THE PINHAS SAPIR CENTER FOR DEVELOPMENT
TEL AVIV UNIVERSITY

"The Accident Implications of a Company Car Benefit"

Sarit Weisburd[1]

Discussion Paper No. 11-15

July 2015

I would like to thank The Pinhas Sapir Center for Development at Tel Aviv University for their financial support.

I would like to thank Orit Yalon Shukrun, Orly Furman and Hadas Yaffe from the Israeli Central Bureau of Statistics for their work in preparing the data for this project as well as participants in Israeli IO Day for their helpful comments.

[1] Sarit Weisburd- The Eitan Berglas School of Economics, Tel Aviv University. Email: saritw@post.tau.ac.il

Abstract

Company cars that include free fuel, insurance and maintenance have become a staple employee benefit in many Israeli and European companies. Moral hazard would suggest that the benefits associated with these cars would result in lower driving care and higher accident rates. However, it is often argued that drivers receiving this benefit face longer commutes and/or a more difficult work schedule which would result in an increased rate of car accidents regardless of a moral hazard effect. Using a difference in differences strategy, we analyze the impact of a legislative change that doubled the monthly tax rate on company cars in Israel (an annual increase in costs of about $3,500). We find evidence that this increase in company car costs resulted in an 11% decrease in the probability of an accident for company car type drivers.

Theoretical and applied works have often raised concerns regarding suboptimal investment in unowned assets.[1] This paper focuses on how changes in car ownership occurring over the last 20 years across Europe and Israel may be impacting driving behavior in these countries. In 2010, company cars made up 12% of the stock of all vehicles in Europe and 15% of the stock of vehicles in Israel (Shiftan et al., 2012). This percentage increases three-fold when considering new cars, where over 40 percent of the market falls under the company car category.[2] Not only are drivers of company cars unaffected by the price depreciation of their cars, the car benefit often includes full financing of fuel, insurance, and maintenance costs. Moral hazard would predict that the benefits associated with these company cars would result in lower driving care and higher accident rates. Alternatively, it is argued that company cars are both newer and safer, with the additional benefit of monitoring provided by vehicle fleet managers.

The widespread usage of vehicle fleets began in Israel in 1995 after tax changes in the fair value of company vehicles made it significantly cheaper for individuals to use company cars. The demand for company cars continued to increase until reaching its peak in 2007, when sixty percent of new cars in Israel were purchased by vehicle fleets. The prevalence of company cars throughout Europe and Israel is attributed to the significant tax benefit provided for these cars.

The price faced by employees choosing to drive a company vehicle has two components - a monthly car fee paid to the company, and a fair value tax paid to the tax authority.[3] In Israel, the monthly car fee for the most popular group of leased vehicles (Mazda 3, Ford Focus, Toyota Corolla, etc.) ranges between 2,000 and 3,000 NIS per

[1] See works by Grossman & Hart (1986), Baker & Hubbard (2004), Schneider (2010), and Shiftan et al. (2011).

[2] See Copenhagen Economics (2009) and The Israel Central Bureau of Statistics 2010 Motorized Vehicles Report (Table 17).

[3] While most vehicle fleets are comprised of leased vehicles, a less common alternative is for the employer to purchase vehicles and then allocate them to employees. In most cases the employer will work together with the leasing company to create a 3 year leasing package that is offered to employees.

month.[4] The fair value tax is determined by the tax authority and in Israel was set at roughly 1,300 NIS per month for this class of family size vehicles prior to 2008.[5] These costs can be compared to the average cost of 120,000 NIS for purchasing a new vehicle in this group of family size cars.

In August 2007, the Israeli Tax Authority announced a gradual increase in the fair value of company vehicles beginning in January 2008 and ending in January 2011. Thus, over a period of four years the fair value of standard family company cars (price group 2) doubled from a monthly cost averaging 1,330 NIS to a monthly cost averaging 2,450 NIS. This increase in the cost of the company car benefit should create an incentive for individuals to consider purchasing a private car, whereas prior to 2007 a vast majority of individuals would choose to remain in the leasing cycle.[6]

We use a difference-in-differences strategy to compare 21,993 drivers who were affected by the change in legislation (e.g. chose to lease a vehicle in 2006 – prior to the announcement of a tax increase) and 73,860 drivers who were not involved in the leasing cycle in 2006. Our analysis also considers an additional treatment group of 11,215 individuals residing in a household that includes a leased vehicle (spouse, parent, child, etc.). If driving a leased vehicle results in more reckless behavior then we would expect a relative decrease in the accident rate for the treatment group of drivers who chose to drive a company car in 2006 and now have a much lower incentive to keep this benefit. A decrease in car accidents could result directly from exiting the company car cycle, or from increased concerns regarding a clean driving record in the event of ceasing to lease

[4]Some companies in Israel provide the car as a benefit to higher level employees. In this case the monthly car fee is waived and these employees are only subject to the fair value tax.

[5]During the years 2005-2012 the average dollar to shekel exchange rate was $1=3.96 NIS.

[6]A survey conducted by Shiftan et. al. (2012) suggests that these drivers are sensitive to the fair value tax charged for the use of company vehicles. Specifically, 9 percent of their sample planned to exit the leasing cycle by 2011 and an additional 20 percent stated that they would no longer lease if costs increased by an additional 1,000 NIS.

in the near future.[7]

This paper is organized as follows. In the next section we review relevant research examining the effect of car ownership on behavior. Section 3 provides an overview of the company car framework and details the specific change in legislation regarding the tax value of company cars and its possible impact on car accidents. Section 4 describes the data used in the empirical analysis while Section 5 reports the empirical results. Section 6 concludes.

1 Empirical Research on Driving Behavior and Company Car Benefits

Driving a company car encompasses the benefits of using a car that you do not own as well as holding high coverage insurance. We examine two separate literatures: the first focuses on the impact of ownership on behavior, while the second examines moral hazard in an insurance framework. Drivers who remain with a company car after the legislative change but are considering leaving the company car cycle in the future may drive more carefully now that involvement in a car accident can impact their future insurance costs.

Dunham (2003) examines differences in vehicle depreciation of corporate owned fleet and rental versus private vehicles. He estimates an upper bound for moral hazard since there remain significant differences between fleet and private vehicles that provide alternative explanations for the increased depreciation rate. Baker and Hubbard find some evidence that a driver who owns his truck will drive in a way that better preserves the truck's value than if it were owned by the trucking company (2004). Similarly, Waldman et al. find that the maintenance frequency is much higher for leased vehicles that the lessee purchases in comparison to cars that are returned to the dealership (2012).

[7] While accident histories have no effect on the pricing of leasing contracts or company cars, insurance providers in Israel vary contract costs based on the client's accident history. Thus, drivers who exit leasing and choose to insure a private vehicle are required by law to submit an accident history from their previous insurer/ company car representative.

Schneider also tests this idea in the taxicab industry and finds that taxi drivers in NYC who lease their cars have 21 percent more driving violations, 16 percent more accidents and 30 percent more vehicle inspection failures than drivers who own their cars (Schneider, 2010).

A study conducted in Israel using questionnaires shows that drivers with leased vehicles drive 3,000 kilometers more per year than their colleagues in similar companies who drive private vehicles. They also found that drivers self-reported a higher rate of car accidents and more aggressive driving behavior when using a company car (Shiftan et al., 2012). Questionnaire studies in the UK found similar results (see Lynn & Lockwood (2008), Dimmer and Parker (1999)). Clark et al. examine accident outcomes in the UK and find a high ratio of "blameworthiness" among company car drivers where excessive speed is often the cause of the car accident (2005,2009). One explanation for this difference in driving patterns is that drivers who face a longer work commute, or more aggressive drivers, self-select into driving leased vehicles. The policy concern is that the allocation of the leasing benefit causes individuals to change their driving patterns, resulting in a negative externality for society both in terms of pollution and car accidents.

There have been a growing number of empirical papers examining whether or not insurance coverage affects driving behavior. Both Chiappori and Salanie (2000) and Abbring et al. (2003) find no evidence of moral hazard. In their paper, Abbring et al. (2003) point out the importance of examining how accident outcomes relate to insurance coverage for the same individual over time. Their concern is that unobserved heterogeneity among the insured would result in more accident prone individuals purchasing more coverage and having more accidents (adverse selection). Without an exogenous shift in insurance costs, this adverse selection effect could mistakenly be interpreted as moral hazard where higher insurance coverage results in more risky driving behavior.

In more recent studies, Abbring et al. (2008) using Dutch longitudinal micro data and Dionne et al. (2013) using French longitudinal micro data do find evidence

of moral hazard. Weisburd (2015) estimates the effect of providing company allocated high coverage insurance to employees of a large Israeli company. She finds that a $100 discount in accident costs results in a 1.7 percentage point increase in the probability of an accident.

We examine a large sample of individuals who were impacted by a natural experiment. Thus, we are able to examine how individuals who are "company car types" change their driving behavior when holding a company car becomes less financially attractive. Without this change in government legislation it is difficult to interpret the cause of observed difference in driving outcomes between private owners and company car drivers.

2 Company Car Benefits & Car Accidents

The annual revenue of the leasing industry in Israel was estimated at 9 billion NIS in 2012, with new car revenues estimated at 19.5 billion NIS.[8] In 2010, 49 percent of new vehicles were purchased by private individuals, 34 percent were purchased by leasing companies, and 17 percent were purchased for company vehicle fleets. Over the years many companies have shifted from vehicle fleets to a leasing benefit as leasing requires a much lower investment in capital.

Leasing companies allocate their cars to firms for a monthly rate over 36 months. Employers then provide their employees with a list of vehicle options and prices. If they choose to lease a vehicle they pay a monthly leasing fee to their employer as well as a fair value tax to the tax authority. Prior to 2008, the fair value tax was determined by the vehicle pricing group and was not a linear function of vehicle price (see Table 3).[9]

[8] See "A Summary of the Israeli Leasing Industry" provided by Midroog (January 2014) and calculations based on a "Summary of the Israeli Car Market" published in Globes by Gdalyahu (April 2015), and "Taxation and Key Statistics for the Automotive Market" published by the Israeli Tax Authority (2012).

[9] This table was produced with data from The Annual Report of the Israeli State Revenue Division (2008), Chapter 14: Car Taxation, Table 6.

The largest concentration of company cars is found in groups (2) and (4). At the end of the leasing contract there is often the option to purchase the car at below market price.

A company car will also usually include maintenance, fuel, and insurance. In large firms, maintenance is organized by a company car manager, who is also legally obligated to track car accidents of employees. Generally, leasing companies offer full coverage insurance to the firms and firms decide whether or not to penalize their employees for accidents. When a penalty does exist it is often a set fee that is signfificantly lower than that found in the private insurance market.

In August 2007, the Israeli Tax Authority announced a gradual increase in the fair value of company vehicles beginning in January 2008 and ending in January 2011. Thus, over a period of four years the fair value of standard family company cars (price group 2) doubled from a monthly cost averaging 1,330 NIS to a monthly cost averaging 2,450 NIS (see Table 4 as summarized in Shiftan et al. (2012)). This policy change got rid of the 7 tax value kinks created by pricing groups and introduced a more linear taxation system. All company car contracts that began after January 2010 face a fair value tax of 2.04 percent of the bluebook car price, where more expensive cars (valued over 130,000 NIS) face a higher fair value tax of 2.4 percent.[10]

This increase in leasing costs should create an incentive for individuals to consider purchasing a private car, whereas prior to 2007 a vast majority of individuals would choose to remain in the company car cycle. Indeed, a survey conducted by Shiftan et al. (2012) found that these drivers appeared to be sensitive to the fair value tax charged for the use of company vehicles. Specifically, 9 percent of their sample planned to exit the leasing cycle by 2011 and an additional 20 percent stated that they would no longer lease if costs increased by an additional 1,000 NIS.

The underlying hypothesis in the theoretical literature on leasing is that these

[10]Starting in 2011 all cars faced the same fair value tax of 2.48 percent of their blue book value.

drivers will exert a lower level of care when using an item that they do not own.[11] Thus, we would expect a higher rate of car accidents among company car drivers than drivers with privately owned vehicles. However, as drivers can self-select into leasing, an alternative explanation is that drivers who exert a lower level of driving care, or face longer commutes will choose company cars and have more accidents. The main concern for empirical papers in this field is differentiating between selection into company cars and behavioral change.

The legislative change in leasing costs, provides an opportunity to conduct a difference-in-differences analysis comparing accident outcomes of drivers who were affected by the change in legislation (e.g. chose to drive a company car in 2006 – prior to the announcement of a tax increase) and drivers who were not involved in the leasing cycle. An additional treatment group are those individuals who reside in a household with a company car. While in most cases we would expect the individual who leased the vehicle to be the primary driver, company cars can be used by all household members. We therefore allow for a separate effect for lessors (z_i) and lessors within household (z_fam_i).

We model accident outcomes y_{it} for individual i in year t as a function of personal characteristics x_{it}, being a lessee z_i, or having a lessee within household z_fam_i,whether or not year t is after the change in legislation $post_{it}$, a time trend t, and an unobserved individual factor v_i,

$$y_{it} = x_{it}\beta_0 + \beta_1 z_i + \beta_2 z\_fam_i + \beta_3 (z_i \times post_{it}) + \beta_4 (z\_fam_i \times post_{it}) + \beta_5 post_{it} + \beta_6 t + v_i + \varepsilon_{it} \quad (1)$$

where y_{it} is the number of accidents per year, $z_i = 1$ for an individual who chose to lease a vehicle in 2006, $z\_fam_i = 1$ for an individual with $z_i = 0$ who lives in a household where $z_i = 1$ for another household member, and $post_{it}$ takes the value

[11] See papers by: Henderson and Ioannides (1983), Smith and Wakeman (1985), and Mann(1992).

of 0 before 2008 and 1 for later years. The zero mean residual term $\varepsilon_{it} = y_{it} - (x_{it}\beta_0 + \beta_1 z_i + \beta_2 z\_fam_i + \beta_3 (z_i \times post_{it}) + \beta_4 (z\_fam_i \times post_{it}) + \beta_5 post_{it} + \beta_6 t + v_i)$ reflects the randomness associated with the occurrence of an accident involving other automobiles and unexpected road hazards. Importantly, v_i may be known by the individual while ε_{it} is not.

The coefficient on the interaction term $\beta_3 = E(y_{post} - y_{pre}|z = 1, x) - E(y_{post} - y_{pre}|z = 0, x)$ estimates the change in driving care induced by driving a company car. In essence, we compare the change in accident outcomes between the pre-legislation period – when company cars were very attractive– and future periods when lessees may have already left or are considering leaving the leasing cycle.[12] If driving a leased vehicle results in more reckless behavior then we would expect β_3 to be significant and negative. Using a similar comparison, we would expect β_4 to be negative if the company car is shared with other members in the household.

This technique, allows us to separate a causal effect of leasing from two possible sources of bias. The first, a correlation between the unobserved accident risk (v_i) and the choice of becoming a lessor (z_i) would bias our results absent the change in legislation. The inclusion of private drivers provides a control for the second source of bias created when accidents risks (v_i) are changing over time (due to changes in vehicle types, road maintenance, etc.). In the next section we focus on the characteristics of individuals driving company and private cars and how this could impact any measurement of the effect of car ownership on driving behavior.

[12] While accident histories have no effect on the pricing of leasing contracts, insurance providers in Israel vary contract costs based on the client's accident history. Thus, drivers who exit leasing and choose to insure a private vehicle are required by law to submit an accident history from their previous insurer/ company car representative.

3 Data

The dataset for this study was created by the Israel Central Bureau of Statics by combining detailed data on individuals surveyed in the 2008 population census with information on the usage of company cars and accident outcomes between 2006 and 2010. Thus, we track roughly 300,000 individuals that had at least 15 years of schooling (not counting yeshiva) that were sampled in the 2008 Census. The census data provides information on: gender, age, number of children, marital status, years married, schooling, salary, family income, hours of work per week, residence, commute distance, etc. Additionally, we identify company car drivers using annual tax data that records whether or not each individual in the sample paid the company car fair value tax over this period.

We combine this data with information on year of receiving a driver's license as well as car accidents reported to the police between 2006 and 2010.[13] Our accident data differs from previous studies that often analyze moral hazard using data provided by insurance companies. As large accidents are a relatively rare occurrence, it is plausible that drivers may be choosing which accidents to report to their insurance provider (ex-post moral hazard). We focus on ex-ante moral hazard by analyzing the impact of this legislative change on a more homogenous group of serious car accidents that were reported to the police department.

We focus on individuals who are working in 2006 and have a valid drivers license in order to ensure that we are tracking a similar group of individuals in the treatment (leasing) and control (private vehicles) group. A concern could be that by definition individuals in the treatment group are working and driving and it is necessary to focus on a similar group of individuals in the control group. This shrinks our sample size to 95,853 individuals aged 28 to 59 in 2006 who hold a valid drivers license over the entire period. We create a separate treatment group of eligible drivers who live in the same

[13] In Israel, individuals are required by law to report all car accidents involving injuries or hit-and-runs to the police department.

household as an individual with a company vehicle. These individuals lie somewhere between the treatment and control groups, as they likely have access to the company car but are not the primary driver.

Previous research examining the impact of car ownership on driving behavior has often discussed the possible differences in characteristics of those who own versus lease a vehicle. To the best of our knowledge this is the first paper that combines car ownership data with census data thereby providing information on a large range of characteristics that could have important implications for the accident rate. We differentiate between male and female drivers in order to better understand differences in observed characteristics within gender between those who drive private and company cars.

Tables 5 and 6 summarize the characteristics of men who are company car drivers, in comparison to those who live in a household with a company car, and those who drive their own private vehicle. Male company car drivers are 10 percent more likely to have graduated from college, and on average have 3 additional years of driving experience. They tend to be more homogeneous in terms of religious diversification (lower rates of both Non-Jews and observant Jews within this group). The average income of individuals in the company car group is more than double that of the control group (318,700 NIS versus 154,400 NIS). Company car drivers record working 4 hours more per week, are 14 percent more likely to commute during rush hour, and face a longer commute than private owners. Not surprisingly, they are much more likely to drive to work than those residing in a company car household or private car owners (85 percent versus 64 and 69 percent). In most cases men residing in a household with a company car have characteristics that fall somewhere between those in the company and private car groups. However, they are the most likely group to have 2 cars and to reside in the Tel Aviv area.

Tables 7 and 8 replicate tables 5 and 6 for women who drive private vehicles, reside within a company car household, and drive a company car. Female company car drivers are 10 percent more likely to have graduated from college than male company

car drivers, female drivers in private vehicles have a more similar graduation rate to men driving company cars. Women company drivers relative to private drivers, follow a similar trend to their male counterparts in terms of religious homogeneity and additional years of driving experience. While women in our sample work less hours and report lower earnings than men, those in the company car group earn more than double that of the private group (243,900 NIS versus 103,000 NIS). They also work 8 hours more per week and face a longer commute than private owners. Over 60 percent of women in all three groups commute during rush hour, a higher rate than that found even among company car drivers in the male group. Women with company cars are also more likely to drive to work than those residing in a company car household or private car owners (82 percent versus 67 and 72 percent). Women residing in a households with a company car have similar characteristics to those driving private cars. Two significant outliers are higher graduation rates as well as place of residence.

While we would generally expect more educated drivers and drivers with more experience to drive more carefully, many of the other characteristics of individuals in the company car group point to higher accident risks. Individuals who spend more time on the roads have a higher probability for accident involvement. If lessors are working longer hours and traveling during high traffic periods, they may be less alert on the roads. Thus, any comparison of accident rates between those driving in private vehicles and those using company cars must take into account these differences in characteristics.

Individuals are classified into control and treatment groups based on car ownership in 2006. The change in the cost of a company car can explain the statistic that only 85 percent of these men and 81 percent of these women are still driving a company car in 2008. However, we also find that 14 percent of men in company car households (who did not have a company car in 2006) and 9 percent of private drivers in 2006 were driving a company car in 2008 (a corresponding 4 and 3 percent among female drivers). This change in car type could be driven by unobserved characteristics that are correlated

with the accident rate (e.g. increased vehicle usage) and highlights the importance of using a differencing strategy where the treatment and control group remain constant over time. We do not include these new company car drivers in the treatment group since their selection into a company car could be driven by a change in driving behavior. Finding a significant decrease in accidents for the treatment group, despite including these "switchers" in the control group should strengthen the validity of an ownership effect on accident outcomes.

All of the individuals in the treatment group worked at firms that offered a company car fringe benefit, these firms are highly concentrated in the hi-tech sector (see Figure 1). While some individuals in the control group came from these same firms and opted out of the car fringe benefit, others work at companies that don't give access to this benefit. While looking at individuals at the same firm that do not drive a company car may provide a good control in terms of working hours and ability, it could raise concerns regarding commute distance and driving preferences. We therefore also include individuals in different fields with similar levels of education in the control group. These individuals may provide a cleaner control as they did not have the possibility of opting in to the benefit. Additionally, we separate individuals into treatment and control based on whether or not they made use of a company car in 2006 and not by usage in specific year t. In 2006, the car fringe benefit was considered very attractive and most employees opted to take advantage of the benefit. In later years, it became more common to select into the benefit based on commute distance and driving needs.

The change in legislation lowered the attractiveness of the company car benefit. Figure 2 illustrates how the tax was implemented according to Table 4 and individuals in the treatment group faced a much higher cost by the end of 2010. Despite the large increase in costs, the change in legislation only decreased the number of lessors by about 5%, but seemed successful in curtailing the fast growth within the leasing industry (see Figure 3). Importantly, the change in legislation may have impacted both those individ-

uals in the treatment group who opted out of the company car cycle and began driving a private car, and those individuals remaining within the company car cycle but who are considering opting out at the end of their lease.

This legislative change provides an opportunity to measure the impact of company cars on driving behavior as long as the control group was following a similar accident trend up to the change in legislation. We examine the accident rate on an annual basis between 2006 and 2010 for those within the treatment and control group (see Figure 4). Prior to 2008 the treatment group has a higher accident rate with a trend that mimics that of the control group. However in 2008, the treatment group exhibits a significant decrease in car accidents that continues to fall so that in 2010 the treatment group reports a lower accident rate than the control group. In the following section, we provide empirical evidence that the driving force behind this drop was the cost increase in company cars.

4 Empirical Results

Previous research has examined the company car impact when drivers choose whether or not to select a company car and how this choice correlates with car accidents. We compare these results to our estimates within the difference-in-differences structure created by the policy change. Our analysis is conducted separately for men and women as we think the mechanism by which a company car impacts driving behavior may not be uniform across genders.[14]

Specification (i) in Table 9 provides an estimate of the company car benefit β_3 from equation (1) under the assumption that men in the treatment group are identical to men in the control group. If this were the case it looks like men who lease are 0.001

[14]Generally, having a company car combines usage of a vehicle that you do not own, fuel, and high coverage insurance. This insurance benefit is highest for those that remain in the company car cycle and are never subject to insurance premiums that are dependent on accident history. If women are more likely to leave their job due to maternity leave or other factors they may be less impacted by the company car benefit.

percentage points less likely to be involved in an accident than those driving private vehicles. However when we control for observed characteristics of drivers in specification (ii) we find that company car drivers with identical characteristics to private drivers are 0.003 percentage points more likely to be involved in an accident. As the average accident rate among male drivers is 0.022 this implies that male company car drivers are 14 percent more likely to be involved in an accident than private drivers.

The other coefficient estimates in specification (ii) provide some general statistics regarding accident risks. Younger drivers in our sample are more likely to be involved in a car accident. There is a much higher accident rate among the non-Jewish population in Israel.[15] Native Israelis, as well as Sephardi drivers have a higher accident rate then immigrants from the US and Israel. Russian immigrants have a significantly higher accident rate then any of the previous groups.[16] Individuals working more than 40 hours per week and individuals whose commute is over 10 kilometers are more likely to be involved in an accident. The change in sign between specifications (i) and (ii) could be explained by a higher level of education and a higher likelihood of being a parent (correlated with lower accident rates), and a lower percentage of minority religions and immigrants (correlated with higher accident rates).

In specifications (iii) we compare accident outcomes for the same male driver who switches between a company car and a private car. If the "switch" was due to an exogenous policy change then a fixed effect analysis can remove the selection issues discussed previously. We estimate a significantly larger company car impact of 0.005, implying a 23 percent increase in the accident rate. If individuals tend to opt into a company car when they move and face longer commutes, or increase family size, or work hours this could lead to a change in the accident rate that was not a result of

[15] This has been attributed to different factors such as road infrastructure, vehicle types, community norms, and discrepancies in driving examinations.

[16] This phenomenon has not been discussed in the literature and we believe that it warrants further research.

car ownership.[17] We therefore examine this further in the differencing framework which focuses on an exogenous shift in the attractiveness of the company car benefit.

Table 10 fits model (1) to women in our sample. We find no significant change in the estimate of β_3 when including additional controls for observed characteristics of drivers. While our estimated effect of the company car benefit for women (0.003 s.e. 0.001) is identical to that of men it is no longer significant in specification (iii) when controlling for individual fixed effects. This raises possible concerns regarding unobserved heterogeneity between women in the company car and private car groups.

The negative impact of company cars becomes less clear when estimating the impact of the legislative change in company car taxation on total accidents. Table 11 examines the impact of the increase in company car costs on men in the treatment group relative to the control group. Using a differencing approach, we estimate that the change in taxation policy resulted in a 0.002 percentage point relative decrease in the accident rate for those in the treatment group. When controlling for observed characteristics (specification (ii)), as well as when including individual fixed effects (specification (iii)) the impact is smaller than that measured in Table (9) and no longer significant at the five percent level. We find no evidence of any change in driving behavior for women in the company car group relative to the private group after the change in legislation (12).

The estimates reported in Table 11 are less susceptible to bias created by endogenous shifting between the company car and private owners group. Absent a policy change, even when examining the same individual over time, unobserved factors impacting the company car decision can result in an overestimate of the company car impact. If this is the case then our estimates from Table 11 could be considered more accurate as it lower concerns regarding selection bias. However, we may be concerned that the differencing specification adds noise to the analysis as the change in the cost of the

[17] We are unable to control for changes in working hours, or commute distance as we only have a cross-section of data from 2008 regarding this information.

company car benefit may have no impact on the probability of exiting the company car cycle for some drivers. Additionally, since allocation to the treatment and control groups occur based on the 2006 choice, in the post period there are lessors being counted in the control group.

One way of gaining a more precise measure of the legislative impact is to focus on accidents that are more common among individuals with company cars. We reported in Tables (6) and (8) that company car drivers face longer work commutes. We also find that 40 percent of accidents reported by company car drivers occur on highways, as opposed to 30 percent of private car drivers. Table 13 estimates the impact of the increase in the tax value of company cars on highway accidents. In this specification we find a statistically significant 0.002 percentage point decrease in the probability of a highway accident among male drivers. This implies that post-legislation there was a 28 percent decrease in the probability of a highway accident for company car drivers.

5 Conclusion

Economists have long studied the implications of including fringe benefits within an employee compensation package. The literature focuses primarily on the tax distortion created by the benefit as well as the behavioral change that can result from these policies. In Israel and throughout Europe company cars often contribute to 50% of new car purchases as the employers cost of providing a company car is much lower than if the employee were to purchase that same vehicle privately. The main cause of the price difference is that employees face a 45% tax rate on their income, while companies can attribute up to 4% of direct leasing costs and 25% of fuel and maintenance costs as tax deductible expenses. Additionally, there is likely to be an economies of scale impact where large companies are able to bargain for a lower company price from the leasing firms.

In appendix A we compare the costs of a private car purchase to a company car

purchase. Thus, we estimate the difference in price for an employer allocating a 2012 Mazda 3 to her employee for a three year leasing contract, and the alternative of providing that employee with a salary increase to purchase that same car and sell it three years later. Prior to the 2008 increase in the fair value of company cars, the annual cost to the employer of providing this company car is 46,355 NIS while the employer would have to pay salary and National Insurance contribution costs of 103,720 NIS to enable the employee to purchase this same car privately. The legislative change served to decrease the gap to 44,000 NIS but providing a company car is still significantly cheaper than an equivalent salary increase.

Absent an overhaul of the current approach to fringe benefit taxation in Europe company cars may be here to stay.[18] Without taking advantage of the policy change, the data show a 23 percent increase in the accident rate for the same male driver who moves from a private to a company car. However this estimate combines a company car impact with a selection impact as there may be unobserved accident risks that impact the decision to join or leave leasing. We find that this effect shrinks to 11 percent, when taking advantage of the increase in company car costs to run a comparative analysis of accident outcomes between men with and without company cars. The most significant impact of the legislation seems to be occurring for highway accidents among male company car drivers. We find a 0.002 percentage point decrease in the probability of a highway accident with an average rate of 0.007 reports per driver per year.

The lack of effect among female drivers deserves further attention. While the literature on moral hazard has often documented a differential impact for younger drivers, to the best of our knowledge this has not come up in regard to gender. If the difference in outcomes can be explained by different likelihoods of remaining within the company car cycle this could shed additional light on the mechanism through which company cars

[18] In the US companies must include the full value of the company car in their employee's income. This provides a solution to the tax distortion found in Europe and Israel.

affect behavior.

In 2011, the Israeli Tax Authority believes the current fair value tax is sufficiently close to the economic value of the company car benefit.[19] The tax authority reported that leasing companies are responding to a decrease in demand for company cars by providing more attractive leases directly to private drivers. While this may increase fairness of opportunity by opening up the market to individuals whose companies were not providing the company car benefit it raises concerns regarding the market power of leasing companies and the driving implications of these leasing packages.

[19] Taxation and Key Statistics for the Automotive Market (The Israeli Tax Authority Economic Research Division, 2012).

References

[1] Abbring, J. H., Chiappori, P., & Pinquet, J. (2003). Moral hazard and dynamic insurance data. Journal of the European Economic Association, 1(4), 767-820.

[2] Abbring, J. H., Chiappori, P., & Zavadil, T. (2008). Better safe than sorry? ex ante and ex post moral hazard in dynamic insurance data.

[3] Albert, G., Hakkert, S., & Shiftan, Y. (2014). Safety implications of company carsâ€"the israeli experience. European Transport Research Review, 6(2), 93-102.

[4] Baker, G. P., & Hubbard, T. N. (2004). Contractibility and asset ownership: On-board computers and governance in U. S. trucking. The Quarterly Journal of Economics, 119(4), 1443-1479.

[5] CDC. WISQARS (web-based injury statistics query and reporting system). (2010). Retrieved October 12, 2010, from http://www.cdc.gov/injury/wisqars

[6] Chiappori, P., & Salanie, B. (2000). Testing for asymmetric information in insurance markets. Journal of Political Economy, 108(1), 56-78.

[7] Clarke, D. D., Ward, P., Bartle, C., & Truman, W. (2005). An in-depth study of work-related road traffic accidents

[8] Clarke, D. D., Ward, P., Bartle, C., & Truman, W. (2009). Work-related road traffic collisions in the UK. Accident Analysis & Prevention, 41(2), 345-351.

[9] Dimmer, A., & Parker, D. (1999). The accidents, attitude and behaviour of company car drivers. Behavioural Research in Road Safety Ix. pa3524/99,

[10] Dionne, G., Michaud, P., & Dahchour, M. (2013). Separating moral hazard from adverse selection and learning in automobile insurance: Longitudinal evidence from france. Journal of the European Economic Association, 11(4), 897-917.

[11] Dunham, W. R. (2003). Moral hazard and the market for used automobiles. Review of Industrial Organization, 23(1), 65-83.

[12] Igal Hendel, & Alessandro Lizzeri. (2002). The role of leasing under adverse selection. Journal of Political Economy, 110(1), 113-143.

[13] Johnson, J. P., Schneider, H. S., & Waldman, M. (2014). The role and growth of new-car leasing: Theory and evidence. Journal of Law and Economics, 57(3)

[14] Johnson, J. P., & Waldman, M. (2010). Leasing, lemons, and moral hazard. Journal of Law and Economics, 53(2), 307-328.

[15] Johnson, J. P., & Waldman, M. (2003). Leasing, lemons, and buybacks. The Rand Journal of Economics, 34(2), 247-265.

[16] Lynn, P., & Lockwood, C. (1999). The accidental liability of company car drivers. Trl Report 317,

[17] Odesser, A., & Yitzchak, O. (2008). Chapter 14: Car taxationAnnual Report of the Israeli State Revenue Division.

[18] Schneider, H. (2010). Moral hazard in leasing contracts: Evidence from the new york city taxi industry. Journal of Law and Economics, 53(4), 783-805.

[19] Shiftan, Y., Albert, G., & Keinan, T. (2012). The impact of company-car taxation policy on travel behavior. Transport Policy, 19(1), 139-146.

[20] Taxation and key statistics for the automotive market (2012). The Israeli Tax Authority Economic Research Division.

[21] Weisburd, S. (2015). Identifying moral hazard in car insurance contracts. Review of Economics and Statistics.

6 Appendix A: Estimating the Cost Difference of an Employer and Employee Car Purchase

We consider the costs faced by an individual who purchases a new Mazda 3 in 2012 and then resells the vehicle 3 years later (see Table 1). Shiftan et al. estimate that Israeli drivers in the hi-tech industry drive between 15,650 and 26,600 kilometers per year. We therefore calculate costs for driving 20,000 kilometers per year at the average price of 7.63 NIS per liter of gasoline. The estimated gas mileage for that vehicle category is 13.16 km per liter, resulting in the annual fuel usage of 1,519 liters per year at a value of 11,591 NIS. We estimate the additional costs of insurance and maintenance at 8,800 NIS per year. Lastly, we consider a real interest rate of 4 percent.

The total cost for this individual of owning the car over 3 years is estimated at 151,827 NIS with net present value of 152,802 NIS. This employee requires net earnings of 92,607 NIS per year in order to finance this cost, with an estimated employer cost of 103,720 NIS per year.

Let us consider the alternative of the employer leasing a new Mazda 3 in 2012 and providing her employee with a company car fringe benefit (see Table 2). Companies can list up to 15 percent of leasing costs under company expenses and 25 percent of that sum can be filed as a tax deduction (when the primary use of the vehicle is for private use). 25 percent of fuel costs as well as maintenance and insurance can be included in the tax deduction. We can then calculate the reduction in costs in each row based on the 25 percent income tax faced by large companies in Israel over this period.

Thus, providing this same vehicle as a company car to employees is estimated at 96,538 NIS with a net present value of 92,960 NIS. Prior to 2008, the employer also would have had to compensate the employee annually for the company car fair value tax of 15,960 ($12x1,330$) per year. Thus, the total cost of a company car would have amounted to 46,355 NIS , almost 60,000 NIS less than the cost of providing the employee with enough income to purchase her own car. After the increase in the company car fair

value tax , the price of providing a company car is 59,297 NIS, which is still 44,000 NIS lower than providing this benefit through a salary increase.

Table 1: The Costs of Private Car Ownership

	Year 1	Year 2	Year 3
Purchase & Sale	127,000		-52,000
Interest Forgone	5080	5283	5291
Operating Costs: Petrol	11,591	11,591	11,591
Other	8,800	8,800	8,800
	152,471	25,674	-26,318

Table 2: The Costs of Providing an Employee with a Company Car

	Year 1	Year 2	Year 3
Leasing Cost	12,666 (-118.74)	12,666 (-118.74)	12,666 (-118.74)
Interest Forgone	502	522	523
Operating Costs: Petrol	11,591 (-724.43)	11,591 (-724.43)	11,591 (-724.43)
Other	8,800 (-550)	8,800 (-550)	8,800 (-550)
	32,166	32,186	32,187

car_group	max price	privately owned (1000's)	Leasing (1000's)	company cars (1000's)	Rentals (1000's)	other not private (1000's)	Total (1000's)
1	92,000	189	5	4	4	3	205
2	111,000	990	170	46	29	40	1,276
3	130,000	445	9	13	1	6	473
4	147,000	46	21	7	2	5	80
5	191,000	162	5	10	1	3	181
6	273,000	62	2	6	0	1	72
7	----------	28	1	6	0	1	36

Table 3: The Distribution of Car Ownership in Israel (2008)

Marginal value							
Price group	Value of personal use in 2007	2008	2009	2010	2011	Value of personal use at the end of the process	Total addition to the value of personal use
1	1180	200	200	340	340	2260	1080
2	1330	200	200	360	360	2450	1120
3	1740	360	350	350	350	3150	1410
4	2160	410	410	410	400	3780	1620
5	3030	550	550	550	550	5230	2200
6	3850	740	730	730	730	6780	2930
7	4850	970	970	970	960	8720	3870

Table 4: The Fair Value of Company Cars in Israel

Figure 1: Distribution of Industries within Treatment Group

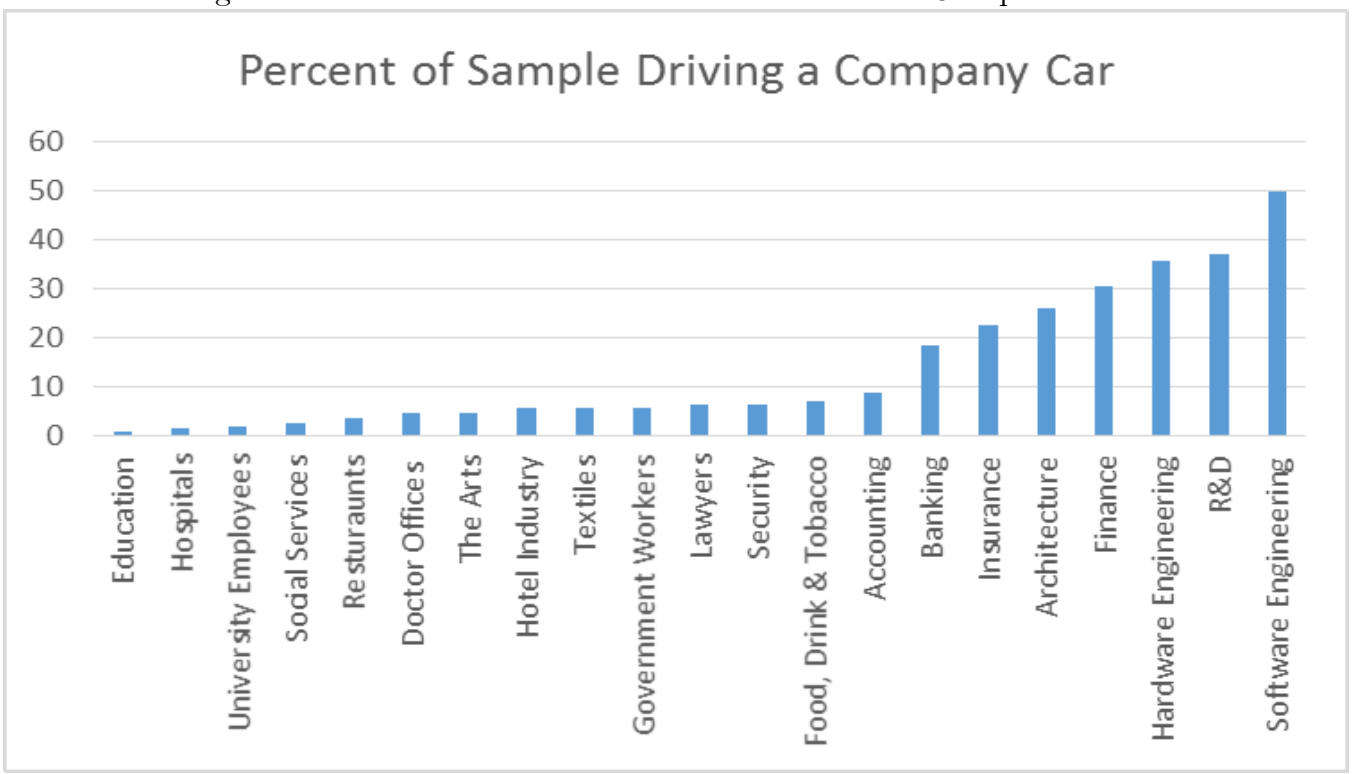

Figure 2: Average Fair Value Tax Paid By Individuals in Treatment Group

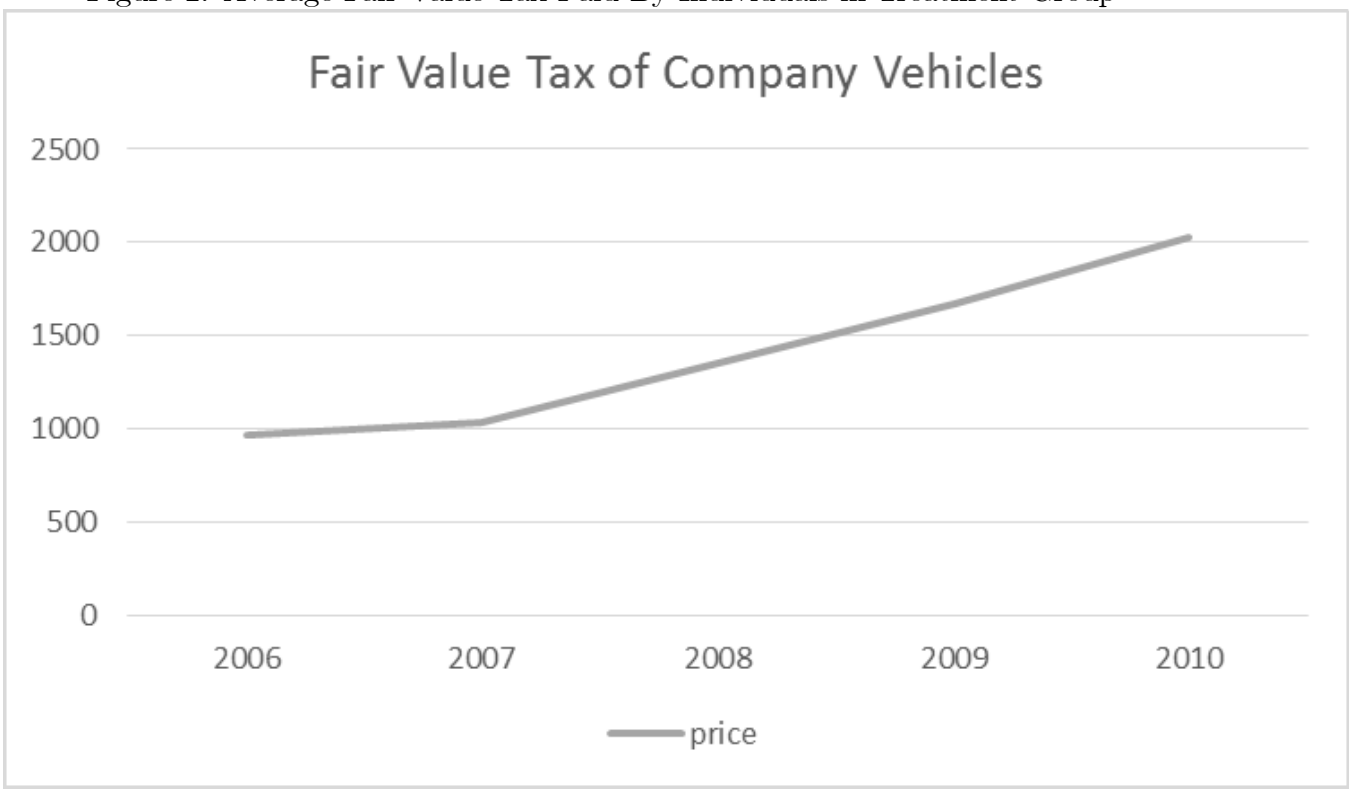

Figure 3: Individuals Driving a Company Car

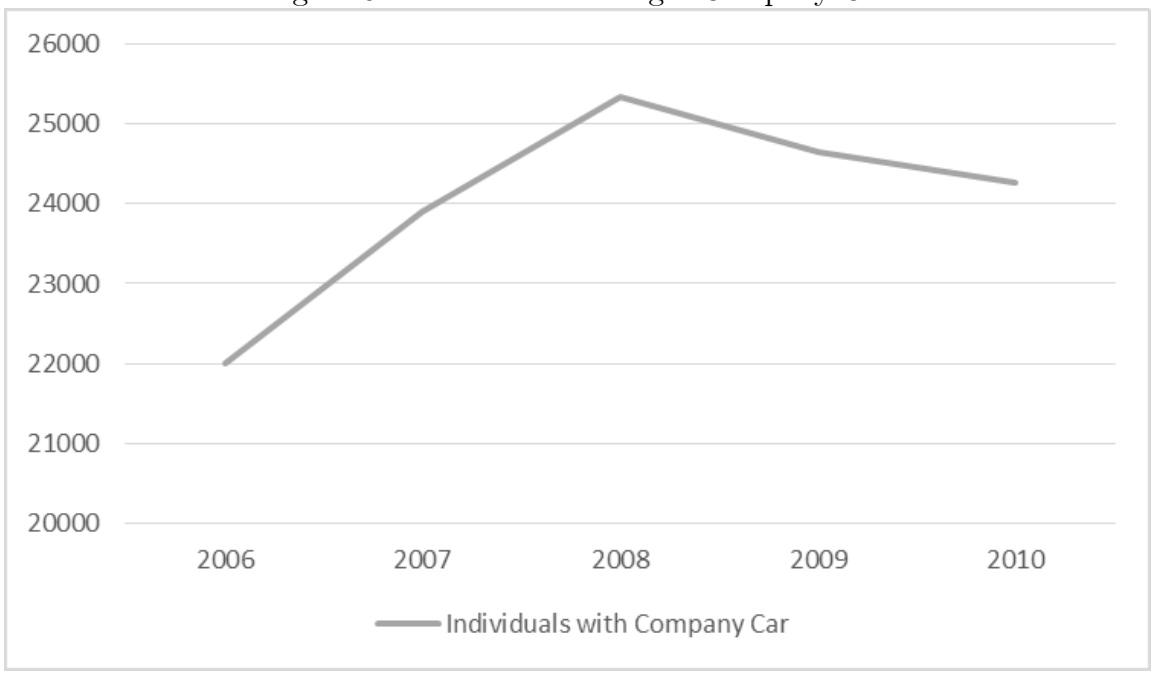

Figure 4: Accident Trend for Treatment and Control Groups

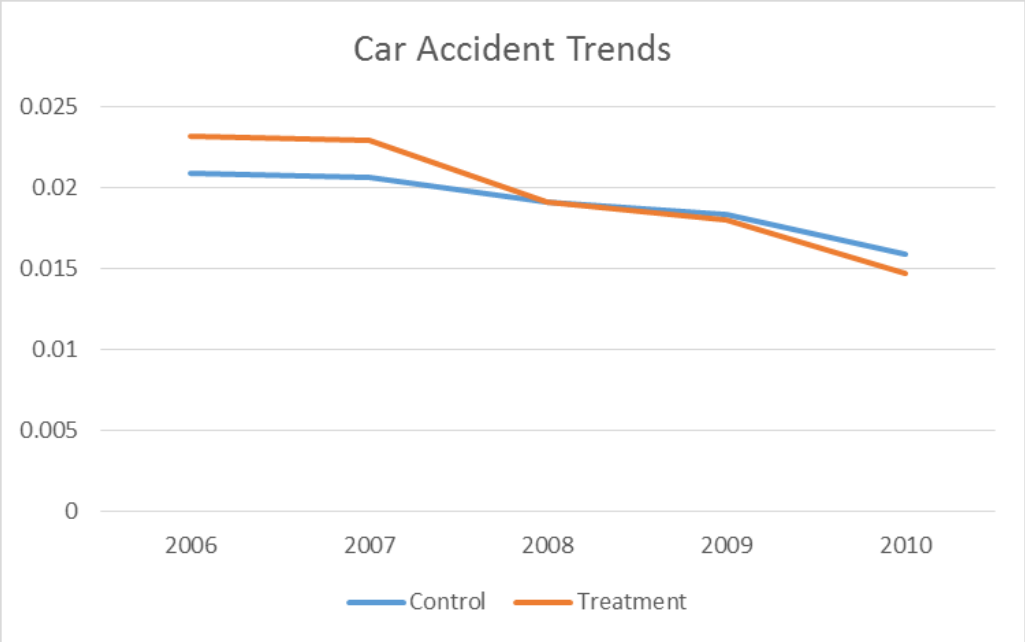

Table 5: Male Summary Statistics (I)

	Company Car	Company Car in HH	Private Owner
Individual Characteristics:			
Age	43.26	42.13	42.92
	(8.645)	(8.695)	(9.467)
Driving Experience	22.92	21.61	19.56
	(8.133)	(7.92)	(8.409)
Has Children (0/1)	0.717	0.74	0.661
	(0.451)	(0.439)	(0.473)
Minority Religion	0.0326	0.0336	0.162
	(0.178)	(0.18)	(0.368)
Native Israeli	0.76	0.767	0.673
	(0.427)	(0.423)	(0.469)
Russian Immigrant	0.134	0.13	0.214
	(0.341)	(0.337)	(0.41)
Reside in Northern Israel	0.101	0.0847	0.179
	(0.302)	(0.278)	(0.383)
Reside in Central Israel	0.39	0.403	0.25
	(0.488)	(0.491)	(0.433)
Reside in Tel Aviv	0.215	0.247	0.17
	(0.411)	(0.431)	(0.376)
Reside in Southern Israel	0.0776	0.0827	0.131
	(0.267)	(0.275)	(0.337)
Reside in Jerusalem	0.0319	0.0289	0.0712
	(0.176)	(0.168)	(0.257)
Education Characteristics:			
Years of Education	16.16	16.4	15.94
	(2.397)	(2.824)	(3.03)
College Graduate	0.721	0.717	0.628
	(0.448)	(0.451)	(0.483)
Attended Yeshiva	0.022	0.023	0.049
	(0.147)	(0.149)	(0.215)
N:	16,748	1,488	31,730

Table 6: Male Summary Statistics (II)

	Company Car	Company Car in HH	Private Owner
Work Characteristics:			
Annual Individual Income	318,700	198,100	154,400
	(323200)	(148200)	(137400)
Annual Family Income	427970.7	465891.9	249490.5
	(250184.2)	(272922.8)	(172132.2)
Weekly Work Hours	50.75	48.25	46.37
	(9.242)	(10.79)	(11.43)
Commute Distance	24.26	19.38	17.73
	(25.75)	(22.3)	(24.69)
Rush Hour Commute	0.617	0.532	0.486
	(0.486)	(0.499)	(0.5)
Work Nights	0.141	0.184	0.217
	(0.348)	(0.388)	(0.412)
Commute Characteristics:			
Number of Cars	1.701	1.902	1.43
	(0.723)	(0.705)	(0.608)
Drive Car (0/1)	0.852	0.693	0.644
	(0.355)	(0.461)	(0.479)
Company Shuttle (0/1)	0.014	0.053	0.085
	(0.117)	(0.224)	(0.279)
Public Transportation (0/1)	0.038	0.115	0.129
	(0.192)	(0.319)	(0.336)
Drive Motorcycle (0/1)	0.011	0.038	0.026
	(0.103)	(0.19)	(0.159)
Leased Vehicle (2008)	0.854	0.14	0.09
	(0.353)	(0.347)	(0.287)
N:	16,748	1,488	31,730

Table 7: Female Summary Statistics (I)

	Company Car	Company Car in HH	Private Owner
Individual Characteristics:			
Age	41.67	41.53	42.84
	(8.077)	(8.262)	(8.914)
Driving Experience	20.27	19	18.46
	(7.449)	(7.438)	(8.001)
Has Children (0/1)	0.706	0.764	0.667
	(0.455)	(0.424)	(0.471)
Minority Religion	0.021	0.025	0.102
	(0.142)	(0.157)	(0.303)
Native Israeli	0.786	0.779	0.741
	(0.41)	(0.415)	(0.438)
Russian Immigrant	0.11	0.121	0.144
	(0.313)	(0.326)	(0.351)
Reside in Northern Israel	0.0839	0.106	0.17
	(0.277)	(0.307)	(0.376)
Reside in Central Israel	0.405	0.403	0.274
	(0.491)	(0.49)	(0.446)
Reside in Tel Aviv	0.263	0.183	0.159
	(0.44)	(0.387)	(0.366)
Reside in Southern Israel	0.071	0.081	0.133
	(0.256)	(0.274)	(0.34)
Reside in Jerusalem	0.025	0.034	0.064
	(0.155)	(0.181)	(0.246)
Education Characteristics:			
Years of Education	16.57	16.59	16.39
	(2.335)	(2.615)	(2.638)
College Graduate	0.809	0.762	0.699
	(0.393)	(0.426)	(0.459)
Attended Yeshiva	0.001	0.001	0.002
	(0.031)	(0.036)	(0.047)
N:	5,245	9,727	42,130

Table 8: Female Summary Statistics (II)

	Company Car	Company Car in HH	Private Owner
Work Characteristics:			
Annual Individual Income	243,900	110,200	103,100
	(220,200)	(815,600)	(744,400)
Annual Family Income	462,368	435,312.10	258,153.30
	(300,872.3)	(229,846.2)	(178,807.5)
Weekly Work Hours	44.77	36.36	36.71
	(9.692)	(11.26)	(11.29)
Commute Distance	19.27	13.11	12.13
	(21.56)	(15.56)	(17.14)
Rush Hour Commute	0.641	0.64	0.624
	(0.48)	(0.48)	(0.484)
Work Nights	0.18	0.213	0.224
	(0.384)	(0.409)	(0.417)
Commute Characteristics:			
Number of Cars	1.739	1.867	1.54
	(0.757)	(0.594)	(0.658)
Drive Car (0/1)	0.82	0.727	0.67
	(0.384)	(0.445)	(0.47)
Company Shuttle (0/1)	0.006	0.017	0.029
	(0.080)	(0.129)	(0.167)
Public Transportation (0/1)	0.043	0.09	0.134
	(0.203)	(0.287)	(0.34)
Carpool (0/1)	0.012	0.027	0.034
	(0.107)	(0.162)	(0.182)
Leased Vehicle (2008)	0.81	0.040	0.026
	(0.392)	(0.196)	(0.159)
N:	5,245	9,727	42,130

Table 9: OLS Regression: The Impact of Leasing on Car Accidents (Men)

Variables	(i)	(ii)	(iii)
Lesser	-0.001**	0.003***	0.005**
	(0.001)	(0.001)	(0.002)
Lesser in HH	0.001	-0.000	0.000
	(0.001)	(0.001)	(0.003)
Year	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)
Age		-0.001**	
		(0.000)	
Has Children		-0.002**	
		(0.001)	
Minority Religion		0.006***	
		(0.001)	
Immigrated from Russia		0.010***	
		(0.001)	
Born in Israel		0.005***	
		(0.001)	
College Graduate		-0.002**	
		(0.001)	
Work Nights		0.003**	
		(0.001)	
Long Commute (0/1)		0.003***	
		(0.001)	
Observations	231140	180073	231140

Table 10: OLS Regression: The Impact of Leasing on Car Accidents (Women)

Variables	(i)	(ii)	(iii)
Lesser	0.003***	0.003**	0.003
	(0.001)	(0.001)	(0.002)
Lesser in HH	-0.000	0.000	0.002
	(0.001)	(0.001)	(0.002)
Year	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Age		-0.001***	
		(0.000)	
Has Children		0.000	
		(0.001)	
Minority Religion		0.004***	
		(0.001)	
Immigrated from Russia		0.009***	
		(0.001)	
Born in Israel		0.005***	
		(0.001)	
College Graduate		-0.000	
		(0.001)	
Work Nights		0.000	
		(0.001)	
Long Commute (0/1)		0.004***	
		(0.001)	
Observations	262351	212449	262351

Table 11: DID Regression: The Impact of Leasing on Car Accidents (Men)

	(1)	(2)	(3)
Treat X Post	-0.003**	-0.002*	-0.002*
	(0.001)	(0.001)	(0.001)
Treat_Family X Post	-0.001	-0.001	-0.002
	(0.003)	(0.003)	(0.003)
Treat	-0.002*	0.002**	
	(0.001)	(0.001)	
Treat_Family	-0.006**	-0.003	
	(0.003)	(0.003)	
Post	-0.003***	0.001	0.001
	(0.001)	(0.001)	(0.001)
Year		-0.001***	-0.002***
		(0.000)	(0.000)
Age		-0.001**	
		(0.000)	
Minority Religion (0/1)		0.006***	
		(0.001)	
Born in Israel		0.005***	
		(0.001)	
Immigrated from Russia		0.010***	
		(0.001)	
Long Commute		0.003***	
		(0.001)	
Work Nights		0.003**	
		(0.001)	
Additional Individual Controls[c]	No	Yes	Yes
Individual Fixed Effects	No	No	Yes
Observations	231140	180073	231140

Table 12: DID Regression: The Impact of Leasing on Car Accidents (Women)

	(1)	(2)	(3)
Treat X Post	-0.001	-0.000	-0.000
	(0.002)	(0.002)	(0.002)
Treat_Family X Post	-0.003*	-0.003	-0.002
	(0.001)	(0.002)	(0.001)
Treat	0.002	0.001	
	(0.002)	(0.002)	
Treat_Family	0.001	0.001	
	(0.001)	(0.001)	
Post	-0.003***	0.001	0.001
	(0.001)	(0.001)	(0.001)
Year		-0.001***	-0.002***
		(0.000)	(0.000)
Age		-0.001***	
		(0.000)	
Minority Religion (0/1)		0.004***	
		(0.001)	
Born in Israel		0.005***	
		(0.001)	
Immigrated from Russia		0.008***	
		(0.001)	
Long Commute		-0.001	
		(0.001)	
Work Nights		0.000	
		(0.001)	
Additional Individual Controls[c]	No	Yes	Yes
Individual Fixed Effects	No	No	Yes
Observations	262351	212449	262351

Table 13: DID Regression: The Impact of Leasing on Highway Car Accidents

	(1) Male	(2) Male
Treat X Post	-0.002*	-0.002**
	(0.001)	(0.001)
Treat_Family X Post	0.001	-0.001
	(0.002)	(0.002)
Treat	0.002***	
	(0.001)	
Treat_Family	-0.003*	
	(0.002)	
Post	-0.001	-0.000
	(0.001)	(0.001)
Year	-0.000	-0.000
	(0.000)	(0.000)
Age	-0.000	
	(0.000)	
Minority Religion (0/1)	0.001*	
	(0.001)	
Born in Israel	0.002**	
	(0.001)	
Immigrated from Russia	0.003***	
	(0.001)	
Long Commute	0.003***	
	(0.000)	
Work Nights	0.003***	
	(0.001)	
Additional Individual Controls[c]	Yes	Yes
Individual Fixed Effects	No	Yes
Observations	180073	231140