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Company cars and household car choices*

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Abstract

Tax systems that favour company cars for personal use could cause households to have more cars. It could also affect the technology choice. We investigate the relationship between household car choices and access to a company car through a difference-in-difference design using Norwegian microdata. We find that access to a company car is associated with an increase in the total number of cars and in the number of combustion-engine cars. For electric cars, the results are inconclusive. However, wage growth and access to company cars are also positively correlated. Therefore, we cannot interpret the difference in number of cars between the treatment and control group as a causal effect of the company car scheme, but as correlations. Still, existing evidence on the income elasticity of car demand suggests that the increase in the number of cars is unlikely to be driven by wage growth alone. (*JEL* D12, H24, J33, Q58, R41)

Keywords: Fringe benefits; Company car; Car Ownership; Electric Vehicles; Tax

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1 Introduction

The convenience and flexibility provided by cars have made them a crucial element in modern mobility. The global number of vehicles has been on a steady rise and reached approximately 1.4 billion in 2022 (Hedges & Company, 2021).[1] However, the increased number of cars has led to a rise in CO_2 emissions and other types of pollution, both from production and use (ACEA, 2022; IEA, 2021, p.194). In addition, car use contributes to other externalities such as road congestion, accidents and noise, and they take up space both when parked and in use. Greenhouse gas emissions from transport accounts for almost one quarter of global energy-related CO_2 emissions (Pathak et al., 2022).[2] To reduce emissions, countries have several strategies, including reducing transport volume, shifting from cars towards public transportation, cycling, and walking, and transitioning from combustion-engine cars to zero-emission vehicles (Hegsvold et al., 2022).

In this paper we study the relationship between having access to a company car and the number of cars in the family, as well as the number of electric vehicles and combustion-engine cars.[3] Getting a company car that can be used privately may increase the number of cars in the household compared to the number of cars the household would have had if no household member had a company car. Understanding this magnitude is important as producing and using cars have significant external consequences. Company cars can make having a car cheaper, easier and with less risk regarding unexpected costs. The personal use of a company car is taxed in most countries (Harding, 2014). If the company cars are taxed too lightly, there is both a fiscal loss to the government revenue and an environmental cost because having and/or using a car becomes cheaper (Harding, 2014).

Previous research has shown that having a company car[4] increases the total number of cars that households possess (Börjesson & Roberts, 2023; Metzler et al., 2019). Börjesson and Roberts (2023) is the first paper to use administrative microdata to investigate this question. The context is Sweden, and the paper uses household fixed effects to control for unobserved characteristics that do not change over time. They find that having a company car both increases the probability of having at least one car by respectively 38 percentage points (single households) and 14 p.p. (couple households), and the number of cars in the household by 0.41 (couple households).

[1] The USA has the highest number of cars per capita (0.89), whereas Europe has 0.52 cars per capita and India 0.05 (Hedges & Company, 2021).

[2] These numbers do not include emissions related to the production of vehicles.

[3] We use the term family and household interchangeably in this article, but statistically we use families as the unit of observation. The statistical difference between a household and a family is that a family can only consist of two generations and maximum one couple, while a household is everyone that lives in the same residence. There can therefore be more than one family in a household. Definitions (in Norwegian) can be seen here: https://www.ssb.no/befolkning/barn-familier-og-husholdninger/statistikk/familier-og-husholdninger.

[4] In this setting "having a company car" means to use a car paid by the employer for private trips.

Metzler et al. (2019) investigate the question for Germany. Their data is a household survey. The research design is to compare the log of the number of kilometres driven with private cars and company cars, with no household fixed effects. They find that company cars are driven longer, but that they use less fuel per kilometre than private cars, probably because the company cars are newer and mid-sized. Further, they find that households holding a company car have 25% more cars. Further, Gutiérrez-i-Puigarnau and Van Ommeren (2011) find that in the Netherlands, those with a company car have a more expensive car than those without a company car. Both studies could suffer from selection bias. See Börjesson and Roberts (2023) for a more comprehensive review of the company car literature.

Harding (2014) provide a benchmark for neutral taxing of personal use of company cars and considers whether the benefit is taxed lower than the benchmark in different OECD countries. She finds that the capital component in the Norwegian company car tax system implies that on average, the whole value of the private use of company cars is taxed. Thus, Norway has no fiscal loss in the company car tax, but the design of the tax does not give environmental incentives, according to Harding (2014). Except for Norway and Canada, Harding (2014) finds that all other OECD countries tax the company cars too lightly.

In this paper we use a difference-in-difference design. We use administrative microdata, which is data on the individual level from administrative registers such as the tax return from the tax authority and the vehicle register from the Norwegian Public Roads Administration. This means that we cover the universe of workers, cars, families and firms. If we look at who acquires a company car, the decision could be related to an increase in car demand (endogeneity problem), and we therefore focus on who gets an *offer* of a company car. We look at workers who are likely to be offered a company car when they change job and compare them to workers that change job, but are not likely to be offered a company car. The sample consists of workers who are employed in what we call company car occupations and change job from one firm to another. We then distinguish between those who are hired by what we call company car firms, and therefore are likely to be offered of a company car, and those who are hired by firms where company cars are not offered. This constitutes our treatment and control groups. We do not observe whether those working in company car occupations in company car firms actually get an offer of a company car. If only a subset of this group is offered a company car, our underlying assumption is that this offer is independent of the outcome variables.

In addition to our main analysis, we use the same research design as the Swedish study by Börjesson and Roberts (2023) (discussed more below). Although time-invariant characteristics are controlled for, the choice of acquiring a company car could be associated with (unobservable) changes in household car demand (Angrist & Pischke, 2009). This could for instance be members in the family starting a new spare-time activity that require more flexible transport or changes in parking availability. If employees have the ability to influence the decision of being offered a company car and they choose to do so when they already intend to purchase a car, the employee may acquire a company car when their alternative would have been buying another car. This would cause an upward bias in the estimated effect of company cars on the number of cars in the household. We want to compare the results of the Swedish research design in Sweden and Norway to see if the results are similar.

One contribution of this paper is that it is the first investigation of the company car scheme that uses quasi-experimental methods. It is also the first investigation of the company car scheme in a context with high market penetration of electric vehicles. In addition to the company car literature, this paper contributes to a growing literature that uses administrative microdata to study car ownership and use (Fevang et al., 2021; Gillingham et al., 2022; Gillingham & Munk-Nielsen, 2019; Pyddoke, 2009). For instance, Østli (2023) investigates whether better public transport influences the number of cars in the household. Jordbakke (2023) investigates how new parking rules for people living in the city influences their car consumption. This paper also adds to the literature that uses job changes for exogenous variation. Paetzold and Winner (2016) use change of job to find out if the work environment influences the decision to cheat on the tax.

The rest of the paper is organized as follows. First we present the company car scheme and the Norwegian car market more in detail. Then we present the data and define important variables. Furthermore, we present the empirical strategy and the samples for the two different research strategies. Then we turn to the results, before we discuss income elasticities of car demand, and conclude.

2 Background

In this section we give brief information about the taxation of personal use of company cars in Norway, compare the costs of different options and present descriptive statistics about company cars in Norway and the Norwegian car market.

2.1 Taxing the private use of company cars

Private use of company cars are prevalent in many countries. How this benefit is taxed varies. The tax could have only a capital component, only a distance component, combinations of the two, or other tax designs. The capital component can be based on the list price, the cost price or the fair value of the car. The distance component can be added based on personal kilometers, deducted based on business kilometers, or using other methods (Harding, 2014).

In Norway the benefit of the personal use of the company car is valued based on the list price of the same car bought as new. The tax on the capital cost of the car includes the fuel cost and other car-related costs on private trips.[5] 30% of the list price up to a certain amount and then 20% of the remaining list price is added to the wage as a fringe benefit.[6] This amount is taxed according to the marginal tax rate, which depends on the wage level.[7] If the car is older than 3 calender years, the company car tax is lower.

All costs related to the company car are covered by the employer, except costs not defined as 'car costs', which includes parking costs, toll road costs, and ferry costs. There is no rule saying who in the family can use the car. The company car tax is not reduced if the employee pays some of the expenses themselves. However, if the company car is only used sporadically for private trips, defined as maximum 10 days annually and maximum 1000 km, there is no company car tax.[8]

Gutiérrez-i-Puigarnau and Van Ommeren (2011) state that it is common to not pay VAT on the company car, at least in the Netherlands. Firms in Norway are not allowed to deduct the VAT on leasing or purchasing of passenger cars on their VAT accounting.[9] If that had been possible, the cost of a company car would have been lower than the cost of owning a car as a private person, which would have given large incentives to firms to offer a company car instead of wage. How this is in other OECD countries is not covered by the study of Harding (2014).

With only a capital component and with the same tax rules for electric and combustion-engine cars, the scheme probably favors combustion-engine cars, as non-electric cars have higher fuel costs. However, electric company cars had a 40–50% discount in the valuation in 2021 and earlier. This discount was reduced to 20% in 2022 and abolished in 2023.

2.2 Comparing the cost of different options

The value of the company car can mean three different things: 1) the taxable value based on the tax rules, see Section 2.1, 2) the annual cost of owning and using a new car, see

[5]In Sweden, the company car tax has both a capital component and a distance component (Börjesson & Roberts, 2023; Harding, 2014).

[6]The kink where the percentage changes from 30% to 20% increases by around 1-3% every year. See more details here: https://www.skatteetaten.no/en/person/taxes/get-the-taxes-right/property-and-belongings/cars-boats-and-other-vehicles/company-car/private-use-of-a-company-car/

[7]The top marginal tax rate in 2021 was 46.4% and the wage above 1,021,550 NOK has this tax rate. For wages between 651,250 NOK and 1,021,550 NOK the marginal tax rate was 43.4%.

[8]The commuting trip to and from work is defined as a private trip, not a work-related trip, as long as the work place is the same for at least two weeks.

[9]More information (in Norwegian) here: https://www.skatteetaten.no/rettskilder/type/handboker/merverdiavgiftshandboken/gjeldende/M-8/M-8-4/

Figure 1, or 3) the personal value of the private use of the company car. The personal value can be both higher and lower than the taxable value and the annual car cost.

The annual company car tax is lower than the average annual cost to a private person of owning and using a new car, see Figure 1.[10] In addition to costing less than a new car, the company car scheme removes any uncertainty about annual car expenses, for instance fuel costs if the fuel price is increasing, accidents which might increase insurance costs and unexpected maintenance. This might be a large benefit to some households.

The idea behind the company car tax is neutrality between fringe benefits and wages. The employee should be indifferent between getting a company car and receiving a wage increase equal to the taxable value of the company car. However, it is possible that the employer does not offer the same amount as wage as the personal value of the company car for the employee. Depending on risk preferences related to car costs, the value of the company car for the employee could be higher than the cost to the employer.[11] The value of no uncertainty related to car expenses can be high for some employees, while for the firm this might induce no costs at all, at least if it is a large firm. In these cases, the wage that the firm will be willing to offer as an alternative to a company car will be lower than the value of the company car to the employee.

One factor that can make a company car a less economic choice is that the alternative is not a new car but a used car or no car. Also, the annual cost of owning and using a new car for a specific household can be different than the calculations shown in Figure 1. In Figure 1 we compare the cost of a car costing 636,000 NOK for an employee who has the highest marginal tax rate (46.4%) and drives 20,000 km per year. For privately owned cars, we assume that the employee drives half of the kilometers for work and gets mileage allowance for this. The governmental mileage allowance that many employers follow, is 4.03 NOK per km, and 3.50 NOK/km is without tax. Different annual mileage, new car price and marginal tax rate changes the absolute cost of the different options, but the order of the different options when ordering from the cheapest to the most expensive, as seen in Figure 1, does not change. See Figure A-1 for the cost of a more expensive car and Figure A-2 in the Appendix for different marginal tax rates.

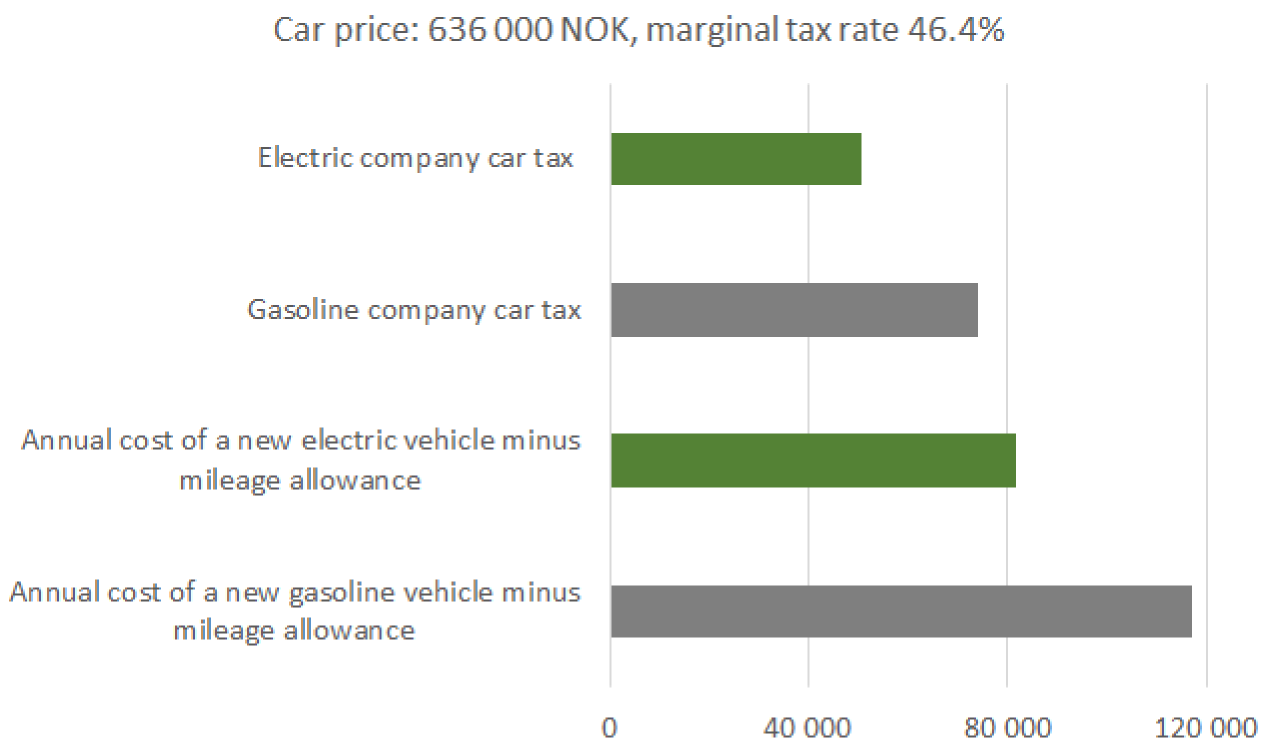
2.3 Descriptive statistics on company cars in Norway

Every year during 2015–2021, around 40,000 employees use a passenger company car for personal purposes. The number has been stable during this period. Since many employees keep the company car for multiple years, 73,309 unique persons have a company car during

[10]The annual cost of owning and using a new car is based on calculations from The Norwegian Road Federation (OFV, 2021), and will of course vary from household to household.

[11]This point is not relevant for employees that own their own company.

Figure 1: The annual company car tax compared to the annual cost of owning and using a new car.



The source of the annual cost of owning and using a new car is The Norwegian Road Federation. This compares the cost of a car costing 636,000 NOK, with the top marginal tax rate which is 46.4% and driving 20,000 km per year. For privately owned cars we assume driving half of the kilometers for work and getting mileage allowance for this. The governmental mileage allowance that many employers follow, is 4.03 NOK per km, and 3.50 NOK/km is without tax. The 46.4% marginal tax rate is for wages above 1,021,550 NOK. For wages between 651,250–1,021,550 NOK in 2021, the marginal tax rate is 43.4%. See Figure A-1 for the cost of a more expensive car and Figure A-2 in the Appendix for different marginal tax rates.

2015–2021.

The most common occupations are seller and top manager. Please see Table A-1 in the Appendix for details on the occupations. Company car users are typically male (82%) and on average 48 years old. The mean gross wage in 2021 among all company car users is 846,578 NOK, among sellers 731,050 NOK and among top managers 998,454 NOK.[12]

There are 32,165 unique firms in Norway that give a company car to at least one employee during the period 2015–2021. The number of companies with company cars is stable during the period 2015–2021. Each year the number of unique companies is 17–18,000. This means that around 7% of employers give one or more employees passenger a company car.[13] 57% of all the firms with at least one company car user only have one company car user. 19% of the firms have two users.

The industries with the highest company car share among the employees are wholesale trade (except motor vehicles and motorcycles), manufacture of beverages and rental and leasing activities. The sector with the most company cars in absolute terms is private companies in the non-financial sector.

The mean age of the company cars is 2.6 years-old and the median is 2. Passenger company cars between 0 and 7 years old in 2021 constitute 4% of the passenger car stock that are 0-7 years-old. There are roughly around 10,000 new company cars every year (with 2018 and 2020 as exceptions), and new company cars is 5-7% of the total new car market (see Table A-2 in the Appendix for details).

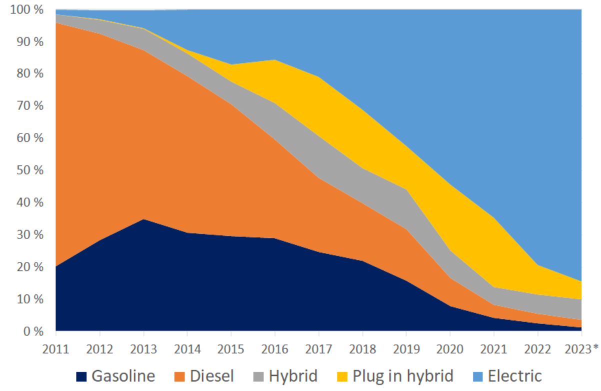
The median amount that is reported as the taxable value of the company car is 104,580 NOK. For electric vehicles the median amount is 100,886 NOK and for non-electric vehicles the median is 126,525 NOK.

During the last decade, the Norwegian new car market has gone through a technology shift, see Figure 2a. From having a 98.55% market share in 2011, combustion-engine vehicles (not including plug-in hybrids) had a 10% market share the first five months of 2023. Electric vehicles had a market share of 1.45% in 2011, and in the first five month of 2023, the share was 83%. The electric vehicle share among 0 year-old company cars follows the electric vehicle share in the car market, see Figure 2b.

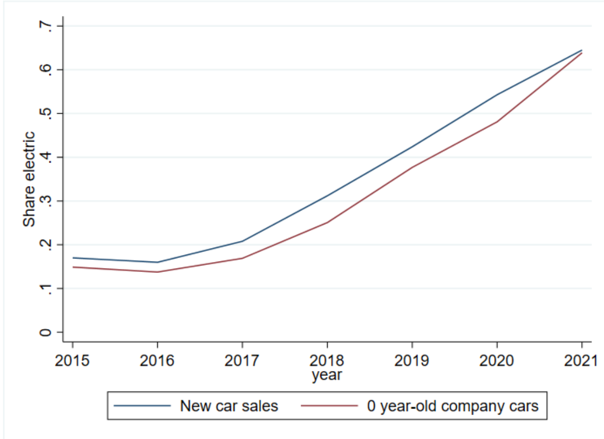
[12] This is after the outliers having wage over 2 million NOK is taken out of the sample.

[13] There are 260,000 employers in Norway, according to this source: https://www.skatteetaten.no/en/business-and-organisation/employer/the-a-melding/about-the-a-ordning/about-a-ordningen/

Figure 2: Sale shares by technology



(a) Sale shares by technology 2011-2023.



(b) The electric vehicle share among new company cars compared to the whole market 2015-2021.

Notes: New company cars are part of the new car sales. There are around 10 000 new company cars every year, which is 6-7% of the total new car market, see Table A-2 in the Appendix. Source of Figure 2a is The Norwegian Road Federation (OFV) and the figure builds on Figure 1a in Andreassen and Lind (forthcoming). 2023 includes the first quarter of the year.

3 Data and empirical strategy

In this section we present the data that we use in the analysis and explain how we define important variables. Then we turn to the empirical strategy. First we present the strategy using the Swedish research design (Börjesson & Roberts, 2023), before we present and discuss the empirical strategy of the main analysis.

3.1 Data

We use rich administrative microdata from 2015-2021 in Norway. The data covers the universe of employees, employers (firms), families, and passenger cars.[14] Whether a car is a company car cannot be identified in the vehicle register. The vehicle register says who owns the car.[15] To identify the company cars, we use annual data reported from the employer to the tax administration through the same system as the monthly digital wage reporting.[16] This data can be linked with the vehicle register, wage data, household data and other administrative data through anonymous person id, car id and company id. The variables that we use from the company car data are person id, car id, year,

[14] Self-employed persons are included in the sample if they have a limited liability company and employ themselves in this company, but not if they have a sole proprietorship.

[15] From 2020 and onwards we know who leases the car, which in the case of company cars is most often the employer, but it is not registered who uses the car.

[16] For more information, see here: https://www.skatteetaten.no/en/business-and-organisation/employer/the-a-melding/about-the-a-ordning/about-a-ordningen/

company/firm id[17], and the taxable value of the personal use of the company car.

Company cars are valued based on the list price (see Section 2.1). If the value in the company car data is lower than 100,000 NOK for a non-electric car that is 3 years or younger, we assume that the employee does not use the car for the whole year.[18] In this case, w.e set the number of company cars to a fraction equal to the taxable value divided by 100,000 NOK, see Section B.2.1 in the Appendix for details. If the amount is higher than 100 000 NOK, the cars are counted as one car the whole year. A more precise way to measure the share of the year a person has a company car, is to find the median list price of the company car model and then divide the list price on the taxable value.

The family register has a variable for whether a person lives in a couple or alone, and the size of the family. The monthly wage reporting tells us the id of the employer, the gross wage (with and without fringe benefits), the working hours (which we use to define the main employer each month) and the occupation code. The company car data tells us who has a company car and what firm the person works in. See Section B in the Appendix for more detailed information about the data.

3.1.1 Defining important variables

We define *company car occupation* in a given year as occupations where over 10% of the work stock in the whole labor market has a company car. From this list of occupations, we exclude occupations where it seems likely that the employees decide about the offer of a company car themselves, e.g. top managers.

We define *company car firms* as firms that has given a company car to at least two persons every year the treated works in the firm. We exclude the firms with only one employee having a company car as it can be more likely that this employee is special or that this employee can decide about the offer of a company car themselves.

We assume that those working in a company car occupation and in a company car firm get *an offer of a company car*. Whether this is a valid assumption is discussed in chapter 3.3.2.

3.2 Using the Swedish research design

3.2.1 The empirical strategy

In this section, we present the empirical strategy where we use the same research design as Börjesson and Roberts (2023) on Norwegian data in order to compare the results for

[17]Company and firm are used interchangeably in this article.

[18]Since electric vehicles get a 40–50% discount in the valuation, we assume that electric vehicles are used the whole year.

Sweden and Norway. Börjesson and Roberts (2023) compare the change in the number of cars over time within households that have a company car with the within-household changes over time for those not having a company car. One of our critiques of this strategy is that the households not having company car can be different on time-varying variables than the households having a company car (see Subsection 3.2.3).

We follow Börjesson and Roberts (2023) in separating the analysis between couples and singles and controlling for household fixed effect, time fixed effects, log annual income of the household and number of members of the household including children.[19] Results are shown in Section 4.1. The regression equation is:

$$Y_{i,t} = \alpha_i + \delta_t + \theta C_{i,t} + X_{i,t} + \epsilon_{i,t} \tag{1}$$

where $Y_{i,t}$ is the number of cars or the likelihood of having a car, α_i is household fixed effects, δ_t is time fixed effects, $C_{i,t}$ is whether the household has a company car or not, θ is the effect of having a company car in the Swedish research design, $X_{i,t}$ is a vector of control variables and $\epsilon_{i,t}$ is the error term.

When looking at the change in the number of cars for the households, where some change their company car status, either getting a company car or losing a company car, and some have a company car during the whole period of investigation, an implicit assumption is that the effect of getting a company car and losing a company car is symmetric. Börjesson and Roberts (2023) find that for single households the effect is symmetric, while for couple households, they find a small asymmetric effect.

This design does not take into account the different timing of when the households get or lose a company car, which can be problematic if there are dynamic effects on the number of cars over time or heterogenous effects across groups of households gaining access to a company car at different times (Callaway & Sant'Anna, 2021; Roth et al., 2023). The main analysis (see Section 3.3), using a heterogeneity-robust estimator, takes the possibility of heterogenous treatment effects into account.

Börjesson and Roberts (2023) take out observations where the household does not have a company car the whole year, in order to not overstate the number of cars that year. Based on our company car measure, where the number of company cars can be positive but lower than one, (see Section 3.1), we keep such observations.

[19] Börjesson and Roberts (2023) also control for centrality.

3.2.2 The sample using the Swedish research strategy

The sample where we use the research strategy of Börjesson and Roberts (2023) consists of everyone that are employed every year from 2015-2021. This means that not everyone with a company car is part of the sample, because they are not employed every year. For couples at least one of the adults work. Those that are not in the family register are defined as single. See Table 1 for descriptive statistics of the sample.

Table 1: Descriptive statistics of the sample in 2015 when we are using the Swedish research design (Börjesson & Roberts, 2023).

Single household			
	All	No company car	Company car
Having a car or not	0.59	0.59	1
Number of cars	0.74	0.73	1.22
Number of persons in the family	1.44	1.44	1.43
Share male	0.58	0.58	0.77
Number of households	422,105	417,467	4,638
Couple household			
	All	No company car	Company car
Having a car or not	0.92	0.92	1
Number of cars	1.61	1.60	1.96
Number of persons in the family	3.42	3.42	3.53
Share male head of household (oldest person in the household)	0.76	0.76	0.94
Number of households	592,246	575,778	16,468

3.2.3 Drawbacks of the Swedish strategy

The Swedish strategy is based on comparing the change in the number of cars in households with a company car with those without a company car. This research strategy has two main drawbacks: Endogenity and selection bias. Endogeneity issues arise if the independent variable is influenced by the outcome variable. In our case this means that whether a person has a company car can be influenced by the demand for cars in the family. Imagine that a family would like to get one more car. The father in the family asks his boss if he can get a company car and maybe let go of some wage increase. The boss says yes, and the family increases the number of cars. The independent variable (having a company car) is then influenced by the outcome variable (number of cars in the family).

The second drawback, the selection bias, means that the groups we compare are not similar on important variables. Car preferences play an important role in car ownership decisions, and vary between households. Car preferences might vary within households over time and interact with both observable and unobservable variables. Household fixed effects are therefore not enough to control for car preferences.

In the next subsection we explain how we address these issues in our research design.

3.3 Empirical strategy of the main analysis

In this subsection we present the empirical strategy of the main analysis.[20] First, we present the target parameter, the identification strategy, including all assumptions behind it, and discuss the use of covariates in the analysis. Further, we present the estimation strategy and descriptive statistics of the main sample, before we investigate the plausibility of the parallel trend assumption.

3.3.1 Target parameter

A parameter of interest is the effect of having a company car on the number of cars in the households:

$$\tau = \mathbb{E}[Y_{i,t=2}(1) - Y_{i,t=2}(0) | D_i = 1] \tag{2}$$

where Y_i is the number of cars in the household, $D_i = 1$ indicates having a company car and $t = 2$ is the post-period in a 2x2 difference-in-difference set-up (Roth et al., 2023). The number in the parenthesis is the potential outcome. (1) means the potential outcome when having a company car, and (0) means the potential outcome when not having a company car. The first term ($\mathbb{E}[Y_{i,t=2}(1)|D_i = 1]$) we can observe because this is the outcome for those having a company car. The second term ($\mathbb{E}[Y_{i,t=2}(0)|D_i = 1]$) is the potential outcome of those with a company car had they not had a company car. This is the unobservable counterfactual: How many cars would the households with a company car have if they did not have a company car.

For the individual the counterfactual is unobservable. We cannot observe a household's car ownership both when having a company car and when not having a company car. For a group and with the right research strategy, it is possible to recover the average unobservable counterfactual. We have not found a strategy to recover the number of cars if the families did not have a company car ($\mathbb{E}[Y_{i,t=2}(0)|D_i = 1]$) or the change in the number of cars between the period after they got a company car and before they got the company car, had they not gotten a company car ($\mathbb{E}[Y_{i,t=2}(0) - Y_{i,t=1}(0)|D_i = 1]$).

However, another interesting parameter is the effect of getting an *offer* of a company car:

$$\beta = \mathbb{E}[Y_{i,t=2}(1) - Y_{i,t=2}(0) | Z_i = 1] \tag{3}$$

where $Z_i = 1$ is getting an offer of a company car. β estimates the effect of getting an offer of a company car, which is the difference between the number of cars after getting an offer of a car and the number of cars the households would have had, had they not gotten an offer of a company car. This is an intention-to-treat effect. The strategy to

[20] This part has benefited from the synthesis of the recent developments in the difference-in-difference literature in Roth et al. (2023) and Baker et al. (2022).

uncover the unobservable counterfactual is our identification strategy.

3.3.2 Identification strategy and assumptions

As discussed in Section 3.2, one may be concerned about selection and endogeneity when it comes to the aquisition of a company car. To mitigate these concerns, we (1) limit our sample to households where one adult household member has a company car occupation during the whole sample period, and (2) look at what happens with the number of cars in the household when this household member changes job. Households in the treatment group work in companies that do not offer company cars and then they change job **to** a firm that offer company cars. Households in the control group **never** get an offer of a company car, neither before nor after the job change. However, the control group also consist of job changers working in company car occupations. Hence, we expect the control group to be similar to the treatment group.

Furthermore, as the acquisition of a company car can be caused by an increase in car demand in the family, we want the timing of the access to the company car to be exogenous. We attempt to achieve this by looking at those that change job. Changing job can cause an increase in car demand, and therefore the control group changes job as well. Since we look at everyone that we assume gets an *offer* of a company car, this will estimate the intention-to-treat effect.

In addition to the comparison already mentioned, we do another comparison. We look at the effect of *losing* the possibility of a company car. The treatment group changes job **from** a company car firm to a non-company car firm. The control group **always** works in a company car firm. Both groups work in company car occupations.

To sum up, we make two different comparisons with four different types of job changers:

- Getting an offer of a company car:
  - Treatment group: Change job from non-company car firm **to** a company car firm
  - Control group: **Never** work in a company car firm, but change job (and work in company car occupations).
- Losing access to a company car:
  - Treatment group: Change job **from** a company car firm to a non-company car firm
  - Control group: **Always** work in a company car firm, but change job (and work in company car occupations).

The first assumptions behind the identification strategy is that it is not the possibility of the company car itself that triggers the change of employer. If this assumption does not hold, we get a selection into who works in company car firms compared to those working in firms not giving company cars to their employees. If this selection means that people with preferences for more cars decide to work in company car firms, the bias will go in direction of increasing the estimated effect of the company car scheme.

Second, we assume that those working in company car occupations in a company car firm get an offer of a company car. If only a subset of this group is offered a company car, our underlying assumption is that this offer is exogenous with respect to the trend in the outcome variables. This means that $Z_i \perp Y_i$. Then it does not matter for the identification strategy if there are some in the treatment group that does not get the offer of the company car.

Third, we assume that the treatment group would have followed the same trend for the number of cars as the control group, had they not gotten the offer of a company car:

$$\mathbb{E}[Y_{i,2}(0) - Y_{i,1}(0)|Z_i = 1] = \mathbb{E}[Y_{i,2}(0) - Y_{i,1}(0)|Z_i = 0] \tag{4}$$

This is the parallel trend assumption that difference-in-difference research designs rely on (Roth et al., 2023). If those working in company car firms for instance have higher wage growth and use this to aquire more cars, the parallel trends assumption is violated. See more discussion about this in Section 3.3.6. Implicit in this assumption is that the effect of changing job is similar for the treatment and control group.

Fourth, we assume that before treatment takes place, the treatment effect is zero (no anticipation effect): $Y_{i,1}(0) = Y_{i,1}(1)$ for all i with $Z_i = 1$. This means that the treated do not anticipate the treatment before the treatment happens. In our case, the treated might plan to change job before they actually do it. Especially if the job change happens early in the year, the household would know about it the year before. Therefore we do robustness tests only looking at the outcome for those changing job from June 1st in year 0, see Appendix D.2. The coefficients do not change much.

The fifth assumption is that treatment does not turn on and off. This means that if a person has first started to work in a company car firm, the offer of a company car is not taken away. We observe that the company car firms give company car to at least two employees every year the treated works in the firm, so this assumption seems plausible.

The last assumption is that there are no spillover and general equilibrium effects. This means that if one household gets an offer of a company car, it does not influence the car ownership of for instance the neighbour, also working in company car occupations, through the neighbour borrowing the company car and therefore reducing their own car ownership. This assumption seems likely to hold. A general equilibrium effect would be for instance that the supply of company cars influences prices in the car market, which could occur in specific segments of the car market, but probably not.

3.3.3 Covariates

It is possible to relax the parallel trend assumption to hold only conditional on covariates (Roth et al., 2023). The covariates should be measured prior to treatment, as covariates after treatment can lead to a problem with bad controls (Angrist & Pischke, 2009; Roth et al., 2023). Time-varying covariates that are not bad controls can also be used. We can use covariates to make it more plausible that the workers starting to work in company car firms (getting an offer of a company car) are random conditional on the covariates. Imposing parallel trends conditional on covariates "gives us an extra degree of robustness, since conditional random assignment can fail so long as the remaining unobservables have a time-invariant additive effect on the outcome" (Roth et al., 2023, p.23).

In order to use covariates in the analysis, we need another assumption, which is the overlap assumption. This means that for each treated unit with covariates X_i, there is also a unit in the control group with the same value on the X_i (Roth et al., 2023).

Age of the worker the year before the job change is a relevant variable to condition the parallel trend assumption on. The wage growth can follow an age profile and changing job at different ages might lead to different wage growth in the new job. As this might not be a linear relationship, we also include a squared term for age.

In addition, we use log wage the year before the job change as a control. The reason why we do not use wage or wage growth after the job change as a control variable is that it could be a "bad control" variable (Angrist & Pischke, 2009). The offer of a company car could affect salary because presumably those who get a company car would receive a higher cash salary if they did not get a company car. Say that we only look at those with a high wage, so the question becomes: Given a high wage, what is the difference in the number of cars between those who have been offered a company car and those who have not. Then, controlling for wage means that in addition to the effect you are interested in (the effect of the company car offer on the number of cars in the household), you get a selection effect. In the selection effect, one compares the number of cars for those who have a high wage and are offered a company car with the number of cars for those who have a high wage and are not offered a company car. But those who have a high wage and are offered a company car are not the same as those who have a high wage and are not offered a company car, because the offer of a company car affects the wage. Therefore, we only include the wage before the treatment starts (the change of jobs) as a control variable.

Another relevant variable can be the average age of the cars that the household have the year before the job change. The age of the cars can be a proxy for car preferences at that time. Those having car(s) that are 10 years old might have a different trend in the number of cars than those having car(s) that are 1 year old. Furthermore, the number of persons in the household the year before the job change and the couple status the year before the job change are relevant control variables.

3.3.4 Estimation strategy

We use a difference-in-difference estimator that is robust for heterogeneity across treatment cohorts and across time: Callaway and Sant'Anna (2021). We have 5 treatment cohorts, depending on when the person in the household changes job. g defines when the first treatment takes place, meaning when the person changes job. We estimate the effect for each treatment cohort g at each t relative to the time period before the treatment starts, $g-1$, (ATT (g, t))[21] for all $t \geq g$:

$$Y_{i,t} = \alpha_i + \delta_t + \beta_{g,t} Z_{i,t} + \epsilon_{i,t} \tag{5}$$

where $Y_{i,t}$ is the number of cars in the household i at time t, $Z_{i,t}$ is whether one adult in the household i has the possibility of a company car at time t, α_i are household-fixed effects, δ_t are time-fixed effects. To create an event study, the estimator aggregates ATT(g, t) for all cohorts each period e after treatment ($e = t - g$). We use both not-yet treated and the never treated as control.

The event studies we show in Section 3.3.6 and Section 4.2, have a varying base period in the pre-period (Callaway, 2021).[22] Varying base period means that the base period is the period before, instead of $g-1$ being the base period for all periods also in the pre-period. For year –1 the base period is –2 and for the year –2, the base period is –3. The pre-period farthest away from treatment for each treatment cohort is left out since that pre-period does not have a base period. This way of estimating the pre-trends might make it more difficult to see if there is a long-term pre-trend. We therefore also should look at the raw data. If there are anticipation effects but no long-term pre-trend, this might be the best way to present the pre-treatment periods (Callaway, 2021).

If we use covariates (see Section 3.3.3), we use the Callaway and Sant'Anna (2021) doubly robust estimator where either outcome regression or inverse probability weighting are used, depending on which one is correctly specified (Roth et al., 2023).

[21] ATT means average treatment effect of the treated

[22] In Stata the varying base period in the pre-period is not possible to change to a universal base period at the time of writing.

3.3.5 Descriptive statistics of the main sample

The main sample consists of households where one of the adults changes employer once during the period 2016-2020 (since we have data from 2015-2021 and we therefore get pre-periods and post-periods for everyone) and work in company car occupations all 7 years. There are 241 households getting an offer of a company car and the control group is 414 households. There are 250 households losing access to a company car, and their control group is 1,128 households.

The average number of cars before treatment is 1.55 cars for the treatment group gaining access to a company car and 1.50 cars in the control group. 91% of the treatment group have a car in the pre-period, and a somewhat lower share in the control group (87%), see Table 2. For the treatment group losing access to a company car, the average number of cars, including company cars, is 1.65 before treatment. For the respective control group, the average is 1.66. 93% in the treatment group and 95% in the control group have at least one car. The treatment and control group in both comparisons are different on many variables, see Table 2.

3.3.6 Investigating the plausibility of the parallel trend assumption

That the levels on the variables in Table 2 are different is not a problem in itself, as long as we believe that *the trend* on the number of cars in the post-period will be the same for the control group and the treatment group, had the treatment group not gotten an offer of a company car, or lost the possibility of a company car. The parallel trend assumption "allows for confounding factors that affect treatment status, but these must have a constant additive effect on the mean outcome" (Roth et al., 2023, p.22). This means that it is decisive that the confounding factors only affect the levels, not the trends.

However, it is difficult to decide whether a factor only affects the levels and not the trends. There could be time-varying confounding factors, which cannot be controlled for through using unit fixed effects. The pre-trends on the number of cars look quite good, at least between year -3 and year -1, as can be seen in Figure 6 and Figure 4b. But that the pre-trends hold is no guarantee that the counterfactual post-trends hold. One time-varying confounding factor could be change in the wage growth. We therefore test how the wage growth of the treatment and control group develops. This can give some indications on whether the parallel trend assumption is plausible.

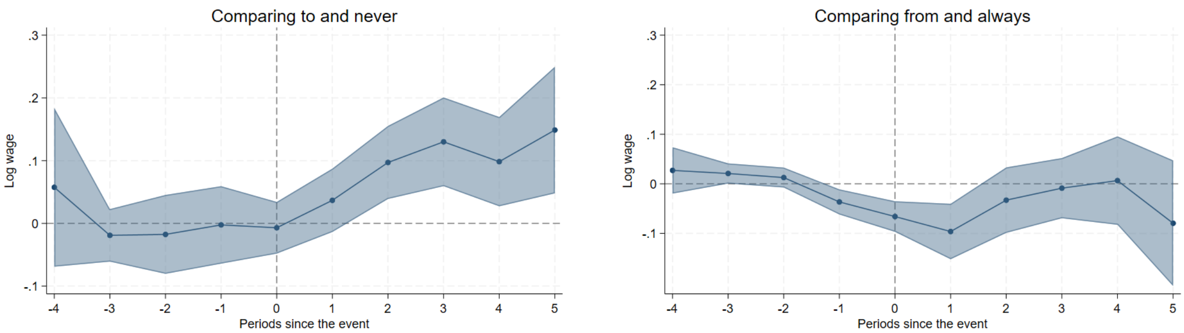
In Figure 3 we see an event study where the outcome is wage growth, not including fringe benefits. Year 0 is the year the job change happens. For those gaining the possibility of a company car, the gross wage growth is more than the control group, see Figure 3a. We see that also with covariates the event-study show an increase in wage growth for the treatment group, see Figure A-13 in the Appendix. The aggregated effect is

Table 2: Descriptive statistics of the main sample, pre-treatment.

	Treatment "Changes to"	Control "Never"			Treatment "Changes from"	Control "Always"		
	mean	mean	diff	p-value	mean	mean	diff	p-value
Number of company cars	0 (0)	0 (0)	0	.	0.358 (0.464)	0.510 (0.486)	-0.151	0.0000
Share having company car	0 (0)	0 (0)	0	.	0.387 (0.486)	0.536 (0.499)	-0.149	0.0000
Number of cars, including company cars	1.549 (0.877)	1.504 (0.926)	0.045	0.300	1.646 (0.919)	1.664 (0.869)	-0.018	0.6015
Number of cars, excluding company cars	1.549 (0.877)	1.504 (0.926)	0.045	0.300	1.288 (0.980)	1.156 (0.908)	0.132	0.0004
Probability of having a car, including company car	0.911 (0.285)	0.871 (0.336)	0.041	0.008	0.930 (0.255)	0.945 (0.228)	-0.015	0.114
Number of electric cars, including company cars	0.113 (0.353)	0.134 (0.364)	-0.022	0.209	0.161 (0.414)	0.113 (0.339)	0.048	0.0007
Mean age of the car(s) the households own (excl. company cars)	5.741 (5.536)	5.895 (5.586)	-0.154	0.566	4.842 (5.496)	4.463 (5.720)	0.379	0.0967
Travel distance between home and work (in kilometers)	86.5 (162.7)	43.0 (130.1)	43.5	0.0000	105.5 (232.0)	106.3 (214.4)	-0.8	0.9280
Travel time between home and work by car (in minutes)	70.9 (132.1)	37.9 (106.1)	33.0	0.0000	86.3 (187.1)	86.2 (171.9)	0.1	0.9889
Travel time between home and work by public transport (in minutes)	188.2 (296.3)	117.3 (208.0)	70.9	0.0000	204.2 (348.7)	212.5 (347.0)	-8.3	0.5629
Age of the job changer	44.0 (9.1)	45.9 (9.4)	-1.9	0.0000	43.8 (8.1)	44.9 (8.6)	-1.1	0.0014
Gross wage for the job changer (NOK)	658,894 (213,841)	708,079 (268,976)	-49,185	0.0001	767,994 (259,957)	707,072 (221,896)	60,922	0.0000
Share couples	0.826 (0.406)	0.792 (0.380)	0.033	0.0820	0.818 (0.386)	0.793 (0.405)	0.026	0.1103
Share male of the job changer	0.844 (0.363)	0.804 (0.397)	0.040	0.0324	0.726 (0.446)	0.795 (0.404)	-0.068	0.0000
Number of persons in the family	3.05 (1.27)	2.92 (1.26)	0.12	0.0442	3.22 (1.24)	3.00 (1.26)	0.22	0.0000
Number of children in the family (no matter the age)	1.23 (1.05)	1.13 (1.06)	0.10	0.0560	1.40 (1.02)	1.21 (1.03)	0.10	0.0000
Number of families	241	414			250	1 128		

Standard deviation in parenthesis.

Figure 3: Comparing wage growth for the treatment and the control group.



6.7 percentage points higher and statistically significant on a 1% level, see Table 3, row 1. The effect reduces to 4.9 p.p. and is statistically significant on a 10% level when including control variables (age, age squared, mean age of the cars the households own, couple status, number of household members, distance between home and work, travel time between home and work by car without congestion, travel time between home and work by public transport and a categorical variable measuring centrality of the firm they work in, measured the year before the job change).

For those losing the possibility of a company car, the wage growth is lower, at least in the first years after the job change, see Figure 3b. The aggregated effect is 5.2 p.p. lower wage growth, statistically significant on a 5% level, see Table 3, row 1. When including control variables, the wage growth is 6.3 p.p. lower and statistically significant on a 1% level. In Figure A-3 in the Appendix, we can see the raw data for log wage for the different groups.

In Table 3, row 2 and Figure A-4 we see the wage in nominal terms, not log wage. The wage in nominal terms is not statistically significantly different for those getting an offer of a company car compared to the control group. For those losing the possibility of a company car, the reduction in the wage in nominal terms is statistically significant on a 1% and 5% level, with and without control variables.

Having higher wage growth could translate into higher growth in the number of cars and a lower wage growth could result in fewer cars, without the company car scheme being the reason. Having different trends in wage could also indicate that the treatment and control group are different on other (unobservable) variables as well, not just the wage growth. Thus, the control group might not be a good control group for the treatment group. This makes us conclude that the parallel trend assumption probably does not hold. Therefore, we cannot interpret the coefficients we get in the analysis as causal, but rather as correlations between getting an offer of a company car and the change in the number of cars. We will return to this in Section 4.3, considering income elasticities for the demand of cars.

In addition to wage, we look at the change in distance, travel time by car and by public transport between home and work for the different groups, see Table 3, row 8-10 and Figure A-10, A-11 and A-12. For the treatment group that gets an offer of a company car, the commuting distance increases compared to the control group. This can be both a cause and a consequence of the increase in the number of cars in the household (see Section 4.2).

We also investigate whether access to company cars is associated with changes in other household characteristics. The results show that the treatment and control groups are balanced with respect to changes in family size, number of children, number of children

Table 3: Aggregated effects for the balance tests. The variables in each row are outcome variables in the Callaway and Sant'Anna (2021)-difference-in-difference estimator. Column (1) and (2) compare the treatment group that gets an offer of a company car with the control group that never gets an offer of a company car, while column (3) and (4) compare the treatment group that loses the offer of a company car with the control group that always has an offer of a company car. Column (1) and (3) are without control variables, and column (2) and (4) include control variables.

	(1)	(2)	(3)	(4)
	Getting an offer of a company car		Losing the possibility of a company car	
		With covariates		With covariates
Log wage	0.067**	0.048'	-0.052*	-0.061**
	(0.025)	(0.025)	(0.023)	(0.022)
Wage	19,064	10,868	-32,342*	-37,422**
	(12.217)	(12,479)	(13,472)	(13,030)
Number of individuals in the household	0.039	-0.030	0.020	-0.0004
	(0.054)	(0.048)	(0.045)	(0.041)
Number of children in total	0.004	-0.061	0.046	0.026
	(0.045)	(0.039)	(0.037)	(0.033)
Number of children under the age of 18	0.021	-0.028	0.003	0.004
	(0.044)	(0.040)	(0.039)	(0.033)
Moving out of the neighbourhood (binary)	0.009	0.006	0.006	0.013
	(0.021)	(0.023)	(0.022)	(0.023)
Changing the couple status (binary)	0.012	0.010	0.024*	0.022'
	(0.011)	(0.012)	(0.012)	(0.012)
Distance between home and work	21.0*	20.4*	-22.2	-23.7
(in kilometers)	(10.0)	(10.3)	(17.5)	(17.4)
Travel time between home and work by car without congestion	16.9*	16.4'	-17.6	-18.8
(in minutes)	(8.2)	(8.4)	(14.0)	(14.0)
Travel time between home and work by public transport	42.4*	40.4*	-13.2	-15.2
(in minutes)	(16.9)	(17.5)	(30.7)	(30.5)
Number of observations	4,585	4,585	9,646	9,646
Number of households	655	655	1,378	1,378

Covariates are age, age squared, mean age of the cars the households own, couple status, the number of household members, distance between home and work, travel time between home and work by car without congestion and travel time between home and work by public transport

For row 3-10, the covariates also include log wage.

All covariates are measured the year before job change.

We use a dummy on those observations that are missing on specific variables.

Standard errors are in parenthesis.

' $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

under the age of 18, whether they move out of the neighbourhood and whether they change couple status (either from single to couple or from couple to single), see Table 3 and Figure A-5 – Figure A-9 in the Appendix.

4 Results

In this section we first present the results from using the Swedish research design (Börjesson & Roberts, 2023) before we present the results from the main analysis.

4.1 Results from comparing households with and without company cars (The Swedish research design)

The results when using the same research design as in Börjesson and Roberts (2023) can be seen in Table 4. First, we show the result with only household fixed effects (the columns with the odd number) and then we show the results with both fixed effects and control variables (the columns with the even numbers). The control variables are number of household members and log annual gross income for the household. The coefficients do not change much when adding control variables. Following Börjesson and Roberts (2023), we focus on the results with control variables.

The point estimates are similar to those in Börjesson and Roberts (2023). Having a company car is associated with an increase in the likelihood of having a car by 10 percentage points for couples (Table 4, column 2) in Norway and 14 percentage points in Sweden (Börjesson & Roberts, 2023). For single households, the increase is 36 percentage points (column 4) in Norway and 38 p.p. in Sweden (Börjesson & Roberts, 2023). The increase in the number of cars in the family is almost the same as in Sweden: 0.41 (column 6) in Norway and 0.41 in Sweden (Börjesson & Roberts, 2023). Börjesson and Roberts (2023) do not report the increase in the number of cars for singles. We find that the increase in the number of cars is the same for singles as couples (0.41, column 8).

4.2 Results from the main analysis

In this Section we first present the raw data and the first stage results, before we turn to the results for the different outcome variables. The analysis for the years at the beginning and the end (year -5 and -4 and year 4 and 5) have few observations and can therefore be quite noisy.

4.2.1 Raw data

In Figure 4a we see the number of company cars in the treatment and control groups. We see that those in the 'changes to'-group do not have company cars until they change job.

Table 4: The results from using the Swedish strategy (Börjesson & Roberts, 2023). The first four columns show the change in the likelihood of having a car for couples and singles, with and without control variables, when comparing those with a company car with those without. The last four columns show the change in the number of cars, including company cars, for couples and singles, with and without control variables, when comparing those with a company car with those without.

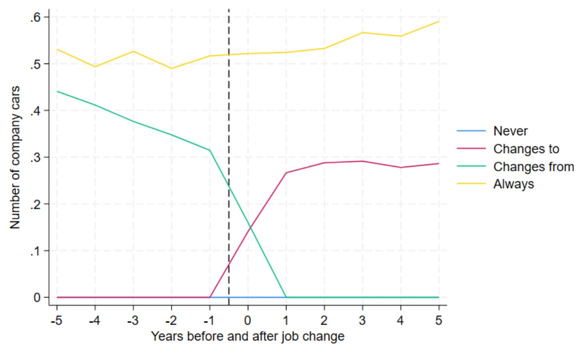
	Likelihood of having a car				Number of cars, incl company cars			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Couples	Couples	Singles	Singles	Couples	Couples	Singles	Singles
Company car	0.105***	0.103***	0.369***	0.363***	0.417***	0.409***	0.405***	0.405***
	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	No	Yes	No	Yes	No	Yes	No	Yes
Households	685,403	685,403	462,798	462,798	685,403	685,403	462,798	462,798
Observations	4,294,964	4,294,964	2,723,558	2,723,558	4,294,964	4,294,964	2,723,558	2,723,558

Control variables are number of household members and log annual gross income for the household.
The company car variable is a binary variable and do not take into account that the family might not have a company car the whole year.
When counting the number of cars, including the company cars, in column 5-8, the company cars are not counted as 1 the whole year if the taxable value is below a threshold, see Section 3.1 for more explanation.
Robust standard error in parenthesis.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

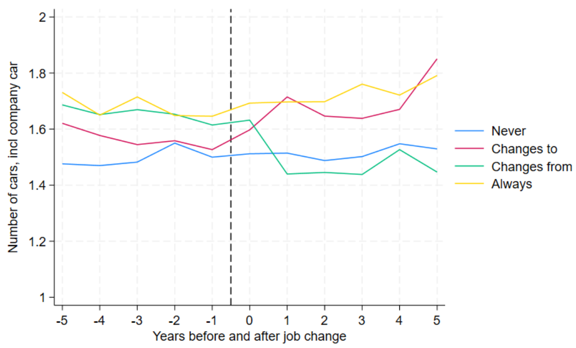
The 'never'-group does not have a company car. Those in the 'changes from'-group have a company car before they change job. The 'always' group has a company car the whole time, both before and after the job change.

The number of cars in the households, including company cars, for the different treatment groups can be seen in Figure 4b. The blue line represents the group that never gets an offer of a company car and is the control group for those that change to a company car offer (red line). The yellow line represents those that always have a company car possibility, which is the control group for those that change from a company car firm (green line). There is a slight increase in the number of cars from year -5 to year 5 for the control group that never has a company car (blue line). This is a general time trend, which is important to control for.

Figure 4: Raw data



(a) Raw data: Company cars



(b) Raw data: Number of cars in the households

Table 5: Aggregated effects using the Callaway and Sant'Anna (2021)-estimator.

	(1)	(2)	(3)	(4)
	Getting an offer of a company car		Losing the possibility of a company car	
		With covariates		With covariates
Change in the share having company car, (Figure 5)	0.284***	0.284***	-0.229***	-0.233***
	(0.029)	(0.030)	(0.026)	(0.027)
Change in the number of cars in the households, incl. company cars (Figure 6a and 7a)	0.144**	0.133**	-0.136**	-0.141**
	(0.050)	(0.051)	(0.048)	(0.048)
Change in the number of cars in the households, excl. company cars (Figure 6b and 7b)	-0.104*	-0.115*	0.115*	0.114*
	(0.052)	(0.053)	(0.049)	(0.049)
Likelihood of having a car, incl. company cars (Figure 8)	0.037'	0.031	-0.036'	-0.038'
	(0.021)	(0.022)	(0.019)	(0.020)
Change in the number of electric vehicles, incl. company cars (Figure 9)	0.012	0.005	-0.016	-0.023
	(0.025)	(0.026)	(0.029)	(0.029)
Change in the number of non-electric vehicles, incl. company cars (Figure 9)	0.119*	0.114*	-0.192***	-0.193***
	(0.054)	(0.055)	(0.050)	(0.049)
Household fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Number of observations	4,585	4,585	9,646	9,646
Number of households	655	655	1,378	1,378

Covariates are age, age squared, log wage, mean age of the cars the households own, couple status, number of household members, distance between home and work, travel time between home and work by car without congestion and travel time between home and work by public transport. All covariates are measured the year before job change.
We use a dummy on those observations that are missing on specific variables.
Standard errors are in parenthesis.
' $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.2.2 First stage

In Table 5, row 1 and Figure 5 we see the share having company car before and after treatment for the two treatment and control groups using the Callaway and Sant'Anna (2021)-estimator. This is a binary indicator, while in Figure 4a we see the number of company cars.[23]

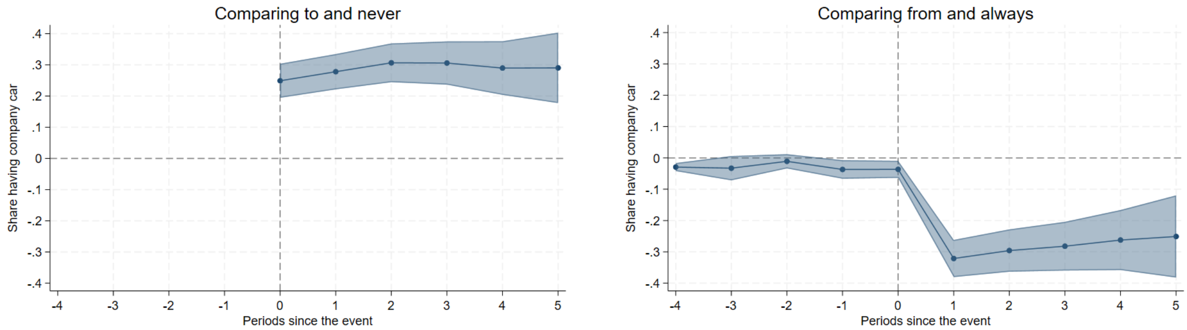
Those in the 'changes to'-group do not have any company cars before they change job. After the job change, 28% have a company car.[24] The 'changes from'-group has a company car before they change job, and then they lose the possibility of having a company car. Compared to their control group who always have the possibility of a company car, the reduction after the job change is 23 percentage points.[25]

4.2.3 The number of cars in the households

In Figure 6a and Table 5, row 2, column 1, we see that getting an offer of a company car is associated with an increase in the number of cars, including company cars, by 0.144. This is statistically significant on a 1% level. With covariates the change is 0.133 and also

[23]None have more than one company car, but several do not have a company car the whole year (see Section 3.1 and Appendix B for how we count the company cars).
[24]For the continuous company car variable, the increase is 0.248 (without control variables, not shown).
[25]For the continuous company car variable, the increase is 0.250 (without control variables, not shown).

Figure 5: First stage: Change in the share having company car.



statistically significant on a 1% level. Pre-treatment, the number of cars in the treatment group is 1.55 (see Table 2). Therefore the increase in the number of cars is 8.6–9.3%. When excluding the company cars, the reduction in the number of cars is -0.104 (-0.115 with covariates) and statistically significant on a 5% level.

Losing access to a company car is associated with a reduction in the number of cars, incl. company cars, by 0.14 (Figure 7a and Table 5, row 2, column 3 and 4). This is statistically significant on a 1% level. Pre-treatment, the number of cars, including company cars, in the treatment group is 1.65. The decrease in the number of cars is around 8% (8.2-8.5%). The reduction in the number of cars for those losing access to a company car and the increase in the number of cars for those gaining access to a company car therefore seems to be quite symmetric. Excluding the company cars, the number of cars increases by 0.115 without covariates and 0.114 with covariates (Figure 7b and Table 5, row 3, column 3 and 4). This is statistically significant on a 5% level.

When we include covariates in the analysis, the results do not change much (Table 5 (column 2 and 4) and Figure A-14 and Figure A-15 in the Appendix). The covariates we include are age the year before the job change, the same age squared (to take into account the possibility of a non-linear age effect), mean age of the cars the households own the year before job change, couple status the year before job change, number of household members, distance between home and work, travel time between home and work by car without congestion and travel time between home and work by public transport, the year before job change.

To take anticipation effects into account, we investigate the change for only those changing job from June 1st in year 0. The coefficients do not change much, around 1 percentage point higher increase and decrease in the number of cars, see Table A-6 and Figure A-16–A-19 in Appendix D.2.

Figure 6: The change in the number of cars for those getting access to a company car. a) including company cars and b) excluding company cars.

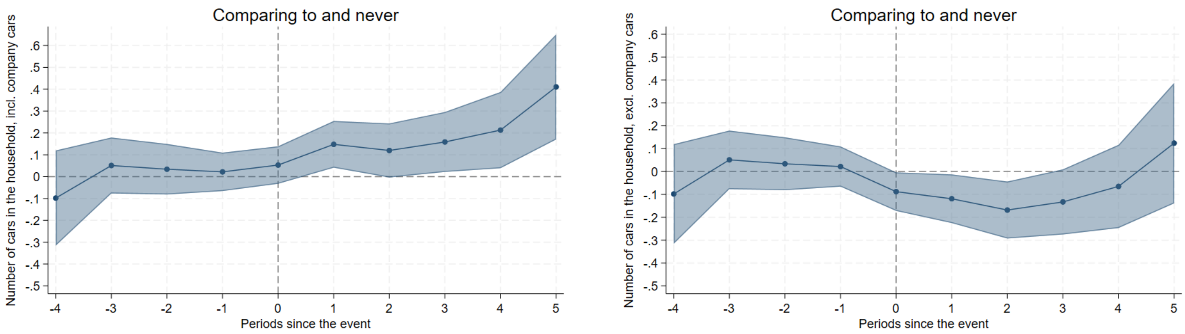


Figure 7: The change in the number of cars in the household for those losing access to a company car. a) including company cars and b) excluding company cars.

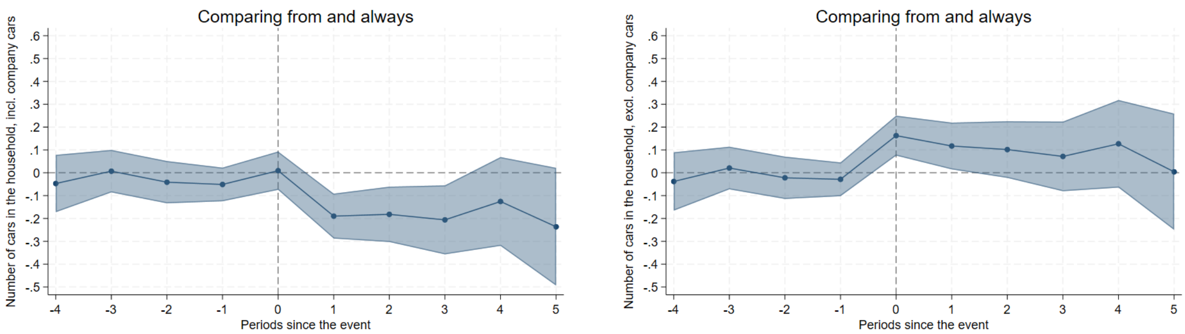
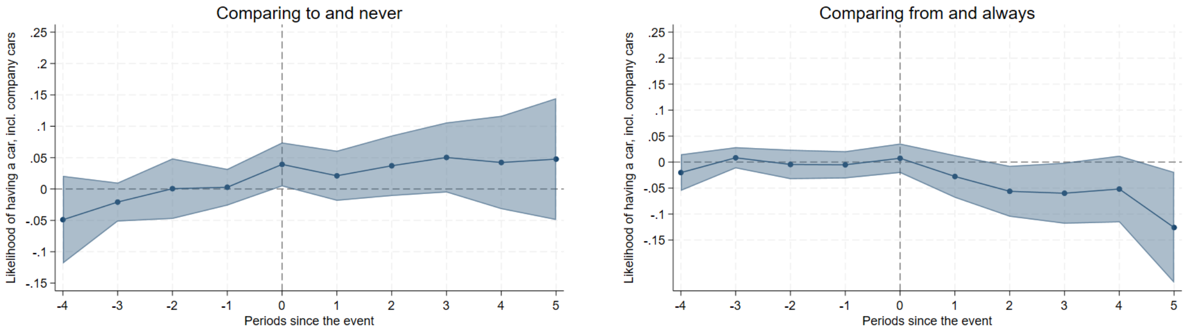


Figure 8: Change in the likelihood of having a car when (a) getting access to a company car or (b) losing access to a company car.



4.2.4 Change in the the likelihood of having a car

In the sample the large majority has a car before treatment. Before treatment, 91% of the 'changing to'-group have a car and 93% of the 'changing from'-group, including company cars (Table 2, row 4). This is probably because we limit the sample to individuals that work every year in company car occupations, which means for instance no students. There is a 3.7 p.p. increase in the likelihood of having a car for those changing to company car access on a 10% level of statistically significance (Table 5, row 4).[26] For the group losing access to company car the likelihood of having a car decreases by 3.6–3.8 p.p., also on a 10% level of statistically significance (Table 5, row 4).

4.2.5 Electric vehicles

The estimated effects on the number of electric cars go in the same direction as the total number of cars, but the point estimates are much smaller, and the coefficients are not statistically significant, see Figure 9 and Table 5, row 5. The small point estimates could partly reflect that electric vehicles have a moderate market share in the sample period. Before job change, the gaining access group has on average 0.11 electric vehicles, while the losing access group has 0.16 (Table 2, row 6). The point estimates then correspond to a 11% increase in electric cars for those that change to a company car firm (4% with covariates) and a 10% decrease for those that change from a company car firm (14% with covariates).

In Figure 10 and Table 5, row 6, column 1 and 2, we see that the increase in non-electric vehicles (including plug-in hybrids) for those changing to company car possibility constitute around 85% of the increase in the number of cars, and this increase is statistically significant on a 5% level. For those changing from the company car firms, the reduction in non-electric vehicles is higher than the reduction in cars (Table 5, row 6, column 3 and 4 compared to row 2, column 3 and 4). This could be (i) because electric vehicles

[26]With control variables, the increase is not statistically significant

Figure 9: Change in the number of electric vehicles when (a) getting access to a company car or (b) losing access to a company car.

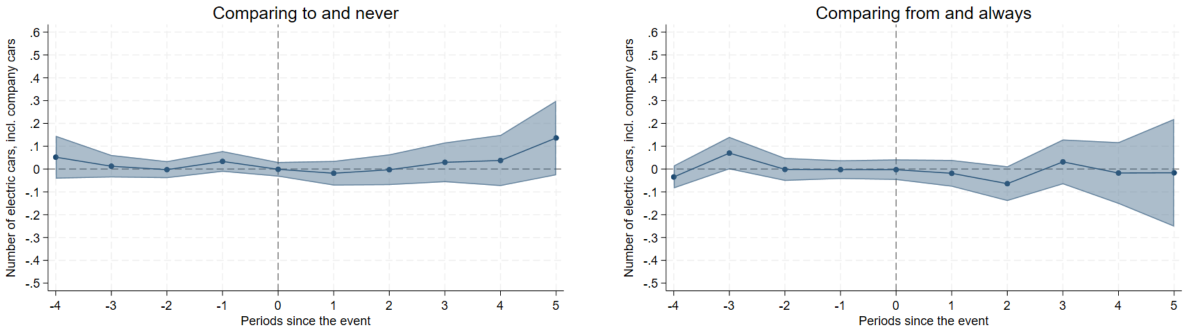
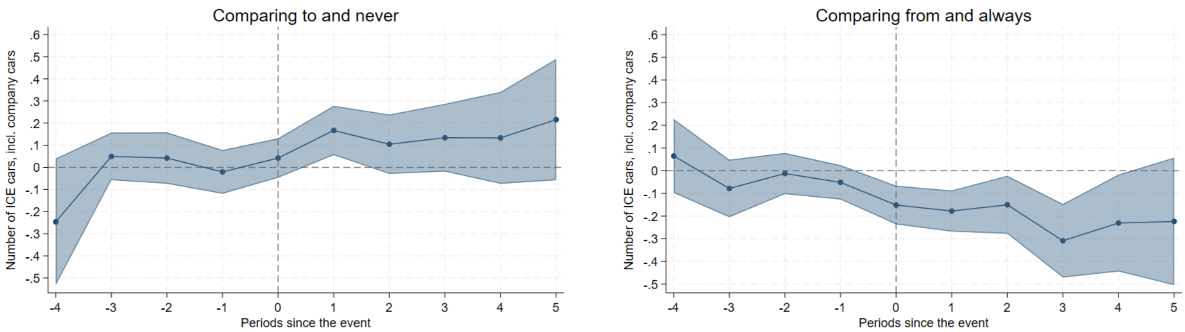


Figure 10: Change in the number of non-electric vehicles (gasoline, diesel, hybrid and plug in hybrids) when (a) getting access to a company car or (b) losing access to a company car.



are not being perfect substitutes for combustion-engine cars during the period of investigation and therefore not a suitable car when using the car a lot for work, (ii) because the company car scheme favours non-electric vehicles or (iii) because of selection effects where those that work in company car firms prefer non-electric vehicles, or a combination of these explanations.

4.2.6 From intention-to-treat to effects on the treated

We can roughly translate the intention-to-treat effects that we have estimated, to average effects on the treated. We then need to make one more assumption, which is that nothing else than the company car influences the average number of cars in the household (the levels, not just the trends). This assumption might not hold.

The increase in the number of cars is 0.164 for those getting an offer of a company car (Table 5, row 2, column 2). The share of the treatment group having a company car (the take-up rate) is 0.295 (Table 5, row 1, column 2). We then find the following average treatment effect on the treated (ATT):

$$\frac{0.164}{0.295} = 0.556$$

$$\text{Standard error} \approx \frac{0.068}{0.295} = 0.231$$

The standard error on this estimate is not exactly calculated with this method, it is only an approximation. Then the 95% confidence interval of this estimate is [0.103, 1.009].[27]

The confidence intervals on the average treatment effect of the treated-estimates are very large, and we therefore do not know if the estimates of the increase in the number of cars for those that have a company car are larger or smaller than the coefficients based on the Swedish research design (around 0.40 for both single and couple households).

4.3 Income elasticities

We find that the number of cars increase by 9% for those gaining access to a company car, and since we cannot disentangle the effect of changes in wage and the effect of the company car scheme, we look at estimates for how much demand for cars increase when the income increases. Johansen and Munk-Nielsen (2022) estimate elasticities in a structural model using Norwegian administrative data from 2005-2017. They find that when net income increases by 1% the demand for cars increases by 0.42%. Our wage variable is gross wage, while the income variable in Johansen and Munk-Nielsen (2022) is net income.

We find a 6.7 percentage point higher wage growth among those that change to a company car firm (4.8 pp with control variables), compared to the control group. Assuming an income elasticity of 0.42 %, this would translate into a 2.7% increase in the number of cars, while we find an 9.3% increase.[28] This could mean that some of the increase in the number of cars that we observe is due to the company car scheme.

However, estimates of income elasticities on car demand might be specific to the base levels and the sample, as well as the assumptions behind the structural model in Johansen and Munk-Nielsen (2022), and might not be directly transferable to this context.

5 Conclusion

Getting a company car from the employer is correlated with an increase in the number of cars in the households. We think that the strategy of Börjesson and Roberts (2023)

[27] $0.556 \pm 1.96 * 0.231 = [0.103, 1.009]$

[28] With control variables the increase in number of cars because of increased income would be 1.8%, while we find 8.6% increase in the number of cars when including control variables.

leads to a selection bias because households with and without company car are probably different with respect to time-varying unobservable factors and the decision to acquire a company car might be caused by increase in car demand (endogeneity problems). We have tried to remedy this by comparing the within-household change in the number of cars between groups that could be more similar, namely households where one adult works in a company car occupation and change job. However, the wage development of the treatment group is different from the control group. Therefore, we cannot disentangle the magnitude of the effects of the company car scheme from the wage growth.

We find that gaining access to a company car is associated with an increase in the numbers of cars in the household by 9%. At the same time, gaining access to a company car is associated with 4-7 p.p. higher wage growth. Losing access to a company car is associated with a decrease in the numbers of cars in the household by 8% and a 5-6 p.p. wage decrease. How much of the change in the number of cars in the household is due to wage growth and how much is due to the company car scheme is not settled. Based on income elasticities on car demand estimated by Johansen and Munk-Nielsen (2022), we induce that the increase in the number of cars is unlikely to be driven by wage growth alone.

The company car scheme during the period of investigation (2015-2021) had a discount for electric vehicles. Gaining or losing access to a company car is not associated with a statistically significant change in the number of electric vehicles, although the point estimates go in the same direction as the change in the total number of cars. From 2023, there is no discount for electric vehicles in the company car scheme. How the company car scheme will influence the number of electric cars when there is no discount is a topic for further research as data becomes available.

If the company car tax is at the right level, but sets a fixed sum, not giving any incentives to buy cars that pollutes less and to drive less, the company car tax system "will provide adverse environmental incentives", according to Harding (2014, p.38). Whether the company car scheme as it is designed in Norway leads to more driving is an interesting question. As the odometer data is collected the first time when the car is 4 years and in addition it is not possible to distinguish between private and work-related driving, we unfortunately do not have data to investigate this question. One possibility is to ask the companies that offer electronic driving books for access to anonymous data. This data will distinguish between private and work-related travel. If we get relevant data and develop a credible research strategy, we will investigate whether the company car scheme influences the driving pattern.

If there is any change in the rules for how the company cars are taxed, this can be exploited through a regression discontinuity design in further investigations. Furthermore, it could be possible to look for exogenous job changes, not job changes initiated by the employee themselves.[29] Conducting a survey related to company cars could answer different questions than the administrative microdata that we use and could therefore shed more light on this scheme.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used Chat-GPT-3.5 and Google translate in the writing process of the first paragraph of the introduction and also sporadically other places in the text in order to improve language. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

[29]With exogenous job change we mean job changes that are not decided by the individual, for instance that a firm closes down, or mass layoffs due to reduction in the oil price as happened in parts of Norway in 2014. However, this would result in even fewer observations, as these type job changers in the period 2015-2021 are already in our sample in addition to the less exogenous job changers and this is therefore not a strategy that we have pursued.

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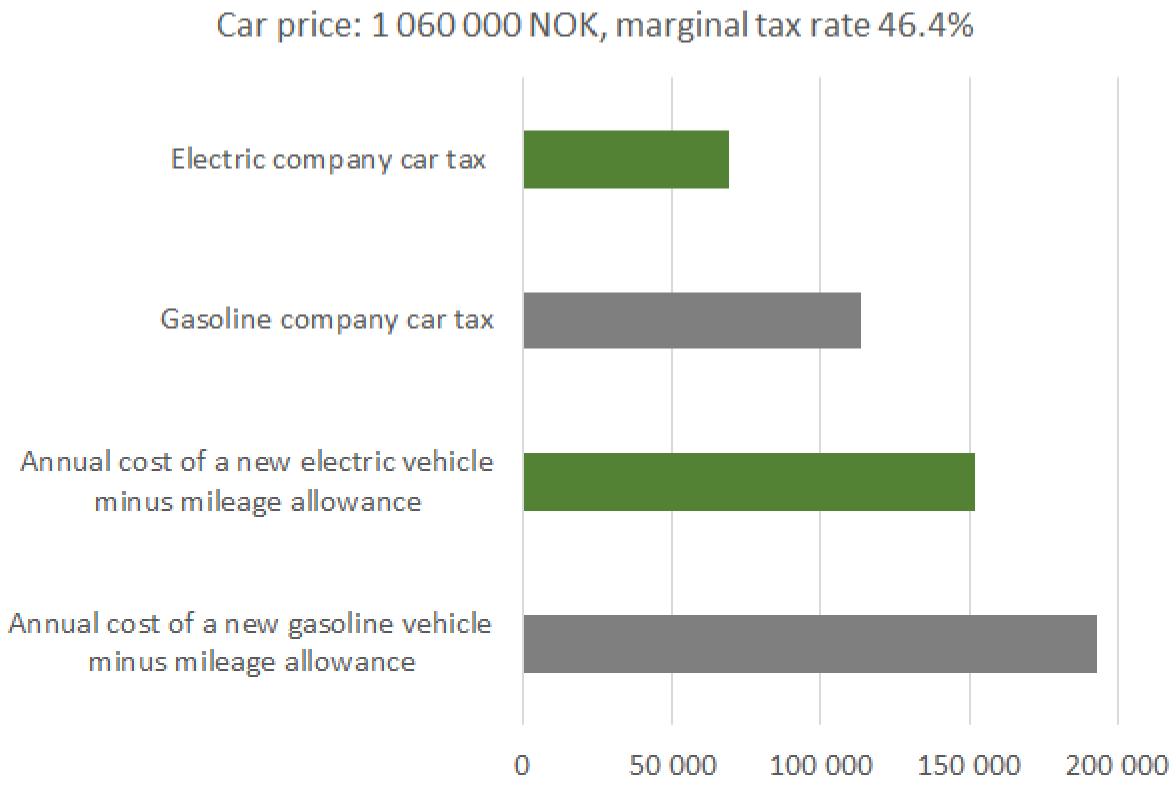
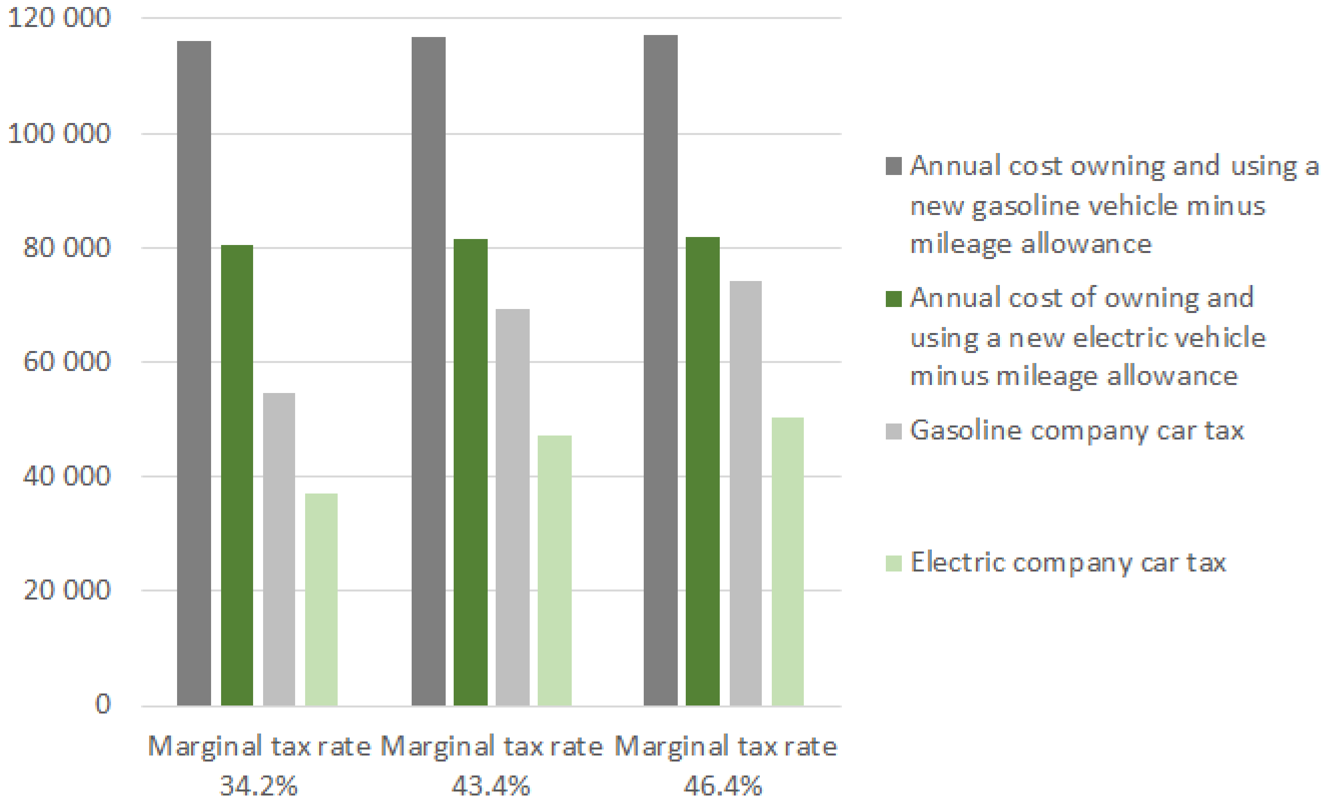
A More details on the background

Figure A-1: The annual company car tax compared to the annual cost of owning and using a new car. Car price: 1 060 000 NOK. Marginal tax rate: 46.4%.



The source of the annual cost of owning and using a new car is The Norwegian Road Federation. This compares the cost of a car costing 1 060 000 NOK, with the top marginal tax rate which is 46.4% and driving 20 000 km per year. For privately owned cars we assume driving half of the kilometers for work and getting mileage allowance for this. The governmental mileage allowance that many employers follow, is 4.03 NOK per km, and 3.50 NOK/km is without tax. The 46.4% marginal tax rate is for wages above 1 021 550 NOK. For wages between 651 250-1 021 550 NOK in 2021, the marginal tax rate is 43.4%.

Figure A-2: The annual company car tax compared to the annual cost of owning and using a new car. Car price: 636 000 NOK. Different marginal tax rates.



The source of the annual cost of owning and using a new car is The Norwegian Road Federation. This compares the cost of a car costing 636 000 NOK, and driving 20 000 km per year. For privately owned cars we assume driving half of the kilometers for work and getting mileage allowance for this. The governmental mileage allowance that many employers follow, is 4.03 NOK per km, and 3.50 NOK/km is without tax. The 46.4% marginal tax rate is for wages above 1 021 550 NOK. For wages between 651 250-1 021 550 NOK in 2021, the marginal tax rate is 43.4%. For wages between 260 100 – 651 250 NOK the tax rate is 34.2%

Table A-1: Company car occupations

Variable	Share
Seller (wholesale)	22.3%
Top manager	11.5%
Sales and marketing manager	8%
Retail managers	5.9%
Other administrative managers	3.1%
Engineer building and construction	2.8%
Manager building and construction	2.7%
Worker in stores	2.2%
Seller within technical and medical products	2.1%
Manager industrial production	1.8%

The share is of the total number of company car users.
In this table we use 4-digit occupation codes, while in the analysis we use 7-digit codes.
This table is made after the outliers on wage is taken out of the sample.

Table A-2: The car market in Norway

Year	Number of new cars sold	Number of new company cars	Share
2015	150,686	9,890	6.6%
2016	154,603	9,973	6.5%
2017	158,650	10,987	6.9%
2018	147,929	7,865	5.3%
2019	142,381	9,267	6.5%
2020	141,412	8,434	6.0%
2021	176,276	10,358	5.9%

The source for number of new cars sold is The Norwegian Road Federation (OFV).

B Details about the data

B.1 Source of the data

In this section we present the source of the data, and the variables that we use.

B.1.1 Vehicle register

The vehicle register is maintained by the Norwegian Public Road Administration. It is not allowed to drive on the road if the car is Norwegian and not registered. In addition, Statistics Norway include data about car scrapping into the vehicle register data from the Norwegian Tax Administration (because they have the responsibility of paying out money for the scrapping).

From 2020, the variables changed, and more were included. Leased cars have both owner id and leaser id. This means that cars that are owned by a leasing company can be tracked to the leaser. In the company car case, the leaser is most often the company that pays the car expenses. Cars that are leased by private persons before 2020 are not counted as a private car. Therefore, the number of cars in the households are higher in 2020 and onwards not just because the private car park is getting larger, but because the counting is made more precise.

The variables from the vehicle register that we use are:

- Car id
- Owner id
- Leaser id (only in 2020 and 2021)
- First registered (in order to find the age of the car) (date)
- First time registered on this owner (date)
- Deregistration date (temporary or permanent de-register)
- Scrapping date
- Fuel

B.1.2 Company car data

Whether a car is a company car cannot be identified in the vehicle register. To identify the company cars, we use annual data reported from the employer to the tax administration through the same system as the monthly wage reporting.[30]

The variables that are in the company car data are:

- Person id
- Car id
- Year
- Company/firm id[31]
- The id of the subunit of the company[32] (We do not use this variable)
- The value of the personal use of the company car. This is the amount that is added to the wage as a fringe benefit, see more information about this in Section 2.1.

Company cars that are used privately, but not reported to the tax authority are not in the data. How many cars this is, is difficult to estimate. The enforcement of the company car tax is done by the tax administration. There are some examples in the media about company cars not being correctly reported to the tax administration and therefore not correctly taxed.[33] The Norwegian Tax Administration did not want to say any numbers on how many cars they control annually to identify tax evasion, and how many cases related to company cars they reveal every year.

B.1.3 Family register

The family register consists of all individuals that are registered as living in Norway in the National Register (*Det sentrale folkeregister*), by the rules of what living in Norway means. Those excluded from the family and household register is persons studying abroad or for other reasons residing outside mainland Norway (in Svalbard, in the military or in the Foreign Service). There is also some missing information as some addresses have more than one dwelling. This is particularly a problem in cities, but the problem has become smaller in recent years. The group of persons with the least information is unmarried students, as they are allowed to register that they live with their parents in the National Register, while they live in another city. Also, if individuals do not update their information in the

[30]See more information about the monthly digital wage reporting system (in Norwegian) here: https://www.skatteetaten.no/bedrift-og-organisasjon/arbeidsgiver/a-meldingen/om-a-ordningen/om-a-ordningen/ and here: https://www.ssb.no/data-til-forskning/utlan-av-data-til-forskere/variabellister/a-ordningen

[31]Company and firm are used interchangeably in this article.

[32]See more information (in Norwegian) here: https://www.ssb.no/virksomheter-foretak-og-regnskap/artikler-og-publikasjoner/fra-bedrift-til-virksomhet. Company or firm is "foretak" and subunit is "virksomhet".

[33]For instance here: https://e24.no/privatoekonomi/i/0nrOJJ/full-forvirring-rundt-yrkesbil-skatt-har-betalt-90000-kroner-for-mye-i-skatt and here: https://www.skatt.no/2021/10/19/skatteklagenemnda-firmabilen-gav-skattesmell-og-tilleggsskatt/

register, as they are mandated to do, the information in the family and household register will be incomplete.[34]

From the family register we use these variables:

- Person id
- Family id
- Year
- Couple status[35]
- Number of individuals in the family
- Number of children in the family, no matter the age of the children, as long as they are registered to live with their parents
- Number of children in the family under the age of 18

We exclude all individuals under the age of 18 and over the age of 67 (the retirement age in Norway).

B.1.4 Moving register

We use data for who has moved during the period of investigation and create a binary variable for whether an individual has moved or not and year.

B.1.5 Population register

From the population register we get the year of birth and gender.

B.1.6 Employers and employees

We use the monthly digitally reported wage data from employers to the tax administration. The variables that we use are:

- Person id
- Company/firm id
- Gross cash wage (not including the value of fringe benefits)
- Working hours (to find the main employer every month)

[34]See more information about the family register here: https://www.ssb.no/befolkning/barn-familier-og-husholdninger/statistikk/familier-og-husholdninger

[35]More information here: https://www.ssb.no/a/metadata/codelist/datadok/1618382/no

- Occupation code
- NACE code of the firm
- Sector code of the firm

B.1.7 Occupation codes

We use Statistics Norway's occupation codes which are reported by the employer at the same time as the wage. These codes are called STYRK-98. There are also more aggregated occupation codes called STYRK-2008.[36] The converting between the two codes is easily available on the web page of Statistics Norway.[37] The occupation code data probably have some noise as there are no incentives related to reporting this variable correctly.

B.1.8 Distance and travel time between home and work by car and public transport

We use travel time and distance by car based on data where the fastest route between the center of neighbourhoods are calculated based on the road network. The travel time is without congestion to avoid the outcome variable (number of cars in the household) to influence the control variable (travel time between home and work). Detailed description on how this is done can be found in Sand et al. (2022, p.27-28). Furthermore, we use travel time by public transport calculated by the transport models that Institute of Transport Economics use.[38]

B.2 Information collected from the data

In this section, we present what we do to extract information from the data.

B.2.1 Company car users

Over the period 2015-2021 there are in total 598,349 observations in the company car reporting data. 19,423 observations are duplicates in terms of all variables in the data, including the taxable amount. We cannot be sure that these are actually duplicates, but since the taxable amount is exactly the same, we assume that they are duplicates and they are removed.

There are 19,094 company cars without a car id. We do not know what type of car the company cars that do not have a car id number is, and they are not part of the analysis. Further 192,003 observations are not found in the vehicle register. This could

[36] See more information (in N947243 orwegian) here: https://www.ssb.no/klass/klassifikasjoner/145/koder
[37] See converting file here: https://www.ssb.no/klass/klassifikasjoner/145/versjon/683/korrespondanser/426
[38] More information here: https://www.toi.no/transport-models/

be cars that are not passenger vehicles. Another explanation is that the car id is wrongly written. Those that are not found in the vehicle register are excluded from the analysis. Cars that are registered for use outside public road (4 car-year observations), van class 2 (1 car-year observation) and veteran car (5 car-year observations) are also excluded from the sample.

Then we have 386,913 observations in total in the company car data. Some of the company cars are used by several employees and some of the employees have several company cars during a year (not necessarily at the same time). There are roughly around 50,000 unique company cars every year. During the whole period of investigation the number of unique cars is 357,299. 86% of the cars have one user during the year and 12% of the cars have 2 users. 19.3% of the company cars are owned by a private person, while 80.7% is owned by companies, which is both leasing companies and other types of companies.

There are 805 company cars that are marked as scrapped one year or more before the car is reported as a company car. They are still part of the sample, as they are reported and taxed as a company car.

From the company car data we can aggregate information on each person-firm-year. There are 288 person-year missing id on the firm. They are counted when counting number of company car users but are not part of further analysis.

The company cars are valued based on the list price (see Section 2.1).[39] If the value in the company car data is lower than 100 000 NOK for a non-electric car that is 3 years or younger, we assume that the employee do not use the car for the whole year. We divide the amount by 100 000 and get a share of the year that they have the car. For electric vehicles we divide the amount by 60 000 if the year is 2018 or later, and by 50 000 if the year is 2017 or earlier. If the car is older than 3 years, we divide the amount by 75 000.[40] If the amount is higher than what we divide on, the cars are counted as one car the whole year. A more precise way to measure the share of the year a person has a company car is to include the average list price of the company car model.

B.2.2 The number of cars per family per year

We use the vehicle register to count the number of cars per person per year. The vehicle register is the vehicle fleet on December 31 the year in question. We restrict our analysis to passenger cars (cars in vehicle group 101).

[39]A non-electric car that costs 636 000 NOK (which is the price in the example in Figure 1) is valued to 159 740 NOK. A non-electric car that costs 340 000 NOK, is valued to 100 540 NOK in 2021. An electric car that costs 636 000 NOK is valued to 108 860 NOK.

[40]For electric vehicles older than 3 years we divide by 45 000 in 2018 and onwards and 37500 in 2017 and earlier.

We exclude the cars that are scrapped before 2015. Further, we exclude veteran cars, embassy cars, vans, rally cars, cars that are only valid to use outside of public road, and cars that are registered for Svalbard.

The cars that are registered on the owner before or at the end of the year we are observing is counted. The cars that are either

- registered on the owner after the observed year, or
- scrapped before or at the observed year, or
- de-registered after the observed year and after the car is registered on this individual

are not counted.

We limit the possible number of registered cars per person per year to 3 in order to not let outliers with for instance over 100 registered cars influence the average number of cars.

Then we link the data to the family register and count the total number of cars per couple per year. Also here we limit the number to maximum 3 cars per couple per year. For those that are single, we use the number of cars per person.

B.2.3 Company car occupations

Linking employees and company cars, we count the individuals in each occupation with and without a company car each year. The occupations where 10% or more have a company car that year is defined as a company car occupation.

From this list of occupations, we exclude occupations where it seems likely that the employees decide about the offer of a company car themselves, e.g. top managers. There are two types of occupation codes. In Section 2.3 and Table A-1 we use 4-digit occupation codes, which is more aggregated, while in the analysis we use 7-digit codes, which is more detailed. We also use the aggregated 4-digit code to see who has a top manager position even if the name of the occupation is not CEO, and they are defined as non-company car occupations.

B.2.4 Company car firms

Linking employers and employees and company cars, we define the firms with at least two company car users as company car firms.

B.2.5 Job change

The main employer each month is defined by having the highest number of working hours that month. Job change is defined as:

- the employer in the month n is different than in the month before $n-1$, so firm-id[n] $\neq$ firm-id[n-1], and
- the employer is the same the month after (firm-id[n] = firm-id[n+1])

Table A-3: Example change of job

Person ID	Month	Year	Employer ID	Job change
1	1	2015	5	0
1	2	2015	7	0
1	3	2015	5	0
1	4	2015	6	1
1	5	2015	6	0
1	6	2015	7	1
1	7	2015	7	0
1	8	2015	7	0

We only include those that change job *once* during the period of investigation.

B.2.6 Wage

We take out the outliers on wage. Those with a wage higher than 2 million NOK are excluded from the sample.

B.3 Number of observations

Table A-4: Observations not part of the analysis

	Number of observations
Number of employees from 2015-2021	22,735,454
Number of employees that changed job once from 2015-2021 and changed job between 2016-2020	3,299,856
The job changers that are in the work force all seven years	1,653,113
The job changers that work in company car occupations all seven years	60,018
Number of households where *only one adult* has a company car, changed job once and works in a company car occupation all seven years	
+ only keep the company car firms that give company car to more than one employee	53,253
Take out observations where the firm some years give company car to more than one employee and some years do not	36,792
Take out observations where employees earn 0 one year	36,706
Only keep job changers that are observed all 7 years (balanced panel)	14,231
Total number of observations in the analysis	14,231

Table A-5: Observations not part of the analysis, only 2015

	Number of observations
Number of unique employees in 2015	3,184,832
Number of employees that changed job once from 2015-2021 and changed job between 2016-2020 in 2015	431,265
In the work force all seven years per year	236,159
Work in company car occupation all seven years in 2015	8,196
Number of households where *only one adult* has a company car, changed job once and works in a company car occupation all seven years	
+ only keep the company car firms that give company car to more than one employee	7,181
Take out observations where the firm some years give company car to more than one employee and some years do not	3,941
Take out observations where employees earn 0 one year	3,929
Only keep households that are observed all 7 years (balanced panel)	2,033
Total number of observations in the analysis per year	2,033

B.4 The sample when using the Swedish research design

The sample when using the design of Börjesson and Roberts (2023) is adults being employed every year from 2015-2021. In couples, only one adult has to be employed the whole period.

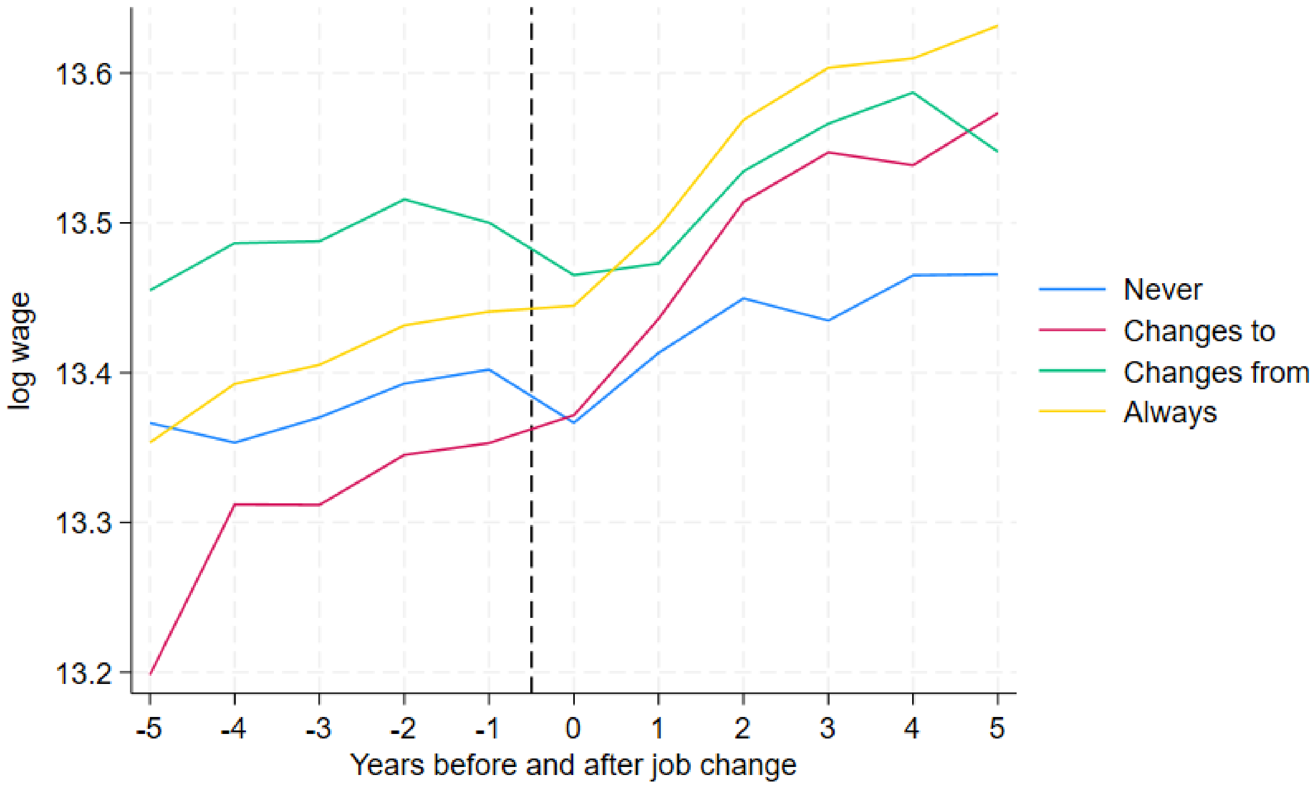
Börjesson and Roberts (2023) define couple households as a married couple or partners with at least one mutual child. We follow the statistical definitions of Statistics Norway for families and households where couples can also be non-married and childless.[41] Those that are not in the family register are defined as single households.

[41] See more information here (in Norwegian): https://www.ssb.no/befolkning/barn-familier-og-husholdninger/statistikk/familier-og-husholdninger

C Details about the empirical strategy

C.1 Raw data

Figure A-3: Raw data: Log wage.



C.2 Balance tests

Figure A-4: Outcome variable: Nominal wage.

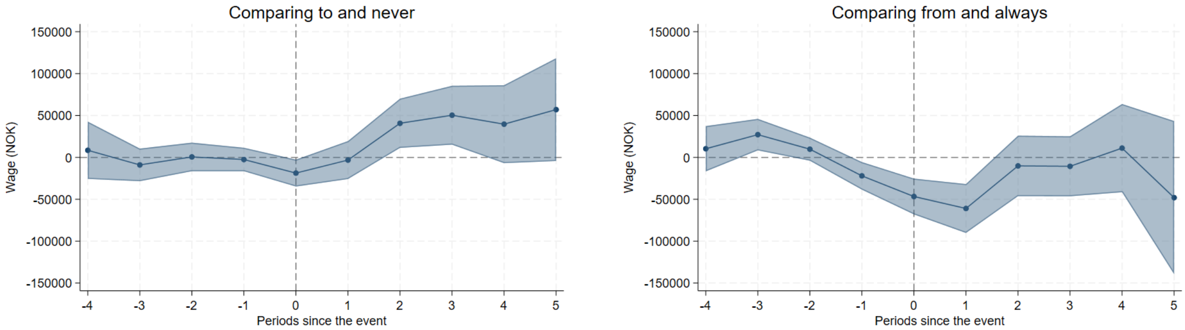


Figure A-5: Outcome variable: The number of children.

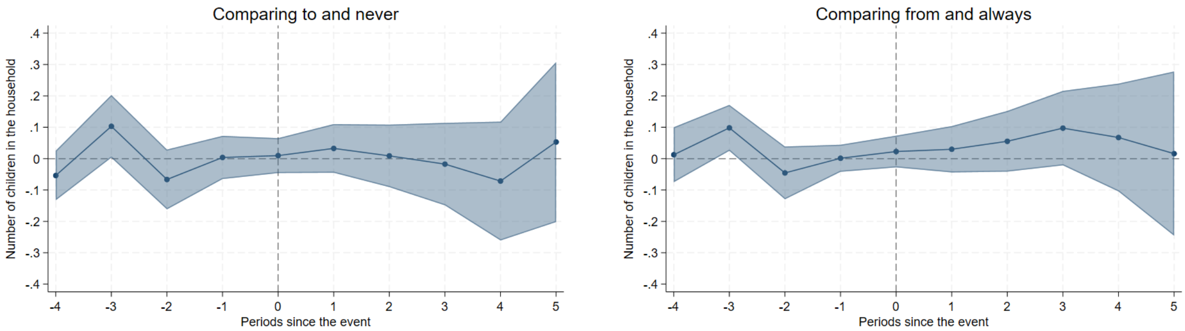


Figure A-6: Outcome variable: The number of children under the age of 18.

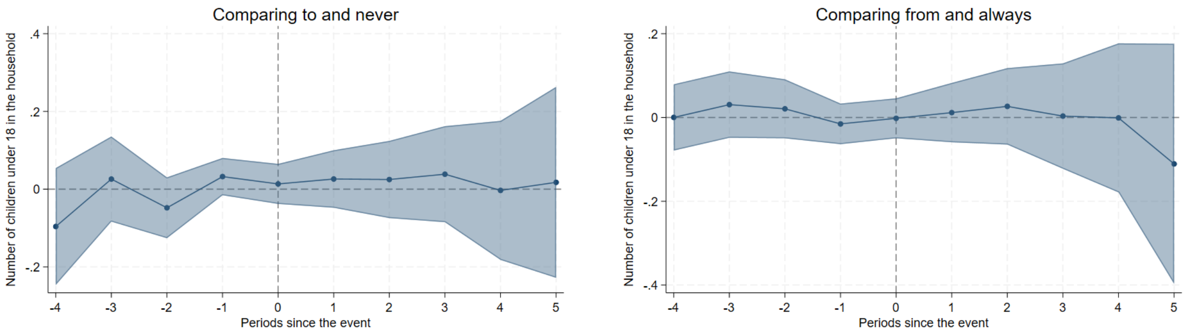


Figure A-7: Outcome variable: The number of persons in the household.

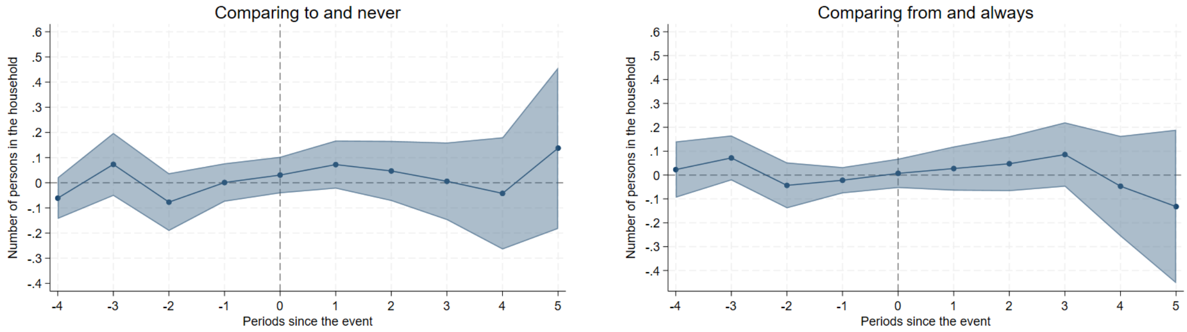


Figure A-8: Outcome variable: Moving (binary).

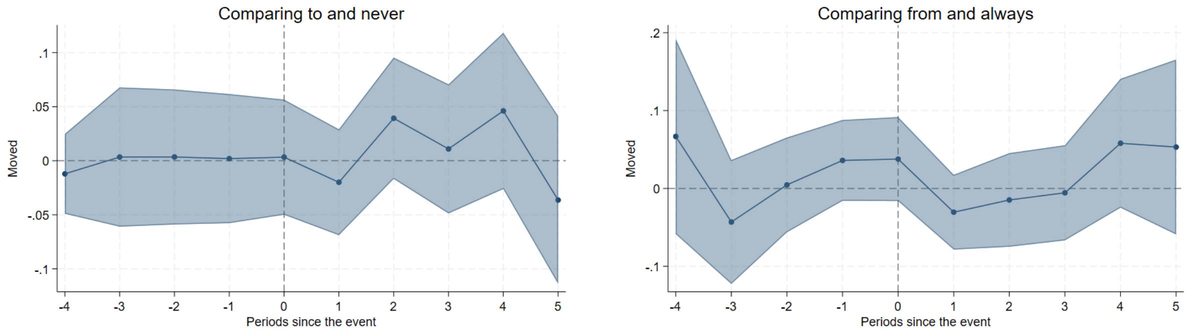


Figure A-9: Outcome variable: Changing couple status (binary).

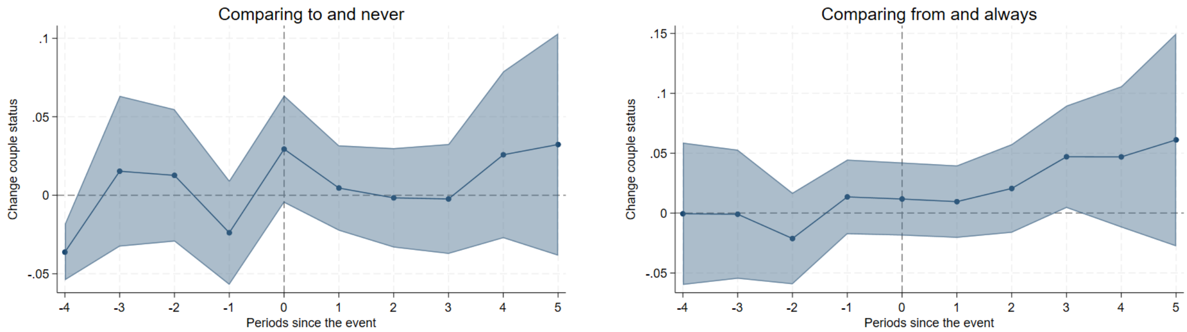


Figure A-10: Outcome variable: Distance between home and work (in kilometers)

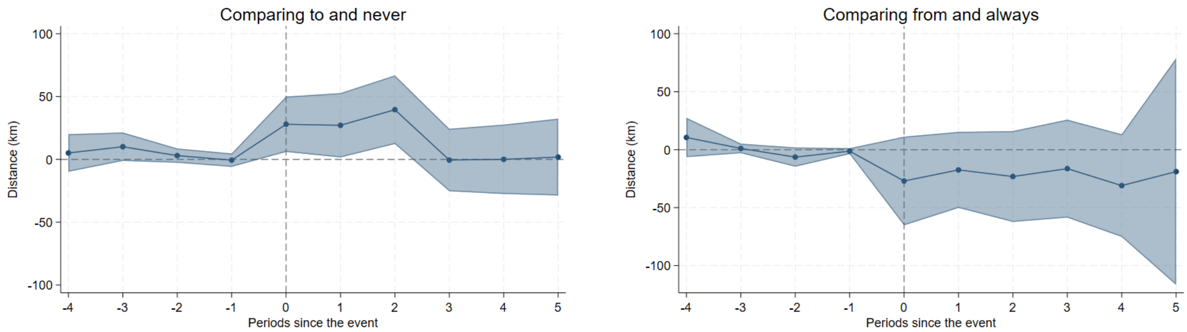


Figure A-11: Outcome variable: Travel time between home and work by car, keeping the speed limit and without congestion (in minutes).

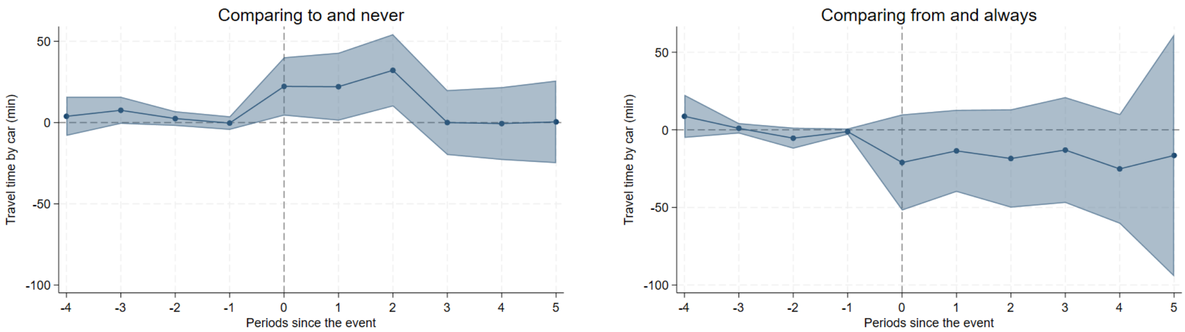
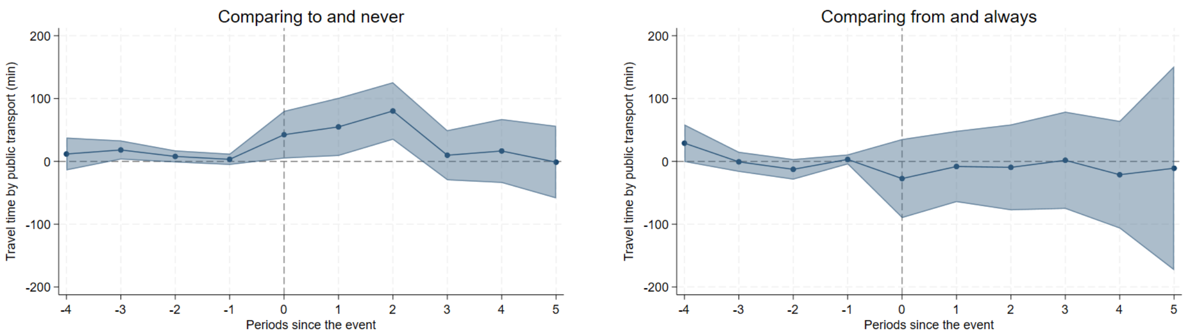
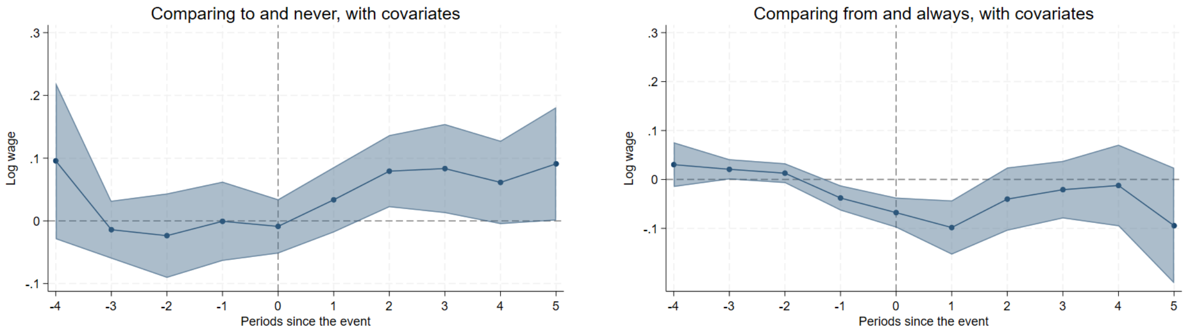


Figure A-12: Outcome variable: Travel time between home and work by public transport (in minutes).



C.3 Log wage with covariates

Figure A-13: Outcome variable: Log wage. Including covariates



D More results

D.1 With covariates

Figure A-14: The change in the number of cars for those getting access to a company car, including covariates. a) including company cars and b) excluding company cars.

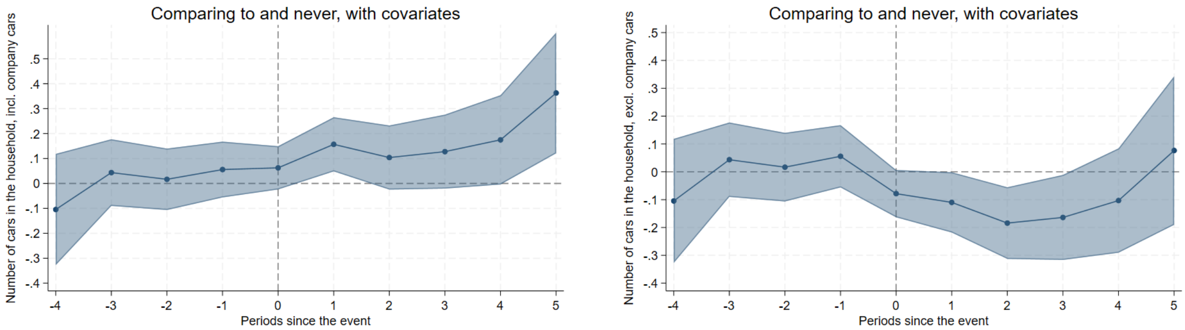
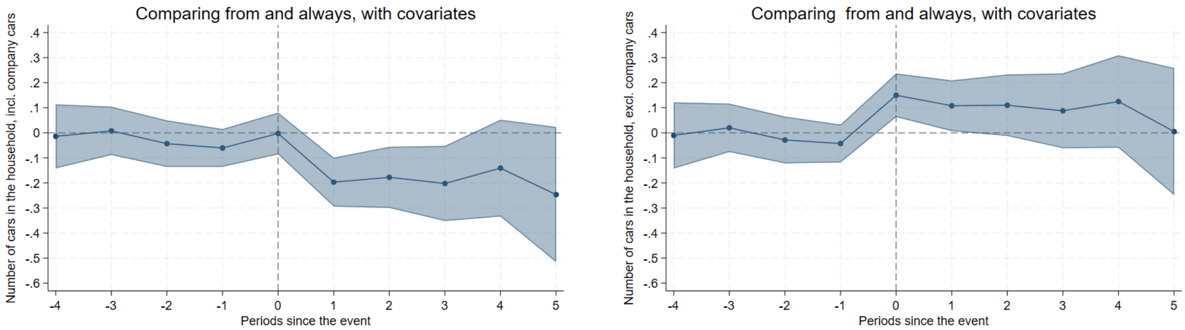


Figure A-15: The change in the number of cars in the household for those losing access to a company car, including covariates. a) including company cars and b) excluding company cars.



D.2 Only looking at those changing job late in the year (from June 1st)

Table A-6: Aggregated effects using the Callaway and Sant'Anna (2021)-estimator for only those changing job from June 1st.

	(1) Getting an offer of a company car	(2) Losing the possibility of a company car
Change in the number of cars in the households,	0.163**	-0.165**
incl. company cars (Figure A-16)	(0.060)	(0.058)
Likelihood of having a car,	0.044'	-0.041
incl. company cars (Figure A-17)	(0.026)	(0.026)
Change in the number of electric vehicles,	0.023	-0.034
incl. company cars (Figure A-18)	(0.031)	(0.035)
Change in the number of non-electric vehicles,	0.111'	-0.200***
incl. company cars (Figure A-19)	(0.065)	(0.057)
Household fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
Number of observations	3,178	6,076
Number of households	454	868

Standard errors are in parenthesis.

' $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure A-16: Number of cars, only those changing job late in the year.

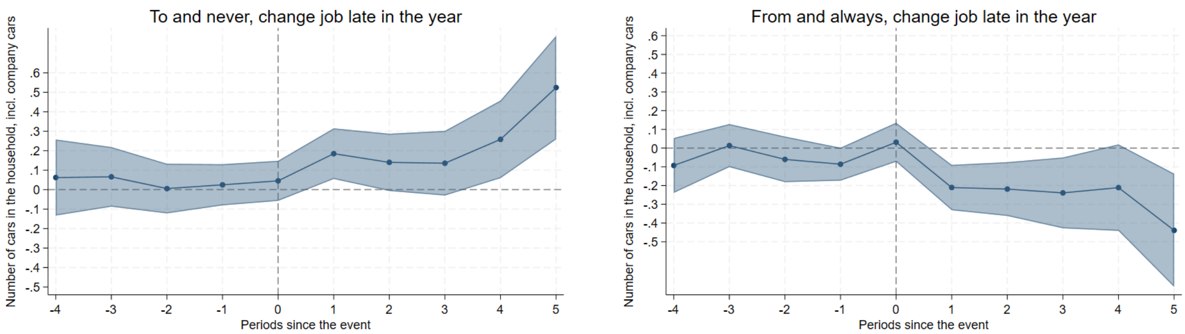


Figure A-17: Likelihood of having car, only those changing job late in the year.

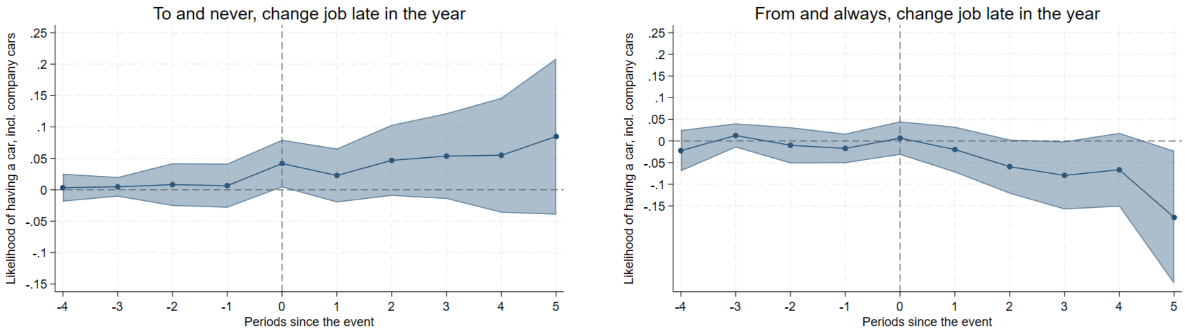


Figure A-18: Number of electric vehicles, only those changing job late in the year.

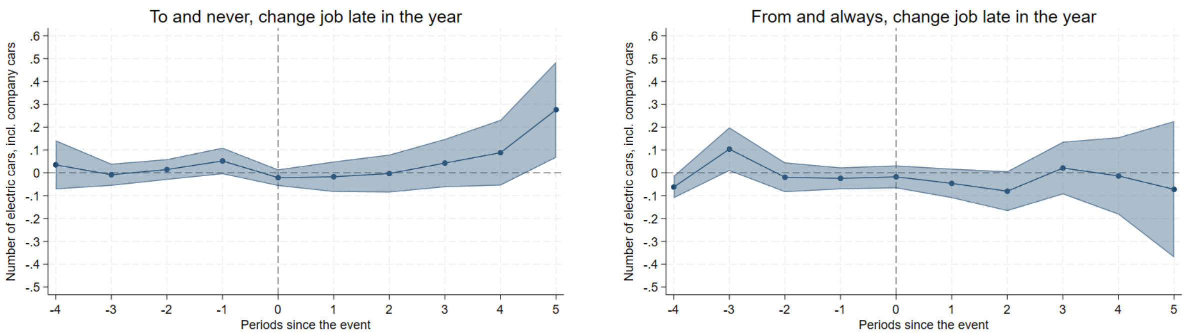


Figure A-19: Number of non-electric vehicles, only those changing job late in the year.