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ZEW policy brief

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The 'Diesel' Debate: Economic Policy Recommendations

Challenges from an economic perspective

Diesel technology and the harm that its use causes in the form of local and global pollutant emissions have long been in the focus of environmental policy debates. Even the option of imposing driving bans on diesel cars is now a distinct possibility. Thus far, however, what this diesel debate has unfortunately largely neglected is the economic perspective.
The question at the heart of the diesel debate is what is the best way of fulfilling and reconciling the disparate desires for mobility, good health and an intact environment going forward? Economists' key demand here is that policymakers should address the issue of negative externalities and set a technology-neutral price on the associated activities. This would ensure – from an economic perspective – that social objectives are achieved at the lowest possible cost for consumers and industry alike.
This ZEW policy brief considers various negative externalities arising from the use of internal-combustion engines and proposes economic policy instruments as part of a long-term strategy to mitigate these effects.

KEY POLICY RECOMMENDATIONS //

The following measures would make economic sense as part of attempts to mitigate local transport-related environmental harm such as polluted air and congestion and to avoid transport-induced CO_2 emissions cost efficiently:

- Road use in cities should be regulated by congestion charging linked to the volume of traffic and the local levels of pollution. Congestion charging is clearly preferable to measures such as driving bans because it provides people with choice while mitigating local environmental harm such as polluted air and congestion.
- Climate policy needs to take account of the fact that, because of the already high level of fuel tax on mineral oil, it is relatively expensive to avoid traffic-related CO_2 emissions. Cost-efficient climate policy should therefore achieve additional CO_2 abatement in the sectors of the EU Emissions Trading Scheme or integrate the transport sector into this scheme.

CURRENT SITUATION – GROWING PRESSURE ON POLICYMAKERS AND CAR PRODUCERS IN GERMANY

The pressure on policymakers and car producers to introduce effective and ambitious measures to mitigate the various harmful effects of road traffic has recently grown sharply.

Air quality is a case in point. Back in early 2017 the European Commission sent a final written warning to Germany and four other EU Member States, urging them to refrain from repeatedly exceeding the limits on air pollution caused by nitrogen oxide (NOx). In doing so, the Commission pointed to repeated infringements of the EU Directive on air quality (2008/50/EC), which commits the Member States to protect their citizens against harmful air pollutants. Despite these obligations it remains a problem for many places in Europe to keep their air clean. Twenty-three out of 28 Member States – and more than 130 cities – consistently fail to comply with the relevant limits. In Germany this affects 28 air quality areas, including Berlin, Munich, Hamburg and Stuttgart. One consequence of the high concentrations of NOx is that many people suffer from respiratory and cardiovascular disorders. This can exacerbate the symptoms observed in asthmatics and people with existing medical conditions. At the beginning of this year the EU's Environment Commissioner, Karmenu Vella, reiterated the Commission's efforts in this regard and notified the ministries responsible in Germany and eight further Member States that infringement proceedings had been instituted and the case could be referred to the European Court of Justice (European Commission, 2018).

Focus on NOx emissions from diesel vehicles

The focus of the debate has now shifted to diesel vehicles. Around 40 per cent of EU-wide NOx emissions are produced by road traffic, roughly 80 per cent of which is attributable to diesel vehicles (European Commission, 2017). It should be noted that NOx emissions in Germany, for example, fell by more than 1.7 million tonnes, or 59 per cent, between 1990 and 2015, with the sharpest decrease (1 million tonnes) coming from road traffic (German Environment Agency, 2017a). Despite the reductions already achieved, for example through exhaust gas after-treatment by catalytic converters, road traffic remains by far the largest source of NOx emissions.

Urgent action is required especially following the latest decision by Germany's Federal Administrative Court. Two rulings handed down by the judges at the end of February 2018 rejected appeals lodged by the German federal states of North Rhine-Westphalia and Baden-Württemberg against first-instance court decisions (Federal Administrative Court, 2018). These court rulings now appear to have paved the way for the gradual introduction of diesel driving bans, although the principle of proportionality must be safeguarded here. What this means in practice is that vehicles of the Euro 5 emissions standard in Stuttgart's low-emission zone cannot have bans imposed on them before 1 September 2019. The option of allowing exemptions for tradesmen and certain groups of residents, for example, is also being considered.

Several policy instruments in the political debate

Anyone following the recent political debate on how to mitigate the harmful effects of road traffic will notice parallels with the German general election campaign in 2017, when the so-called 'diesel crisis' became a major election issue during the final stages of the campaign. Politicians vied with each other by making increasingly radical demands to introduce quotas for electric cars, bans on driving diesel vehicles, and a binding commitment to phase out internal-combustion engines. The debate in the wake of the ruling by Germany's Federal Administrative Court fuelled additional demands to introduce free local public transport, colour-coded permit stickers for low-emission zones, and an obligation to upgrade older diesel engines at the expense of the car manufacturers.

The fact of the matter is that cars cause less harm to the local environment and climate now than they did in the past. Specific emissions of both local pollutants and greenhouse gases per person-kilometre travelled have fallen since 1995 (German Environment Agency, 2017b). At the same time, however, the increase in total road mileage since 1995 (which in the case of diesel cars, for example, has risen by 185 per cent) offsets the reductions already achieved owing to efficiency improvements and reflects the growing need for mobility. This situation is illustrated by the total vehicle population over time: the total number of registered cars in Germany in 2017 was 45.8 million, which was an increase of 1.6 per cent on the previous year (German Federal Motor Transport Authority, 2017). Consequently, traffic-related greenhouse gas emissions (CO2) in 2015 had fallen by only 2.2 per cent overall compared with 1990.

Immediately following the Paris climate conference the Board of Academic Advisers to Germany's Federal Ministry of Transport and Digital Infrastructure published a report (BMVI, 2016) that called for a concrete long-term strategy to be devised for transport. It argued that climate protection required internationally coordinated efforts to reduce greenhouse gas emissions, and these needed to be supplemented by voluntary private and municipal initiatives.

WHAT WOULD AN ECONOMICALLY SENSIBLE LONG-TERM TRANSPORT STRATEGY LOOK LIKE?

Externalities justify regulation

Economists talk of externalities when the actions of one party affect the benefits enjoyed by other parties without the acting party having adequately taken this into account. Where there are negative externalities, an actor incurs social costs that he himself does not have to pay either fully or partially. In the absence of any regulation we would expect the actions concerned to be performed excessively and the social benefit to fall to a sub-optimal level. First we need to identify what kinds of negative externalities are caused by road traffic. The transport policy debate should focus primarily on the external costs incurred by the use of roads. Here we can essentially identify five kinds of negative externalities caused by traffic: (i) local pollutant emissions such as particulate matter, sulphur dioxide (SO2) and NOx, (ii) CO2 emissions, (iii) congestion, (iv) road accidents, (v) noise emissions.

The following sections explain and discuss measures that could address the first three of the points listed here.

Regulate road use in cities by means of congestion charging

The problem of traffic-related air pollution in inner cities caused by local pollutant emissions can be efficiently solved by congestion charging. The principle behind such congestion charging is simple: if car drivers want to use urban roads, they have to pay a fee – the congestion charge – every time they do so. Those who drive frequently pay a lot, while those who rarely drive into the city pay less. The amount charged for urban driving should be strictly graduated on a scale according to the pollutant emissions, irrespective of the technology or the type of fuel used. So, for example, vehicles with lower emissions standards would pay higher congestion charges than a state-of-the-art Euro 6d-TEMP engine. The adverse consequences of driving, the cost of which has traditionally been borne by society as a whole, are therefore made visible and are charged specifically to the actual polluter. Clean air can then no longer simply be polluted for free. The externality of air pollution is 'internalised', as economists say. Appropriately priced congestion charging would also address other local externalities of road transport such as congestion. Cities such as Singapore, London and Stockholm have been pursuing this approach successfully for years.

From an economic perspective, congestion charging is clearly preferable to currently hotly debated measures such as diesel driving bans, especially as it improves the air in cities at lower social cost. If congestion charging imposes an additional cost on urban driving, this creates effective incentives for drivers to change their behaviour. Environmentally friendlier alternatives such as buses, trains and cycling will become cheaper than driving and therefore more appealing for many people. The higher the congestion charge, the more drivers will leave their cars at home and use other modes of transport. Those who commute to work daily could share cars to save on congestion charges. Some journeys will not be undertaken at all. However, the often-cited tradesmen would still be able to use their own vehicles to drive into cities.

Congestion charging creates incentives while allowing choice

The key point here is that congestion charging provides those affected with a choice. They themselves can decide whether or not it is worth driving their car into the city centre. Whenever the individual benefit is greater than the associated social cost, they will pay the charge, otherwise they will look for alternatives. This is ideal for society.

By imposing driving bans, on the other hand, cities are depriving people of choice and creating a fait accompli. And the environmental impact of driving bans is fairly controversial. A case in point is Mexico City, where for many years now there has been a regulation that the last number on a car's registration plate determines whether or not the car is allowed to drive into the city on a certain weekday. Ones and twos, for example, are banned on Thursdays. Fewer cars, less pollution – that's the idea, at least. Studies show, however, that this idea did not work out ultimately and the regulation was unsuccessful (Davis, 2008; 2017). Why? Because many people in Mexico City simply bought a second car (different registration plate!) to circumvent the driving ban. The fact that most of the additional vehicles brought onto the streets as a result were older used – i.e. dirtier – cars was counterproductive for the city's air quality.

Diesel driving bans are expensive and unfair

Driving bans in German cities – especially those limited to diesel vehicles – would probably achieve a certain local environmental impact. However, the social costs involved would be disproportionately high and unfairly distributed. All diesel drivers – and those alone – would be punished by such driving bans. Their vehicles would then be unusable on certain routes. Their resale value would plummet, and this would even affect diesel vehicles that were never or only rarely used in city centres. Their owners would suffer a huge depreciation of their property. Although congestion charging would also presumably reduce a car's resale value, this would happen to a lesser extent than with a driving ban and not virtually right across the board but dependent on the level of pollutant emissions.

It is, of course, the case that exhaust fumes from petrol engines are also harmful to the air in German cities. However, a diesel driving ban does not send a signal to drivers of petrol-engine cars to restrict their mileage. In fact, exactly the opposite will apply in the short term as urban driving will become more attractive for them because the diesel ban will free up the roads. In the medium term, however, those affected by the ban will not be able to manage without a car and so will replace their diesels, most of them presumably buying petrol-driven vehicles. This would be costly and impose a greater burden on all households' finances than a congestion charge, which only makes individual journeys more expensive (painful though this would be for poorer households). Ultimately, at any rate, the roads would be congested again and the environment would hardly benefit at all. What is clear, therefore, is that clean air will not be a free lunch. Congestion charging imposes costs on individual households. For car owners, however, these costs are transparent and easy to understand – in contrast to driving bans and compared with potential attempts by car manufacturers to pass on to their customers the cost of having to upgrade older engines.

Adjusting the level of congestion charge optimises its incentive effect

Congestion charging creates lasting incentives to manage without a car, whether it has a diesel or petrol engine. New information technology enables the charge payable to be flexibly adjusted in line with the particular volume of traffic and the current pollutant concentration. The busier the roads and the more polluted the air, the higher the charge should be. The price mechanism therefore signals to drivers when their behaviour is especially harmful to people and the environment, thus further optimising the incentive effect of the congestion charge.

And congestion charging offers yet another advantage over driving bans: cities can use the introduction of such charges to raise revenue. Cities would essentially be free to choose what they did with these funds, and there are more than enough potential uses everywhere. The money could be invested in the expansion of local public transport. However, the introduction of free public transport, as some are calling for in the current debate, could well have unintended substitution effects, as demonstrated by the example of Tallinn in Estonia. The most frequent users of the free public transport system here were primarily those who had previously been travelling by bus or train anyway or who had already been cycling or walking around the city (Cats et al., 2017). This change of behaviour should not be subsidised.

Congestion charging provides cities with additional revenue

So does this mean that congestion charging merely imposes obligations on consumers, whereas companies do not have to make any financial contribution? Firstly, it is correct to say that this regulation will make driving more expensive. On the other hand, it will improve air quality and reduce road congestion. In addition, this regulation puts pressure on companies to bring new technologies to market so that they can compete successfully with other car manufacturers and other modes of transport. In order to ensure a level playing field over the long term, the intention is also to harmonise regulation on pollutant emissions across all modes of transport.

Cost-efficient climate protection in road traffic through standard carbon price

High implicit carbon tax on fuel

Unlike local pollutants such as NOx, carbon dioxide (CO2) is a global pollutant that disperses equally throughout the atmosphere. Its harmful impacts therefore arise irrespectively of where the emissions occur. As far as climate effects are concerned, it is thus irrelevant in what sector or country the CO2 is avoided. But, in that case, how should carbon emissions from road traffic be reduced? When considering the issue of carbon emissions in the transport sector, it is important to realise that this sector already bears a considerable burden of, among other things, implicit carbon taxes. This may come as a surprise, but mineral oil – for cars essentially petrol and diesel (with the focus here on the latter) – is relatively highly taxed in the EU. In Germany the fuel tax on diesel amounts to roughly €0.47 per litre. The average tax rate in the EU is slightly lower. In the case of fossil fuels there is now a fixed relationship between the quantity of fuel used and carbon emissions. This is because there is currently no cost-effective technology available for filtering CO2 emitted by road traffic. Irrespective of whether you are driving a Dacia Logan or a Mercedes-Benz S-Class, the combustion of one litre of diesel always produces 2,639 grams of CO2. The fuel tax can therefore be directly translated into a carbon tax (measured in euros per tonne of CO2). The tax rate currently applicable in Germany for each tonne of CO2 produced by the combustion of diesel in cars is therefore around €180 (excluding value added tax). For petrol the relevant tax rate is roughly €280 per tonne of CO2 owing to the higher fuel tax applied.

From an economic perspective, this implicit carbon tax has an important effect – namely on the incentives for the individual driver to make an effort to avoid CO2 emissions (Weimann, 2008; Sturm and Vogt, 2011). When purchasing a new car, people have a choice between various features such as, for example, engine performance and fuel consumption. For the same level of performance, engines that use less fuel cost more. Buyers therefore have to weigh up the competing criteria of higher purchase costs versus lower fuel consumption. This is exactly where the calculation outlined above applies. What does a fuel-efficient engine cost and how much does it save? Relatively inexpensive, more fuel-efficient technologies (less than €180 per tonne of CO2 for diesel cars) are popular with buyers, whereas relatively expensive ones (more than €180 per tonne of CO2) are not. However, the saving effect on the demand side in terms of fuel consumption and, consequently, the CO2 emitted by car traffic also has an impact on the supply side. It is only worth investing in new, more fuel-efficient technologies for diesel cars if they cost less than €180 per tonne of CO2. There will be no demand for more expensive technologies. Because the car-selling market is highly competitive, it is reasonable to assume that the technologies that have been successful and are already installed in diesel cars are those costing less than €180 per tonne of CO2. This means that each additional tonne of CO2 abatement by diesel cars on the road costs at least €180. In other words, €180 is the marginal abatement cost of CO2 for diesel cars.

Standard carbon price safeguards climate policy at the lowest cost

A key finding of environmental economics is that a cost-efficient climate policy can only be successfully pursued if the marginal abatement costs are the same for all carbon emitters in an economy (Sturm and Vogt, 2011). Cost efficiency here means that a mitigation target is achieved at the lowest possible cost. As soon as there are variations in marginal abatement costs, either the cost of climate policy can be reduced for the same level of emissions, or more climate protection can be achieved for the same cost. For the transport sector in Germany the fundamental problem is that the marginal abatement costs of CO2 for diesel cars are €180 per tonne of CO2. In the EU Emissions Trading Scheme (ETS) for CO2, on the other hand, carbon emitters have marginal abatement costs that are 18 times lower than those for car traffic. The price of certificates equals the marginal abatement costs in the EU ETS and is currently around €10 per tonne of CO2. What does this mean for the costs of climate policy? Well, an additional tonne of CO2 abatement in the EU ETS costs roughly €10 per tonne of CO2. For diesel cars, by contrast, this cost is 18 times higher (and for petrol-driven cars it is 28 times higher). Such a climate policy is not sensible because it is more expensive than necessary. From an economic perspective it is therefore definitely a mistake to seek to protect the climate by varying or even increasing fuel tax. For the same reason, the requirements imposed by the EU Commission in respect of cars' carbon emissions are inconsistent with the principle of cost efficiency (Sturm and Vogt, 2011). At the same time it is evident that relatively inexpensive CO2 abatement options are available in the sectors of the EU ETS, i.e. outside the transport sector.

Reduce quantity of certificates in EU ETS or integrate transport sector into EU ETS

But what would a cost-efficient climate policy look like? The key point is that all carbon emitters in an economy should receive the same signal regarding the scarcity of CO2 emissions. The same carbon price must therefore apply everywhere, irrespective of whether this price is generated through a tax or an emissions trading scheme. Because the price in the EU ETS is much lower than the carbon price for the transport sector, the quantity of certificates in the EU ETS should be reduced. This would raise the price in the EU ETS and narrow the difference in marginal abatement costs. A further option would be to integrate the transport sector into the EU ETS (Achtnicht et al., 2015; BMVI, 2016). This would be possible from a purely technical point of view if, for example, refineries had to purchase the appropriate quantity of certificates for each tonne of fuel brought into circulation. In such an expanded EU ETS there would then be a fixed quantity of tradeable certificates for the current EU ETS sectors and the transport sector. Despite the fact that fuel prices would rise slightly as a result (although not if fuel tax were lowered commensurately), the advantage of this policy would be that it would be possible to increase CO2 emissions in the transport sector without increasing the EU's total emissions – the quantity of certificates in the expanded EU ETS would, after all, be fixed. This would cause prices in the EU ETS to rise, and additional CO2 abatement would then take place in the other ETS sectors outside the transport sector (because they have relatively low marginal abatement costs).

CONCLUSION //

What the ‘diesel’ debate has unfortunately largely neglected so far is the economic perspective. The question at the heart of the debate is what is the best way of fulfilling and reconciling desires for mobility, good health and an intact environment going forward? Economists’ key demand here is that policymakers should address the issue of negative externalities and set a technology-neutral price on the associated activities. This would ensure that social objectives are achieved at the lowest possible cost for consumers and industry alike. Congestion charging for the use of roads in cities and a standard carbon price as part of a cost-efficient approach to climate protection would constitute suitable economic policy instruments for devising a long-term strategy.

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