid given CO2 intensity introduced in 2007 to substitute the engine displacement component.

Comparison between control and treatment group

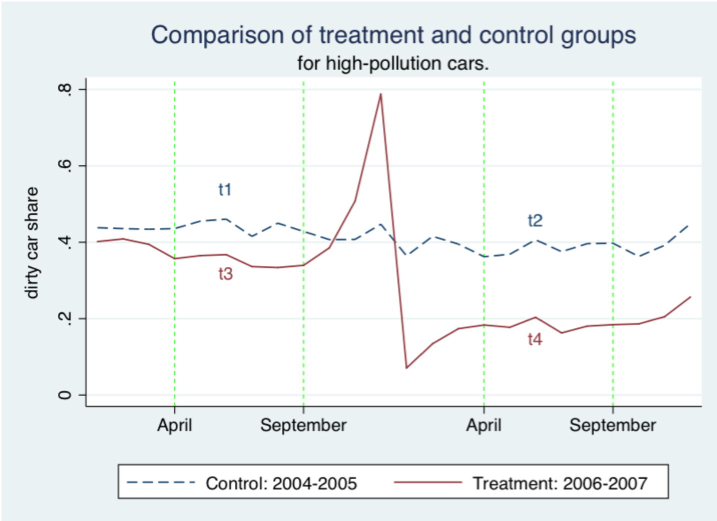

Figure 21: Control and treatment group comparison for cars emitting more than 180grCO2/Km. *Control* = t_1, t_2 and *Treatment* = t_3, t_4, where t_1 is April-September 2004, t_2 is April-September 2005, t_3 is April-September 2006 and t_4 is April-September 2007.

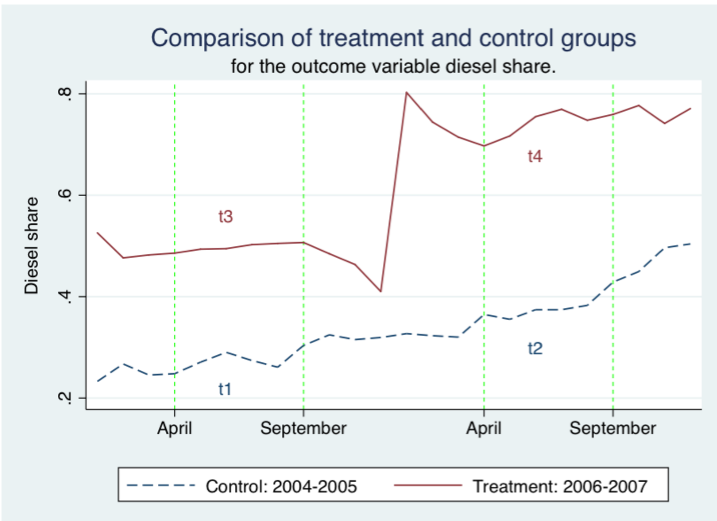

Figure 22: Control and treatment group comparison for diesel share. *Control* = t_1, t_2 and *Treatment* = t_3, t_4, where t_1 is April-September 2004, t_2 is April-September 2005, t_3 is April-September 2006 and t_4 is April-September 2007.

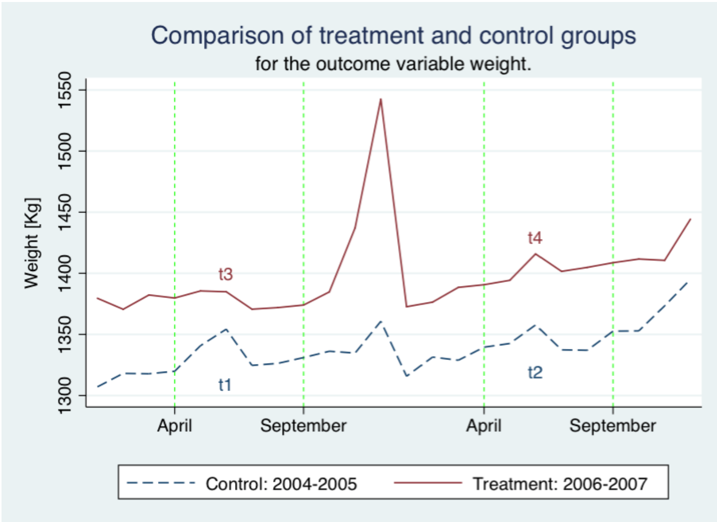

Figure 23: Control and treatment group comparison for outcome variable weight. $Control = t_1, t_2$ and $Treatment = t_3, t_4$, where t_1 is April-September 2004, t_2 is April-September 2005, t_3 is April-September 2006 and t_4 is April-September 2007.

Common Trend Assumption

The four six-months periods employed in the DID in the control (t_3, t_4) and treatment groups (t_1, t_2) are compared for each outcome variable. Note: the months between October 2006 and March 2007 have been removed from the estimation to exclude the anticipation effect.

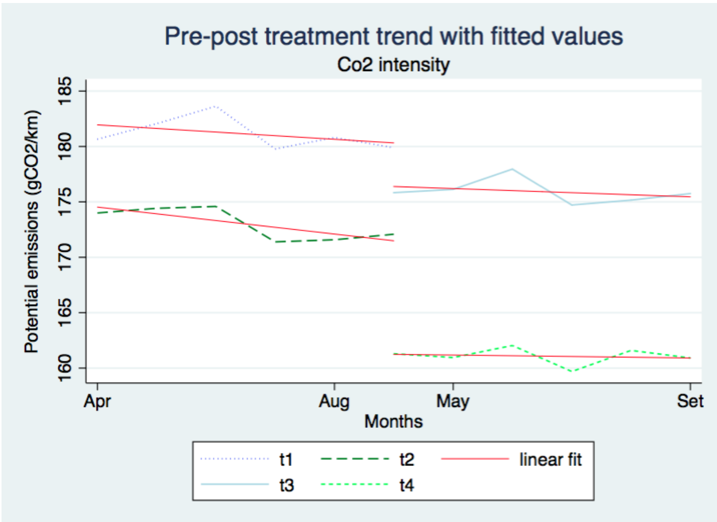

Figure 24: CO2 intensity of the new vehicles purchase.

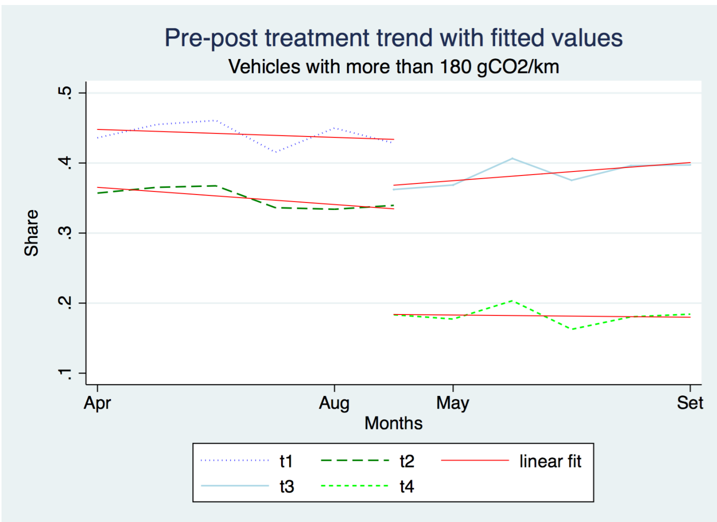

Figure 25: High polluting vehicles.

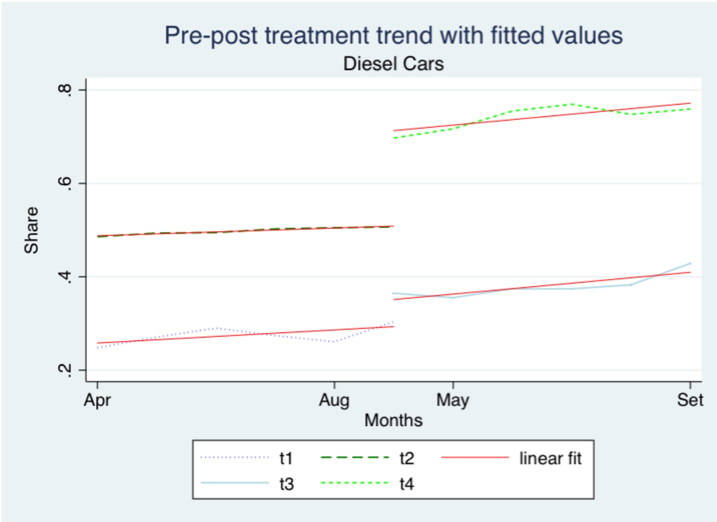

Figure 26: Diesel share.

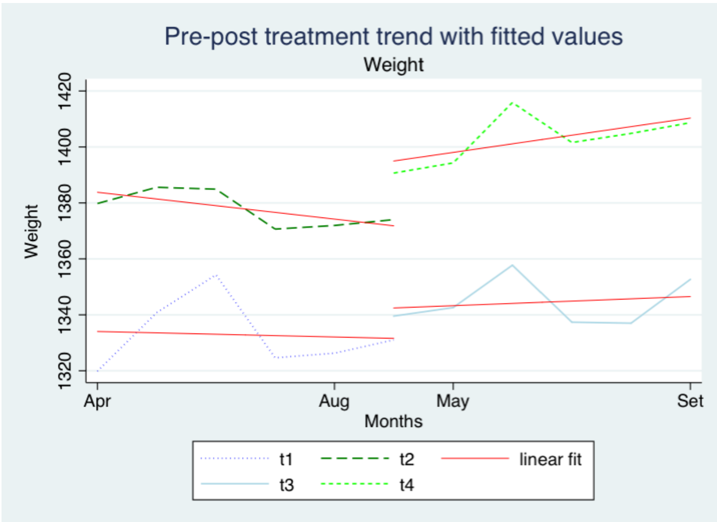

Figure 27: Weight.

Appendix B: Tables

Table 12: **Correlation between Co2 intensity and the other tax components .**

	(1) CO2 int [ln(g/Km)]
weight [ln(Kg)]	0.746***
	(0.001)
engine sz [ln(ccm)]	0.292***
	(0.001)
Power [ln(KW)]	0.004***
	(0.001)
Diesel	-0.240***
	(0.000)
Year	-0.028***
	(0.000)
Constant	53.194***
	(0.089)
Observations	921775
R^2	0.826

High correlation between weight and CO2 emissions.
Lower correlation with the other components.
As expected diesel cars emit less CO2 than gasoline cars.
The CO2 intensity is decreasing in years beacuse of fuel efficiency improvements.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: **Bands for each component used in the calculation of the registration tax in different years. The prices are in NOK (2012 currency).**

		2004	**2005**	**2006**	**2007**	**2008**
Weight (Kg)	0-1150	39.52	39.76	39.16	36.82	36.40
	1151-1400	79.04	79.52	79.45	80.25	79.32
	1401-1500	158.10	159.05	157.77	160.52	158.67
	over 1500	183.87	184.97	183.51	186.68	184.53
Power (KW)	0-65	152.66	153.58	153.30	133.91	132.37
	66-90	556.79	560.14	557.24	557.97	551.55
	91-130	1113.93	1120.63	1115.59	1339.12	1323.71
	over 130	1885.04	1896.37	1886.54	2789.83	2757.73
Engine Vol (ccm)	0-1200	11.67	11.74	11.68		
	1201-1800	30.55	30.73	30.58		
	1801-2200	71.86	72.29	71.94		
	over 2200	89.77	90.31	90.42		
CO2g /Km	0-120				44.64	44.13
	121-140				212.03	209.59
	141-180				557.97	551.55
	181-250				1562.30	1544.54
	over 250				1562.30	1544.54

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