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CO_2 emissions from cars

Regulation via EU Emissions Trading System better than stricter CO_2 limits

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The integration of road transport into the EU Emissions Trading System (EU ETS) using an upstream approach (with refineries and fuel importers as participants) is superior to the instrument of CO_2 limit values for cars on the counts of ecological effectiveness and macroeconomic efficiency. This applies in particular if a cap on CO_2 emissions enjoys top political priority. Higher taxes on fuel would also be more appropriate than a further tightening of limit values after 2020/21. Nonetheless, if policymakers should decide that (stricter) CO_2 limit values for cars are to remain the instrument of choice after 2021, it would be appropriate to gear them to the (lower) targets in other large auto markets.

The CO_2 targets for new vehicles are currently the EU's most important instrument for achieving a further reduction in road traffic emissions. By 2021 the average CO_2 emissions for newly registered passenger cars must drop to 95 grams per kilometre (2013: 127 g/km). This is an ambitious but attainable target. However, the makers of larger cars in particular already have to electrify a significant part of the drivetrain to be able to comply with the required targets.

The instrument of CO_2 limit values for cars has disadvantages. It is not based on the actual emissions of road traffic; heavy-duty vehicles are not taken into account. Furthermore, it exacts reductions in CO_2 emissions in an area where this is particularly expensive. The danger does exist that much stricter CO_2 targets after 2021 will send production costs rising sharply; as a reaction, production capacities could be relocated abroad.

Instead of stricter CO_2 targets for passenger cars there could be increased fuel tax rates in future. This instrument offers advantages: petroleum tax is established in all EU countries. A higher petroleum tax rate would apply to all road vehicles. The tax is based on a vehicle's actual fuel consumption and not the theoretical amount. However, higher petroleum taxes cannot guarantee that fuel consumption and/or CO_2 emissions from road traffic will be limited to a desired amount. A hike in tax rates harmonised across all EU member states is also made difficult by the fact that tax issues in the EU are a matter for the member states. Higher petroleum taxes would have negative social implications.

Integrating road traffic into a reformed EU ETS from 2020/21 would yield many benefits. First and foremost are ecological effectiveness and economic efficiency. This combination is not provided by either CO_2 limits or taxes. European climate protection policy would become more effective. Rising oil prices and competition in the auto industry would remain drivers of technological progress in the alternative propulsion technologies segment. The potential impact on competition with other industries participating in the EU ETS would also have to be factored into the equation, of course.

CO_2 emissions from cars

CO_2 emissions from cars

Auto industry in the spotlight of environmental policy

It is not only in Europe that the auto industry has traditionally found itself in the spotlight of environmental policy. In years gone by, policymakers mainly sought to reduce the harmful exhaust emissions (e.g. oxides of nitrogen [NO_x], sulphur dioxide [SO_2], hydrocarbons, particulates) produced by road traffic. Major political initiatives were specific exhaust standards (Euro 1 to Euro 6) for vehicles, the compulsory fitting of catalytic converters and the banning of lead in petrol. These measures were effective. For example NO_x emissions by the transport sector in Germany fell by nearly 65% between 1990 and 2012, according to the Federal Environment Agency (UBA). The drop in sulphur dioxide emissions was even more striking at over 99%. And for Europe, too, the European Environmental Agency (EEA) reports that on a long-term comparison the exhaust emissions of all major pollutants by the transport sector are declining, albeit not by as much as in Germany on average. Overall, harmful transport emissions are thus trending downward, while further advances in cutting particulate matter and NO_x emissions for example need to be made and are being targeted.

Besides the above-mentioned regulatory instruments the taxes on fuel or vehicles also usually have an ecological component. For instance, fuel taxes (the petroleum tax in Germany is actually called energy tax) are designed to help internalise the external effects of transport (e.g. pollution, noise emissions), even though measuring these external effects is not a minor matter.

Greater concentration on reducing vehicle CO_2 emissions

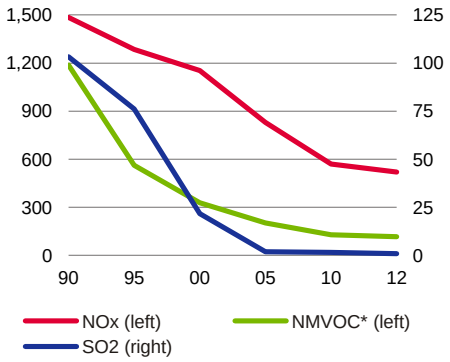
For several years EU policymakers have been trying to use the appropriate instruments to help reduce CO_2 emissions by the transport sector. There are two main drivers for these efforts: firstly, the transport sector is supposed to make an appropriate contribution to achieving the European climate protection targets. And secondly, policymakers want to indirectly reduce the sector's extremely heavy dependency on oil, which is a finite source of energy. This will tend to become more expensive over the next few years (despite the recent drop in prices), because the global demand for oil is growing faster than the supply and because new sources of oil can – despite advances in technology – only be tapped at high cost. Declining CO_2 emissions and lower oil consumption are thus complementary objectives.

It is understandable that politicians focus on vehicle CO_2 emissions: transport (excluding the international sea shipping and international aviation segments) is the only sector in the EU whose absolute CO_2 emissions were higher in 2012 than in 1990. While the transport sector was responsible for just 17.3% of CO_2 emissions in the EU in 1990 this figure had already risen to 23.7% by 2012, according to Eurostat. The absolute volume of CO_2 emissions by the transport sector has been declining since 2007, but total EU emissions have been falling even faster since then.

Within the transport sector – again excluding the international sea shipping and aviation segments – road traffic with a share of over 94% (2012) is responsible for the lion's share of all CO_2 emissions in the EU; including the sea shipping and aviation segments then road traffic still accounts for nearly 72%. Road transport CO_2 emissions in the EU were more than 9% lower in 2012 than at their peak in 2007, but still some 17% higher than in 1990.

Pollutant emissions in transport sector decline 1

Thousand tonnes, Germany

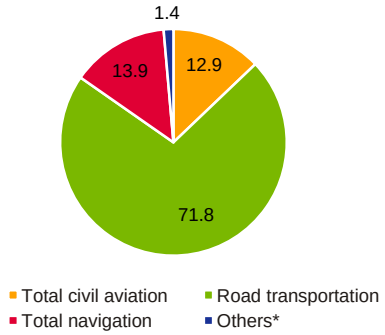


* Non methane volatile organic compounds

Source: Federal Environment Agency

Road transportation largest source of CO_2 emissions 2

Share of different modes of transport in total CO_2 emissions from transport, 2012, EU-28, %

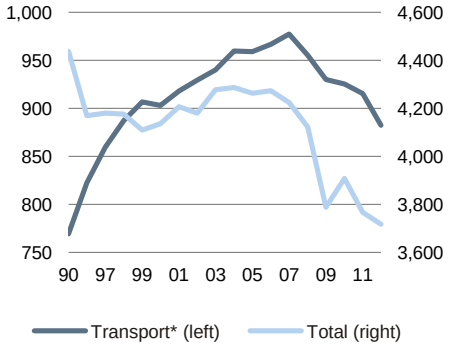


* Railways: excluding indirect emissions from electricity sector

Sources: EEA, Eurostat

Falling CO_2 emissions of late 3

Million tonnes, EU-28



* Excluding international aviation and sea shipping

Source: Eurostat

CO_2 emissions from cars

Regulation after 2020/21 still unclear

The CO_2 targets for new vehicles are currently the EU's most important instrument for achieving a further reduction in road traffic emissions.

In brief, the key provisions are as follows[1]:

— By 2015 newly registered passenger cars in the EU may not emit an average of more than 130 grams of CO_2 per kilometre travelled (g/km), based on the New European Driving Cycle (NEDC). By 2021 at the latest the target limit will fall to 95 g/km. The 2015 target will be attained as average CO_2 emissions were already 127 g/km in 2013.

— Heavier vehicles are allowed higher emissions. On a long-term comparison, however, the manufacturers of heavy (and usually larger-engined) vehicles have to make a larger absolute and relative reduction in the average CO_2 emissions of their fleet than those carmakers that mainly produce smaller cars.

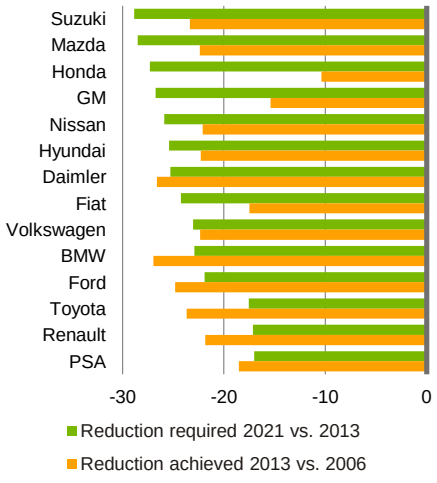
— If the target limits for CO_2 are breached, penalty payments of up to EUR 95 per gram and per vehicle are incurred.

— Certain technologies that are proven to reduce a vehicle's CO_2 emissions, but are not captured by the NEDC, may be counted towards the fleet target (up to a maximum of 7 g/km). The so-called eco-innovations can include, for example, the vehicle's thermal management (insulation of the engine bay, conversion of thermal energy into electrical energy).

— Vehicles with low emissions (below 50 g/km) can temporarily be counted towards the specific fleet target of the individual carmaker as more than one vehicle. Such vehicles can be counted towards the targets for 2015 between 2012 and 2015 and towards the targets for 2021 between 2020 and 2022. These so-called super-credits mean that one single such vehicle is counted as 2.5 vehicles in 2014 and 1.5 vehicles in 2015. No super-credits will be awarded from 2016 until 2019. Between 2020 and 2022 the factors will then drop from 2 (2020) to 1.67 (2021) and then to 1.33 (2022).

Much already achieved, still much to do 4

Reduction in CO_2 emissions (g/km) of newly registered cars in the EU by OEM*, %

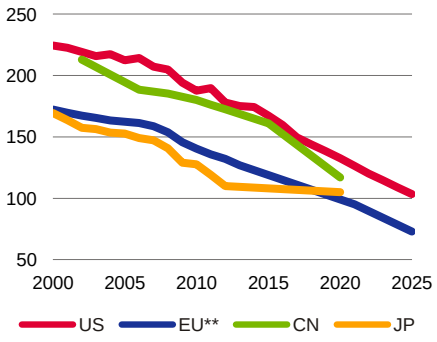


* Original Equipment Manufacturers

Sources: European Commission, Deutsche Bank Research

EU: Demanding targets 5

CO2 limits* for passenger cars in grams per kilometre, based on European driving cycle



* The US has annual target values. The EU, CN and JP are assumed to have a steady reduction path between the current value and the targets for 2015 and 2020.

** Value for 2025 is equal to the average of the proposal put forward by the Environment Committee of the European Parliament.

Sources: ICCT, EU

The 2021 target for newly registered passenger cars of 95 g/km represents a reduction of more than 25% compared with the level reached in 2013 (127 g/km). This is the most exacting target limit on an international comparison. For light commercial vehicles (vans) CO_2 emissions per kilometre are to fall to 147 g/km by 2020 (2012: 180 g/km).

The European Commission has announced that it will review the current legislation in 2015 and possibly make recommendations regarding longer-term CO_2 targets. In April 2013 the European Parliament's Environment Committee already called for CO_2 emission targets of between 68 g/km and 78 g/km in 2025; taking the mean value of this range (73 g/km), this would constitute a further reduction of 23%, and in just four years (i.e. just shorter than one model cycle)! This would make it an extremely ambitious target. Although there are still no official recommendations from the European Commission for concrete CO_2 targets after 2021, it currently looks as if the basic principle of manufacturer-specific targets is to be retained.

The CO_2 regulation for new cars at the EU level is thus basically settled until 2021. In the following we want to discuss the pros and cons of potential alternative environmental policy instruments for the subsequent period. We shall start, however, with a general assessment of the CO_2 target instrument.

[1] See European Commission (2014). Reducing CO2 emissions from passenger cars. Brussels. For further information see also Puls, Thomas (2013). CO2-Regulierung für Pkws. Fragen und Antworten zu den europäischen Grenzwerten für Fahrzeughersteller. Institut der deutschen Wirtschaft. Cologne.

Command and control regulations: Economically and ecologically inefficient

Command and control well suited to preventing acute pollution

CO_2 targets for passenger cars can be classified as traditional regulatory instruments (mandatory requirements, bans). Command and control mechanisms are particularly suited to cases where acute pollution is to be prevented or restricted to an environmentally acceptable degree. For example, the introduction or emission of pollutants into rivers or the atmosphere can be banned or specific limits can be set at levels regarded as ecologically acceptable or safe. As such, command and control regulation is very effective in the sense that it prevents or mitigates the acute cause of pollution.

At the same time, command and control regulations are characteristically very low in efficiency: all emitters must comply with mandatory standards and bans to the same extent, regardless of whether they find it easy or difficult to do so. As such, the same policy measure gives rise to differing costs for individual market participants, which is a sign of economic and ecological inefficiency.

Climate change is a global externality and not a regional source of pollution

If the specific CO_2 targets for passenger cars are examined according to these criteria, we come to a largely negative conclusion. Firstly, the CO_2 emissions by cars do not constitute an acute source of pollution. It is generally agreed that road traffic CO_2 emissions contribute to anthropogenic climate change. Road traffic in the EU accounts for around 2% of total global energy-related CO_2 emissions. Climate change is a global externality and not a regional phenomenon. In addition, climate change is occurring relatively slowly, and there is still considerable uncertainty surrounding the actual consequences and the speed of the processes. These aspects would thus argue against a ban on CO_2 emissions from road traffic.

High CO_2 mitigation costs in the vehicle technology sector

The current limits for passenger cars are of course to be understood more as an obligation and not as a ban. This does not, however, change the fact that they are inefficient. There are two aspects to this lack of efficiency: firstly, the individual automakers encounter differing levels of difficulty in complying with the limits, which results in the same target giving rise to differing costs. This aspect is addressed by applying limits that differ from manufacturer to manufacturer, but it is not thereby completely cancelled out. Secondly, with respect to efficiency it is, however, more serious that it is currently (a very great deal) more expensive to cut CO_2 emissions from cars by electrifying the drivetrain for instance than by using alternative measures in other sectors. If the money that the auto industry invests in complying with the targets were to be used for example to modernise heating systems in buildings or improve their insulation, the reduction in CO_2 emissions would be very much higher, because CO_2 abatement costs are much lower in the building sector.[2] So unnecessarily high costs are incurred in one industry without producing a macroeconomically better situation (lowest possible emissions for the costs incurred); we shall return to this aspect later.

Actual emissions given too little attention

Another disadvantage of the existing regime is that the CO_2 limits are not based on a vehicle's actual emissions but on its emissions determined according to the NEDC. It is common knowledge that a vehicle's actual emissions can differ widely from the official limit values. This impairs the effectiveness of the instrument. The instrument is thus unable to limit absolute CO_2 emissions from road traffic to a specific level.

[2] See McKinsey & Company (2009). Pathways to a low-carbon economy.

CO_2 limits for cars do not address a vehicle's actual emission

It is unusual that the command and control regulations are based on such theoretical limit values and not on actual emissions. In power plants, for example, there are certain limit values that have to be complied with via chimney-mounted measuring equipment. Given the numerous sources of emissions (cars) in road transport this problem appears unavoidable, however.

There are further effects that reduce the effectiveness of the instrument albeit so far only to a small degree: for instance in the existing regime battery electric vehicles (BEVs) have been treated as zero emission vehicles, although of course CO_2 emissions are a by-product of the electricity generation process. BEVs and plug-in hybrids (PHEVs) that emit less than 50 g/km CO_2 according to a special test cycle can – as mentioned above – also be temporarily counted towards the automaker's fleet target with a factor of more than 1. These super-credits are in our opinion generally ideal for promoting new propulsion technologies. One advantage of this instrument is that no costs are incurred by the public sector. True, super-credits will slightly mitigate the CO_2 target of the respective manufacturer. Since, however, the CO_2 abatement costs for e-mobility are high in any case, we consider this to be a poor argument.[3]

Super credits boost carmakers' incentive to bring alternative propulsion technologies to market

Ultimately it is an acceptable compromise that the CO_2 emissions caused indirectly by the electricity consumption of BEVs or PHEVs are not counted towards targets for passenger cars. Firstly, this provides an incentive to companies to bring such vehicles to market (despite the meagre margin per vehicle); this incentive is further amplified by super credits. Secondly, the electricity sector's CO_2 emissions at least in Europe are already covered by the EU Emissions Trading System (EU ETS). Within the EU ETS the transport sector's higher demand for electricity results – all things being equal – in higher prices for emissions allowances which are limited in number; true, this additional demand caused by the increasing electrification of the road transport sector is initially of little consequence. If, for example, 1 million electric vehicles consume an average of 20 kWh of electricity per 100 km and cover an average of 10,000 kilometres per year on Germany's roads, their additional power consumption would amount to just 0.3% of total German gross electricity consumption.

Potential and costs of additional emission reductions uncertain

The instrument of CO_2 targets should – leaving aside the fundamental considerations stated above – also be viewed sceptically with respect to pragmatic economic policy; this applies above all to possibly more demanding targets after 2021.

Electrification level must rise so that CO_2 targets can be attained

The target for 2021 of 95 g/km is considered ambitious, but not out of reach. The makers of larger cars in particular will have to electrify a significant part of the drivetrain to be able to comply with the required targets. However, the companies that operate primarily in the volume segment are also facing sizeable and cost-intensive investments. Higher car prices due to regulation are thus inevitable. Whether these higher acquisition costs for car owners can be amortised by lower fuel costs depends not least on how individuals drive and on how much they will have to pay for fuel in future. Nobody can provide any guarantees.

However, the situation will then become critical if even more ambitious targets for 2025 were already to be set soon.[4] The cost of reducing each additional gram of CO_2 increases disproportionately rapidly because the cheaper measures for boosting the efficiency of a conventional drivetrain will gradually

[3] See Heymann, Eric et al. (2011). Electromobility: Falling costs are a must. Deutsche Bank Research. Current Issues. Frankfurt am Main.
[4] See Heymann, Eric (2013). CO2 limits for new cars: Keep things in perspective! Deutsche Bank Research. Talking point. Frankfurt am Main.

Market share of alternative propulsion technologies to remain small for now

be exhausted. For example, the above-mentioned passenger car targets that the Environment Committee has proposed for 2025 cannot be achieved without extensive electrification of cars in almost all vehicle classes. The costs of different forms of e-mobility are indeed expected to decline. However, the degree of technological progress that can be achieved in this field is uncertain. There is also uncertainty about the degree to which the – in some cases – still immense cost difference between cars with (partly) electric propulsion technology and those with internal combustion engines will narrow by the given date. Most current market forecasts at least suggest that BEVs, PHEVs and vehicles with range extenders will remain (considerably) more expensive until the next decade – despite falling costs of these technologies. This holds especially for the small and compact car segment. One reason for higher costs is that economies of scale still cannot be achieved in manufacturing in the short term. That is one reason why these vehicles will not capture any major share of the market for the time being.[5]

Weakening of Europe as a manufacturing location

Higher costs of producing alternative propulsion technologies are a problem

These uncertainties show that very ambitious targets for 2025 harbour considerable risks. True, regulation always takes place in an uncertain environment. And without the government-imposed limits there would have been less pronounced advances in reducing fuel consumption of cars over the past few years. Nonetheless, regulatory efforts must not disregard either the laws of physics or economic realities. While it is technologically possible to manufacture vehicles that comply with the proposed targets, the related costs are currently inordinately high compared with the overall CO_2 savings and lower fuel costs for drivers. In plain English: if the authorities wanted the proposed targets to be met, then many private and also business customers in Europe and beyond might simply no longer be able to afford the cars. The relative price premium for new propulsion technologies is expected to remain high in the medium term especially in the small and compact cars segment. In order to offset the expected higher manufacturing costs (more) production capacities could be relocated (for example from western Europe to eastern Europe or from Europe to Asia and America).

Are alternative propulsion technologies still too expensive for emerging markets?

It is often argued that (even) stricter CO_2 limits would primarily hit those German automakers focused on the premium segment. Indeed, to comply with the targets after 2021 the makers of heavier/larger cars would have to probably continue reducing their CO_2 emissions faster than volume carmakers in both absolute and relative terms. Nevertheless, the danger does exist that excessively strict targets – such as those proposed by the European Parliament's Environment Committee – will also hurt French, Italian and also those German carmakers whose business is focused on the volume segment. This would harm the international competitiveness of European manufacturing facilities. So it may turn out that cars produced in Europe and designed to comply with EU targets can no longer hold their own in price competition outside Europe where targets are less exacting. In order to benefit from the rising demand for cars in Asia's growth markets, for example, European carmakers could even intensify the efforts anticipated anyway to relocate some of their production to the emerging markets and locally manufacture vehicles that are equipped with "slimmed-down", cheaper technology. Of course stricter targets in the EU would also hit importers, for instance from Japan or South Korea. For them, however, the EU is only a relatively small market in terms of their respective overall sales.

[5] See for example Roland Berger Strategy Consultants (2014). CO2 reduction 2021 and beyond: OEM strategies. Presentation at the Automotive Megatrends conference in Brussels.

Planned switch to new test cycle would have to be taken into account if new targets are set

The setting of stricter targets after 2021 will also be made more difficult by the fact that in the next few years the regime for determining passenger car targets is to be switched from NEDC to a globally applicable test cycle (Worldwide harmonized Light Vehicles Test Procedure, WLTP), which is supposed to correspond more closely with actual driving behaviour and be geared more strongly to the driver's actual car. This changeover is no minor task and requires several years of preparation. Each setting of targets for the period after 2021 would thus have to factor in that the basis for calculating these targets is supposed to change in the medium term.

Ultimately, these aspects are, however, detailed issues that concern the instrument of passenger car targets. This also applies, among other things, to those factors that are key to the individual calculation of company-specific fleet targets. In the EU and most other countries a manufacturer's average vehicle weight is the determinant of this individual factor. Accordingly, heavier vehicles may – as already mentioned – consume more fuel and emit CO_2, but at the same time they will also be required to achieve larger reductions. As such, the linkage is justified because heavier cars – all things being equal – consume more fuel. In the US the manufacturer-specific factor by contrast is based on the vehicle footprint, which is not necessarily linked with fuel consumption.

CO_2 target instrument no longer effective

Limit values for cars do not cap road transport CO_2 emissions

Although such details are important for the auto industry, as they have a major influence on the respective fleet targets and costs, the fundamental question that arises in light of the above-mentioned problems is whether the instrument of CO_2 targets has not in the meantime exhausted its rationale. Summarising the analysis up to this point, our assessment is very negative: the instrument is economically and ecologically inefficient. The high costs incurred in the auto industry compare unfavourably with the overall reduction in CO_2 emissions. Also, the instrument does not lead to an absolute capping of CO_2 emissions in the road traffic segment; the entire heavy-duty vehicle sector is (still) not even taken into account. Even stricter targets for passenger cars harbour a major risk to the competitiveness of Europe as a manufacturing location and potential sales there on account of the higher (production) costs that can be expected.

Of course these negative aspects are also tempered by several plus points. CO_2 targets do provide a European framework that is superior to a multiplicity of national regulations. The strict targets effectively compel the auto industry to make technological progress (even if the costs do not justify the benefits). Super-credits are generally ideal for promoting e-mobility, enabling economies of scale in production to be realised faster and at the same time apportioning the costs of this process on the auto industry; they are, however, used only sparingly. These advantages do not outweigh the disadvantages overall, in our opinion.

The yardsticks that should be used are the targets in other countries

Should the EU continue with CO_2 targets for passenger cars for the period after 2021, the yardsticks that should be used are the targets in other countries, especially from the US, China, Japan and South Korea. Internationally harmonised targets based on the same calculation principles would at least prevent excessive distortions from occurring with regard to the competitiveness of individual manufacturing facilities. Such an internationally harmonised approach is, however, unlikely as things currently stand. For instance, it is still unclear whether all countries will participate in the WLTP. Also, there are relatively large differences between the currently formulated targets of individual countries, as illustrated in chart 5 on page 3.

Since of course road traffic should make its contribution to achieving environmental and climate policy objectives, the question that arises is which

alternative instruments exist that can enable the sector's CO_2 emissions to be reduced. In the following we present such alternative instruments along with their advantages and disadvantages.

Fuel taxes: Consumption-based charges and fiscal effects, …

Fuel taxes (from now on referred to as petroleum taxes) are a traditional instrument that enables the internalisation of the external effects of road traffic. Petroleum taxes are of course a key source of fiscal revenue in many countries. A higher petroleum tax rate reduces – all things being equal – the demand for petrol and diesel and thus results in lower CO_2 emissions by road traffic.

Instead of stricter CO_2 targets for passenger cars there could be increased fuel tax rates in future. This instrument offers a number of benefits:

— Petroleum tax is established in all countries and can easily be collected or adjusted in terms of rate.

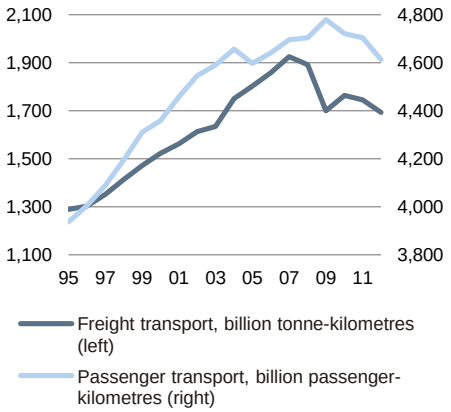
— A higher petroleum tax rate applies to all road traffic, i.e. to heavy-duty vehicles and not only cars and light-duty vehicles.

— The basis for calculating petroleum tax is a vehicle's actual fuel consumption and not the theoretical amount. High-mileage drivers with a "sporty" driving style pay higher taxes, whereas those whose approach to driving is anticipatory are rewarded; not using a car is rewarded in any case.

— Since the demand for fuel is relatively inelastic at least in the short term a higher petroleum tax generates positive fiscal effects – i.e. higher tax revenues.

Lower transport volume 6

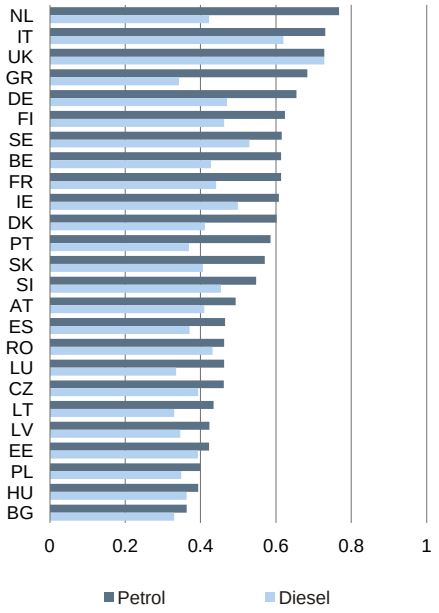
Transport volume, EU-28



Source: Eurostat

Huge differences 7

Indirect taxes on fuel, 2013, Cents per litre



Source: European Commission

... but implementability is difficult

True, higher petroleum tax rates are not a panacea. They also have some disadvantages and/or problems:

— Petroleum taxes cannot guarantee that fuel consumption and/or absolute CO_2 emissions from road traffic are limited to a desired amount. The instrument is thus ineffective with respect to this objective. The demand for petrol and diesel increased especially in the second half of the last century because despite higher taxes and fuel prices the level of motor vehicle ownership in the population increased continually. Efficiency gains as well as partially declining mileage per vehicle were offset by the overall increase in vehicles on the road and increases in total road traffic volume (rebound effect). Only since the end of the last decade has the road traffic volume in the EU been on the decline, with economic weakness being the main reason for this in the road freight segment.

— Taxes in the EU are a matter for the member states. Although the European Commission has for years been pushing for greater harmonisation of energy taxes, petroleum taxes do in fact still vary relatively widely within the EU. For example, the tax on petrol in the EU state with the highest rate (the Netherlands) is more than twice as high as in the country with the lowest rate (Bulgaria). In order to minimise competition effects ("petrol station tourism" in this case) it would be desirable for increases in tax rates to be as uniform as possible in all EU states. Since alternatives to the CO_2 regulations would only be required for the period after 2021, there would be enough time to prepare and implement an increase in petroleum taxes in all EU states.

— Advocates of CO_2 targets for passenger cars argue that a tax solution would not entail any direct compulsion for the auto industry to increase the efficiency of its vehicles or bring alternative propulsion technologies to market; this argument is correct at first glance. Nevertheless, the stiff competition in the sector, the upward trend in oil prices and changing customer preferences ensure that sufficiently strong incentives exist for the auto industry to continually improve the efficiency of their vehicles. All around the world a vehicle's energy efficiency is becoming an increasingly important criterion for car buyers. This process would be boosted further by the early notification of increases in petroleum tax rates implemented over several years. The electrification of the drivetrain would, however, be expected to occur more slowly because this is currently induced primarily by the strict CO_2 targets.

— Higher petroleum taxes have social implications. Those people who need to have their own car (commuters, rural inhabitants) would be hit harder by higher tax rates than other demographic groups and would be virtually unable to avoid them in the short term. Nevertheless, this social problem could also be at least mitigated with enough advance warning, as a certain grace period would make it easier for people to switch to more efficient vehicles, car pools and/or public transport.

Tax solution yields more advantages than disadvantages compared with a further tightening of limit values

In the end, the tax solution is superior to a further tightening of CO_2 targets. With regard to the absolute CO_2 emissions of road traffic an increase in petroleum tax rates announced in advance and introduced gradually over several years is unlikely to give rise to significantly worse outcomes (if at all) than under the existing regime of CO_2 targets, but with much lower macroeconomic costs. The costs to the auto industry would be considerably lower with the tax solution. The state could receive additional tax revenues.

Taxes on motor vehicles: Sensible complement

A vehicle tax related more strongly to the CO_2 emissions of the vehicle would be a good complement to higher petroleum taxes. Although the vehicle tax is not based on actual CO_2 emissions and is usually levied once a year as a flat fee, it can serve as a yardstick for private and commercial car buyers. Higher tax rates for vehicles with above-average CO_2 emissions could co-exist with tax relief for electric vehicles, for example. In order for the vehicle tax to steer demand appreciably towards low-emission vehicles the tax rate would need to have a wide range of levels. This would in turn provide an incentive for the auto industry to boost the efficiency of the vehicle fleet. It is politically difficult to harmonise the taxation of motor vehicles at the European level. All the same, differing national regulations for vehicle tax would not be a problem on account of the overall rather small impact.

Emissions trading: Absolute cap on CO_2 emissions guaranteed

Emissions trading provides exemplary effectiveness and efficiency

To date, the transport sector – excluding the European aviation segment – has not yet been integrated into the EU Emissions Trading System. The EU ETS mainly covers the power industry and energy-intensive industries, that is major emitters. The fundamental principle of emissions trading is to set an upper limit on emission allowances for CO_2 or other greenhouse gases (cap). The allowances are distributed to market participants via a pre-established allocation procedure (e.g. auction) and may then be traded. For example, those companies which are able to reduce their emissions at low costs may sell their surplus allowances to companies that have higher CO_2 mitigation costs. Thanks to trading, CO_2 emissions are ultimately reduced where it costs the least to do.

So the instrument of emissions trading is a winner – at least in theory – due to its high effectiveness (the reduction target is reached) and efficiency (lowest cost possible). If the allowance ceiling falls over time, the price of allowances will – all things being equal – increase, which in turn will make it lucrative to implement new reduction measures.

EU ETS under fire due to fall in the price of allowances

The EU ETS has become the subject of criticism in recent years because allowance prices have plummeted; this is why the incentives for the participating companies to invest in low carbon technologies are too low, according to the critics. The price deterioration is mainly attributable to three factors: First of all, the EU economic crisis has resulted in lower demand for CO_2 allowances. Second, the inflows of allowances from international emission reduction projects outstripped expectations. And third, the allocation of (free) allowances to companies was overly generous in the past. As a result, the supply of allowances exceeded demand and prices fell over the past few years. Despite this criticism, the EU ETS enables the stipulated CO_2 reduction target to be reached – ultimately at much lower cost than expected.

Road transport can be integrated into EU ETS via an upstream approach

Probably one important reason why the transport sector has not yet been integrated into the EU ETS is the multitude of small emission sources whose individual integration would trigger high transaction costs. Having said that, road transport could be integrated into EU emissions trading via what is known as an upstream approach. In this case, neither the individual vehicles nor their owners would take part in the EU ETS, but instead the producers of fuels, that is the refineries. If fuels were imported from outside the EU, the importers would also have to participate in the EU ETS. Of course the cap on emissions allowances would have to be revised upwards if these players were to be included in the EU ETS.

Then, for every unit of petrol or diesel (ultimately also natural gas) sold, refineries and importers would have to present as many CO_2 allowances as are equivalent to the CO_2 content of the fuel sold. This would limit the number of additional market participants to relatively few companies or facilities. The costs of these allowances would be added to the price of petrol and diesel. An upstream approach also appears appropriate not least because with electric vehicles CO_2 emissions are also regulated at source – that is in the electricity sector – via the EU ETS. As such, it would simply be logical for the fossil fuels consumed in the road transport segment to be included upstream in emissions trading. However, the premium would probably be moderate even if prices of CO_2 allowances were considerably higher. In this regime, a CO_2 price of EUR 30 per tonne would correspond to a premium of roughly 7 cents per litre of petrol and 8 cents per litre of diesel. By comparison: the CO_2 price is currently close to EUR 7 per tonne. Conversely, the petroleum tax on petrol in Germany for instance is equivalent – on paper – to an allowance price of about EUR 280 per tonne of CO_2 (and on diesel about EUR 178 per tonne because of a lower tax rate). These values are an indication of the high CO_2 mitigation costs in the automotive industry.

Political obstacles can be overcome

Emissions trading guarantees capping of CO_2 emissions

Integrating road transport into the EU ETS would be linked with many benefits, from our point of view. First and foremost, of course, are ecological effectiveness and economic efficiency. This combination is not offered by any other environmental policy instrument. Emissions trading is the superior approach especially if the political focus is on capping CO_2 emissions. Further targets for cars or other vehicles would no longer be necessary. Besides, this instrument is technologically neutral.

One further benefit is that a European framework already exists in the shape of the EU ETS. Before the beginning of the next decade there is sufficient time to wrap up the organisational preparations for the integration of road transport (and other transport segments) into emissions trading. The current EU ETS trading period ends in 2020. Discussions are being held on potential reforms of the instrument at present anyway, a major reason being to eliminate the current structural oversupply of allowances. The EU has recently declared that it will continue to bank on the (revitalised) EU ETS as the most important climate policy instrument, which we welcome.[6] As part of a reform of EU emissions trading, which should comprise long-term CO_2 reduction targets, it would make sense to integrate the transport sector into emissions trading, too. As already mentioned, transport generates close to 24% of total CO_2 emissions in the EU. This would substantially boost the effectiveness of overall European climate protection policy.

EU declares ist ongoing future commitment to emissions trading

Integrating road transport into the EU ETS would impact competition in other sectors

Naturally, the integration of road transport into emissions trading would have economic policy implications. Given the pronounced willingness and ability of the transport sector to pay for mobility, the CO_2 mitigation measures would probably be shifted into other industries participating in the EU ETS. In these other industries, CO_2 mitigation costs are lower as a rule than in the case of sophisticated vehicle efficiency technologies, but considerably higher allowance prices would hurt the competitiveness of energy-intensive industries vis-à-vis their peers outside the EU, for instance. This competition effect naturally hinges on how ambitious climate policy targets will prove to be outside the EU from 2020. The EU decision to reduce CO_2 emissions by at least 40% compared with 1990 by 2030 shows that it is making the first move with respect to the US and China, even though these two countries have announced long-term climate targets of late.[7] Light should be shed on the climate policy targets of other countries at the latest during the UN climate conference in Paris at the end of 2015. Any potential competition policy disadvantages for certain industries (for instance if no breakthrough is achieved in Paris and major competitors of the EU do not commit to ambitious and binding climate targets) could also be addressed in future via special treatment when allowances are allocated (e.g. largely free allowances for process-related emissions in, say, segments of the building materials industry or particularly energy-intensive companies involved in international competition).

Oil prices and competition in the auto industry remain drivers of technological progress

Critics of integrating road transport into the EU ETS fear that there is too little incentive for the auto industry to develop and market energy-efficient technologies.[8] To be frank, this would not make a particle of difference in respect of the CO_2 reduction target, because thanks to the EU ETS this target would be achieved in any event, and at the lowest cost possible. And ultimately the top priority of climate policy should be to cut CO_2 emissions at the lowest possible macroeconomic cost. Another aspect deflating the critics' argument is that upward trending oil prices and the competition in the sector will lastingly remain two key drivers of innovation in the auto industry. In fact, the costs of different forms of e-mobility are set to decline. Additional enforcement of their market penetration through stricter CO_2 limits will become less important in the course of the coming decade. Emissions trading would certainly not create any compelling reason for the auto industry to market particularly expensive technologies. Compared with even stricter CO_2 targets for cars, the costs to the auto industry would be much lower if road transport were integrated into the EU ETS. Moreover, the concerns could be assuaged if the industry were at least not allowed to fall below the CO_2 limits prescribed and reached until then.

[6] See Heymann, Eric (2014). EU climate targets: High degree of flexibility highlights conflicts within the EU. Deutsche Bank Research. Talking Point. Frankfurt am Main.
[7] See Heymann, Eric (2014). US and China reach climate protection agreement: A bird in the hand is worth two in the bush. Deutsche Bank Research. Talking Point. Frankfurt am Main.
[8] See Transport & Environment (2014). Three reasons why road transport in the ETS is a bad idea.

Interim conclusion: Emissions trading and tax solution are superior to (a further tightening of) CO_2 limit values

Summing up, we note that the integration of road transport into EU emissions trading by means of an upstream approach is superior to the instrument of CO_2 limit values for cars on the counts of ecological effectiveness and macro-economic efficiency. This applies in particular if a cap on CO_2 emissions enjoys top political priority. Compared to tightened limit values after 2020/21, the tax solution would show more advantages than disadvantages. None of the three instruments discussed can be implemented without political opposition. Nonetheless, if policymakers should decide that CO_2 limit values for cars are also to remain the instrument of choice after 2021, it would at least be appropriate to gear them to the other large auto markets.

Further supplementary measures possible

Apart from the instruments already discussed – CO_2 limit values, higher taxes on fuels and EU emissions trading – further supplementary measures focusing on CO_2 emissions in road transport are also conceivable:

Consumption labelling

— Energy consumption labels for cars, which are mandatory not only in the EU, for instance, give customers an overview of a vehicle's fuel consumption and CO_2 emissions.

Privileges in the road transport segment

— Particularly energy-efficient cars (e.g. BEVs or PHEVs) could be promoted via preferential treatment in traffic flows. This can be done by granting exclusive use of dedicated lanes or reserved parking areas. Conversely, cars with internal combustion engines or high CO_2 emissions could be banned from use in certain city districts or their use could be made more expensive by, say, a congestion charge or a city toll. However, such an instrument would only provide an incentive in a few cities with both high traffic volumes and adequate existing infrastructure. Moreover, some of the above-mentioned privileges (exclusive use of specific lanes and parking areas) only function as long as there are only a few users that benefit.

Ecological differentiation of road tolls

— Similarly, the motorway tolls collected in many countries could also contain a greater ecological component – such as a car's CO_2 emissions. In order to minimise transaction costs, however, this would probably be predicated on electronic toll collection, so that the differing CO_2 emissions of a vehicle are always recorded and invoiced automatically. Data protection aspects would, of course, also have to be clarified.

Promoting fuels with low CO_2 emissions

— Policymakers could temporarily or permanently impose a lower tax on lower-carbon fuels (e.g. natural gas, sustainably generated bio-fuels) than on petrol or diesel. Natural gas, in particular, has – to date – been a severely underrated alternative in road transport (a bridge technology, so to speak).[9]

Direct or indirect subsidies

— Many countries pay direct subsidies on the purchase of a BEV or PHEV in order to foster their market penetration. We take a critical view of direct subsides given the high CO_2 abatement costs discussed earlier and chronically tight public budgets. Furthermore, this market intervention favours a specific type of technology, and policymakers cannot possibly know whether or when a given technology can hold its own without subsidies. Via heavy subsidies it is indeed possible to help smooth a technology's entry into a defined market. However, this can also block the

[9] See Energiewirtschaftliches Institut an der Universität zu Köln (2014). Potentiale von Erdgas als CO2-Vermeidungsoption. Cologne. See also Heymann, Eric (2012). Natural gas as a fuel for road vehicles: The underrated alternative. Deutsche Bank Research. Talking Point. Frankfurt am Main.

way for other technologies which would be better economically and/or ecologically in the long run. Ultimately, subsidies lead to vested interests, which is why they are always hard to eliminate later on. Indirect public support measures were to be preferred to direct subsidies. The German National Platform for Electric Mobility recently suggested supporting purchases of commercially owned/used electric vehicles through an accelerated depreciation of 50% in the first year.[10]

On balance, most of the measures outlined here are at best a possible supplement to a more extensive regime. What this all boils down to is that the integration of road transport into a reformed and revitalised EU emissions trading regime from 2020/21 is an approach that is ecologically and economically superior to further even stricter CO_2 limit values for cars.

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[10] See National Platform for Electric Mobility (2014). Fortschrittsbericht 2014 – Bilanz der Marktvorbereitung. Berlin.

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