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Electric company cars: the impact of policy support and policy options in times of limited budgets

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Executive Summary

As plug-in electric vehicle (PEV) adoption accelerates, incentivizing electric company cars emerges as a critical component of environmental and transport policy. However, in times of constrained public budgets, optimizing policy impact becomes essential. This paper empirically examines the effects of PEV incentives for company cars, with a specific focus on benefit-in-kind (BiK) taxation policies. Leveraging the market diffusion model ALADIN, we evaluate how different BiK tax scenarios for combustion engine vehicles impact PEV market penetration in Germany, comparing policy outcomes across a range of budget-limited interventions. Findings indicate that adjusting BiK taxation can meaningfully influence company car electrification rates, informing policymakers on cost-effective strategies to promote EV adoption.

1 **Introduction**

1.1 Motivation

For the European transport sector to stay within the carbon budget needed to reach the Paris Agreement, internal combustion engine vehicles need to be phased out by 2033 at the latest, even earlier than the 2035 target in Regulation (EU) 2019/631. Sales of plug-in electric vehicles (PEVs), including battery electric vehicles (BEVs) and plug-in-hybrid electric vehicles (PHEVs), are increasing in Europe, reaching 23.4 % of the market in 2023 (EU, EFTA, & UK, cf. [1]). Sales shares vary by country, from more than 80% in Norway to less than 6% in countries such as Poland, Slovakia, Cyprus, and the Czech Republic.

Corporate cars, i.e., cars that are registered by a legal entity rather than a private person in the statistics of registered cars, include fleet cars, commercially leased cars, rental fleets, taxis, and company-provided cars. In total, they accounted for about 57% of newly sold cars in the European Union [2]. They thus make a large contribution to the fleet composition, and since many of these vehicles normally have a quicker turnover rate than private vehicles, they influence the used car market. There are no official statistics on the breakdown between the different categories of corporate cars.

In this paper, when discussing company cars, we refer to company-provided cars, i.e., cars that are given to an employee and that can be used both for work and private purposes. While the employee does not have to pay for the car, they must add a corresponding benefit in kind to their taxable income, resulting in an increased tax burden, so-called fringe benefit tax. Please note that company cars are not equally common in all European countries.

The European Commission has recently pointed to the importance of corporate fleets in achieving its goals in the Green Deal and Clean Industrial Deal. Legal action is in preparation[1]. In the meantime, they point out that fiscal measures at the national level can be important to decarbonise corporate fleets. Understanding the effectiveness of these measures is thus highly relevant. The aim of this study is thus to investigate the impact of company car taxation on the market uptake of BEVs and PHEVs, both using sales data in Europe and an agent-based simulation model (ALADIN) calibrated to real-world driving profiles and purchase behaviours.

1.2 Existing Literature

Several studies have provided an overview of PEV incentives. Hardman et al. (2017) [3] review the effectiveness of purchase incentives for PEVs. They primarily review market analyses and surveys, and do not provide a quantitative assessment of the magnitude of the effects. In a later review, Hardman (2019) [4] focuses on recurring and indirect incentives. Specifically, parking incentives and high occupancy vehicle (HOV) lanes are found to have a positive impact on sales. National governments have had policies such as purchase incentives in place for over two decades, and differences in scale and approaches partially explain the variation across countries [5].

The fringe benefit tax is a fixed percent of the price of the vehicle. In some countries, such as Austria, France, Ireland, and Portugal, the actual purchase cost of the vehicle is used as a base, while in other countries, such as Denmark, the Netherlands, and Sweden, list prices are used instead [6,7]. PEV are incentives mainly through a lower price on which the tax is calculated [8]. In Sweden, e.g., the list price has been the corresponding conventional vehicle until recently, while it is now a fixed amount [9]. In Belgium, France, the Netherlands, and the UK, there is a formula to be calculated that considers the type-approval CO2 emissions of the vehicle as well [8]. The number of countries that have provided some kind of tax benefit for PEVs in their company car taxation has increased from 5 countries in 2010, 11 in 2016, and 19 in 2022. By lowering the taxable income, the PEV becomes economically more attractive to the employee [8].

To conclude, company cars are an important new car market with significant consequences for the economy and high relevance for PEVs, but existing PEV company car incentives have received little attention in the literature.

2 Data and Methods

2.1 Data

Our regression modelling is based on the BEV and PHEV market ramp-ups on an annual basis in 30 European countries, including the subsidy measures in the individual countries. The various support measures were monetised based on average vehicles in the individual countries and evaluated using panel data regression. The dependent variable is the share of BEVs and/or PHEVs in new registrations. The result expresses the extent to which this share changes when a subsidy is increased by €1000. A comprehensive description of the data set, the procedure and the results can be found in [10] and [11].

2.2 Methods

The ALADIN model (Alternative Drive Diffusion and Infrastructure) is used for agent-based modelling of the purchase decision and drive choice. ALADIN determines the utility-optimised drive choice of the individual agents for new car purchases at the time of purchase, taking technical and economic restrictions into account. In simple terms, ALADIN determines which drive technology the vehicles are equipped with, while the total number of new registrations is specified.

The ALADIN model is based on several thousand real driving profiles from Germany over a one-week observation period. Further details on the model in [12 – 14]. Company cars are the decisive user group for this study. Here, company cars are primarily registered in the medium and large car segments. The decision to choose company cars is depicted in the model as a mixture of the user's view (minimisation of user costs) and the company's view (depreciation, etc.).

[1] https://transport.ec.europa.eu/document/download/1498648c-63fc-4715-975d-ccbc64703da5_en?filename=Communication%20-%20Decarbonising%20corporate%20fleets.pdf

2.3 Scenario definition

For the analyse of potential policy changes, a reference evaluation of BEV and PHEV sales in Germany is needed and the policy scenarios or policy options to be analysed must be defined. Figure 1 shows the reference evolution of PEV sales in Germany until 2035 (based on [15]). Table 1 shows the three policy options or scenarios to be analysed.

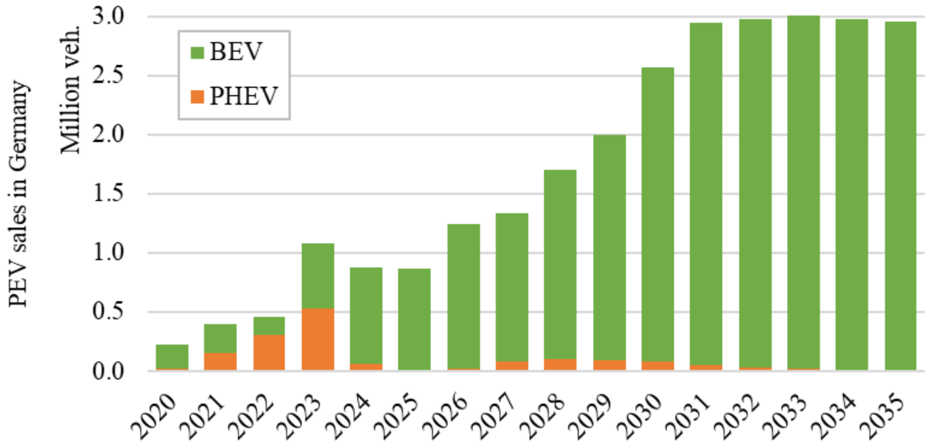

Figure 1: BEV and PHEV sales evolution in reference scenario for Germany.

We analyse four scenarios “ICE Increase, “slight increase”, “all increase” and “tableexpensive ICE” of changes in company car taxation in Germany according to their changes in benefit-in-kind taxation of company cars in Germany. Table 1 outlines these scenarios for the taxation of company cars based on the benefit-in-kind (BiK) rate, which determines the level of income tax a company car user must pay for private use of a vehicle provided by their employer. The scenarios represent different policy designs for encouraging the adoption of low-emission vehicles by altering the tax treatment of battery electric vehicles (BEVs), plug-in hybrid vehicles (PHEVs), and internal combustion engine (ICE) vehicles.

The "Current" scenario reflects the existing tax structure: BEVs benefit from the lowest BiK rate at 0.25%, followed by PHEVs at 0.5%, while ICE vehicles are taxed at 1.0%. Scenario A ("ICE increase") targets only conventional vehicles, doubling the ICE BiK rate to 2.0%, while leaving BEVs and PHEVs unchanged. Scenario B ("slight increase") introduces a moderate increase across all vehicle types: BEVs double to 0.5%, PHEVs rise to 1.25%, and ICE vehicles increase to 2.0%. Scenario C ("all increase") applies a stronger upward adjustment: BEVs and PHEVs are taxed at 0.5% and 2.0% respectively, while ICE vehicles remain at 2.0%. Finally, scenario D ("expensive ICE") sets the most aggressive differentiation by keeping BEVs at a modest 1.0% but raising ICE taxation to 2.5%, emphasizing a strong disincentive for the continued use of fossil-fuel-powered cars.

Overall, the scenarios allow for comparative analysis of how different taxation strategies could influence company car choices, with increasing levels of ambition and steering effect towards electrification.

Table 1: Scenario definition

Vehicle type	Current BiK tax	A - ICE increase	B – slight increase	C – all increase	D – expensive ICE
BEV	0.25 %	0.25%	0.50%	0.50%	1.00%
PHEV	0.50 %	1.00%	1.25%	2.00%	2.00%
ICE	1.00 %	2.00%	2.00%	2.00%	2.50%

3 Results

3.1 Empirical results

Table 2 shows the regression results from OLS regressions with the logarithm of BEV and PHEV sales shares as the dependent variable. Incentives are measured in 1,000 € for one-time incentives (e.g., rebates) and

1,000 €/year for recurring incentives (e.g., tax reductions). All models include country fixed effects, and columns 2 and 4 additionally include further control variables.

Table 2: Regression results for company car incentives on PEV sales shares.

	BEV sales shares		**PHEV sales shares**	
Rebate (‘000 €)	0.144*** (0.030)	0.143*** (0.028)	0.027 (0.033)	0.029 (0.034)
POS tax (‘000 €)	0.023 (0.020)	0.020 (0.021)	0.059* (0.036)	0.066 (0.044)
VAT reduction (‘000 €)	-0.077* (0.047)	-0.080* (0.048)	0.028 (0.053)	0.022 (0.047)
Income tax (‘000 €/a)	-0.005 (0.032)	-0.010 (0.032)	0.209 (0.428)	0.145 (0.353)
Circulation tax & depreciation (‘000 €/a)	0.181 (0.366)	0.176 (0.366)	-0.244* (0.133)	-0.202 (0.126)
Company Car tax (‘000 €/a)	0.227*** (0.059)	0.220*** (0.064)	0.881*** (0.245)	0.849*** (0.230)
Trend	0.413*** (0.028)	0.426*** (0.046)	0.554*** (0.025)	0.450*** (0.052)
Country fixed effects	✓	✓	✓	✓
Additional controls		✓		✓
Observations	356	356	341	341
No. of countries	31	31	31	31
Adjusted R^2	0.880	0.879	0.816	0.824
F Statistic	375.9***	262.4***	220.5***	163.2***

The results indicate that higher purchase rebates are significantly associated with increased sales shares of BEVs (columns 1–2), with an estimated coefficient of around 0.14 and high statistical significance ($p < 0.01$). In contrast, purchase rebates have no significant effect on PHEV sales shares (columns 3–4). Similarly, company car tax benefits are strongly and significantly associated with higher sales shares for both BEVs and PHEVs. The coefficient for BEVs is approximately 0.22 ($p < 0.01$), while for PHEVs it is even higher at around 0.85–0.88 ($p < 0.01$), highlighting the particular importance of company car taxation for plug-in hybrids.

VAT reductions are associated with significantly lower BEV shares, which may reflect reverse causality or policy targeting in countries with initially lower uptake. Other fiscal incentives—such as point-of-sale (POS) tax reductions, income tax benefits, and annual circulation tax and depreciation incentives—do not show consistent or statistically significant associations, except for circulation tax and depreciation incentives, which are weakly negatively associated with PHEV uptake (column 3).

The strong positive and significant time trend in all models reflects the general increase in BEV and PHEV market shares over the sample period. Overall, the models explain a large share of the variation in sales shares, with adjusted R^2 values ranging from 0.816 to 0.880.

3.2 Simulation results of policy option for benefit-in-kind changes

Figure 2 shows the changes in PEV sales for Germany until 2030 compared to the reference evolution. Further results on the PEV stock, CO_2 emissions, and federal budget are summarised in table 3.

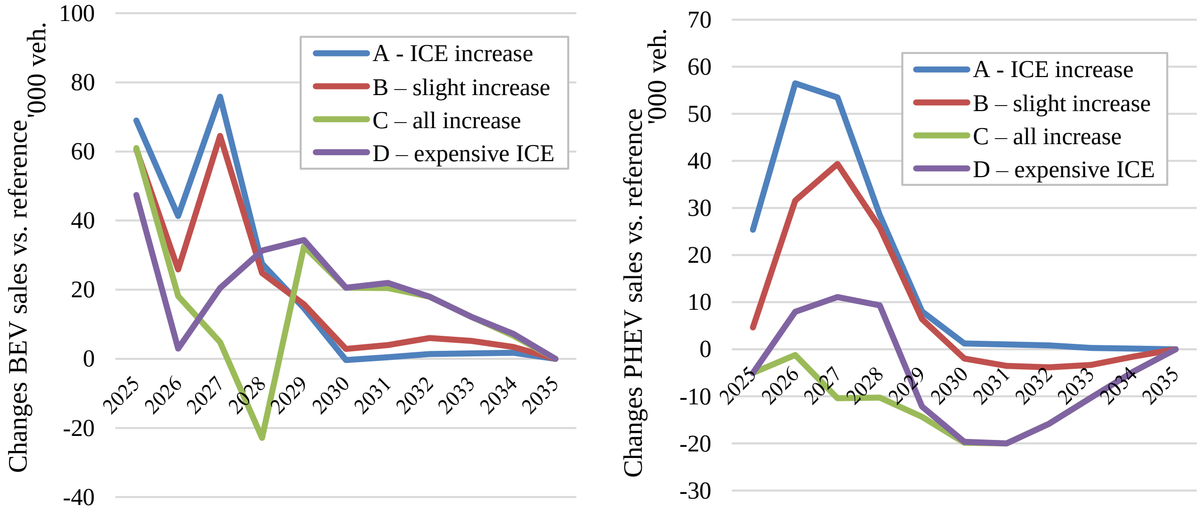

Figure 2: Changes of BEV (left) and PHEV (right) sales combined per year and scenario compared to the reference scenario for Germany.

The figure illustrates the results from scenario-based modelling of changes in annual battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) sales relative to a reference scenario from 2025 to 2035. The left panel shows BEV sales, and the right panel depicts PHEV sales, both expressed in thousands of vehicles. Four policy scenarios are examined: (A) increased taxation on internal combustion engine (ICE) vehicles, (B) a slight increase in taxation across all powertrains, (C) a broad increase in taxation on all vehicle types, and (D) a strong tax increase on ICE vehicles only.

Across all scenarios, BEV sales show the strongest positive deviation from the reference scenario in the early years, especially between 2025 and 2027. The percentage sales increase compared to the reference evolution is between 2 and 8 % compared to the reference BEV sales in the years 2025 – 2028 and almost zero from 2030 onwards. Scenario A ("ICE increase") leads to the most substantial short-term boost, followed by Scenario B. Scenario D shows a delayed but more gradual increase, while Scenario C—where taxation increases for all powertrains—results in a significant drop in BEV sales around 2028. Over time, the differences between scenarios narrow, and by 2035, sales tend to converge toward the reference trajectory.

For PHEVs, the effects are smaller and more short-lived. Scenario A again yields the highest initial increase, while Scenario B provides only moderate gains. Scenario D shows only a brief, limited impact. Notably, in Scenario C, PHEV sales fall below the reference level from 2028 onward, likely due to the reduced attractiveness of plug-in vehicles under generalized tax increases. Overall, the results underscore that targeted taxation of ICE vehicles is more effective in promoting electric vehicle uptake than broad, undifferentiated tax hikes. The percentage changes compared to the reference sales numbers are also interesting. In Scenario A, which targets ICE vehicles with higher taxation, PHEV sales spike dramatically in the short term, with increases of 281% in 2025 and 288% in 2026. These effects taper off rapidly in subsequent years, dropping to single digit increases by 2029 and virtually no difference from the reference by 2034. Scenario B, with a more moderate tax increase, leads to a smaller but still notable short-term boost in PHEV sales (51% in 2025 and 161% in 2026), followed by a gradual decline into negative territory from 2030 onward. Scenarios C and D, which apply either broad taxation or specifically expensive ICE costs, show consistently negative impacts on PHEV sales from the beginning or shortly after. Scenario C results in a 56% drop in 2025, and losses deepen over time, reaching around -40% from 2031 onwards. Scenario D follows a similar trajectory, with slightly less negative effects in the early years but converging with Scenario C in later years. Overall, the results suggest that strong ICE-specific taxation (Scenario A) can trigger a short-term surge in PHEV adoption, but the effect is not sustained. More broadly applied taxation schemes (Scenarios C and D) tend to suppress PHEV sales over the long term, possibly due to reduced competitiveness or affordability relative to both ICE and BEVs.

The changes in BEV and PHEV sales in the different policy scenarios also affect the annual CO_2 emissions of the car fleet in Germany. Figure 3 shows the change in annual emissions in Mt CO_2/a for each policy scenario compared to the reference evolution. Scenarios A and B with cheap company car BEVs but more expensive combustion engine vehicles lead to immediate emission reductions of up to 0.8 Mt/a in 2030, which decline thereafter. In contrast, Scenarios C and D with an increase of company car taxation for all propulsion systems lead to a slight increase in emissions already in 2025, which grow up to 0.4 Mt/a in 2028 and a slight emission reduction thereafter.

The total cumulative emission changes until 2035 are shown in Figure 4 compared to the reference evolution. Scenario A saves a total of 6.2 Mt until 2035, Scenario B 4.2 Mt, whereas Scenario C leads to a slight emission increase of 0.5 Mt in total, and Scenario D to a slight cumulative emission decrease of 1.0 Mt.

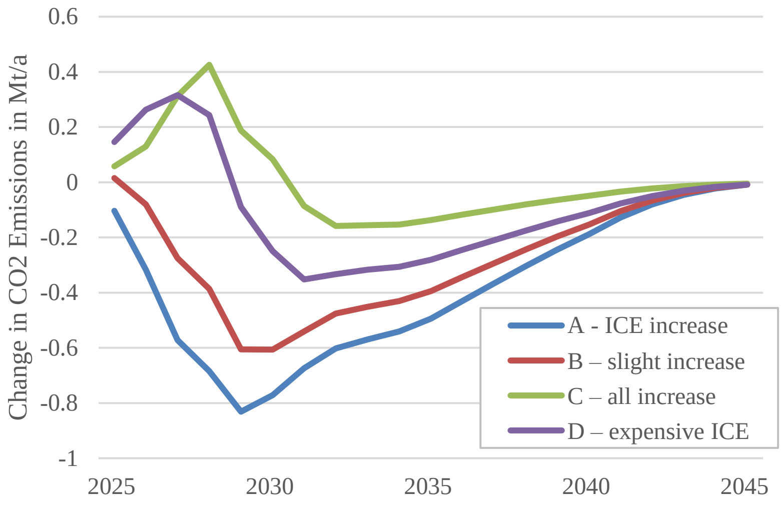

Figure 3: Changes in annual CO_2 emissions compared to the reference case in Mt CO_2 per year by scenario

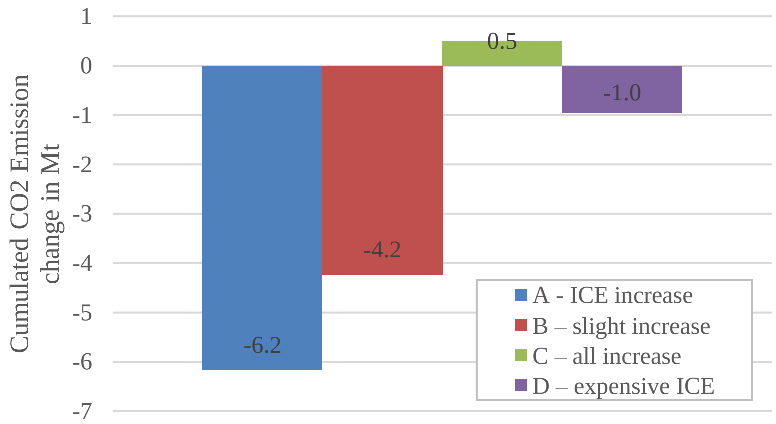

Figure 4: Cumulative changes in CO_2 emissions until 2035 compared to the reference case in Mt CO_2 by scenario.

4 Discussion

The results of this study demonstrate a clear link between targeted fiscal incentives, including company car costs, and the uptake of electric vehicles, in particular BEVs and PHEVs. However, as with any model-based analysis, the interpretation of these findings must be accompanied by a careful discussion of underlying assumptions, data quality, and methodological limitations. The ALADIN model used in this work is based on agent-based simulations of vehicle purchase decisions, grounded in real-world driving profiles and detailed economic representations. This provides a high degree of behavioural details, particularly for the company car segment, where both user costs and employer considerations are relevant. Nevertheless, uncertainties remain regarding the exact weights of user versus company perspectives, as well as in the projections of future vehicle costs, taxation schemes, and market dynamics.

Data availability and quality are further sources of uncertainty. While the model uses several thousand actual driving profiles, these are based on German users and may not fully reflect usage patterns in other European contexts. Moreover, fiscal incentive data and vehicle taxation policies across EU countries may be subject to inaccuracies or temporal mismatches, particularly for incentives that are complex or recently reformed. This could partly explain surprising findings such as the negative correlation between VAT reductions and BEV sales, which may stem from reverse causality or reflect short-term targeting in low-uptake regions. Furthermore, certain relevant behavioural and institutional aspects – such as fleet procurement strategies, employer leasing frameworks, or evolving vehicle supply constraints – are not explicitly modelled.

Despite these limitations, several findings appear robust across model variants and scenario runs. The strong and statistically significant effect of company car taxation on both BEV and especially PHEV uptake is a consistent result, as is the limited and inconsistent impact of most other fiscal measures beyond purchase rebates. Scenario analysis further reinforces this point: policies that specifically penalize internal combustion engine (ICE) vehicles (Scenario A) consistently lead to the highest short-term increases in electric vehicle uptake and the greatest cumulative emission reductions, even under varying assumptions. In contrast, undifferentiated tax increases (Scenarios C and D) tend to weaken electrification momentum and result in smaller or even negative climate effects. These stable patterns suggest that differentiated fiscal policy design – favouring electric vehicles while disincentivising ICEs – remains a key lever for accelerating the transition to low-emission mobility, particularly in the company car segment.

5 Summary and Conclusion

This study investigated the impact of company car taxation on the market uptake of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) using an agent-based simulation model (ALADIN) calibrated to real-world driving profiles and purchase behaviours. The empirical analysis confirmed the high relevance of company car tax benefits for both BEV and PHEV market shares, with particularly strong effects for PHEVs. In contrast, other fiscal incentives such as value-added tax (VAT) reductions and circulation tax benefits showed limited or inconsistent associations with market uptake. Scenario-based modelling further revealed that targeted taxation of internal combustion engine (ICE) vehicles, while maintaining favourable conditions for electric vehicles, is the most effective approach to stimulate BEV and PHEV sales in the short term and to reduce fleet emissions over time. Broad and undifferentiated increases in taxation, by contrast, tend to suppress electric vehicle sales and may lead to negative climate impacts.

From a policy perspective, the results highlight the importance of well-calibrated, technology-specific fiscal instruments in steering the transition to low-emission company cars. A key recommendation is to maintain or expand preferential tax treatment for electric vehicles – especially in the company car segment – while gradually increasing the tax burden for ICE vehicles. This creates a clear and credible signal favouring electrification without relying on high subsidy spending. Furthermore, the design of fiscal measures should avoid blanket approaches that inadvertently reduce the attractiveness of electric vehicles, as seen in scenarios with generalized tax increases. Policymakers should also consider the temporal dynamics: short-term tax changes can lead to rapid behavioural responses, but long-term effects require stable, predictable frameworks. Lastly, improving data availability on company car fleets, taxation structures, and user behaviour across EU countries would support better-informed modelling and policymaking in the future.

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