BEACON Bridging European & Local Climate Action

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# COMPANY CAR TAXATION IN SWEDEN

## Study

On behalf of:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

European Climate Initiative EUKI

of the Federal Republic of Germany

**Company Car Taxation in Sweden**
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of the Federal Republic of Germany

# Abbreviations

| | |
|---|---|
| BEV | Battery Electric Vehicle |
| BMU | Federal Environmental Ministry (‘Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit‘) |
| EFV | Environmentally friendly vehicle |
| ESD | Effort Sharing Decision |
| ESR | Effort Sharing Regulation |
| ETS | Emissions Trading System |
| EU | European Union |
| EUR | Euro |
| EV | Electric vehicle |
| FCEV | Fuel Cell Electric Vehicles |
| g | Gram |
| GDP | Gross domestic product |
| GHG | Greenhouse gas |
| HEV | Hybrid Electric Vehicle |
| $km^2$ | Square kilometre |
| kWh | Kilowatt hour |
| LNG | Liquified natural gas |
| LPG | Liquified petroleum gas |
| $MtCO_2e$ | Million tonnes of carbon dioxide equivalent |
| NOx | Nitrogen oxide |
| PEV | Plug-in Electric Vehicle |
| PHEV | Plug-in Hybrid Electric Vehicle |
| PM | Particulate matter |
| RES | Renewable energy sources |
| RED | Renewable Energy Directive |
| SEK | Swedish krona |
| UK | United Kingdom |
| VOC | Volatile organic compound |
| VW | Volkswagen |

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# 1 Summary

Greenhouse gas (GHG) emissions from the transport sector in both Sweden and Germany have only decreased slightly in the past two decades (-6% and -4% respectively from 1991 to 2015). Accelerated GHG emission reductions, however, are necessary to meet the climate targets of each country.

Road transport continues to be the dominant source of GHG emissions in both countries. Effective policy instruments need to be implemented to facilitate the uptake of zero- or low-emission road vehicles. Incentivising low-emission company registered cars, which represent the majority of vehicle registrations in both countries, can be an effective instrument.

In many countries the benefit arising from the private use of company cars is subject to income taxes. In other words, if an employee uses a company car also for private driving, a certain amount (i.e. taxable benefit) is added to the annual taxable income. The taxable benefit is typically calculated based on the list price of the car. Given the fact that zero- or low-emission vehicles are generally more expensive than comparable vehicles with an internal combustion vehicle, environmentally friendly cars are disadvantaged. To compensate this cost disadvantage, Sweden, Germany and many other countries in the European Union have instruments in place that reduce the taxable benefit of environmentally friendly company cars. However, the extent of this reduction in both countries differs drastically. In Sweden, the reduction may be up to four times higher than in Germany, making zero- or low-emission vehicles not only cost competitive with conventional vehicles but actually cheaper.

There may be a window of opportunity for German policy makers to amend the company car taxation scheme due to the overall positive national budget situation, the current discussions on poor air quality in cities, and the diesel scandal ('Dieselgate').

A company car taxation scheme in Germany modelled after the Swedish one would strongly contribute to Germany's sector target of reducing GHG emissions from transport to 98 million tonnes $CO_2$ equivalent ($MtCO_2e$) by 2030 (2015: 159.6 $MtCO_2e$).

 

# 2 National context

## 2.1 National climate policy

Sweden has been a pioneer in international environmental policy and was one of the first signatories and countries to ratify the Kyoto Protocol at the turn of the millennium. The current red-green government under Prime Minister Stefan Löfven has committed Sweden to becoming greenhouse gas (GHG) neutral by 2045 — five years earlier than under the previous target. Sweden has the lowest ratio of GHG emissions per GDP and the second lowest ratio of GHG emissions per capita (after Croatia) in the European Union (EU)-28 (European Environment Agency, 2018a). Almost 60% of Swedish electricity generation is based on renewable energy sources (RES). Of total electricity production in 2015, hydropower accounted for 47%, nuclear 34%, and wind power 10%, while biofuels and fossil-based production made up the remaining 9%. Wind power and the use of biofuels for electricity and heat production is increasing steadily (The Swedish Environmental Protection Agency, 2017a). Taken together, this means that electrifying energy use, e.g. with heat pumps for heating or electric cars for transport, is a highly effective strategy in the Swedish context.

Sweden is the fifth largest country in Europe by area, but its population density is relatively low, with an average of 24.5 inhabitants per square kilometre ($km^2$) (the UK has 271 and Germany 232 inhabitants per $km^2$). However, population density is much higher in southern Sweden with 85% of the population living in urban areas (The Swedish Environmental Protection Agency, 2017b). Sweden has a strong trade-oriented economy with exports accounting for 46% of GDP.

In Sweden, energy imports made up a quarter of total energy use in 2015. The dependency on energy imports was almost 80% in 1980 and has been decreasing ever since (The Global Economy, 2017). The energy system is primarily based on domestic sources of nuclear power and renewable energy such as water, wind and biomass. Imported fossil fuels, such as natural gas and oil, are mainly used for the transport and industry sectors.

Sweden's Effort Sharing Decision (ESD) target for 2020 is to reduce emission by 17% below 2005 and is only exceeded by Denmark, Ireland and Luxembourg. This is particularly impressive given the already low emissions intensity in Sweden. According to the recently adopted Effort Sharing Regulation (ESR), Sweden, Luxembourg and Norway will have the most ambitious GHG reduction target in Europe for 2030. By then, emissions in the sectors outside the Emissions Trading System (ETS) are to be reduced by 40% compared to 2005. According to forecasts, Sweden will exceed its 2020 target by around 15 percentage points and achieve a 32% reduction instead of 17%, although economic output grew by 20% between 2005 and 2015 (just under 2% per year). The emission intensity of the Swedish economy has therefore fallen significantly.

The energy sector, which includes transport, is the largest source of GHG emissions followed by industrial processes, agriculture and waste (Figure 1). With 63% of Sweden under (productive and unproductive) forest cover, forests (trees and soil) account for a significant uptake of $CO_2$ emissions. The size of the sink fluctuates over time but has nevertheless increased by approximately 20% between 1990 and 2015. In 2015, it accounted for an uptake of 46.6 million tonnes $CO_2$ equivalent ($MtCO_2e$). This can be compared to the total Swedish GHG emissions of 53.7 $MtCO_2e$.

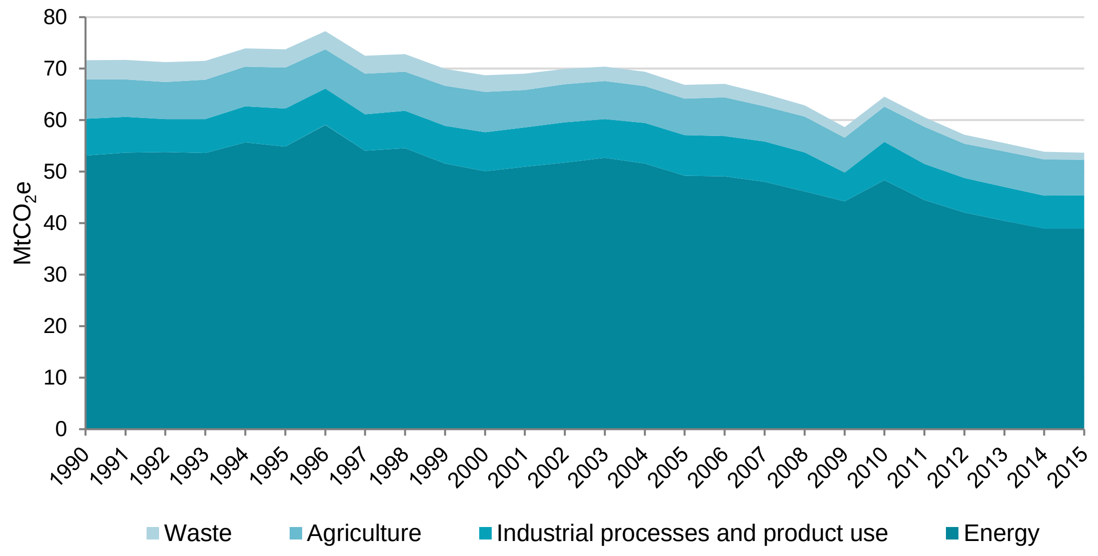


Figure 1: Development of GHG emissions in Sweden (1990–2015) (The Swedish Environmental Protection Agency, 2017b)

In June 2017, Sweden's Parliament adopted a climate policy framework with a climate act for Sweden (The Swedish Environmental Protection Agency, 2017b). This framework sets out the implementation of the Paris Agreement in the country. By 2045, Sweden aims to achieve zero net GHG emissions (Swedish Ministry of the Environment and Energy, 2017). The framework contains new ambitious climate goals, a climate act, and plans for a climate policy council.

From 1 January 2018, the climate act establishes the following:

- The government's climate policy must be based on the climate goals.
- The government is required to present a climate report every year in its budget bill.
- Every fourth year, the government is required to draw up a climate policy action plan to describe how the climate goals are to be achieved.
- Climate policy goals and budget policy goals must work together.

The climate policy framework contains several new climate goals for Sweden:

- By 2045, Sweden is to have zero net GHG emissions and should thereafter achieve negative emissions. Based on current population forecasts for Sweden, this means that emissions in Sweden will be less than one tonne per person by 2045 (2016: 5.6 $tCO_2e$/inhabitant; EU average 8.7) (eurostat, 2018).
- By 2030, emissions from domestic transport, excluding domestic aviation, will be reduced by at least 70% compared with 2010.
- By 2030, emissions in Sweden in the sectors that will be covered by the EU ESR should be at least 63% lower than in 1990.

 

- By 2040, emissions in Sweden in the sectors that will be covered by the EU ESR should be at least 75% lower than in 1990.

The third pillar of the framework is a climate policy council. It will be tasked with supporting the government by providing an independent assessment of how the overall policy presented by the government is compatible with the climate goals. The council will evaluate whether the direction of various policy areas will increase or reduce the likelihood of achieving the climate goals.

## 2.2 Sector context

The transport sector accounts for 34% or 18.2 $MtCO_2e$ of total GHG emissions in Sweden in 2015. Compared to 1990, emissions from transport have decrease slightly in absolute terms by around 6% or 1.1 $MtCO_2e$ (Figure 2).

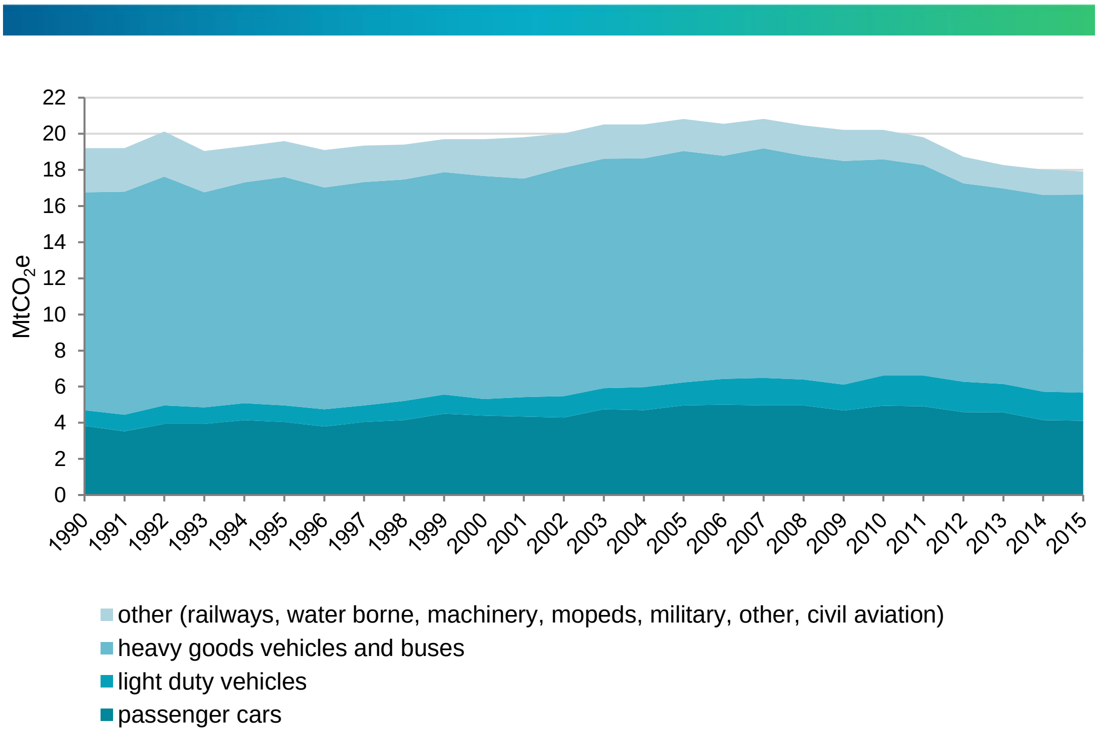


Figure 2: Development of transport emissions in Sweden (1990–2015) (The Swedish Environmental Protection Agency, 2017b)

Domestic transport is dominated by road traffic. Both passenger transport and freight transport have increased since 1970, but to different degrees. Passenger transport more than doubled, whereas freight transport grew by approximately a quarter. The modal split of freight transport and passenger transport in Sweden and Germany is similar (Figure 3). In Sweden, passenger cars (82%, 2015) are leading in passenger transport, followed by rail (9%, 2015) and busses and coaches (7%, 2015). Road transport (71%, 2015) is also the dominant mode of transportation for freight transportation followed by rail (29%, 2015) (European Commission, 2017). In 2015, fossil fuels (e.g. petrol, diesel) accounted for 82% of energy used in the transport sector, while the remainder consisted of electricity and biofuels (The Swedish Environmental Protection Agency, 2017b).

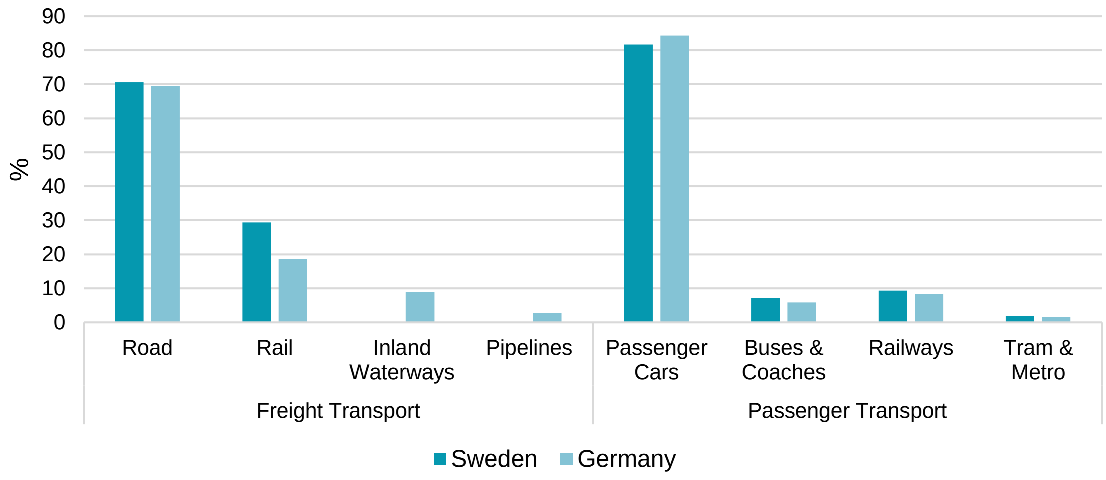


Figure 3: Modal split of freight transport and passenger transport in Sweden and Germany in 2015 (European Commission, 2017)

Emissions from domestic transport peaked in 2006–2007 and have been declining ever since, but this decline has slowed since 2013. The reduction in emissions since 2006 can be mainly attributed to national instruments, which often go beyond EU level requirements, such as the national carbon tax or stricter emission standards for new vehicles. As a result of these instruments, the uptake in low-emission vehicles has increased as well as the use of alternative fuels, in particular biofuels.

Lately, the Swedish municipal climate investment program has granted support[1] for infrastructure for the introduction of electrical vehicles (EV) (Kommuninvest, 2017). In 2018, a new bonus-malus-scheme (section **Error! Reference source not found.**), emission reduction obligation for petrol and diesel, and a tax on air travel that aims to reduce the climate impact of aviation will enter into force. To increase the pace of vehicle fleet electrification, a special 'charge-at-home' program will be launched. This will make it easier and cheaper for households to install charging points for EVs at home and transition to sustainable means of transport. In addition, the Swedish government supports research and development activities in the transport sector. Swedish agencies are financing several large research projects covering the entire value chain from cultivation of raw materials for bio-based motor fuels to the use of new fuels.

[1] Financing of electric buses for local transport through green bonds.

 

# 3 General description of the policy instrument

## 3.1 History

Company registered cars represent more than half of all new car registrations in Sweden. Approximately 50% of these vehicles are made available to employees for private use (The Swedish Environmental Protection Agency, 2017b). As is the case in many other countries, including Germany, the private use of a company car is a benefit, and is therefore added to the taxable income of an employee. What is different from country to country is the calculation of this taxable benefit. The higher the benefit, the more additional tax has to be paid.

To incentivise the purchase of fuel-efficient company cars in Sweden, the calculation of the taxable benefit arising from the private use of company cars has been modified multiple times since 1997. Initially, the changes aimed at making the employee pay for the fuel consumed for private use, thereby incentivising fuel-efficient driving and the purchase of fuel-efficient company cars. In December 2001, the government implemented new legislation to lower the taxable benefit for vehicles driven on biofuels. The aim was to make environmentally friendly vehicles (EFV) cost competitive with conventional vehicles, so companies, which tend to opt for the cheaper model, would purchase the environmentally friendly model. The same reasoning remains valid today, although the definition EFV has been expanded to also include EVs.

The latest change in the legislation affects the vehicle tax. As of January 2018, the vehicle tax, which was previously included in the standard calculation of the taxable benefit, is now an additional item in the calculation.

## 3.2 Legal basis

The income tax act ('Inkomstskattelag' (1999:1229)) provides the legal basis for the company car tax (Sveriges Riksdag, 2018). The income tax act has been revised over the years according to new policies passed by Swedish parliament that affect income taxation. The income tax itself is deducted by the employer and directly paid to the Swedish tax agency ('Skatteverket').

## 3.3 Functioning

The taxable benefit is based on standard calculations that are impacted by the following aspects:

- car's list price
- value of extra equipment not included in the list price (e.g. winter tires, roof box)
- characterised as an EFV ('miljöbil')
- number of kilometres driven for work purposes
- vehicle tax

As mentioned in section **Error! Reference source not found.**, the characteristics of what is considered and EFV has changed over the years. Today, EFV include Battery Electric Vehicles (BEVs), Hybrid Electric Vehicles (HEV), Plug-in Electric Vehicles (PEV, battery-only and hybrid), Fuel Cell Electric Vehicles (FCEVs), and vehicles that run on alternative fuels (e.g. liquified petroleum gas (LPG), liquefied natural gas (LNG), biofuels).

In 2018, the taxable benefit value is computed as the total of:

|   |   |
|---|---|
|   | EUR 1,393 (SEK 14,423) (31.7%[2] of the base amount[3] ) |
| + | the list price of the car and any extras multiplied by 75% of the government loan rate[4] |
| + | the total of the list price of the car and any extras not exceeding 7.5 base amount[2] multiplied by 9% |
| + | the total of the list price of the car and any extras exceeding 7.5 base amount[2] multiplied by 20% |
| + | Vehicle tax[5] (applies to cars with production year 2018 or later that have been registered for the first time on 1 July 2018 or later) |
| = | **Taxable benefit** |
| - | 40–50% reduction on taxable benefit for electric and Hybrid Electric Vehicles (HEVs) and vehicles driven on LNG. The reduction is capped at EUR 969 (SEK 10,000) |
| = | **Taxable benefit for EFV** |
| - | 25% reduction on taxable benefit (for environmental car if applicable) if the vehicle is driven more the 30,000 km for work purposes |
| = | **Taxable benefit for cars mostly driven for work purposes** |

The taxable benefit of EFV is, in most cases, considerably lower than that of conventional cars. This is due to two main aspects of the company car taxation scheme: 1) Reduction of the list price used for the calculation of the taxable benefit and 2) additional reductions for EFVs.

- As can be seen in the above calculation, the car's list price is a key input parameter to calculate the taxable benefit. To account for the higher list price of most EFV, the list price used for the calculation above is reduced to a level of a comparable conventional car[6] without the environmental technology. However, the company purchasing the vehicle still has to pay the full list price. For example, when calculating the taxable benefit of the Volkswagen (VW) e-Golf, the list price used for the calculation of the taxable benefit is cut by half. The list price for this model amounts to around EUR 40,000, the list price for a comparable conventional car amounts to about EUR 20,000 (VW Golf 1.0 TSI).

[2] Base rate

[3] In 2018, the base amount is EUR 4,400 (SEK 45,500).

[4] In 2018, the government loan rate is 0.5%.

[5] If the vehicle tax is counted as a separate item and not part of the base amount, the base rate is reduced from 31.7% to 29%.

[6] Comparable car means simplified corresponding car with conventional operation of the same make, model and equipment level as the climate bonus car.

- Additional reduction of up to EUR 969 (SEK 10,000) apply for EFVs.

Using the reduced list price and applying further deductions for EFV, the annual taxable benefit for the e-Golf is around EUR 2,500. The taxable benefit for a comparable conventional car that costs half as much is around to EUR 3,300. With the introduction of vehicle tax as a separate calculation item, the difference in taxable benefit between conventional cars and EFV will become even greater, thereby further incentivising the purchase of an EV.

Fuel provided by the employer is taxed separately. If the employer pays for the employee's private use of fuel, the benefit of free fuel is valued at the fair market value multiplied by 1.2. Hence, employees have an incentive to choose more fuel-efficient cars and to limit the private use of company cars.

## 3.4 Interlinkages with other policy instruments

Sweden has several policy instruments in place to support low-carbon transport (Table 1). The policy instruments are designed to complement each other and aim to reduce GHG emissions in the transport sector. Important sector targets in Sweden include a share of biofuels of 50% by 2030 and a reduction of transport emissions by 70% by 2030. Biofuels have lower GHG emissions than fossil fuels, however the GHG emission savings vary a lot depending on the feedstock. For each feedstock, default values and typical values for GHG emission savings compared to fossil fuels are listed in Annex V in the Renewable Energy Directive (RED). Whereas rape seed biodiesel is listed with typical GHG emission savings of 52% and a default value of 47%, waste cooking oil biodiesel is listed with 88% typical GHG emission savings and 84% as default value.[7]

Table 1: Low-carbon transport policy instruments in Sweden (The Swedish Environmental Protection Agency, 2017b)

| Year introduced | Instrument | Functioning | Status |
|---|---|---|---|
| 2006 | Differentiated vehicle tax | The $CO_2$-related vehicle tax is EUR 2.14 (SEK 22) per $gCO_2$/km beyond 111 $gCO_2$/km. This $CO_2$ component is multiplied by a factor of 2.37 for diesel cars. Cars adapted for alternative fuels such as ethanol and gas, except LPG, are taxed at a lower rate of EUR 1.07 (SEK 11) per $gCO_2$/km beyond the first 111 $gCO_2$/km. | Active |
| 2012 | Super-green car rebate | EV buyers receive a EUR 3,900 (SEK 40,000) rebate for new cars that emit no more than 50 $gCO_2$/km. On 1 January 2016, the rebate was lowered to EUR 1,950 (SEK 20,000) for buyers of hybrid cars. If the buyer is a company, the rebate is up to 35% of the cost difference between the price of a super-green car and a non-super-green car of a similar type. The maximum rebate is EUR 3,900 (SEK 40,000). | Inactive as of 2018. Replaced by a bonus-malus-scheme |
| 2013 | Tax exemption | EFV are exempt from vehicle tax for the first five years after registration. | Inactive as of 2018. Replaced by a |

[7] Council of the European Union, Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources, 21 June 2018.

 

| | | | |
|---|---|---|---|
| | | | bonus-malus-scheme |
| 2018 | Bonus-malus-scheme | See below | Active |

As of July 2018, a bonus-malus-system will enter into force in Sweden. New vehicles emitting less than 61 $gCO_2$/km qualify for a bonus, while new vehicles with emissions above 94 $gCO_2$/km will be taxed at a higher rate for the first three years after registration.

Zero-emission vehicles may receive a bonus of up to EUR 5,800 (SEK 60,000), capped at 25% of the car's list price. The bonus then decreases by EUR 81 (SEK 833) for every $gCO_2$ emitted by the vehicle. Cars that run on LNG, receive at least EUR 967 (SEK 10,000). For company cars, the bonus may be up to 35% of the price difference between the list price of the low-emission vehicle and that of a conventional comparable vehicle (Transport Styrelsen, 2018a). Eligible for the bonus are vehicles purchased after 30 June 2018 and before 1 January 2021 (Transport Styrelsen, 2018a).

The malus is added to the vehicle tax and is calculated according to the emission level of a vehicle plus a base amount, which depends on the fuel type. If a vehicle emits between 95–140 $gCO_2$/km a malus of EUR 8 per $gCO_2$ (SEK 82) applies. If the vehicle emits more than 140 $gCO_2$, the malus increases to EUR 10/$gCO_2$ (SEK 107). The base amount for a petrol car is EUR 35 (SEK 360), for a diesel car EUR 59 (SEK 610) plus a fuel surcharge (Transport Styrelsen, 2018b).

# 4 Impacts of the policy instrument

## 4.1 Effectiveness

The decrease in GHG emissions in the transport sector by 6% from 1990 to 2015 (see Figure 2) can be attributed to national policy instruments, which often go beyond EU requirements. The most significant ones include emission performance standards for new vehicles, vehicle taxes, and vehicle fuel taxes. These have resulted in more energy-efficient vehicles and a greater use of renewable fuels.

There is no specific analysis on the effectiveness of the company car taxation in Sweden. Instead, the Swedish government estimated the combined mitigation impact of the company car taxation, differentiated vehicle tax, tax exemption for environmentally friendly vehicles, and the super-green car rebate (compare Table 1). The overall emissions impact of these instruments was estimated to total about 0.4 $MtCO_2e$/year in 2010 and 1.3 $MtCO_2e$/year in 2015 (total transport sector GHG emissions in 2015: 18.2 $MtCO_2e$). For the years 2020 and 2030, the impact will be approximately 2.6 and 4.3 $MtCO_2e$/year respectively compared to a scenario that retained the policy instruments from 1990.

In 2017, Sweden had the highest EV market share of new registrations in the EU, and third highest in Europe after Norway and Iceland (European Alternative Fuels Observators, 2018a). Figure 4 shows the steady increase of the EV market share in the past six years. In contrast, Germany has a much lower EV market share but experienced considerable growth in the past two years. The share of EVs amongst company car registration is particularly high. In November 2017, 70% of sold EVs were registered as company cars (International Energy Agency, 2018). The lower taxable benefit for EFVs when compared to conventional vehicles may be the main reason for the popularity of EVs as company cars.

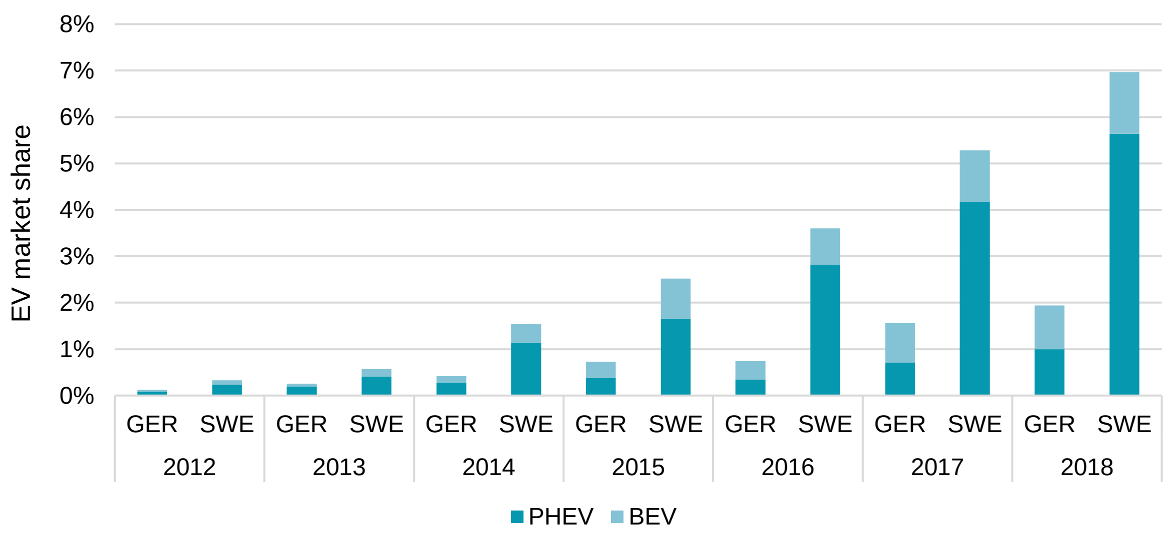


Figure 4: Development of EV market share of new registrations in Sweden and Germany (2012–2018) (European Alternative Fuels Obseravtors, 2018b), (European Alternative Fuels Observatory, 2018c)

## 4.2 Cost efficiency

There is no cost efficiency assessment publicly available for company car taxation in Sweden. However, the Swedish Ministry of the Environment and Energy carried out an analysis that gives an indication of the cost efficiency of policy instruments in the transport sector. The policies described in section **Error! Reference source not found.**, including further fuel efficiency measures on an EU and national, had a substantial effect on emission reductions. Hence, changing market and technology characteristics in the transport sector can to some extent be attributed to those policy instruments. The Ministry used cost estimates of key transport technical measures implemented to provide a rough indication of the cost efficiency of the policy instruments in the sector.

Figure 5 shows the $CO_2$ abatement costs in the passenger car sector over three different time periods from 2000 to 2015. The Ministry compared different $CO_2$ reduction measures (i.e. switch to low-emission vehicles) to a reference alternative. The reference alternative has the same number of cars as the time period studied, but the share of car types reflects that of the base year 2000. The reference car, which is replaced, is assumed to be a standard petrol car that has an emission efficiency improvement of 0.5% per year (The Swedish Environmental Protection Agency, 2017b).

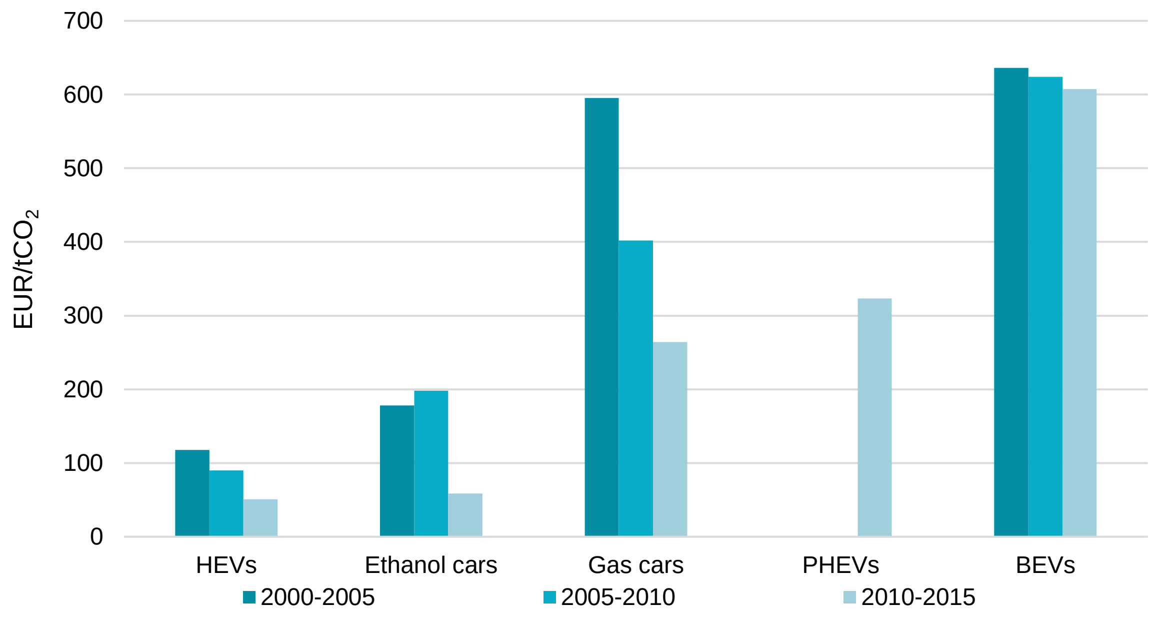


Figure 5: Costs and emission reductions in the passenger car sector in relation to the reference alternative (Trafikverket, 2016)

BEV is the most expensive emission reduction technology for all time periods. This indicates that the high investment costs in BEVs have not been compensated for by low operation and maintenance costs. BEVs show the largest emission reduction potential per car type but are expensive and hence do not contribute much to emission reductions. However, costs for BEV are decreasing and cost parity between BEVs and vehicles with an internal combustion engine is expected in 2024 (Bloomberg, 2018).

 

HEVs have a comparatively low cost of reducing emissions and this already low cost decreased further over the concerned time period. The low fuel consumption of such vehicles keeps the operational cost low, but the high investment costs implies that the overall cost per unit emission reduction is still positive. The battery of HEVs is charged by the internal combustion engine and not by an external source, which leads to inefficiencies and high emissions (depending on the emission intensity of the sourced electricity) compared to Plug-in Hybrid Electric Vehicles (PHEVs). PHEVs can be charged at home or at a specific charging station. They are relatively new on the market and data is only available for 2015. Hence, they are currently difficult to analyse.

Electricity prices are important when considering the cost efficiency of EV policies. Higher electricity prices have a negative impact on the cost efficiency of such policies. Electricity prices for household consumer are considerably lower in Sweden (EUR 0.2/kWh, 2017) than in Germany (EUR 0.3/kWh, 2017) (Eurostat, 2018).

## 4.3 Co-benefits and side-effects

Similar to effectiveness and cost efficiency of the instrument, co-benefits and side-effects cannot be directly attributed to the company car taxation but rather to the general shift to low-carbon transport technologies.

The switch to low-emission vehicles such as EVs has a positive effect on air quality, especially in cities where road transport is a major cause of air pollution. Pollutants from the transport sector that contribute to poor air quality include particulate matter (PM), nitrogen oxides (NOx), and volatile organic compounds (VOCs). As a side-effect, better air quality leads to less health problems and less costs caused by air pollution. Additionally, noise levels of EVs are also considerably lower compared to vehicles using an internal combustion engine.

As a result of a favourable market and policy environment for low-emission vehicles in Sweden, local car manufacturers Volvo and Scania already offer a range of EVs and are leading players in the EV market. In spring of 2017, Volvo Chief Executive Officer Håkan Samuelsson announced that all new cars launched by Volvo Cars from 2019 onwards will be partially or completely battery-powered. The start-up scene in Sweden has also profited from the strong political commitment to low-carbon transport with several companies being established in the area of charging infrastructure such as ChargeAmp and Chargestorm.

## 4.4 Success factors and challenges

Sweden is arguably one of the most successful cases for the promotion of low-carbon transport. The major success factors are progressive policies, which created favourable market conditions, and a high degree of public, political, and industry acceptance of the importance of shifting to low-carbon transport (International Energy Agency, 2018). Sweden's new climate legislation (section **Error! Reference source not found.**) is ambitious and support for low-emission transport also extends to industry. Additionally, The Swedish Electromobility Centre was set up by the Swedish Energy Agency in partnership with Swedish automotive industry and academia to facilitate research and cross-sector collaboration in this field. Under such conditions, updating the company car taxation to become even more beneficial for EFVs (section **Error! Reference source not found.**), is relatively straightforward.

Although overall conditions for low-carbon transport policies, including the company car taxation scheme, are very positive, Sweden is facing the challenge of having put aside sufficient funds in the budget to support those policies. For example, when the super-green car rebate was introduced in 2012, it was designed to cover 5,000 low-carbon vehicles. Sweden reached this threshold in mid-2014, but extended the program in 2014, 2015, and 2016. For each year mentioned above, the Swedish government budgeted a fixed amount of funds for the rebate. This budget would invariably be exhausted before the government decided to extend the program. In other words, the funds were flowing into the market at a faster rate than the Swedish government would replenish them.

Additionally, buyers of low-emission vehicles do not receive the rebate at the point of sale. Instead, the Swedish Transport Agency monitors new vehicle registrations and contacts the owners of eligible vehicles directly. Only then can the owner submit the necessary paperwork to receive the rebate. During these months-long waiting periods, more EVs had been sold than the government had budgeted rebates for, leaving new and potential EV owners wondering when they would receive the rebate, or if they would receive it at all (International Council on Clean Transportation, 2017).

The financing issue is likely to continue, as the bonus payment under the new bonus-malus-scheme is made only after submitting the necessary declaration form the Swedish Transport Agency.

# 5 Transferability

## 5.1 General comparability of the context

Both Sweden and Germany are highly-developed industrialised economies, with similarly ambitious emission reduction objectives. Importantly, they are also similar in their economic structure and both feature export-oriented industrial sectors. There are, however, significant differences in the transport sector to which the company car tax applies. These are bolded in the comparability column in Table 2. Differences (b) and (c) are differences in context that would affect the company car tax's operating and effectiveness in Germany.

Table 2: Key climate policy and energy indicators to assess comparability of the Swedish and German context (Sweden.de, 2018; World Bank, 2018; Climate Transparency, 2017; UNFCCC, 2017; Moro & Lonza, 2017; BMWi, 2017; European Alternative Fuels Observatory, 2018a&b)

| | Germany | Sweden | Comparability |
|---|---|---|---|
| **General information** | | | |
| GDP per capita (in USD, 2017)[8] | 44,549.69 | 53,248.14 | Comparable |
| **Climate policy ambition** | | | |
| 2020 GHG emission reduction goal (compared to1990 in %) | As close as possible to -40 | -40 (binding EU ESD target) | Comparable |
| 2030 GHG emissions reduction goal (compared to 1990 in %) | -55 – -56 | -63 | Comparable |
| 2050 GHG emission reduction goal (compared to 1990) | GHG neutrality (80-95% reduction) | GHG neutrality by 2045 | Comparable |
| **Relevant features of the energy transport sector** | | | |
| 2030 transport sector target (in %) | -40 – -42 (compared to 1990) | -70 (compared to 2010) | **(a) Not comparable**: Higher ambition level in Sweden |
| Company car share of new registrations (in %) | 60 | 50 | Comparable |

[8] Statista 2018a and 2018b

 

| | Germany | Sweden | Comparability |
|---|---|---|---|
| Carbon intensity of electricity supply ($gCO_2e$/kWh), 2013[9] | 485 | 16 | **(b) Not comparable**, electrification is less decarbonising in Germany. |
| Share of biofuels in road transport (in %)[10] | 4.8 | 20.8 | **(c) Not comparable**, but can be the result of EFV incentives in Sweden |
| Share of electric vehicles in road transport (in %, 2017)[11] | 1.56 | 5.28 | |

Similar to Sweden, Germany's economy has a very strong trade focus making it the third largest exporter in the world. The manufacturing industry (especially automakers and highly specialised small and medium sized enterprises), but also the chemical industry, iron and steel making, and electronics, form the basis of Germany's large industrial sector. In 2017, the services sector accounted for 69% of the economy in terms of GDP, the industry sector for 26% and the primary sector for 1% (Destatis, 2018).

The modal spilt in Germany and Sweden are rather similar. In Germany, passenger cars (84%, 2015, (Sweden: 82%)) are leading in passenger transport, followed by rail (8%, 2015 (Sweden: 9%)) and busses and coaches (6%, 2015 (Sweden: 7%)). Road transport (70%, 2015 (Sweden: 71%)) is also the dominant mode of transportation for freight transportation followed by rail (19%, 2015 (Sweden: 29 %), and inland waterways (9%, 2015 (Sweden: 0%)) (European Commission, 2017).

Unlike Sweden, Germany is highly dependent on energy imports. Imports make up two thirds of primary energy use (Umweltbundesamt, 2018a). The energy system is primarily based on fossil fuels. In 2016, 34% of primary energy consumption was met by oil, followed by natural gas with 23%. However, the share of RES has steadily increased. Today, RES constitute 12.6% of primary energy use, ahead of coal at 12.2% and lignite at 11.4%. About half of gross electricity generation (2016) was met by lignite, coal and nuclear. While their share has declined in recent years, the share of RES rose to 29% in 2016 and natural gas has seen its share double since 1990 (BMU, 2018).

In 2015, total GHG emissions in Germany (excluding land use, land-use change and forestry) were about 907 $MtCO_2e$. As shown in Figure 6, energy is the largest source of GHG emissions, as is the case in Sweden, followed by industrial processes, agriculture and waste. Compared to 2014, emissions were approximately 0.4% or 4 Mt lower. Emissions in Germany have decreased by about 27.9% or by approximately 349 Mt between 1990 and 2015 (BMU, 2018). Germanys GHG emissions per GDP as well as the GHG emissions per capita are twice as high as Sweden's (European Environment Agency, 2018b). The reduction in GHG emissions from 1990 to 2015 is in large part due to a higher share of RES in electricity generation and a shift away from the use of solid fuels (e.g. coal and lignite) to lower-emission liquid and gaseous fuels (BMU, 2018).

[9] Moro & Lonza, 2017

[10] European Biofuels Technology Platform, 2015; Svebio.de, 2018

[11] European Alternative Fuels Observatory

 

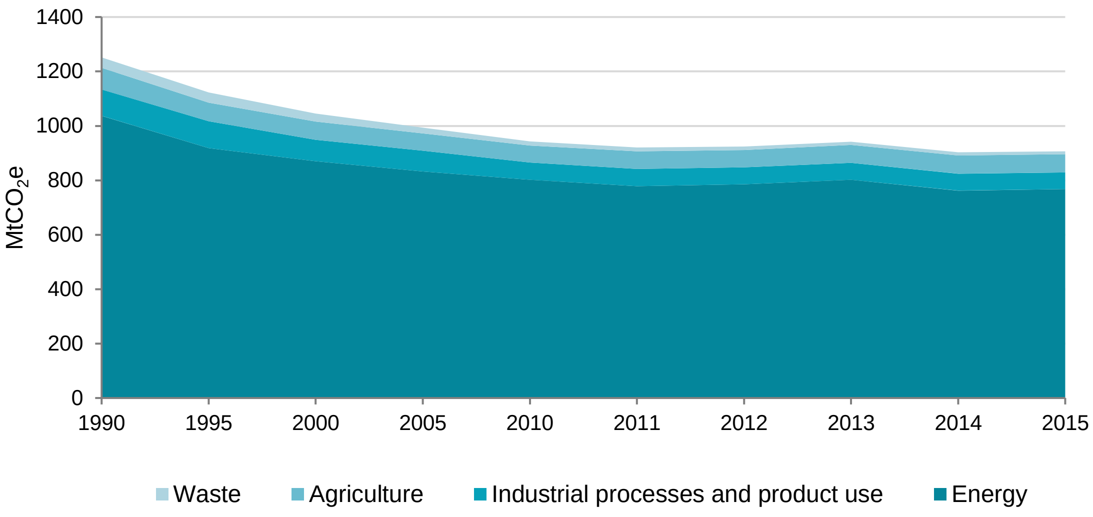


Figure 6: Development of GHG emissions in Germany (1990–2015) (Umweltbundesamt, 2018b)

In November 2016, the federal government approved Germany's long-term climate strategy. The Climate Action Plan ('Klimaschutzplan') 2050 sets out a comprehensive climate strategy that aims at Germany becoming largely carbon-neutral by 2050. Intermediate targets include achieving GHG emission reductions of at least 55% by 2030 compared with 1990 levels. The Climate Action Plan 2050 also defines reduction targets for all relevant sectors for 2030 and sets up a public monitoring and participation processes. The target for the transport sector is to reduce GHG emissions to below 98 $MtCO_2e$ (-42%) by 2030. In 2015, transport (not including international aviation and maritime shipping) accounted for 18% or 159.6 $MtCO_2e$ of all GHG emissions. Compared to 1991, sector emissions have decreased by 4%, despite a considerable increase in the overall volume of transport during the same period. The sector experienced a moderate increase in passenger transport (34.8%) and a strong increase in the freight transport (62.5%) from 1991 to 2015. Road transport is responsible for 95% of domestic GHG emissions in the transport sector (BMU, 2018).

The share of company car registrations in Germany compared to all vehicle registration is larger than in Sweden. In 2017, 2.2 million vehicles (65%) were registered as company cars and 1.2 million (35%) as private cars (Kraftfahrt-Bundesamt, 2018), providing an indication of the relevance of company car taxation in the German context. Private and company cars registered in Germany differ significantly in some characteristics. The average engine size of a company car (105 kW) is larger than that of private cars (95 kW) and the share of diesel engines is higher compared to private cars. By a wide margin, the largest share of EVs is registered as company cars, which, along with fuel-efficient diesel cars, offset the larger engine sizes of company cars. As a result, $CO_2$ emissions of company cars and private cares are almost identical.

Charging infrastructure in Sweden is more developed than in Germany. Sweden has close to 300 public charge points per million population whereas Germany has around 150. Also, fast charging (at 22kW or more) is more common in Sweden (30% of all public charge points, 2016) than in Germany (9% of all public charge points, 2016) (ICCT, 2017).

## 5.2 Properties of the instrument

Germany levies an income tax on the benefits from the private use of company cars, which typically is calculated by adding 1% of the vehicle's purchase price to the taxable, monthly personal income. However, the 1% rule can only be applied if the car is driven at least 50% for work purposes. If that is not the case, employees must keep a logbook detailing their exact personal and business use of the company car. If the car is used to drive to work for more than 47 days a year, additional taxes apply. The additional taxable benefit is calculated as 0.03% of the list price multiplied by the distance travelled to work.

To promote the sales of low-emission company cars, the taxable benefit for EVs is reduced. In 2013, the purchase price could be reduced by EUR 500 for each kilowatt hour (kWh) of electrical energy storage included in the vehicle; however, this tax benefit is lowered by EUR 50 each year from 2014 onwards. At the same time, the total reduction was not allowed to exceed EUR 10,000 in 2013, and this limit is reduced by EUR 500 each year. Accordingly, in 2018, the reduction amounts to EUR 250/kWh (up to EUR 7,500) (German Federal Ministry of Transport and Digitial Infrastructure, 2017)

Table 3 shows that the Swedish company car taxation scheme provides a much greater reduction incentive for low-emission vehicles compared to the German scheme. When applying the discount for EFV in both countries, the reduction in Germany amounts to EUR 900 in Sweden to EUR 3,500 – almost four times higher. The main reason for this strong difference is the list price used for the taxable benefit calculation.

Table 3: Comparison of taxable benefit in Germany and Sweden (own calculations)

| | **Annual taxable benefit Germany** | | **Annual taxable benefit Sweden** | |
|---|---|---|---|---|
| | **VW e-Golf[12]** | **VW Golf 1.0 TSI[13]** | **VW e-Golf** | **VW Golf 1.0 TSI** |
| Without taxable benefit reduction for environmentally friendly vehicles | EUR 4,800[14] | EUR 2,400 | EUR 6,000[15] | EUR 3,300 |
| With taxable benefit reduction for environmentally friendly vehicles | EUR 3,900[16] | EUR 2,400 | EUR 2,500 | EUR 3,300 |

[12] List price: EUR 40,000; Battery capacity 35,8 kWh.

[13] List price: EUR 20,000.

[14] 40,000 (list price) * 1% * 12 (for annual amount).

[15] A petrol car with a list price of about EUR 40,000 was used in this calculation.

[16] (40,000 (list price) – 35.8 (battery capacity) * 250) * 1% * 12 (for annual amount). The list price reduction for this model (EUR 8,950) would be above the cap, thus it is reduced to EUR 7,500.

| | Annual taxable benefit Germany | | Annual taxable benefit Sweden | |
|---|---|---|---|---|
| | VW e-Golf[12] | VW Golf 1.0 TSI[13] | VW e-Golf | VW Golf 1.0 TSI |
| **Reduction of taxable benefit** | **EUR 900** | **EUR 0** | **EUR 3,500** | **EUR 0** |

## 5.3 Potential impacts

Sweden's electricity mix has a low-carbon intensity (16 $gCO_2e/kWh$, 2013; Germany: 485 $gCO_2e/kWh$, 2013), making any electrification efforts in the transport sector an effective emission reduction measure. In Germany, the share of renewables in electricity generation is half (29%, 2015) compared to Sweden. Germany's 2030 climate targets of reducing emissions by 40% compared to 1990 level requires reinforced action in the transport sector, where emissions have stagnated or even increased. It is important to note that to achieve effective emission reductions in this sector, the increase of the share of renewables in the electricity sector will have to be accelerated to ensure electrification leads to emission reduction (Dietrich, Leßmann, & Steinkraus, 2016). Indeed, some studies have criticised the promotion of EVs in Germany against the backdrop of minimal (to negative) effects on emissions given Germany's coal-heavy electricity mix. This argument should be nuanced, given the clear expansion path for renewables in Germany, co-benefits such as local air pollution reduction and the added flexibility that EVs may provide to the electricity system. According to a recent study, EVs already deliver GHG emission reductions today (BMU, 2017).

The 'Dieselgate' scandal, which broke in 2015, showed that car manufacturers such as VW were rigging the emission-testing software in their diesel vehicles so that they could be labelled as more environmentally friendly than they actually were. The subsequent discussion on bans of diesel vehicles in cities and the increasingly negative perception of diesel engines had a detrimental impact on diesel car registrations. The share of diesel engines of new company car registrations dropped from 71% in 2016 to 65% in 2017, while new registrations of petrol engines increased by 42% from 2016 to 2017 (Vetter, 2017). This trend could lead to higher $CO_2$ emissions from company cars since petrol engines burn more fuel than diesel engines. The company car market is undergoing radical changes as diesel cars are no longer the dominant type in the company car segment. A company car taxation scheme similar to Sweden's could prevent buyers of new company cars from simply switching to petrol engines and steer them towards low-emission alternatives.

## 5.4 Conclusion

Sweden is a front-runner in terms of low-emission transport, and more specifically regarding electric mobility. The market share of EVs among new car registrations reached 5.3% in 2017 in Sweden but only 1.6% in Germany.

Sweden has a variety of instruments in place that have helped made this possible. The focal point of this study is company car taxation. Given the fact that this is a very specific instrument, data on its effectiveness and associated costs and benefits are scarce. Company car taxation is applied in most countries across Europe, and reduction for low-emission vehicles are common (e.g. Austria, Belgium, France, the Netherlands). However, the extent of the reduction in Sweden is exceptional. The taxable benefit is reduced not only to make low-emission vehicles price-competitive but also make them even cheaper than comparable conventional cars. Further low-carbon policy instruments in Sweden include the super-green car rebate and its successor, the bonus-malus-scheme, a measure that has proved successful in other countries (e.g. France; please refer for further information to the study 'Bonus-Malus Vehicle Incentive System in France').

Given the current dynamics in Germany around the diesel scandal, poor air quality in cities, and stagnating transport emissions, the timing may be ideal to make Germany's company car taxation scheme more environmentally friendly. The impact on GHG emissions from transport would be significant given the high share of company vehicles. Additionally, Germany's budget surplus of EUR 36.6 billion in 2017 could provide the necessary funding for this policy change (Süddeutsche Zeitung, 2018) .

Policy makers could use this window of opportunity and drastically change the company car taxation scheme to benefit the sales of low-carbon vehicles and, ultimately, the climate.

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