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IMPROVING THE ENVIRONMENTAL IMPACT OF DANISH CAR SHARING PROGRAMS

An Interactive Qualifying Project Report
submitted to the Faculty of
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Degree of Bachelor of Science
by

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ABSTRACT:

This project was sponsored by Danske Delebiler, an advisory board for Danish car sharing companies, to investigate incorporating high-efficiency, low-emissions vehicles (hybrid and alternative fuel cars) into car share fleets to reduce air pollution. Data from member surveys, focus groups, and interviews with car share managers revealed that members are conscious of environmental issues but prioritize low cost, convenience, and location. The project concludes that altering government vehicle tax policy is necessary to expand low-cost, environmentally friendly car share fleets.

EXECUTIVE SUMMARY:

In recent years, air pollution and global warming have become worldwide concerns. Personal cars and trucks used for transportation are responsible for a great deal of toxic chemicals and smog which create health hazards in many urban areas. Vehicles also release a vast amount of carbon dioxide which contributes to the warming of the planet, a dangerous trend which could lead to global disaster in the coming decades. Many groups are taking now action to reduce air pollution and carbon dioxide emissions; reducing the amount of pollution created by personal cars and trucks will make an incredible impact on the health of our planet.

In Denmark many drivers participate in car sharing programs, which, in addition to having other benefits, reduce the amount of air pollution and carbon dioxide released by each driver. Our sponsor, Danske Delebiler, is an advisory board for car sharing companies in Denmark. Car sharing programs reduce pollution by allowing many drivers to share a single car (parked in a central location) instead of each owning a vehicle. Car share drivers pay a fee for each kilometer they drive, but they do not have to purchase a car or pay for gasoline, maintenance, and car insurance. Drivers who own an individual vehicle may be tempted to use it more often than necessary when a more appropriate alternative exists, increasing their fuel consumption much higher than necessary.

Car share members have access to cars for family vacations, visiting friends across town or other errands but since they have to pay for each trip individually they are less likely to use vehicles when a more appropriate option is available. However, to truly reduce air pollution we must not only reduce the amount that people drive but also give them access to cleaner vehicles which use less gasoline and emit less pollution. Our goal

was to help Danske Delebiler further reduce their environmental impact by finding vehicles that meet these criteria.

In order to gather information we distributed a survey to Danish car share members and held a number of focus groups to discuss the car sharing programs and the members' attitudes toward environmentally friendly vehicles. We also traveled to different car sharing offices to conduct interviews and observe the car sharing system currently operating in Denmark. The intention of the survey and focus group was to establish a profile of car sharing customers in Denmark and get some insight into their needs and concerns about car sharing. For example, Figure 1 demonstrates that the majority of car share members joined the program to save money. Although members are certainly aware of environmental issues, they are not a top priority. This data leads to some startling conclusions.

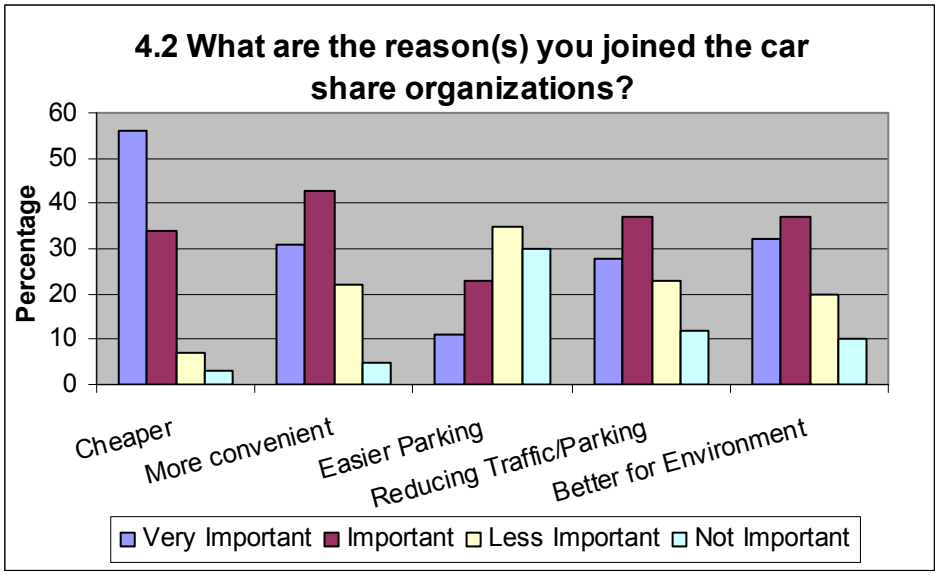

Figure # 1: Why Personal Customers Chose Car Sharing

The results of the survey and focus group demonstrated conclusively that Danish car share members are aware of environmental issues and concerned about the amount of pollution they are creating, but that they join car sharing primarily as a cost-saving

method and the majority would only be willing to use environmentally friendly vehicles if they are located close to their home and have a cost comparable to more conventional vehicles (see figure 2).

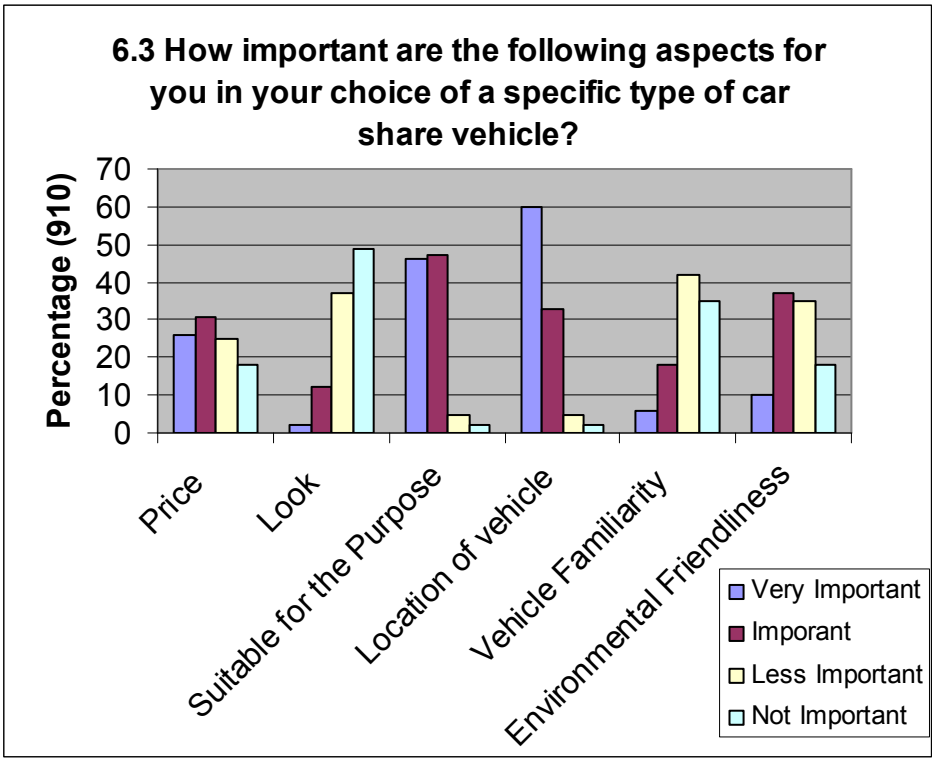

Figure 2: Important Aspects When Choosing a Vehicle

This presents a serious difficulty due to the exorbitant cost of vehicles in Denmark. Low-emissions vehicles (such as hybrid cars like the Toyota Prius) are often more expensive than comparably-equipped conventional vehicles and the Danish government charges a registration tax equal to 205% of the purchase price of the car. The Danish government is reluctant to offer any tax breaks or incentives on environmentally friendly vehicles because it makes a great deal of income on registration and fuel taxes. Denmark has an excellent public transportation and bicycle infrastructure, so unlike American car share customers who use shared cars for errands and short trips around

town Danish drivers tend to use cars more infrequently and for much longer trips such as weekend vacations or visiting friends and family out of town. Survey data indicates that the vast majority of car share trips in Denmark exceed 30km in length (see Figure 3). Focus group responses reinforced the point that small, fuel-efficient conventional vehicles (such as the Mercedes SmartCar or Toyota Aygo, tiny cars with limited passenger and cargo capacity which trade comfort for increased fuel efficiency) would be completely inappropriate for trips of this nature. Car share members require access to larger, more comfortable vehicles which can carry families and in every case except hybrid vehicles, resulting in drastically lower fuel efficiency.

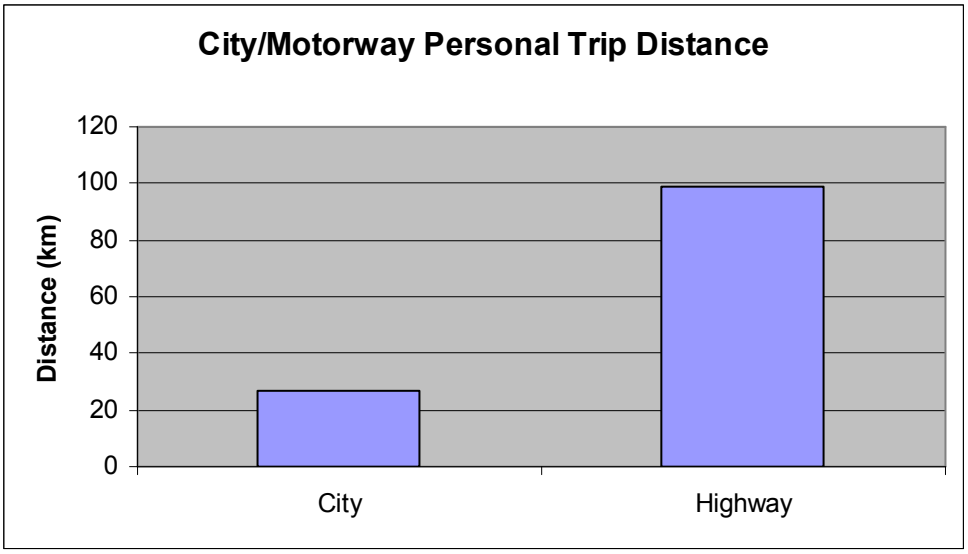

Figure 3: City/Motorway Trip Lengths

Survey respondents and focus group participants indicated overwhelmingly that although they are interested in reducing fuel consumption and vehicle emissions, they would be unwilling to pay a price premium or travel further than a few blocks just to use a hybrid car. Since hybrid vehicles are expensive, car share organizations must often charge a higher price per kilometer to break even and they can't afford to buy many at a

time, which means the cars would be located further than reasonable from customers' homes.

This report concludes that the car share operators in Denmark should take three main steps to reduce the environmental impact of their fleets within the next few years. The first step is to work closely with the Danish government to reprioritize their vehicle tax structure and reduce taxes on low-emissions vehicles. The loss of revenue can easily be recouped by eliminating a loophole that taxes 2-seat vehicles (such as low-efficiency high-emissions Land Rovers, Jeeps, and other large trucks) at a fraction of the rate for normal cars. Once they have purchased hybrid vehicles, car share operators will have to embark on an aggressive member education program to help their customers become aware of the benefits of hybrid vehicles and get acquainted with the new cars. This should be combined with a reinvigorated public marketing campaign focused on "green" issues, designed to offset the high price of hybrid vehicles by increasing membership.

The second step is a longer-term strategy looking forward to 2009, when the European Union will enact much tougher emissions controls on diesel vehicles. Known as Euro5, this new set of standards will drastically reduce the amount of harmful pollution released by diesel engines. At this point, diesel vehicles will boast high fuel efficiency and low emissions, and will be suitable candidates for car share programs. Ideally, by the end of 2009 car share fleets in Denmark will be comprised entirely of hybrid and "clean" diesel vehicles.

ACKNOWLEDGEMENTS:

Our group would like to express our sincere thanks to the following people and organizations for all of their help – without them this project would not have been possible. Because of the following people, we have many fond memories of Copenhagen!

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Kristina Kennedy of Zipcar for an introduction to car sharing and car sharing in the United States.

Martin Lidegaard for his insight into Danish politics, and his assistance in jump starting the focus of our project during our orientation week in Copenhagen.

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INTRODUCTION

Air pollution is a growing global problem. Recently, car technologies including hybrid and electric vehicles have been developed to address this issue. Car share programs also help reduce the number of cars on the road. Furthermore, pollution may be reduced by making the most efficient vehicles available to customers. In order to maximize the efficiency of the car share program in Copenhagen, the Association of Car Share Organizations in Denmark (Danske Delebiler) is sponsoring our project to better understand the driving patterns and needs of their customers.

Denmark has become a leader in energy efficiency, from car share and public transportation programs to expanding the use of wind power. Two years ago WPI completed a project with Copenhagen Delebiler (car share) to improve the framework of the car share program with regard to booking, billing and car access. Now that the program is easier to use, it is important to continue development to maintain the highest level of efficiency possible.

Our goal is to research and propose a plan to make the car share program in Denmark more environmentally efficient. This efficiency may be obtained with the current fleet of cars, or with new alternative energy cars. In Denmark we will gather data on customers' driving patterns, car capabilities, and driver expectations, and investigate the Government's tax system for cars and explore potential Government incentives. After careful analysis of the gathered information we will propose ways to best use current and future resources of the car share program to maximize environmental efficiency, and possible Government incentives and adjustments in tax structure on cars for car share programs.

BACKGROUND

Air Pollution – A Global Problem

Air pollution is a growing problem. As more and more cars are introduced, more particulate matter, carbon monoxide, carbon dioxide, and nitrous oxide are introduced into the atmosphere. These gases cause degradation of the earth's atmosphere, leading to now commonly known problems like El Nino and global warming. Many health issues, including childhood allergies, asthma, leukemia, and other forms of cancer, can be attributed to living in more heavily congested areas.

Particulate matter released from fuel emissions cause problems such as acid rain and smog. Increased levels of greenhouse gases, such as sulfur dioxide and carbon dioxide, trap radiation and heat energy in the earth's atmosphere, effectively warming the climate. Benzene, a carbon structure released in car emissions, is a known carcinogen[1].

Respiratory allergies, hay fever, and asthma, have increased in children over the past few decades. One study showed that children and young adults regularly exposed to higher levels of pollutants, including carbon monoxide, carbon dioxide, sulfur dioxide, ozone, car exhaust, and particulate matter were all more likely to have increased respiratory allergies and diseases[2].

Car emissions account for nearly all benzene (a carcinogen) pollution, and roughly 50% of nitrogen dioxide and carbon monoxide pollution[3]. Benzene in particular is a major health concern because it is known to cause childhood and leukemia, and high

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[1] Karl, Thomas R., et. al.. "Modern Global Climate Change." Science 302(2003): 1719-1723.
[2] Nicolai, T.. "Pollution, environmental factors and childhood respiratory allergic disease." Toxicology 181-182(2002): 317-321.
[3] Ibid, 317-321.

traffic areas have previously been correlated with the disease[4]. High levels of benzene (5mg/l) were used in gasoline, which in turn meant higher concentrations of benzene in fuel emissions. Recently, the EU has capped benzene-fuel levels at 1mg/l, which may help to lower the number of emissions related leukemia cases[5]. Reducing the number of cars and miles driven, which would also lower fuel emissions, will also help to reduce pollution related health problems.

Older cars are not as fuel efficient as newer models, and release greater amounts of particulate matter and dangerous gases into the atmosphere. In a study conducted in by a Danish group in Amsterdam, in-car inhaled pollutants were compared to pollutants inhaled by bicyclists. Surprisingly, the levels of particulate matter, toluene, ethylbenzene, xylenes, and benzene were *higher* inside cars, meaning individuals and children who regularly use cars, especially older cars, are at higher risk for respiratory problems and leukemia than those who use alternate modes of transportation[6].

Car sharing offers promising opportunities to reduce the number of cars driven, and thus reduce the volume of fuel emissions. Car sharing programs also tend to replace cars faster than the average private car owner[7], purchasing new cars every few years. The following chapters will examine the car sharing system, with Zipcar as an example in the United States along with several examples of Danish car share arrangements, and how fuel emissions may be reduced through the use of hybrid vehicles and car sharing programs.

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[4] Rank, Jette, Jens Folke, Per Homann Jespersen. "Differences in cyclists and car drivers exposure to air pollution from traffic in the city of Copenhagen." The Science of the Total Environment 279(2001): 131-136.
[5] Ibid, 131-136.
[6] Ibid, 131-136.
[7] Meijkamp, Rens. "Changing Consumer Behavior Through Eco-Efficient Services: An Emperical Study of Car Sharing in the Netherlands." Business Strategy and the Environment 7(1998): 234-244.

Car Sharing

What is a Car Sharing Organization?

In order to meet the growing transport needs of the urban public, many cities in the world now support car share programs in which members collectively own and drive a fleet of cars instead of owning individual cars. Members pay a small fee to join the program in exchange for the ability to reserve a car for a low hourly rate and retrieve it from a predetermined location. When users return the vehicle, a central authority manages gas, insurance, maintenance, and many of the other hassles of car ownership. These programs are designed to reduce the number of cars on the road and encourage members to use alternative means of transportation while still allowing them access to vehicles for unavoidable tasks, errands, or longer trips. This system works mostly due to the pricing structure of car share memberships compared to individual car ownership[8].

When purchasing a car in a traditional setting, there are certain unavoidable fixed costs of time and money, which are quite high, including the purchase of the vehicle, the price of insurance, registration fees, and maintenance. However, the costs associated with an individual trip are much lower than a trip with a car-share organization because you are only paying for gas. By contrast, there are almost no fixed costs associated with a car share membership: users must pay an annual fee, but this is minute compared to the price of a new car. However, the cost of an individual trip in a shared car is much higher than the same trip in a personal car. In almost all instances, members pay hourly or daily fees,

[8] Danish Environmental Protection Agency, "Evaluation of Car Sharing in Denmark." Environmental Project No. 572 (2000)

which cover the costs of gas, wear and tear on the car, and paying off the price of the car itself.[9]

The reason car share programs can operate effectively stems from the mental comparison that takes place every time someone wants to make a trip somewhere. All the options (an individual car, a shared car, public transportation, walking) are weighed against each other on the basis of cost, time, and hassle. When considering a trip in an individual car, most people will compare only the cost of the trip- gas and a little bit of wear and tear- having already mentally written off the purchase price of the car and the cost of insurance as inevitable. However, a participant in a car share program makes no such mental deductions. The apparent cost of a trip in a shared car is much closer to the actual cost, and is also more comparable to the price of a bus ticket or the hassle of walking. In this situation, car share members will often choose an alternate means of transportation instead of driving.[10]

Consider the standard task of running to the grocery store a few blocks away on a cold day for dinner supplies- one bag of groceries, not prohibitively heavy. A car owner would consider that the trip costs less than a gallon of gas, a dollar or two at most and a small price to pay for shelter from the wind and relief from carrying the groceries or the hassle of riding a bus. However, the car owners are not considering the thousands of dollars paid for the car, the hundreds of dollars in annual insurance payments, or the head gasket they will have to replace in a month's time. Nor do they consider the social cost of having an additional car on the road: air pollution, traffic congestion, wear and tear on the streets, and a shortage of parking at the store. A car share member will weigh the same

[9] Danish Environmental Protection Agency, "Evaluation of Car Sharing in Denmark." Environmental Project No. 572 (2000)
[10] Ibid

benefits against the cost of an hour's rental, versus an inexpensive bus ticket or a short walk in the cold. Often this comparison will fall in favor of the bus.

For this type of driver, participating in a car share program is less expensive than owning a car for two reasons: the cost of purchasing, insuring, and maintaining a car is eliminated, and each driver is likely to drive less – most drivers reduce their mileage significantly when they join a car share program[11]. For all participants there is a "break-even" point - a mileage at which the costs of participating in a car share program outweigh the savings. In those situations, many of the environmental benefits disappear as well, since the driver is consuming just as much fuel and producing just as much air pollution. In Denmark, a driver who purchases a new car and a driver who uses a car share program will spend about the same amount of money and produce the same amount of pollution after driving around 15,000km. This "break-even" point fluctuates, and can go as low as 10,000km/year when compared to a used or low-cost/high-efficiency vehicle[12].

Zipcar[13]

Car sharing programs have sprung up in major cities across the United States, from the non-profit City Car Share in San Francisco, California to Zipcar in Boston. Zipcar, founded in 2000 in Cambridge, Massachusetts, has grown to become the largest car share company in the world, boasting over 85,000 customers and 2,500 vehicles. Since their founding, Zipcar has opened car shares in major cities in New York, New

[11] Tania Briceno et al., "Using Life Cycle Approaches to Evaluate Sustainable Consumption Programs." Norwegian Program for Industrial Ecology, 2005

[12] Danish Environmental Protection Agency, "Evaluation of Car Sharing in Denmark." Environmental Project No. 572 (2000)

[13] All figures and company information courtesy of Zipcar, and an interview with company representative Kristina Kenedy, February 21, 2007.

Jersey, Maryland, Michigan, Minnesota, Illinois, North Carolina, Virginia, Rhode Island, Toronto, the District of Columbia, and most recently, London, England. Not only is Zipcar the largest car share company, but also the fastest growing – in both 2005 and 2006, they enjoyed 100% increases in their membership. The company is also looking to open four new locations within the next few months.

Zipcar has also worked with over 30 colleges in the United States to make cars available to students on campus, and with many corporate businesses. Car sharing has allowed universities and business to cut building costs by not needing to provide new parking, and has also encouraged an increase use of public transportation, walking, and car pooling.

Car sharing with Zipcar is "hassle free" and easy to sign up for. Members may join online for a $75 fee (including $50 annual fee) and may reserve cars by phone or online at any time of the day – no paperwork required. Zipcars are located in small clusters or "pods" throughout a city at convenient street corners, parking garages, and some commercial centers in reserved, Zipcar only parking spaces. A member picks up their reserved car at their convenience, and returns it to the same spot when they are done using the vehicle for the next member to use. Each customer is given a Zipcard upon becoming a member, which is used to lock and unlock the vehicle doors. Only a Zipcard with a reservation for a specific car at a particular time can open that car. Keys are attached to the car near the ignition, preventing the possibility of different members misplacing keys.

Zipcar membership and vehicle reservation is reasonably priced, with annual member fees of $50/month. Reservation fees for cars start at $7.50 per hour or $56/day.

Zipcar has also started Z2B, giving businesses discounted rates Monday through Friday, with an annual fee of $25 per driver. Zipcar also has 7-to-7 rates for businesses, charging a flat rate of $42/day for driving between 7AM and 7PM. Collision insurance, fuel, vehicle maintenance, and XM Satellite Radio are all included in the reservation price. Each Zipcar has a gas card, and members are expected fill the tank when fuel levels drop to ¼ tank.

Zipcar works closely with its members' demands to bring the newest, most popular cars to its fleet, including the Cooper Mini, the Toyota Prius, and several models of Volvos and BMWs. Preference in makes and models varies from region to region. Customers in Boston favor the Cooper Mini for its' hip, trendy look. San Francisco members seem to be more conscious of their environment, and regularly book and request the addition of more hybrid cars to the California fleet. Originally, Zipcar incorporated fully electric cars into their fleets. Initially, they were very popular, and were viewed as fun and exciting to try, but Zipcar soon found that users were confused how to operate the vehicles, and as a result tended not to reserve them more than once or twice. Now, only a few electric cars are available in car fleets (i.e. 2 electric cars of 400 in Boston)[14].

Lack of use of electric cars is not to say that Zipcar does not provide good membership education. Each Zipcar is equipped with a pamphlet including information on use of the car, directions for how to use the XM radio, how to pay for gas, where to park cars, and the number for the 24 hour call center should a member need further assistance. Zipcar regularly sends newsletters and surveys via email to its members, and

[14] All figures and company information courtesy of Zipcar, and an interview with company representative Kristina Kenedy, February 21, 2007.

posts useful information online at zipcar.com. The well established support and information network and close attention to member demands has resulted in thousands of happy customers.

The target audience for the company are 20-35 year olds, thus online surveys and e-newsletters work well for this internet savvy generation. Many students who attend schools in major cities graduate and need transportation to and from work. Zipcar solves that problem, and eliminates the immediate need to purchase a car and pay for insurance and maintenance. It also allows students the luxury of driving cars they may not be able to afford until after working for a few years.

Since its founding, Zipcar has operated as a green company, with its main goal as taking cars off the road. Member surveys approximate over 32,000 vehicles have been taken off the road since 2000. Members report a 47% increase in their use of public transportation and a 36% increase in walking and bicycling trips. By using Zipcar, members enjoy an average savings of $450/month ($5,200/year) on car maintenance. When asked about their use of a personal car since joining Zipcar, over 40% of members report that they either did not purchase a vehicle or sold their vehicle, and report they drive 80% less after joining. The average member reports driving more than 5,000 miles/year before joining – members now drive an average 369 miles/year[15].

Part of Zipcar's success is their marketing strategy – fun, easy, and hassle free. While they do operate with the environment in mind, they recognize that not every member is joining because it's "the right thing to do". Many of Zipcar's members are "passive environmentalists" – they'll do something to reduce air pollution if it's easy and

[15] All figures and company information courtesy of Zipcar, and an interview with company representative Kristina Kenedy, February 21, 2007.

convenient for them. Zipcar does just that. They make car sharing not only easy through paper-free online registration and reservations, but also make it exciting by offering the latest model cars at an affordable price for everyone.

From these numbers it is clear that car sharing programs have the potential to save enormous amounts of money both for consumers and for municipal governments or private bodies (universities or corporations) which join in. However, these aggregate benefits can only be realized if participation in the car share program actually does provide a significant disincentive toward purchasing a new car or keeping existing cars and if the program truly does reduce the number of miles each participant drives.

Advantages of Car Sharing

A community which institutes a car sharing program benefits in many ways. First and most obviously there are primary benefits such as reduced fuel consumption and carbon emissions and a reduction in the numbers of cars on public roads. There are also secondary benefits, such as an increase in the number of people who walk, bike, or use public transportation to accomplish errands, or a greater understanding of the act of sharing community resources[16]. Car share programs have more consumer-oriented advantages as well. For a growing sector of drivers, participating in car share programs can be significantly cheaper than owning a car (one of the major marketing points for car share operators), and many companies offer access to nicer cars than consumers could afford on their own.

The most recognizable primary benefit is the reduction of the number of cars in operation in the community. This reduction is the driving force for all of the other

[16] European Commission, 2001. European Transport Policy 2010, Brussels.

primary, statistically recognizable benefits of a car sharing program. In a study of car share participants in the United States, 30% of members gave up their cars after joining a car sharing program. An additional 60% of members avoided purchasing a personal vehicle by joining the car share organization.[17] Although these statistics are certainly attention-grabbing, it is important to remember that they represent a self-selected group of early adopters, a relatively small group compared to drivers in general, who joined a car share program in its infancy presumably in part due to their desire to avoid using or purchasing a personal vehicle. Moreover, "some participants that did not own a vehicle before increase their driving distances, but this [is] more than offset by the reductions made by previous car owners" [18]

When the number of cars in a community is reduced, many benefits follow. People begin to use other means of transportation to accomplish small trips and errands, such as buses, bicycles, or walking.[19] This choice reduces the amount of fuel consumed and the amount of air pollution released by vehicles, which saves the community money and increases the air quality. A reduction in car-miles also reduces wear and tear on roads, the number of vehicle crashes and accidents, noise pollution, traffic congestion, and the amount of public or commercial space which must be dedicated to parking. Each of these benefits will in turn save the community money or reduce the stress of an average day for an average person.

Car share programs also benefit the community in ways which cannot be represented with statistics. As noted by Briceno, "Car sharing schemes serve as learning

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[17] European Commission, 2001. European Transport Policy 2010, Brussels.
[18] Tania Briceno et al., “Using Life Cycle Approaches to Evaluate Sustainable Consumption Programs.” Norwegian Program for Industrial Ecology, 2005
[19] European Commission, 2001. European Transport Policy 2010, Brussels.

systems for consumers to engage in common use of consumption goods, which encourages more sustainable consumption."[20] Car sharing systems provide a means for consumers to shift their habits away from individual ownership and control of commodities to community-managed control. One important thing to note is that consumers who give up private ownership and join a co-op are not just purchasing shares of the physical commodity (a car); they are purchasing the value-added service of management. Car share memberships have provisions which remove the responsibilities of ownership from the individual and either divide it among the group or manage it from a central authority.

A curious point about car share programs as described is that they are not necessarily helpful for professionals who commute long distances to work. During the day shared vehicles would remain in a parking lot at the workplace, unavailable for others to use. However, those who are willing to find an alternate means of getting to work (such as a carpool with a coworker, public transportation, or even walking) and enroll in car share programs so that a vehicle is available near home for errands and short vacations can do away with the expense and hassle of owning a car entirely, having been freed from the necessity of using a personal vehicle to commute. This situation is an apt demonstration of the principle of car sharing- customers would not join a car share organization so that they can continue to use their car as often or more often than they did before. The organization exists to help people make the transition to a lifestyle which

[20] Tania Briceno et al., "Using Life Cycle Approaches to Evaluate Sustainable Consumption Programs." Norwegian Program for Industrial Ecology, 2005

depends less on access to automobiles but can still provide for the use of a vehicle for some contingencies[21]

Disadvantages of Car Sharing

Car sharing programs are not without disadvantages. The current transportation infrastructure is designed almost solely for individual car owners. Introducing a new system with a new infrastructure will involve changes in consumer behavior, some incidental and some radical. Byrne and Polonsky describe this process well: "The likelihood of adoption is in direct relation to the amount of behavior modification required. These behavior modifications may include everything from significant changes in driving and fueling patterns to alterations in the perception of transportation as a whole."[22] For example, consider the following three alternative transportation systems, some more energy efficient than others but all more efficient than our current system: a community car sharing system, a hybrid gas-electric vehicle, and a vehicle which runs on a mix of vegetable oil and diesel fuel. The oil/diesel car offers some of the most radical benefits in terms of reduced fuel cost and emissions, but it also requires a substantial redesign of consumer vehicles and the fuel production/distribution infrastructure, so the likelihood of adoption is low. A hybrid gas-electric vehicle can make use of currently available fuels, but current gas vehicles must be replaced outright and the infrastructure to repair and maintain these vehicles cheaply and easily does not yet exist. These vehicles are meeting with some success, albeit slowly.[23]

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[21] Danish Environmental Protection Agency, "Evaluation of Car Sharing in Denmark." Environmental Project No. 572 (2000)
[22] Michael Byrne and Michael Polonsky. "Impediments to Consumer Adoption of Sustainable Transportation and Alternative Fuel Vehicles." International Journal of Operations & Production Management, 21:12 (2001): 1521-1538.
[23] Brendan I Koerner. *Rise of the Green Machine*, Wired Apr. 2005

The community car sharing program does not require any new infrastructure for fuel or maintenance. It does not require new vehicles or new training for drivers. It also does not guarantee the same benefits in terms of reduced fuel consumption or miles traveled that other solutions offer- the success of the program depends on the participants. However, this solution does require a complete reappraisal of the driving patterns of a population. Usually, when a person needs to drive somewhere, he/she only has to go out and get into their car and go. However, car sharing programs often require that cars be reserved ahead of time, and cars are not often parked in immediate proximity to one's house. Trash and personal effects cannot be left in the car- much in the same way that a hotel room does not feel as personal as an apartment, the car will never become "yours."

These changes are offset in that (depending on the program) car share members never need to worry about insurance, gas, parking, maintenance, registration, or many of the other hassles of individual ownership. However, in societies which highly value individual ownership and control, the reluctance to share a commodity may be a difficult hurdle to overcome.[24]

By their nature, car sharing programs are ineffective outside of urban areas. Shared cars must be stored in locations which are central to their users and in suburban or rural areas the distance between homes and cars may be prohibitively large. Additionally, rural and suburban areas rarely suffer from extreme traffic congestion or smog caused by excessive numbers of automobiles, so many of the factors which may convince potential customers to join the program are not present. In the United States, car sharing programs

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[24] Michael Byrne and Michael Polonsky. "Impediments to Consumer Adoption of Sustainable Transportation and Alternative Fuel Vehicles." *International Journal of Operations & Production Management*, 21:12 (2001): 1521-1538.

are mostly available in major metropolitan areas such as Boston, Washington D.C., and the San Francisco Bay area, although some operators are starting small programs for some large businesses and on college campuses[25]. In Denmark, drivers are only considered potential car share users if they live in a city or town which has more than 20,000 residents.[26]

Environmental Impact of Car Sharing

As stated earlier in this report, car sharing programs are not explicitly beneficial to the environment. At their core, car sharing programs are based on fuel-burning vehicles which turn limited supplies of fossil fuels into noxious air pollution. There are two positive environmental impacts of car sharing programs. First, they reduce the number of cars owned and the number of miles driven on average for a large group of people. Second, by making centralized purchasing decisions, they can provide access to emerging alternative fuel technologies which might not normally be available to most consumers, as well as ensure that all members have access to new, well-maintained cars with stricter pollution controls.

To assess the real benefit of these programs, consider these statistics released by Zipcar, just one program out of hundreds operating throughout the world: The average Zipcar member reported driving 5295 miles per year before joining the program, as opposed to just 369 miles per year while a part of the program, a reduction of 93%. Furthermore, Zipcar estimates that each member consumes 219 fewer gallons of gasoline per year, resulting in a total savings of over 3 million gallons of gas in the year 2004.[27]

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[25] ZipCar, "Environmental and Community Impact." Oct. 2006
[26] Danish Environmental Protection Agency, "Evaluation of Car Sharing in Denmark." Environmental Project No. 572 (2000)
[27] ZipCar, "Environmental and Community Impact." Oct. 2006

This number sounds impressive at first glance, but it seems insignificant compared to the United States total gasoline consumption per year is around 146 billion gallons.[28] However, it is also important to consider that Zipcar (approx. 75,000 members) comprises just 3 hundredths of a percent of the United States population. It is an understatement to say that the environmental benefits of car sharing organizations will scale appreciably as membership increases.

The Global State of Car Sharing

Despite many obstacles, car share programs have been started in many major metropolitan areas of the world. Car sharing was launched in Switzerland in 1987 and Germany in 1988. This program, known as Mobility Car share, now has 1850 cars at 1000 stations. In North America, Zipcar and FlexCar programs are currently operating in over 10 locations, and opening new locations over time. Zipcar offers its members' access to many new, popular cars which they may not be able to afford on their own, as well as access to fuel-efficient hybrid vehicles or larger SUVs and light trucks. In Denmark, Danske Delebiler, an umbrella organization, oversees a number of different car share programs in Copenhagen, Århus, and other areas.

Car Sharing In Denmark

History of Car Sharing in Denmark

The history of car sharing programs in Denmark stretches back a decade. Many independent programs have been started in diverse areas of the country, mostly urban or suburban such as Copenhagen and Århus, the two largest cities in Denmark. However,

[28] HowStuffWorks

most of these programs are non-profit and do not enjoy the large member base of their counterpart organizations in the United States.

Danske Delebiler

Danske Delebiler, or the Association of Car Sharing Organizations in Denmark, was founded in 2000 to help the different car sharing programs in the country communicate and share resources and expertise. Most of the programs operate in different geographical areas and serve different markets, so there is little competition between member organizations. Most of the members of Danske Delebiler are non-profit community car sharing organizations. Hertz Delebiler is the only for profit member organization[29].

Århus Delebilklub

Århus Delebilklub was the second car sharing organization in Denmark, founded in the second-largest city of Århus on the Danish mainland of Jutland. Århus Delebilklub has one hundred and sixty members in the greater Århus area and fifteen cars in permanent rotation. Up to ten additional cars are leased for the summer months, when member demand is higher for out-of-town trips and weekend vacations.

Århus Delebilklub currently uses an online booking system which is about 2 years old, and a manual, key-based entry system instead of an automatic-entry system like Hertz or Zipcar. Along with København Delebiler, they are investigating the purchase of a similar keyless-entry system called Inverse, which is the system used by City Car Share in San Francisco[30].

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[29] Introductory Presentation and Interview with Danske Delebiler Board Members. March 16th, 2007
[30] Interview with Morten French, owner/operator of Arhus Delebilklub. March 19th, 2007

København Delebiler

København Delebiler is one of the newer car share organizations in Denmark, founded in 2004. Although Copenhagen is the largest city in Denmark and thus the largest market for potential car share customers, København Delebiler is directly competing with Hertz in this market. In general, however, the two companies offer different programs featuring different cars and different pricing structures and target a different member audience. Additionally, Copenhagen is home to a great number of bicycles and a very strong public transportation system, so København Delebiler must also compete with these other means of transportation. København has around 450 members in the area[31].

Hertz Delebilen

Hertz Delebilen is the largest and one of the oldest car share organizations, and the only for-profit group in Denmark. Their program started in 1998 as an offshoot of the already-established Hertz Car Rental business. Hertz is also the only program in Denmark to offer keyless entry systems in their cars, as well as the only program which owns a hybrid car, a Toyota Prius. Hertz also estimates that a little over 10% of their customers are actually businesses using the cars for company needs, and 90% of customers are private members taking family trips or using the cars for personal errands. Hertz currently has 85 cars and about 3000 members throughout all of Denmark[32].

The Current State of Car Sharing in Denmark

According to an interview with Morten Franch, the director of Århus Delebilklub, car sharing works differently in Århus (and Denmark in general) than it does in the U.S.

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[31] Interview with Villads Hansen, Kobenhavns Delebiler. March 29th, 2007
[32] Interview with ***, Hertz Delebilen. March 26th, 2007

Since there is such a widely established infrastructure of bicycles and public transportation in Danish cities, most citizens do not use cars to go shopping, run errands, or pick up the kids within the city- they use bikes. Denmark levies a staggering tax on the purchase of new vehicles (the tax is equal to 300% of the manufacturers price for the vehicle) and gasoline is very expensive (during our trip the average price for gasoline was 9Kr per liter, which is equivalent to about 6.04USD per gallon.

Carsten Bendix of København Delebiler mentioned that in Copenhagen, people do not usually join a car share program because they want to reduce the number of kilometers they drive or avoid purchasing a car, because Danish citizens already typically drive as few kilometers as possible and avoid purchasing vehicles at all cost. Instead, within the city, people join car share because their transportation needs have increased (due to starting a family, moving to a new area, etc.), but not enough to require the purchase of an individual vehicle. Thus, car share programs are not always perceived or marketed as being particularly environmentally friendly, because they can actually put people on the road more than if they stuck to using public transportation or bicycles.
In the United States, we found that car share programs are typically marketed to young professionals and recent college graduates who may not want to buy a car but feel that having access to one is a lifestyle necessity. In Denmark, most young people do not believe that owning a car or even having access to one is a necessary part of their life, and so most young people have no particular need for or interest in a car share program. Additionally, even the less expensive programs are often too expensive for students and young adults. Lastly, since these people are not driving at all, joining a car share program wouldn't reduce their road mileage at all- in fact, it would increase it, so joining a car

share program is not actually an environmentally friendly move for young people in Denmark.

Many Danes in the 30-50 age groups are getting married, settling down, and having children. They are enjoying increased income but also an increased need for transportation for their growing family. In this situation, many people are turning to car share programs to provide a car for one or two trips a month. Most of the people we spoke with felt that the average car share member in Denmark makes less than one trip a week in a delebil, or "shared car," and that they probably take these trips out of the city. Indeed, statistics collected by Århus Delebilklub show that 11 months out of the year, trips longer than 30km account for at least half of the total use of shared cars. During the 12th month, July, long trips account for 80% of the total use.

Although Denmark is generally a very environmentally conscious nation, hybrid vehicles and alternative vehicles (as well as extremely efficient gasoline vehicles) have met with surprisingly little success. Additionally, diesel-powered vehicles are very popular here despite their increase of certain kinds of emissions, due to the lower cost of diesel fuel (on average, diesel costs 2DKK less per liter of gasoline, or about 1.34USD less per gallon).

Some of the car share programs have attempted to include hybrid or high-efficiency vehicles in their fleets, and have not seen a welcomed response. Specifically, København Delebiler owns two Volkswagen Lupos and Hertz Delebilen owns a Toyota Prius. Members of both arrangements have found the cars to be "unfriendly" and somewhat difficult to become accustomed to driving.

Alternative Fuel Vehicles – A potential solution

American and European Hybrids

At first glance it is difficult to determine the economic feasibility of using hybrid cars in Europe. The majority of cars currently used in the Denmark car share program range from small to midsized cars. A few examples are the Toyota Yaris, Ford Fiesta, Fiat Punto and the Toyota Corolla. These cars range in price from roughly 7000 to 8500 euros a piece new. The current hybrid cars, for example the Honda Civic Hybrid and the Toyota Prius are the size of the larger cars currently used and cost between 16,000 and 17,000 euros.

The Civic Hybrid is not currently available in Danish Honda dealerships, and would need to be imported from another European country. Similar high costs and imports with other hybrids will be the major difficulty in introducing these cars into the car share program. However, using hybrid vehicles can help continue the decrease of Danish CO_2 usage to help meet the Danish Energy Plan, Energy21.[33]

Zipcar has successfully introduced alternative energy cars into their program. Most are small sedans, with many are hybrid vehicles as well as a few small SUV's, such as the Honda Element and the hybrid Ford Escape. Knowing what cars have been used here in America provides some early insight into what might be feasible options in Denmark but will have to be researched more on site.

Hybrid Technology

A typical hybrid vehicle consists of an internal combustion engine, an electric motor, and a battery. However, there are many ways that these parts can be employed to make a hybrid car. The simplest version of a hybrid vehicle is one which has the gasoline

[33] Lars Henrik Nielsen; Kaj Jørgensen **2000**.

and electric engines in series (Figure 1b). The engine has a strong alternator which charges the large batteries used to run the electric motor. Other versions of hybrid vehicle employ an electric motor and internal combustion engine in parallel through the use of a clutch, which can engage or disengage either engine to power the car on its own (Figure 1c). The most complicated hybrids use multiple electrical motors, one at each wheel (Figure 1d).

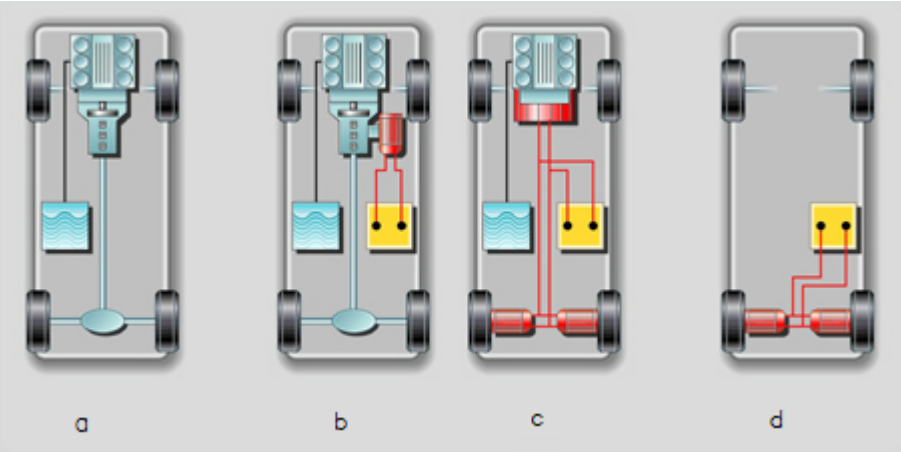


Figure 1: Conventional (a), hybrid (b), and electric vehicle (c) layout.

Hybrid cars can charge their batteries in a variety of ways. The simplest is to equip the gasoline engine with a stronger alternator to charge the large battery. Regenerative braking also provides a significant amount of charging power by engaging a generator when the brake pedal is pushed. This generator applies resistance to the drive train which in turn brakes the car and charges the battery.

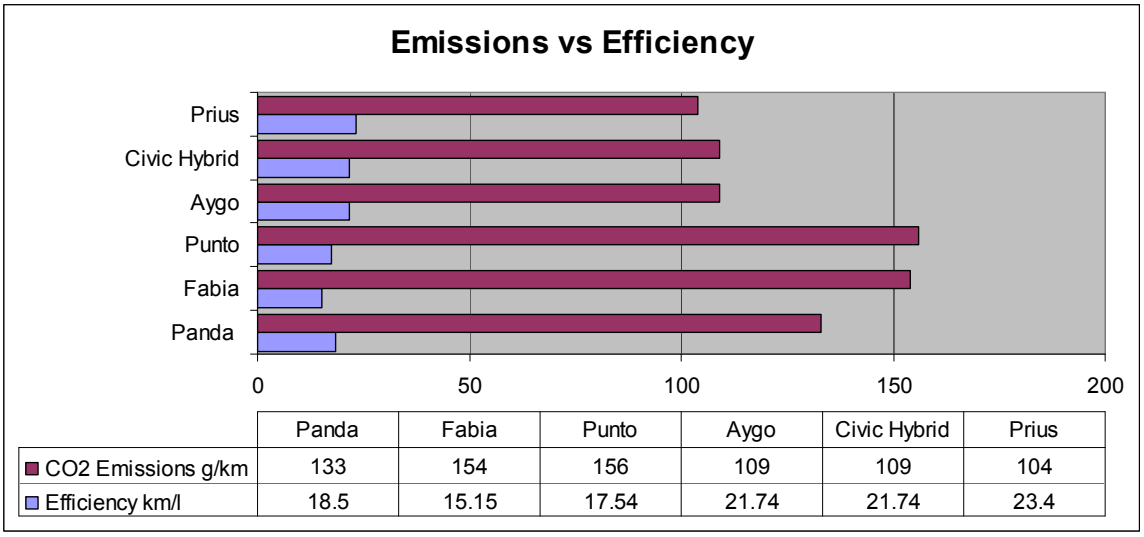
There are many things which should be taken into consideration when deciding what type of hybrid would best fulfill the needs of the user. One issue with the more advanced hybrid designs is the cost of upkeep. Currently, hybrid vehicles have had a fairly reliable record with most customers. Problems arise when there are mechanical

issues because the whole design of a hybrid vehicle is so different that it requires a specialized mechanic, which drastically increases the cost of maintaining the vehicle. The best way to avoid this problem is to make sure to have background knowledge on any cars that may be used and to remember that the more conventional the hybrid setup, the easier it will be to maintain it.

Hybrid vehicles tend to work best driving in the city, where the electric motor can handle the brunt of power train requirements. During high speed highway driving, the drag of the car alone will produce enough force to require the gas engine to run alongside the electric engine. Many times in hybrid cars the overall fuel economy in the city will actually exceed that of highway driving. This data emphasizes that knowing the needs of the consumer is the most important factor in determining the feasibility of using hybrid vehicles.

To demonstrate the importance of selecting an appropriate car for a trip, consider a hybrid Honda Civic, a conventional Honda Civic, and the hybrid Toyota Prius. The Prius is a very advanced hybrid vehicle, and the Civic hybrid is a more conventional design. In the city the Prius gets 60 mpg, the Civic 30mpg, and the hybrid Civic 49mpg. On the highway the Prius gets 51mpg, the Civic 40mpg, and the hybrid Civic 51mpg (Table 1).[34] The highway mileage difference between the Prius and the Civic hybrid is not nearly as great as in the city. This suggests that if a vehicle is to be used primarily on the highway, it is more efficient to drive the simpler hybrid design. In the city, the more advanced hybrid has a definite advantage.

[34] US Fuel Economy. *http://www.fueleconomy.gov* (accessed Feb 2007, 2007).



	Panda	Fabia	Punto	Aygo	Civic Hybrid	Prius
CO2 Emissions g/km	133	154	156	109	109	104
Efficiency km/l	18.5	15.15	17.54	21.74	21.74	23.4

Figure 2: Comparison between various levels of hybrid cars.

Diesel Technology

The use of small diesel vehicles has always received far greater acceptance in Europe than in America. This is in part due to the fact that America has the strictest regulations regarding diesel emissions. Economically, diesel fuel is ideal because of its 30-45 percent higher fuel economy than gasoline. Diesel fuel is also less expensive in Europe than regular gasoline whereas diesel is more expensive than gasoline in America.[35] The main disadvantages of diesel fuel have been the amount of NOX and particulate matter contained in vehicle emissions. High levels of toxic emissions have led to higher taxes on diesel vehicles, leading these vehicles to be viewed negatively by the public. Advances in diesel technology are making the use of diesel engines more feasible. A few of these advancements include ultra-low sulfur diesel fuels, exhaust scrubbing and fuel additives.

Low sulfur fuels have recently been introduced, enabling manufacturers to meet the emissions requirements throughout America. The public doesn't necessarily take note of

[35] Bernard Simon *Financial Times* **2006**, *The Americas*, 6.

the reduced, cleaner fuel emissions; however, it allows the manufacturers to sell more diesel vehicles in more states. This in turn allows for even greater development as the demand for vehicles arises.

Two other advancements are a scrubbing system in the exhaust of diesel vehicles which removes much of the particulate matter, and the addition of urea to fuel, which converts the NOX into harmless gas emissions.[36] With diesel beginning to more easily meet American standards it proves that diesel is becoming a much more environmentally friendly fuel and should be considered as a rival to hybrid vehicles.

Efficient Gasoline Cars

The main vehicle which fits this category is the Mercedes Smart car. This vehicle has an efficient gasoline engine combined with a small, lightweight chassis in order to achieve mileage ratings comparable to that of a hybrid car. The benefit of the Smart car is that it runs on the same general technology associated with current vehicles and so it is more readily accepted by the public and has less risk for costly specialized repairs. The Smart car gets roughly 50 to 60 miles per gallon, which is comparable to the average miles per gallon for hybrid vehicles. Also the space required for a Smart car is roughly half the size of a regular car. However, Smart cars can only hold a driver and one passenger with very little cargo room[37].

Government Incentives

Governments have attempted to curb fuel emissions at a national and global level for decades. While legislation has been passed to lower overall fuel emissions, goals have

[36] Gina Chon *The Associated Press* **2006***, Business News*.
[37] Rick Barrett *Milwaukee Journal Sentinel* **2006***, Business*, 1.

been met with little success due to population growth[38]. Various private and national programs have focused on attempting to reduce the number of cars on the road by banning cars from driving on certain days, increasing road tolls, and increasing car taxes. Consumers have found ways around all of these solutions, and in some cases, fuel emissions have increased as a result of these attempts. One program in Los Angeles sought to reduce the number of older vehicles being driving by offering cash to scrap the car. This program was met with some success[39].

Many countries, including New Zealand, are now seeking to implement fuel emissions trading. Trading would allow for a certain amount of emissions every year per company or per car user. A permit would be issued, and fines would be implemented for exceeding the allotted emissions levels[40].

The cost of alternative energy cars is currently equivalent if not more expensive than gasoline or diesel cars. Assuming maintenance costs are the same for both types, savings for alternative energy cars are between $100 and $640 dollars on average over ten years. Aside from the knowledge that one is doing something good for the environment, there is not much incentive to purchase such a car[41].

Some publicly funded incentives have been offered to encourage U.S. consumers to purchase alternative energy cars over gasoline or diesel vehicles. New York has established a program offering $7000 paid back over ten years to use towards purchasing

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[38] Tietenberg, Tom. Environmental Economics and Policy. Fifth Edition. New York: Pearson Education, Inc., 2007. ch14 pp281-305
[39] Ibid, pp334-358
[40] Gleisner, B.B.. "Cars, carbon, and Kyoto: evaluating an emission charge and other policy instruments as incentives for a transition to hybrid cars in New Zealand." 2006): 81-89.
[41] Ibid, 81-89.

a new hybrid car[42]. Some European countries, including Denmark, have recently implemented a vehicle registration tax, in which taxes on older cars are higher.

Governments seeking to encourage the use of a car share program vs. car ownership may offer tax breaks for people who do not own their own car, or set up programs similar to the car scraping program in Los Angeles. If consumers knew that they could get money for the car they currently own, and that they would have access to a vehicle through a car share, convincing consumers to use alternative energy cars becomes a matter of vehicle availability. Car share programs can make a difference by offering energy efficient vehicles, or only using such cars. Savings in gas can be passed directly to consumers, and maintenance of a technically complex car is not the responsibility of the user. The tax structure and possible government incentive for Denmark will be explored later in this report.

[42] Ibid, 81-89

METHODOLOGY

The goal of our project was to research and propose a plan to make the car share program in Denmark more environmentally efficient. Our group utilized the following methods to gather data and assemble a final proposal: interviews with Zipcar and Danske Delebiler, a survey of Zipcar and Danish car share customers, a Danish car share focus group, observation of the current system car share system, an analysis of the current car market, and an analysis of the current political state and tax structure of Denmark. A summary of proper interviewing and surveying techniques appears in Appendix: Surveying and Interviewing.

Interviews

While in the United States, we interviewed Kristina Kennedy of Zipcar in Boston, Massachusetts. The interview focused on the use of alternative energy cars with regards to car sharing, and the successes or failures involved in the use of hybrid vehicles in American car share programs. In Denmark we interviewed staff members of several car share companies organized under Danske Delebiler. Our interviews focused on finding out their desire and willingness to use alternative energy cars, the feasibility of integrating energy efficient cars into their current programs, and determining the driving and borrowing habits of car share users. Sample questions for our interview with Zipcar appear in Appendix: Sample Interview Questions. Notes from interviews with Danish car share arrangements also appear in the Appendix.

Survey

Before leaving the United States a preliminary survey was composed. This survey was used to collect data on current car share members with regards to their driving patterns and environmental consciousness. Survey questions were discussed and edited with staff of Copenhagen Delebiler, Hertz Delebiler, and Århus Delebiler upon our arrival in Denmark. The survey was posted online as a website, allowing us to ask different questions for business members and private members while using the same basic survey. An Agreement of Confidentiality was signed by the students, ensuring that individual data from CSOs would not be distributed to other CSOs of Danske Delebiler, or to other car share organizations. The agreement appears in the Appendix: Agreement of Confidentiality. Questions from the private and business survey and English translations of the questions appear in Appendix: Car Share Survey.

Member Focus Group

We decided that a focus group comprised of members of Danske Delebiler car sharing organizations would be an effective tool in helping us to collect information which would not be included in the survey, as well as verifying the information we collected from the survey. The focus group was an important tool because it allowed us to speak with people face-to-face and gave the members a chance to voice their concerns in an open-ended forum instead of just answering the predetermined survey questions. In order to gather participants for the focus group, we included a question in the survey asking members if they would be willing to participate in a discussion and asking for their email, and received a surprisingly high positive response rate.

Members who responded were invited to participate in a small group discussion (8-10 people) at the office of the nearest geographically convenient car share organization.

Several of these meetings were held in different locations, with different mixtures of participants from each of the groups to ensure that no one group dominated the conversation. Participants were asked to discuss several aspects of the car sharing experience including why they joined, how they use shared cars, their opinions on the environment, and their receptivity to the proposed use of alternative-fuel and hybrid cars (exact line of questioning and focus group guidelines available in the appendix). This process allowed us to discuss the use of more efficient vehicles and actively alter any plans based on direct feedback from members.

Observations of Current Car Share System

While in Denmark, we observed the current market of available vehicles and which vehicles seemed to be most popular with current car share members. Our analysis of the current car share programs will ensure that our proposal will have the expected effect, making sure any suggested cars will be able to keep up with the demands of a car share program. From our observations, a final list of possible vehicles and degree of efficiency was generated, and appears in the results as Vehicle Database.

Current Vehicle Market

As part of analyzing the various vehicles, the cost of new cars (at the very elemental level of analysis) was taken into account. Analysis involves much more than the simple price of the more efficient vehicle, and includes economic, environmental and social costs. The real cost will be mostly from the economic sector and will have to be outweighed by combined long term fuel savings and environmental and social issues. The cost analysis will have to take into account that Danske Delebiler is made up of both profit and non-profit organizations.

Analysis of Political State and Tax Structure

Information on the tax structure was gathered from the Danish Ministry of Taxation. Various taxes for private and business owned cars, environmental taxes, and registration tax were examined, along with other levels of taxation.

Through interviews with Danske Delebiler and CSOs in Denmark, opinions on current environmental and taxation issues were gathered. With the gathered information we developed a case for Danske Delebiler to present to parliament presenting points as to why CSO's should receive a tax break for environmentally friendly vehicles.

RESULTS

Survey

Our survey was an online survey that was open for responses for two weeks. We received 955 total responses, with member participation from all ten car share organizations in Denmark. Table 1 shows the breakdown of the respondents from each CSO.

	Number of Responses	Focus Group Interest
Albertslund	23	5
Århus	49	10
Bryggebilen	22	6
Farum	96	17
Hertz	433	70
Høje Tåstrup	8	3
Københavns	185	20
Køge	22	3
Munksøgård	26	2
Silkeborg	16	5

Table 1: Survey Respondents

95.3% of respondents were private members, while 4.7% held business memberships. Males composed 61.4% of the responses, and 38.6% of respondents were female. Most members fell between the ages of thirty and forty-nine, with 36.3% between the ages of thirty and thirty-nine, and 28.2 between the ages of forty and forty-nine. Less than 9% of respondents were under twenty-nine years old (Figure 3).

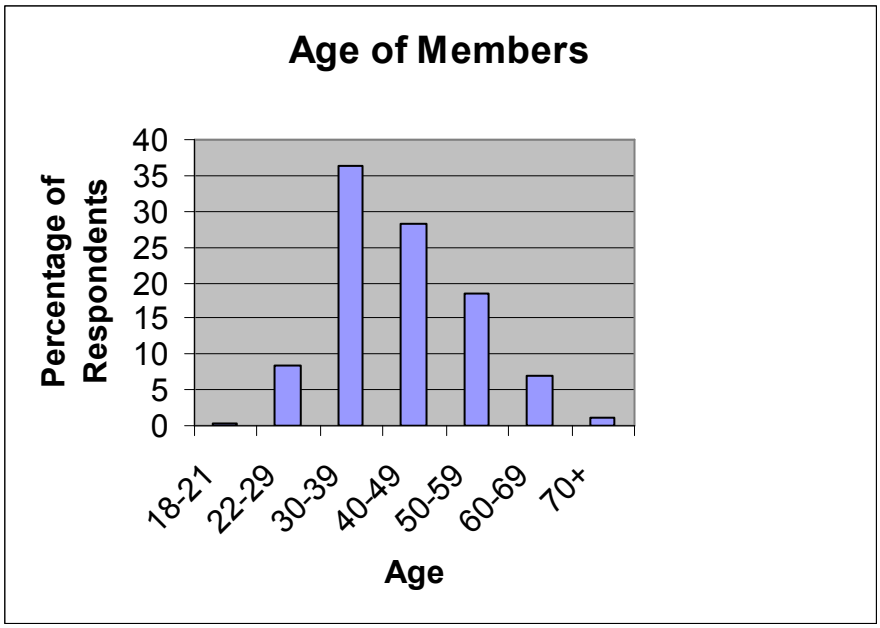

Figure 3: Age of Members

57.4% of respondents have over five years of continued education, and 29.2% have three years of continued education (Figure 4).

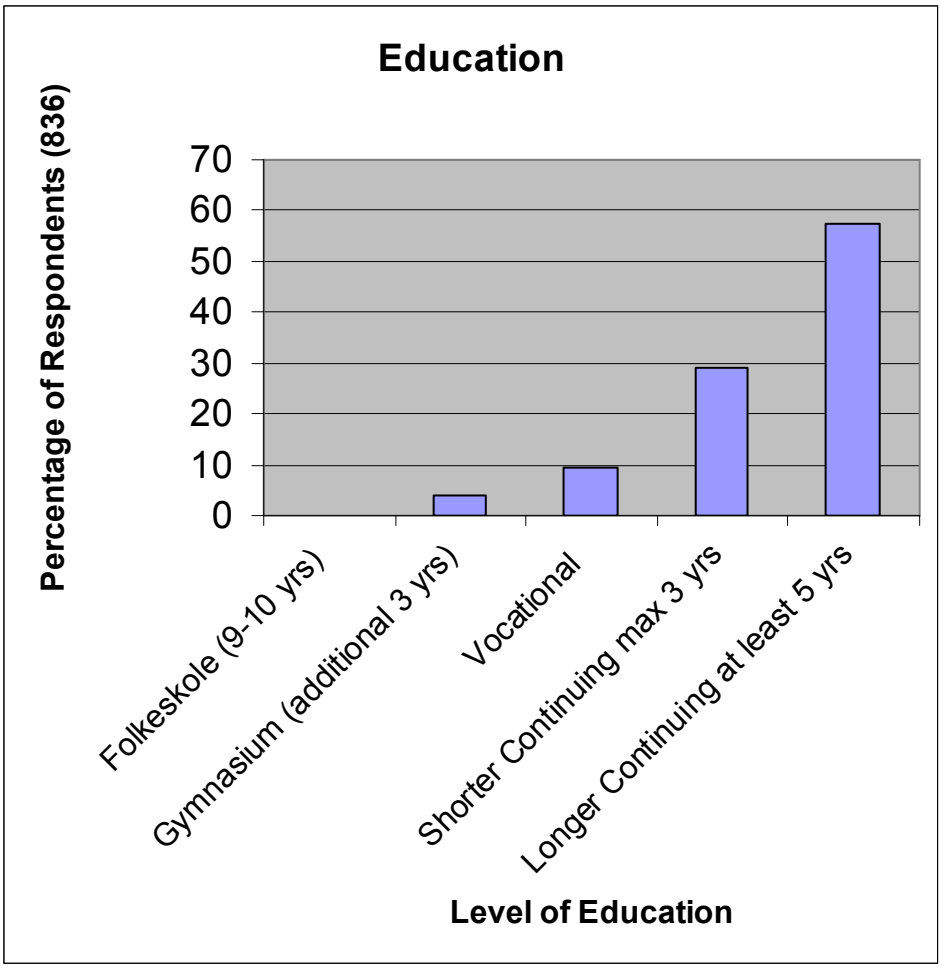

Figure 4: Member Education

37.2% of survey respondents have held membership with a car share arrangement for one to two years. 10% have held membership for five or more years, and 13.1% have been members for less than three months (Figure 5).

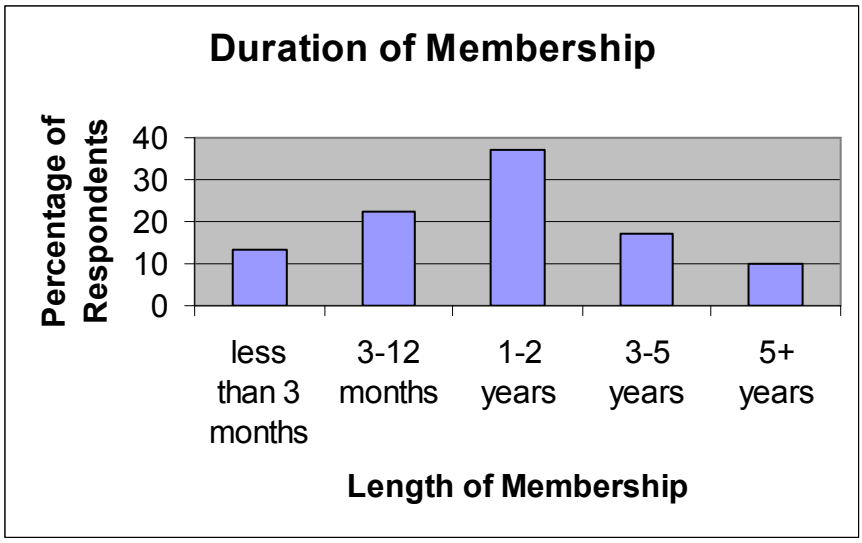

Figure 5: Duration of Membership

Results which are not as directly related to our conclusions and recommendations appear in the Survey Results section of the appendices. Much of that data is provided to meet the direct requests of some of our sponsors. (See Appendix H) Results below are categorized as private responses and business responses.

The following figures show why members joined their CSO's. The graphs are from both private and business members. Figures 8 and 9 show what each member considers most when choosing to use a car share vehicle.

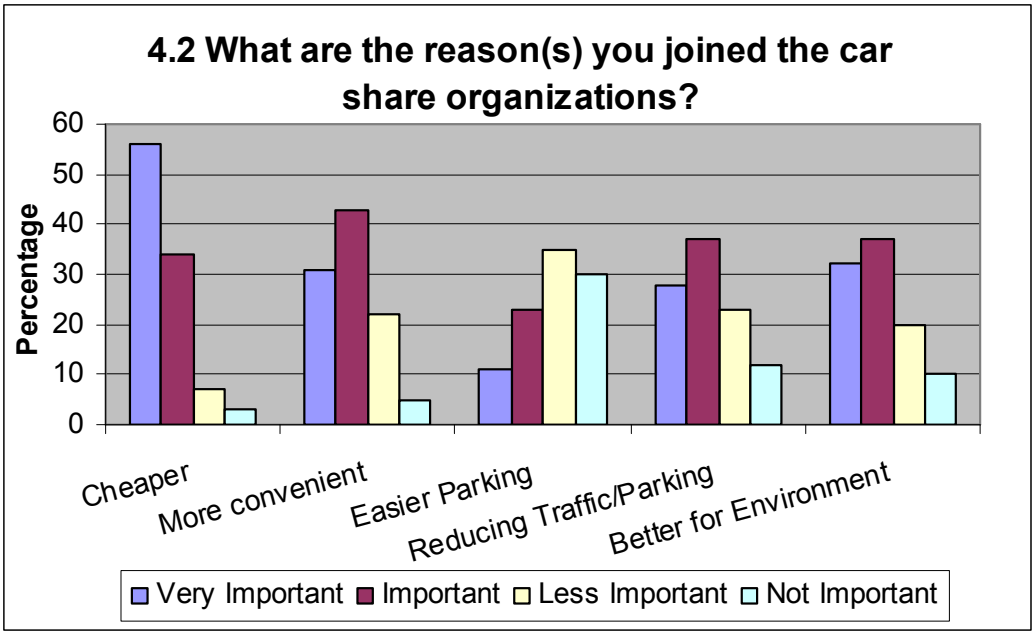

Figure 6: Why Personal Members Joined Car Sharing

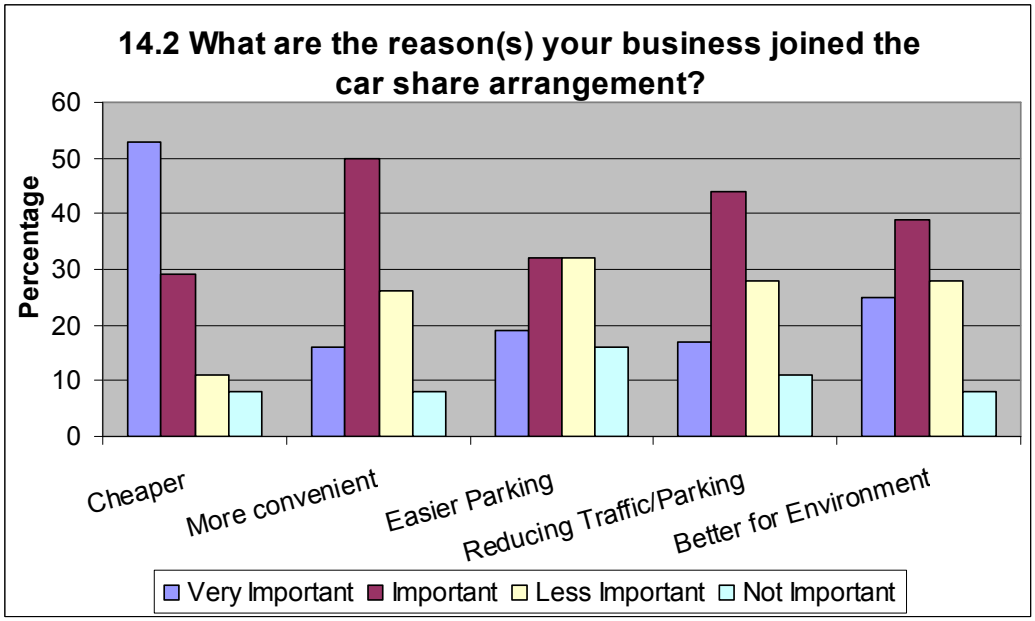

Figure 7: Why Business Members Joined Car Sharing

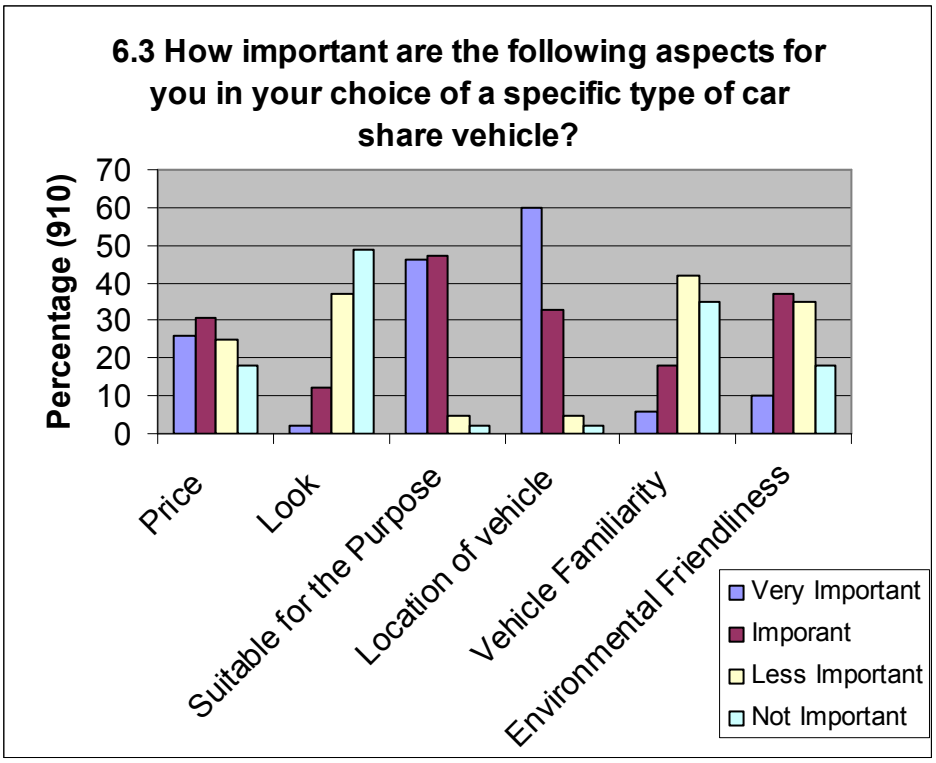

Figure 8: Personal Members Choosing a Vehicle

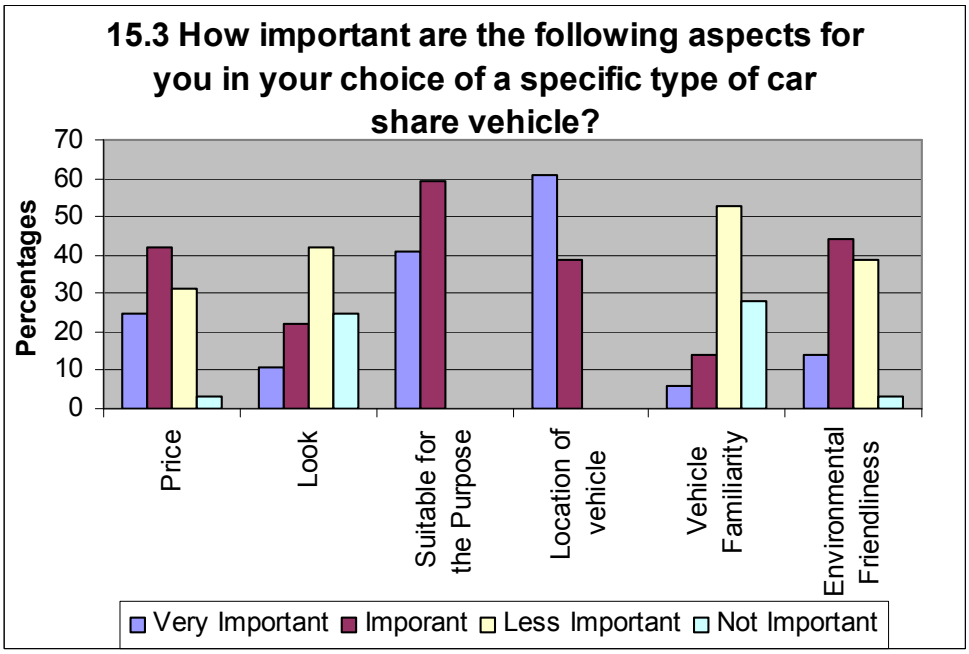

Figure 9: Business Members Choosing a Vehicle

The following graphs show what tasks private and business members use the car share vehicles for. This provides some insight into what vehicles will meet the needs of car share users.

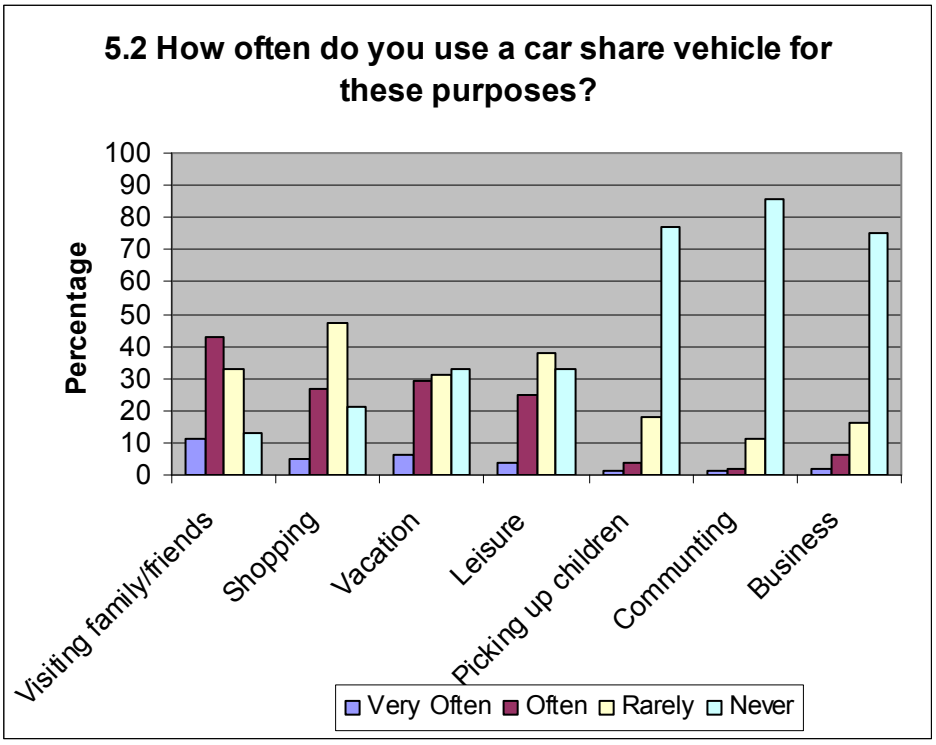

Figure 10: What Members Use Car Share Vehicles For

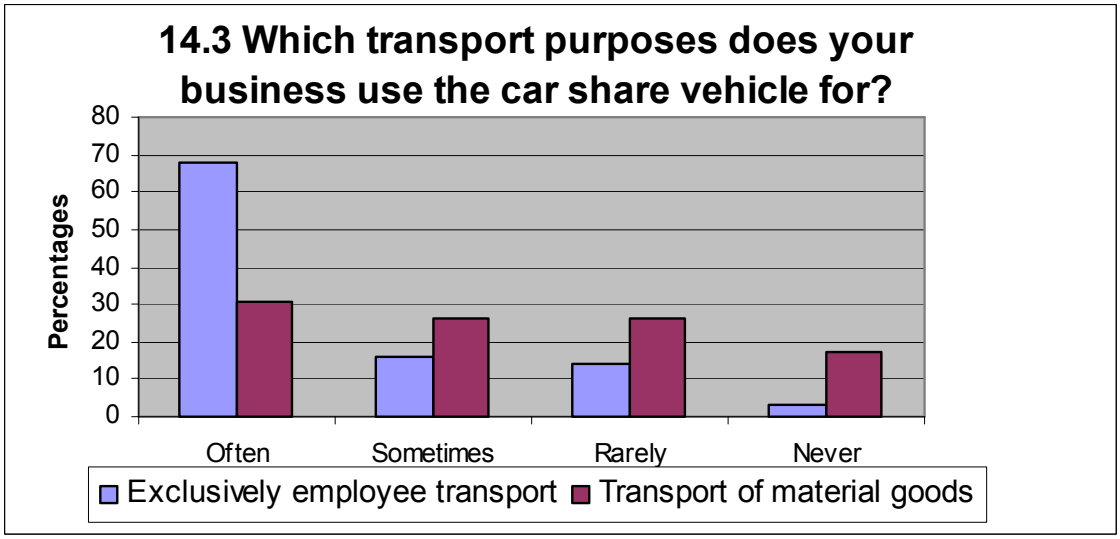

Figure 11: What Business Members Use Car Share Vehicles For

The following graphs show the driving patterns of car share members. This allows us to understand how long an average trip is and how much of each trip is city and highway. It is important to note that Figures 12 and 13 show an average of all trips city and motorway distances. Most trips were either mostly all city or all motorway but when all the trips are put together it turns out averages as seen below. It is shown in this fashion because when looking at fuel economy the length of each individual trip does not matter as much as how much is driven for city and motorway. Figures 14 and 15 break up the distance of the trips into categories giving us an idea of how many trips are of each length.

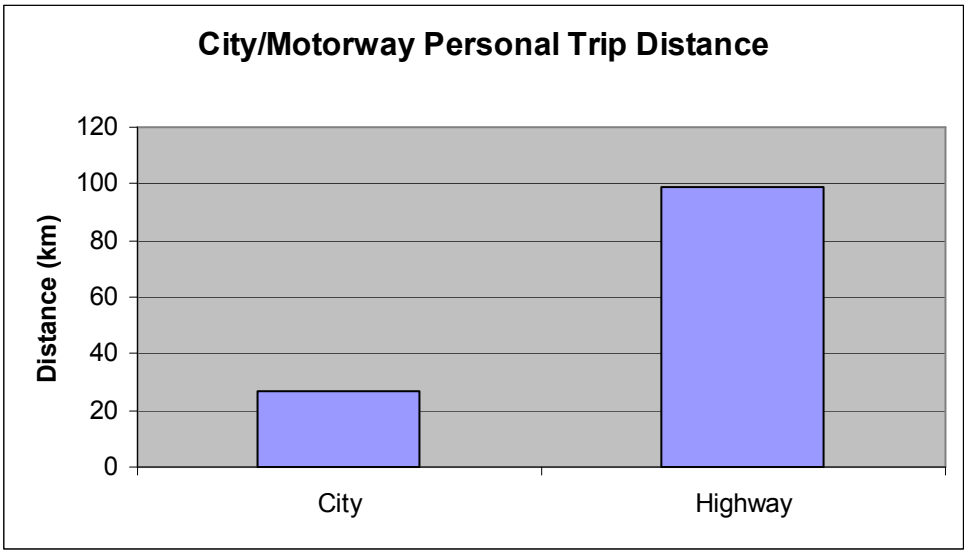

Figure 12: Average Trip Breakdown for Personal Members

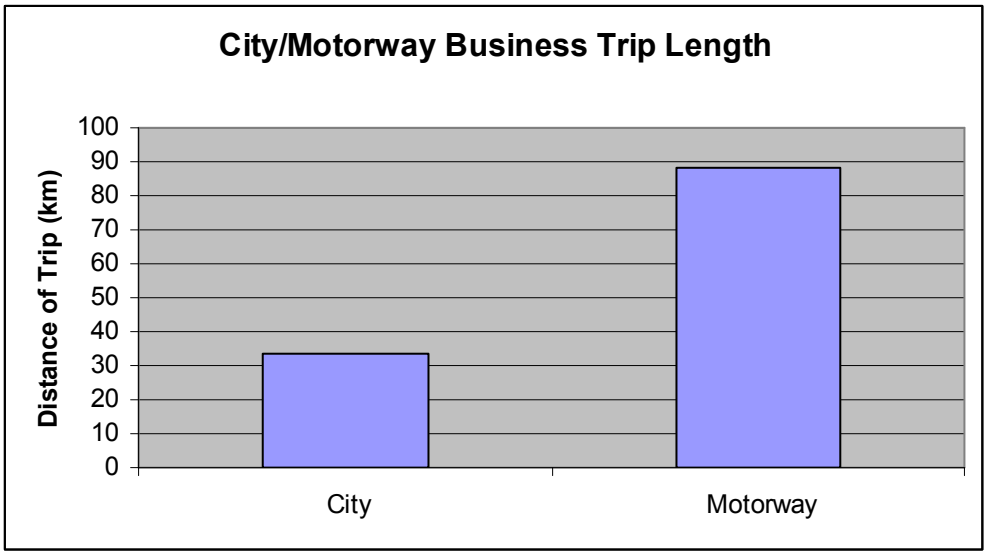

Figure 13: Average Trip Breakdown for Business Members

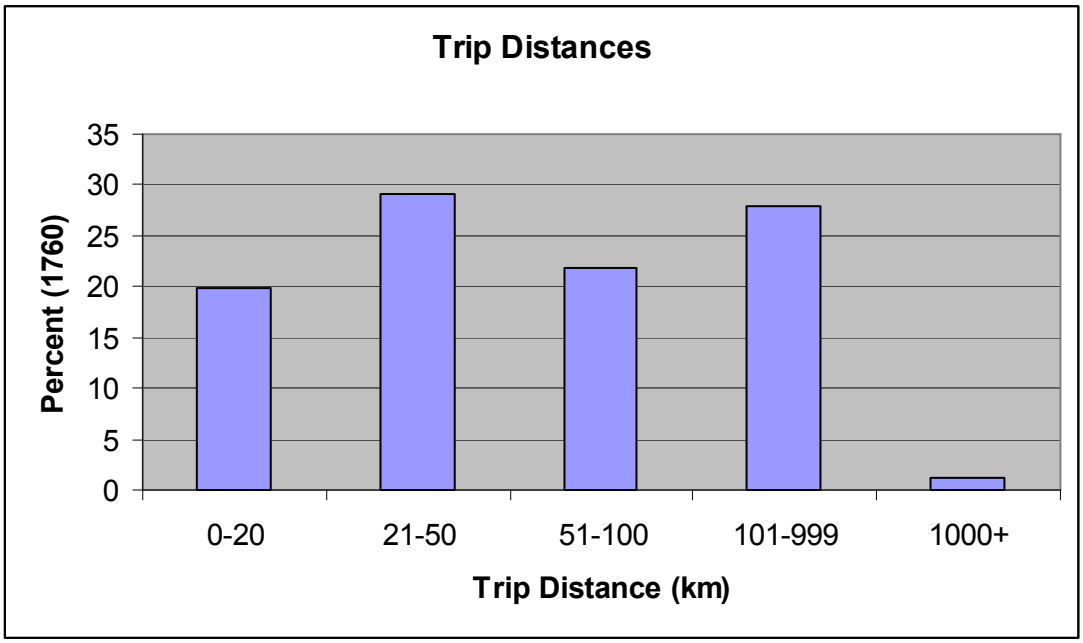

Figure 14: Trip Length Breakdown Personal

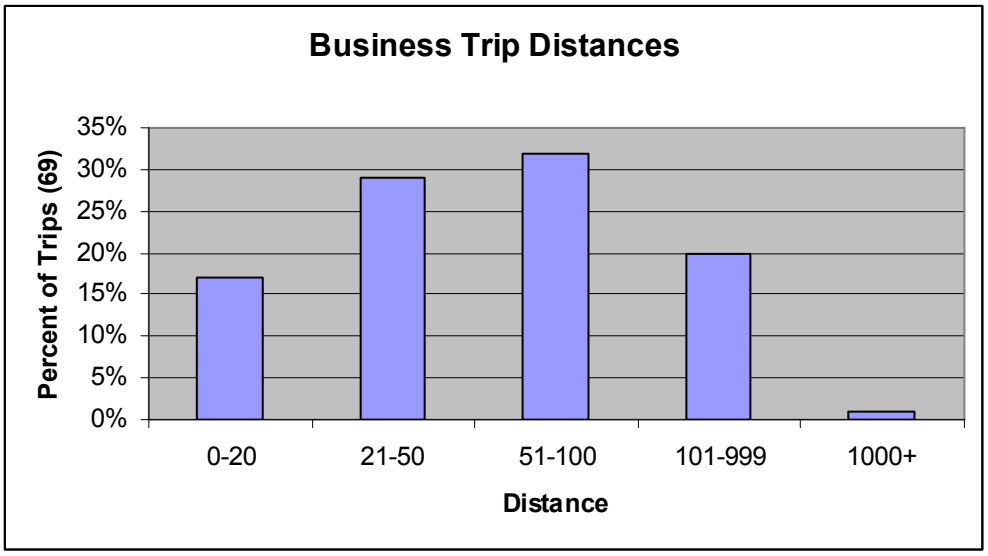

Figure 15: Trip Length Breakdown for Business'

The following graphs use cross tabulation to show that there is support for environmentally friendly vehicles and that they would be used. Figure 16 shows the frequency of use by the 202 members who said the environment was an important reason they joined car sharing and also answered that the environment is an important factor when choosing a car share vehicle to use. Figure 17 shows the frequency of use by the 59 members who show environmental habits in their day to day life. They all answered that they always recycle, always buy organic meat and always buy environmentally certified products.

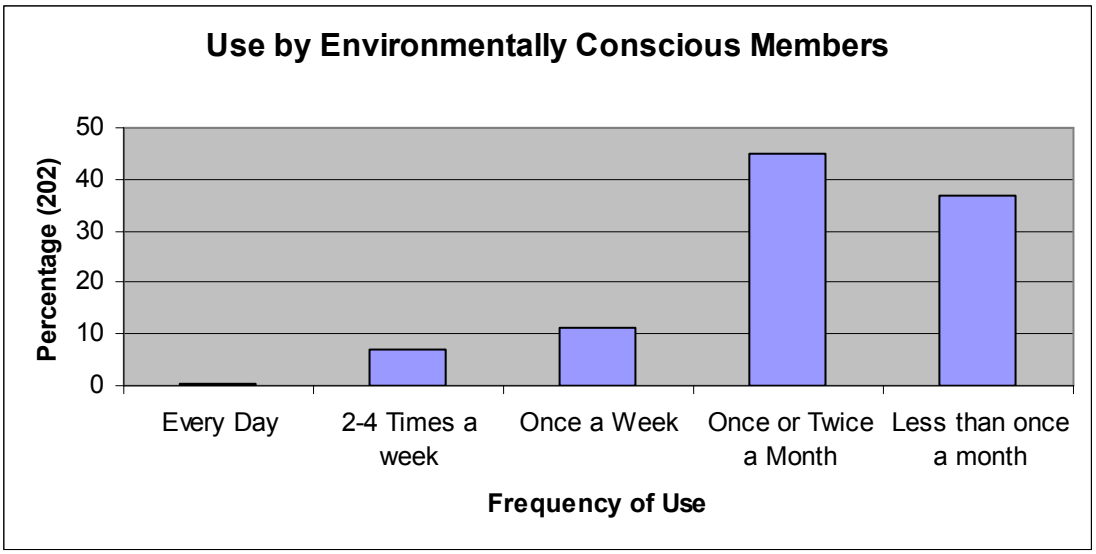

Figure 16: Use of Car Sharing by Environmentally Conscious Members

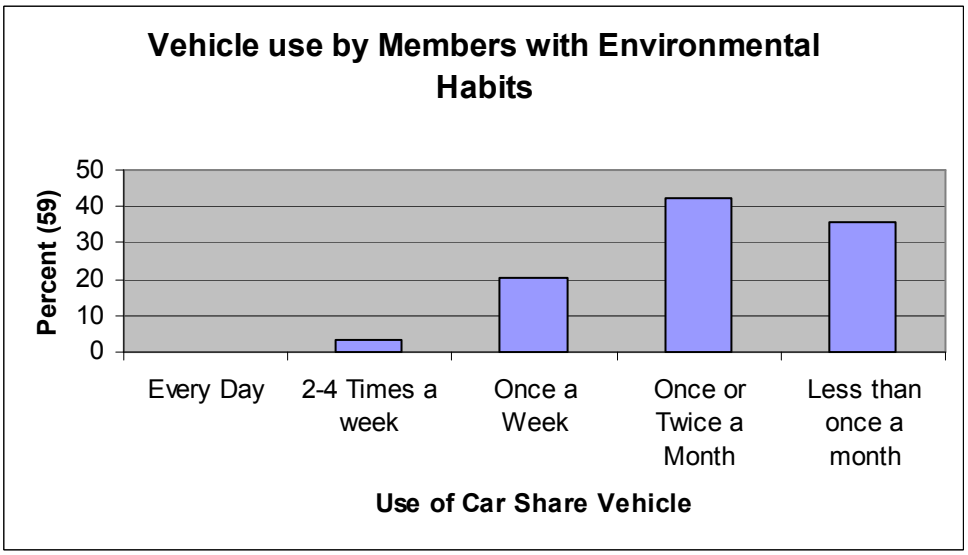

Figure 17: Frequency of Use by Members that Display Environmental Habits

Further results can be found in the appendices. Included there are the general results of each the personal and business sections. Following these sections are many cross tabs done regarding member age, education, vehicle ownership and other aspects involving the environmental habits of car share members.

Data was also categorized city, suburb, and community, and analyzed. All graphs for this data appear in Appendix H. From this analysis, we noted that city members tend

to be slightly younger than suburban and community members, with an age majority of 30-39 (Figure 75). Figures 78-80 showed that many members, in all categories, would own more cars if they were not members of car sharing. Car sharing has taken cars off the road and prevented more cars from being used in all areas. Members in all areas, like in our general analysis, joined car sharing to save money on owning a personal car, and for convenience of the car sharing program (Figure 82). In cities, suburbs, and communities, most car sharing members tend to use the program once or twice a month (Figure 87). As with our general survey, most city, suburban, and community members most often factor the location of a car and the suitability of the car into choosing which vehicle to rent (Figure 89). It is interesting to note in this figure that city dwellers also factor price of the car very highly when selecting a vehicle.

Focus Groups

We conducted a total of three focus groups to gain a more in depth and personal understanding of car share members' opinions on several issues related to our project. Two groups were held at København Delebiler and one at Hertz Delebilen, with each group having two car share members in attendance. Guidelines used during the discussion appear as Focus Group Guidelines in the appendix. All notes taken during the discussions appear under Focus Group Notes in Appendix F. Names of members were replaced with numbers to ensure member confidentiality. Analysis of results from the focus groups appears later in the Discussion and Analysis section of this report.

Vehicle Database

				Emissions in g/km				CSO Used By									
Manufacturer	Model	Fuel	Efficiency (km/l)	CO_2	CO	HC+ NOX	Particulates	H	C	Å	A	B	F	HT	K	M	S
Fiat	Panda w/ser	Diesel	23.2	114	0.095	0.165	0.02										
Fiat	Panda	Gas	18.5	133	0.581		0	x									
Honda	Civic Hybrid	Gas	21.74	109	0.19		0										
Smart	Smartcar	Gas	21.27	113	0.81	0.102	0										
Toyota	Prius	Gas	23.4	104	0.18		0	1									
Citroen	C3 w/sensoc	Diesel	23.8	109	0.182	0.234	0.017										
Land Rover	Range Rove	Gas	6.25	376	1.237		0										
Vauxhall	Corsa	Diesel	23.26	115	0.202	0.215	0.012										
Toyota	Yaris	Diesel	22.2	119	0.15	0.18	0.021										
Citroen	C1	Gas	21.74	109	0.37		0										
Toyota	Aygo	Gas	21.74	109	0.37		0										
Peugeot	107	Gas	21.74	109	0.37		0										
Fiat	Punto	Gas	17.54	136	0.342		0	x		8						6	
Skoda	Fabia	Gas	15.15	156	0.262		0	x		7							
Ford	Fiesta	Gas	15.38	154	0.292		0	x									3
Renault	Clio	Gas	17.86	139	0.425		0	x					x	1			
Toyota	Corolla Wagon												x		1		
Toyota	Yaris Verso												x		3		
Citroen	Berling									10							

H= Hertz
C= Københavns
A= Århus
A= Albertslund
B= Bryggebilen
F= Farum
HT= Høje Tåstrup
K= Køge
M= Munksøgård
S= Silkeborg

Table 2: Vehicle Database

CSO Database

CSO	Location	# Members	# Cars	Types of Cars					
Hertz	Danmark	2733	85	Punto	Fabia	Fiesta	Panda	Clio	Prius
Københavns	København	482	36						
Århus	Århus	160	15-25	Punto	Fabia	Berlinger			
Albertslund		70							
Bryggebilen		56	7	2 Yaris	3 Corolla	2 Verso			
Farum		150	22	Corolla Wagon	Yaris	Verso			
Høje Tåstrup		12	1			Verso			
Køge		35	5	Corolla Wagon		Verso			
Munksøgård		80	6	Punto					
Silkeborg		25	3	Fiesta					

Table 3: CSO Database

Sample Vehicle Cost Analysis

	Prius	Fabia Diesel	Fabia Gas
Initial Vehicle Cost	142830		
Registration Tax	244588		
MOMS tax 25%	35707		
Fuel Economy Rebate	-29200	-14000	1100
Total Vehicle Cost	393925	184000	211100
Fuel Economy (km/l)	23.3	21.5	14.9
Emissions (g/km)			
CO2	104	126	161
Particulate/Nox	N/A	.02/.206	N/A
Fuel Use (L) Per 10,000 km	429.18	465.12	671.14
Costs (DKK) (10 kr/l petrol, 7.5 kr/l diesel) per 10,000 km	4291.85	3488.37	6711.41
Emissions (kg) per 10,000 km			
CO2	1040	1260	1610
NOx		2.06	

		Number of Years	km/year	km
Prius Vs Diesel Fabia		3	30000	90000
Fuel Savings (L)	Prius	323.3856		
Fuel Cost Savings	Fabia	7231.261		
Emissions Reduction (kg)	Prius	CO2	1980	
		NOx	18.54	

Results: Prius costs 7231 kr more to operate over a 3 year period.

		Number of Years	km/year	km
Prius Vs Gas Fabia		3	30000	90000
Fuel Savings (L)	Prius	2177.608		
Fuel Cost Savings	Prius	21776.08		
Emissions Reduction (kg)	Prius	CO2	5130	
		NOx	0	

Results: Prius costs 21,776 kr less to operate over a 3 year period

Table 4: Sample Vehicle Cost Analysis

DISCUSSION & ANALYSIS

Summary of Investigative Research

Interviews

The first person we interviewed in Denmark was Martin Lidegaard, a member of Danish Parliament belonging to the social liberal (radikale venstre) party. Although his party does not currently have a majority vote or a great deal of power in parliament, it does have a very progressive platform and his views on sustainable transportation and tax structure were sympathetic to our project. Mr. Lidegaard was very interested in the concept of car sharing, and he immediately spelled out one of the defining issues of the project: the extremely high registration tax on new cars. He suggested that the easiest solution would be selective tax breaks for environmentally friendly cars, but confessed that although he and his party would be interested in fielding the issue in the future, he didn't have a great deal of hope because the tax ministry is so effective at raising revenue from the state and car registration is one of their primary sources of income. He also shared some grave concerns about the future of bioethanol fuel in Denmark, stating in no uncertain terms that they don't have the agricultural infrastructure to produce that much fuel and most waste biomass can be more efficiently used to heat homes or create electrical power than gasoline.

Our conversation with Mr. Lidegaard was of great value because it helped us establish a direction and a momentum for the project. His frank explanation of the internal functions of the Danish revenue system and the political resistance to tax breaks set the stage for the project's final recommendations and helped us focus our efforts where they are appropriate instead of tracking down misleading and useless information about alternative bioethanol fuels. Additionally, his interest in tackling the project from

the government end gave us hope that it might be possible to change the tax structure to encourage the sale of environmentally friendly vehicles in Denmark. Of course, Mr. Lidegaard did not know anything about the daily operations of car share organizations, so we visited Århus Delebilklub in Århus, Denmark, for more information.

In Århus we met Morten Franch, the director of Århus Delebilklub. Mr. Franch gave us our first candid insight into the cultural and economic issues surrounding transportation in Denmark. He shared that people in Denmark use bicycles, public transportation, and car share programs because it costs so much to own a personal vehicle, rather than because they're concerned about their personal gas consumption. These suspicions were later confirmed (both for Århus and the other CSOs) by the survey and focus group data.

Mr. Franch also told us that the car share driving patterns were significantly different than we had expected. In the U.S., car share pricing schemes are designed to encourage customers to keep the cars for short periods and use them inside the city limits. In Denmark, people use bikes and busses to run errands within the city, and they usually only need a car to drive long distances where it would be more expensive to buy train tickets for an entire family than just rent a car for the weekend. Thus, instead of recommending that the CSOs purchase small, fuel-efficient city cars we may need to recommend larger, family-friendly vehicles. Again, this presumption was supported by data Århus Delebilklub had collected over their 8 years of operation as well as by our own survey data later.

Mr. Franch also filled us in on some of the operational details of CSOs in Denmark. For example, instead of purchasing their own vehicles all of the CSOs except

Hertz lease their vehicles for periods of around 3 years, which will make replacing vehicles much less expensive than buying them outright. He also gave us an overview of the kind of cars and technologies the CSOs currently have access to.

Mr. Franch's input was invaluable because, as an experienced manager, he has a very well-formed sense of how car sharing operates in Denmark, culturally and economically as well as logistically. The information he shared with us helped us get over some of our initial misconceptions and assumptions about how the industry operates in Denmark. Additionally, all of his input later turned out to be extremely accurate, confirmed by survey data.

Our next interview with Mr. Henriksen, the fleet manager of Hertz Delebilen, was instrumental in helping us understand the challenges of integrating efficient non-conventional vehicles into a program designed to be low-hassle. Hertz Delebilen is the only Danish CSO which currently owns a hybrid vehicle, and it has not been very successful so far because members are alienated by the car's radically innovative design. Driving a Prius is unlike driving any other production car in Denmark today, and Hertz members have proven unwilling or uninterested in making the change, despite the car's reduced environmental impact. Since the Prius is more expensive than other cars and alienates users, Hertz has not been interested in purchasing more of them because the fuel savings haven't been enough to offset the negatives, considering how rarely the car is used. Our interview at Hertz helped us understand that there are some sacrifices customers will not always, or ever, make just to drive a green car. The Prius was later relocated to the lot behind the Hertz office so that staff members could be easily dispatched to assist customers in distress.

Our final interview, with Villads Hansen of København Delebiler, provided more information about how car share members react to non-conventional vehicles. København Delebiler owns a number of Volkswagen Lupos, a car designed to be the most fuel-efficient production vehicle ever. It's highest efficiency rating (windows closed, no air conditioning) is around 80 mpg, but to achieve this level the Lupo requires a modified automatic transmission and occasionally shuts down the engine at stoplights. It's also a very small, no-frills car that doesn't accelerate very well. These measures are very disconcerting to European drivers who are used to manual transmissions. Mr. Hansen reinforced that car share members were very uninterested in the Lupo because it was so different and difficult to drive. Indeed, focus group members later commented that they were afraid they would get into accidents because they didn't know how to drive the car.

This last interview drove home the point that car share members are not completely dedicated to reducing their environmental impact at the cost of every other aspect of their lives. If Danish car share programs are going to incorporate more environmentally friendly vehicles, they must consider their customers demands for comfort, convenience, and low price above all else. Minutes from all interviews can be found in Appendix C.

Survey

With our survey netting 955 responses we were able to gather a wealth of information from this source. First, we will discuss the data from the survey which directly impacts our project of researching the introduction of environmentally friendly

vehicles into car sharing. We will also discuss a few other interesting facts we were able to gain from the survey.

The initial important information gained from the survey was why members initially joined car sharing. Figures 6 and 7 show that the key reason people joined car sharing was because it is cheaper than traditional vehicle membership. However, the second most important reason people joined was very close between convenience and environmental reasons. Figure 8 and 9 displays that location, meeting the users' needs, and price are the top three things people consider when choosing to use a car share vehicle. The environmental impact is the next thing they consider and that is ranked fairly close with price. So if a CSO were to use a more environmentally friendly vehicle which was large enough to meet member needs, place it in a location where it is easily accessible, and make the price on par with traditional vehicles, members would be interested in using the vehicle. These four graphs tell us that car share members are typically aware of the environment and would like to do what they can to reduce their impact, but using the vehicles shouldn't cost them a premium or hinder them from accomplishing their goals. This perception was further reinforced through our focus group results.

The next question we were seeking to answer is what the car share vehicles are used for so that the CSO's would have an idea of what type of vehicle would be required to meet the needs of members. Figure 10 shows the main use of car share vehicles is for visiting family and friends and shopping. Since 64.5% of respondents are 30-49 years old we may surmise they need to have vehicles which can fit a family comfortably along with some room for either shopping or luggage. The vehicles are rarely used for picking up

children, commuting or business reinforcing the assertion that smaller vehicles would fit the needs of members. Figure 11 shows the business' most often use of vehicles is for employee transport. Whether or not businesses use vehicles to transport goods is heavily based on what sector of business the company is in, suggesting that businesses would also be able to benefit from mid-sized environmentally friendly vehicles.

Knowing what the vehicles are used for, the next piece of information needed is what type of driving the cars are used for, such as city and motorway driving as well as trip lengths. The general trend was that most CSO's members used the vehicles 3 to 5 times more for motorway driving in comparison to city driving (Figures 12 and 13). One CSO did not fit this trend and members actually drove on average 15 km more in the city then highway per trip. Results from the business survey suggest businesses used vehicles for city driving 27% of the time, slightly higher than personal responses suggests. Knowing the length of trips, Figures 14 and 15, will be most helpful in the future when considering vehicles which may have a limited range capability. This graph allows the CSO's to know how many people could possibly use a vehicle with limited range. The fact that trips average out to such long distances means that more efficient vehicles would have a very significant impact on lowering emissions and fuel use.

The last key point to be shown is that car share members would make use of an environmentally friendly vehicle or be genuinely interested in using them. There is a significant portion of members, 202 responses, which responded saying the environment was a very important factor in them joining car sharing and moreover that impact on the environment is important to very important when choosing which car share vehicle to use. Thus almost a quarter of the car share members consciously think about the environment

in respect to car sharing. Fifty nine people had responses which suggest they have strong environmental habits in their day to day lives through their buying and recycling. Figures 16 and 17, respectively, show the use of car share vehicles by these two groups of people and they both show trends very similar to all car share members. These graphs show that environmentally friendly vehicles would be used by car share members because there is a significant portion of members who think about their environmental impact and they make use of vehicles just as much as any other members.

A variety of other environmental cross tabs were performed to show that car share members are generally concerned with the environment. As a whole all of these graphs, found in Appendices H, further support the idea that car share members would welcome the use of more efficient vehicles.

From the survey data we were able to come to a few other conclusions not directly related to the project. First, it was shown that car sharing attracts many highly educated Danes. Currently 7% of Danes 40-49 years old have over 5 years of continuing education, while 57.4% of car share members in this age bracket have this level of education. This fact further assists our case since more educated people would typically be more open to more technological advancements.

Another interesting trend we saw was that the only relation between the length of membership in comparison to joining for environmental reasons was that it is relatively constant other than those who have been members for over 5 years. The people who have been members for over 5 years did show a significant increase in joining for environmental reasons.

Many CSO's mentioned off hand that they would like to increase vehicle use during the weekdays. A solution that was found for this need could be to increase business memberships. Businesses showed that they used cars much more often than personal members, Figure 72, and were also able to reserve their preferred vehicle more often, Figure 73. This all suggests that by increasing business membership a CSO could possibly solve this problem of vehicle use during the week. The fact that businesses can reserve their preferred car more often can be a selling point to encourage businesses to join car sharing.

There were a few other traits which were recognized once individual CSOs where grouped and compared. Income seemed to not have any specific trend between CSOs and the number of vehicles taken off the road varied greatly between each organization. Organizations which were located within cities seemed to have a higher concern for parking and car sharing has made vehicle use possible for many suburban areas.

Member Focus Group

We held a total of three focus groups, each with two members of a car share organization. Our findings from these focus groups inevitably aligned with many of our survey results, but also gave us a way to expand upon our survey questions to get more in-depth answers from members.

When asked about why they were members, all responded that it was largely for economic reasons, and that car ownership in Denmark had become too expensive to warrant keeping a personal car. All primarily use bikes and public transportation to get around, and typically use car sharing either as a last resort in poor weather, or as a means

to visit family and friends and complete errands that require space to transport purchased items.

Members thought about the price and location of a car before booking a car share car. They typically chose the car that was most economical for their needs, and was conveniently located. When asked if they would consider using a hybrid car, members in the focus groups said they would be happy to try one. Cost and convenience of location would factor into this choice, however. Members said they would not pay a premium for a hybrid car just because it was better for the environment. They said that because these cars are saving on fuel, they should be charged appropriately and that savings on fuel consumption should be passed onto customers, if CSOs incorporate these cars into their fleets.

Two members said that if all factors were equal, they would choose a more environmentally friendly car over another car, and one said he would even consider walking an extra block for it if there was incentive to do so (i.e. environmental friendliness, slightly lower price for such a car, etc.).

One member expressed concerns that he would be unfamiliar with such a car. The member had previously tried a Lupo and felt somewhat uncomfortable driving the car. He said he was "afraid of making a mistake" while driving, as he was not accustomed to the automatic transmission and the Lupo's energy saving features. After taking a course and trying the car, he said he would try it again, and if more user education was readily available that more customers might be more likely to try the newer hybrids.

Two members mentioned that making the vehicles more familiar, not only among members but among the general public, would be essential to introducing new hybrid cars

to Denmark. Both agreed with member education and getting lots of members to drive them, more people would start to feel like driving an environmentally friendly car was "chic" and popular.

As we found with our survey, location and price are some of the most important factors to members when they choose a car. Environmental concerns were also high among member's reasons for choosing a car in our survey. If car share organizations place fuel efficient cars in convenient locations, and offer these cars at a price comparable to a car that gets similar fuel mileage, members will likely begin to use these cars frequently.

In our focus group, one member expressed concerns about not being familiar with a particular car. Car share organizations could alleviate any of these types of concerns by offering instruction for members who wish to use the car. An overview of the car could also be posted online for members to review, or for members who feel comfortable enough to read and try the cars out for themselves. If convenience and ease of use are maximized, and price is kept at a minimum, car share organizations will likely see new fuel efficient cars quickly welcomed into their programs.

Observations of Current System

Currently the most commonly shared vehicles in Denmark are the Fiat Punto, Skoda Fabia and Toyota Corolla Wagon. A few other common larger vehicles are the Toyota Yaris Verso, Citroën Berlinger and Peugeot Partner. The larger vehicles are typically used by car share customers when they have a lot of people or cargo to move, otherwise most customers prefer to use the smaller vehicles. There are also many more options when trying to get a small efficient vehicle. Due to their widespread acceptance

and relatively low fuel consumption, these small vehicles may be the best choice for car sharing companies in Denmark.

The key factors to be looked at while improving the environmental friendliness of the car share program is the fuel efficiency and various emissions, such as CO_2, CO, NOx and particulates. Currently the car share vehicles range from 15.15 km/L to 18.5 km/L with the exception of Hertz Delebilen's single Toyota Prius and Copenhagen Delebiler's diesel vehicles. The gasoline vehicles put out emissions of CO_2 between 130 to 150 grams per kilometer and CO between .25 to .58 grams per kilometer. They also have minimal particulate matter and NOx emissions around .1 grams per kilometer. Copenhagen Delebiler currently uses all diesel vehicles which have a better fuel economy ranging in the low 20's for km/l. But these diesels have significantly higher particulate matter and NOx emissions. [43]

Diesel vehicles typically have slightly lower CO_2 and CO emissions but have much higher levels of NOx and particulate emissions which is very dangerous to individual health and surely should be avoided when looking for environmentally friendly vehicles. However, diesel vehicles typically have higher fuel efficiency and lower fuel cost than similar gasoline vehicles. Europe has typically accepted diesel vehicles as being the best choice for an efficient vehicle due to the positives; currently it seems Europeans tend to overlook the emissions problems, perhaps due to more relaxed standards.

[43] ETA Car Buyers Guide. *http://www.eta.co.uk* (accessed 2007).

European Emissions Standards

The current emissions standards in Europe which are the Euro IV standards are simply minimum requirements which production vehicles must meet. The first emissions standard of the current system began in 1992 with the Euro 1 standard. This new regulation basically meant that as of 1992 any production vehicles must meet the set standards. The current standards as set in 2005 with Euro IV do not have CO_2 limits and have a very relaxed limit of 1 g/km of CO. An important thing to note is that as of September of 2009 the Euro V standard will be put into effect which will make the particulate emissions of diesel vehicles on par with those of gasoline vehicles. This standard would then make the only drawback of using a diesel vehicle the NOx emissions which would be set at .18 g/km versus the .06 g/km which gasoline vehicles have.[44]

Europe does not currently have the emissions framework setup to individually classify vehicles into better emissions classes such as low emissions vehicle or ultra low emissions vehicle such as in the United States. This lack means that manufacturers have little incentive to put in the work to produce a vehicle with emissions any better than the minimums set by the European Emissions Standards since it will not benefit with any extra recognition. In Denmark, there is a yearly "green" tax based on the environmental impact of each vehicle which means that the more environmentally friendly a vehicle is then the lower the tax on that vehicle each year. For example the lowest green tax a vehicle can possibly have is 260 DKK, whereas, larger SUV's can have up to 7,350 DKK as a yearly green tax.

[44] Homeister, N. L. Ve

Current Vehicle Market

Through basic research of the Danish vehicle market we were able to get a general idea of what it would cost to introduce more efficient vehicles into the car share system. In order to get this information research was done via internet and interviews with various vehicle manufacturers. Keep in mind that the cost of current vehicles used by car share organizations is roughly 210,000 Kroner per vehicle. We spoke with a Toyota Prius dealer in Ballerup to discuss the cost of the Toyota Prius as an example of an efficient vehicle. A Toyota Prius costs 142,830 Kroner for the vehicle itself. The customer then pays 251,088 Kroner for the registration tax and 35,707 Kroner for the 25% MOMS tax. These taxes put the Prius at a total price tag of 429,625 Kroner. In order to make the Prius a reasonable alternative price wise, it would need to see a maximum of 67,170 Kroner worth of taxes or 47% versus the current 200%. The reason hybrid vehicles are good options is because they are typically average sized vehicles whereas most other efficient vehicles on the market are compact.

Other vehicles looked at were the Peugeot 107, Citroen C1 and Toyota Aygo. These three vehicles are currently produced as a joint city car venture by the three companies mentioned. Their goal was to produce a highly efficient car for city use which they were very successful with but only after sacrificing vehicle size. While these cars only costs between 115,000 to 125,000 Kroner new, depending on which variant you choose, the issue is that it is a small vehicle and might not necessarily meet the needs of the car share customers. We know from our survey, Figure 8, that the top priorities of car share users when choosing a vehicle is location and fitting the customers' needs which typically involve transportation of family and other goods. Due to this requirement and the small size of these city cars they are not an ideal alternative.

Current diesel vehicles in Denmark do not have particulate filters and would therefore not be an environmental improvement. They would decrease fuel consumption but would produce higher emissions. For this reason diesels would not be a feasible alternative until the requirement of particulate filters in 2009.

Other alternative energy vehicles such as bio fuels, hydrogen and electric do not have enough of a world market, not to mention Danish market, to be an alternative for car sharing. Very few vehicles exist which use these forms of power and the ones that do exist do not have the infrastructure to operate effectively in Denmark and also face the same pricing difficulties hybrids do.

Analysis of Tax Structure and Political State

When a car is purchased in Denmark, many taxes are added to the sticker price of the vehicle. These taxes include VAT (value added tax), registration tax, excise tax or green tax, countervailing tax, insurance, and road taxes. Of these, registration taxes generate the most government revenue, bringing in approximately 24 billion dollars of 34 billion dollars from all car taxes[45].

Registration tax is applied to all cars in Denmark, including taxis, buses, motorcycles, and vans. Registration tax is paid once for the time the car remains on the road. For example, if the car is sold to another company or private buyer, the new owner does not pay registration tax on the car. Taxes for a new car vary depending on the price: taxes are 105% if the cost of the car is under DKK 65,900 (2007) and 180% if the cost exceeds DKK 65,900[46].

[45] http://www.skm.dk/foreign/english/taxindenmark2007/section1howistaxrevenuegenerated/

[46] http://www.skm.dk/foreign/english/taxindenmark2007/5344/

Below is a table taken from the Danish Ministry of Taxation, breaking down how registration tax and other taxes are applied to a newly purchased car:

			Full rate 2007 DKK
Car price before registration tax			
Supplier sales price ex. VAT			85,000
VAT of 25%			21,250
Car price including VAT	(1)		106,250
Allowance in taxed value			
Radio	Yes		1,000
Airbags	4		5,120
ABS	Yes		4,165
ESP	Yes		1,300
Taxed value	(2)		94,665
Registration tax			
Tax on value (2) exceeding DKK 65,990		180.00 %	51,777
Tax on value (2) under DKK 65,990		105.00 %	69,195
Tax allowance			
- Rear windscreen wiper/washer			- 300
- Interior adjusted right wing mirror			- 300
- Seatbelt alarms	3		- 300
Total registration tax	(3)		120,372
Street price of the car, ex. delivery costs (1) + (3)			**226,622**

Table 5: Example Vehicle Tax Analysis[47]

If a new car costs 85,000 before VAT, the purchaser pays 2.66 times that once taxes are added. Several tax allowances are also shown. These allowances serve as incentives for buyers to purchase cars with certain safety features, such as seatbelts and

[47] Skatteministeriet http://www.skm.dk/foreign/english/taxindenmark2007/5344/.(accessed 2007)

anti-lock breaks. Other allowances, as of 1999, are for environmental efficiency. The table below outlines reductions in registration tax based on fuel consumption[48]:

Fuel consumption (km/l)		**Registration reduction**	
Petrol	*Diesel*	*2000-2005*	*2005-2010*
25 – 28.6	28.1 – 32.1	1/6	0
28.6 – 33.3	32.1 – 37.5	1/3	1/5
33.3 – 40.0	37.5 – 45	1/2	2/5
> 40	> 45	2/3	3/5

Table 6: Requirements for Registration Tax Reduction[49]

The problem with offering this kind of tax reduction is that cars do not yet exist that have fuel efficiency high enough to qualify for tax reductions. The Toyota Prius, which is the most efficient gasoline vehicle on the car market today (2007) gets 23.4km/l. The Volkswagon Lupo gets 33.34 km/l but is no longer in production and getting that level of fuel economy is not an easy task. Purchasers of diesel vehicles with particulate filers also receive a tax reduction of 4,000DKK (2006-2009). However, these vehicles are not currently readily available at this time and should be entering the market within the next few years. EU laws requiring diesel cars to have better emissions will go into effect in 2009.

The current reductions for environmental consciousness are not consistent with vehicles that are readily available to private consumers and businesses, thus there is no true economic incentive for purchasing a vehicle such as the Toyota Prius or the Honda Civic. If economic incentives are not available to car share programs, the owners must

[48] http://www.skm.dk/foreign/english/taxindenmark2007/5344/

[49] Skatteministeriet http://www.skm.dk/foreign/english/taxindenmark2007/5344/.(accessed 2007)

pass the costs of newer energy efficient cars onto their members. Our survey has shown that many members have joined for economic as well as environmental reasons and so in order to truly benefit from more environmentally friendly vehicles the cost would have to be addressed first. High registration taxes will increase the hourly rate of new fuel efficient cars, which may deter members from renting such cars, and potential new members from joining car share programs.

Vehicles used as taxis have a reduced registration tax. If the value of the car is greater than DKK 12,500, the registration tax is 20% of the value of the car. In the case that the taxi is resold and used as a private car before it is 3 years old with 210,000km, or 2 years old with 250,000, the full registration tax must be paid[50].

Taxis are defined as "vehicles licensed for and exclusively used for commercial transportation of passengers". Taxis provide a commercial service to serve the private needs of individuals. Car sharing may also be defined as such in the sense that the organizations provide a service to serve members. While several car share arrangements in Denmark are non-profit, members pay a fee for a service and the convenience of using the cars.

While car share organizations are providing a similar service as taxis, they are taxed by the government at a significantly higher rate – the same 300% registration tax that is charged of private car owners[51]. To compensate for higher registration taxes, car share organizations are forced to charge higher fees of their members.

Car share arrangements in Denmark are now hoping to integrate more fuel efficient vehicles into their fleets. Many of these vehicles, such as they Toyota Prius and

[50] http://www.skm.dk/foreign/english/taxindenmark2007/5344/

[51] Interview with

the Honda Civic, are already more expensive than traditional cars. This price is then tripled when registration taxes are added. While these cars save on fuel consumption, the economic benefits are not passed to members due to the high registration fees. Members expect to pay less for fuel efficient cars than their mid-size car counter-parts because they do not use as much fuel, and rightly figure that they should be saving on price/km by driving a more environmentally friendly car. In Appendix F there are notes from each of the three focus groups where members suggested they would expect that hybrid vehicles would have a lower price/km.

Currently, Hertz is the only car share organization in Denmark with a Toyota Prius in its car share fleet. The Prius is in the same price range as other mid-sized cars that use more fuel/km. If the same registration taxes that apply to taxis were applied to new, more fuel efficient vehicles for car sharing, prices could be lowered and the savings on price/km of fuel could be passed on to members. With this kind of incentive, members would be more inclined to use these cars as long as they are well placed and fit the members' needs as seen in Figure 8.

As more hybrid and fuel efficient cars are seen on the roads, more consumers will become interested and realize that they are available and desirable. Private owners may begin to sell their older cars in exchange for the new hybrids and fuel efficient cars, which will save on national fuel consumption. Others may opt to sell cars and become car share members, which will save not only on fuel consumption, but will also alleviate traffic and public parking congestion.

RECOMMENDATIONS

Vehicle Recommendations:

At this time, the needs of car share members call for mid-sized cars suitable for both city driving and longer family trips. Currently, the most environmentally friendly cars that are suitable for members' needs are hybrid vehicles. Models such as the Toyota Prius and the Honda Civic provide a mid-sized, family oriented vehicle. Its hybrid engine saves on fuel in cities, and gets excellent fuel efficiency on longer, motorway trips. We recommend either of these vehicles be incorporated into car sharing fleets in Denmark to increase fuel efficiency of car sharing.

Marketing and Member Education:

Driving a hybrid vehicle is a relatively new concept that many Danes may not yet be familiar with. If vehicles such as the Prius and the Civic are purchased for car sharing fleets, we recommend that car sharing arrangements should organize both advertising and member education programs to make their membership more aware of the new options available to them.

Advertising within car share programs will ensure that members are aware of the more environmentally friendly vehicles that are now available, and will also get members excited about using the new cars, saving on fuel costs, and helping the environment. Such marketing may include ad campaigns, emails and/or newsletters to members, and possible incentives for trying the new vehicles.

Member education will ensure that individuals are more aware of some of the nuances of hybrid vehicles, such as pushing a start button instead of turning a key. Member education may incorporate a short evening class introducing the features of the

car, its efficiency, and other important information so that members feel more comfortable about renting a hybrid vehicle. After hybrids have been part of the car share program and members become more comfortable with the cars, courses may be cut back and replaced with other less staff intensive educational methods. One member who participated in our focus group suggested a "Top 10" list of things to remember when driving a hybrid be placed in all these cars, and also online so that members have easy access to quick instructions. This is one form of member education that could be used after courses have been offered.

The key to member education is that the CSO needs to provide plenty of hype regarding the introduction of efficient vehicles. Members should be aware that these vehicles are probably going to be a big part of the future and realize just how much more efficient and environmentally friendly they are. We found that many members would be willing to take steps to learn these new vehicles if they understood the impact they can potentially have.

Government Recommendations:

Since we have arrived in Denmark, new legislation has been passed altering the tax structure for car ownership. Legislation is heading in the right direction, but incentives are still needed to make purchasing of hybrid cars feasible. Special tax breaks are given on purchases of taxis, which provide an alternative form of public transportation. Car sharing also provides an alternative form of public transport, thus we recommend that car sharing organizations pursue a change in tax structure so that car share vehicle purchases are taxed at a similar decreased rate as taxi purchases. Such a change will require that "car sharing" be more defined so that tax breaks benefit

appropriate groups. Decreased taxes on car share vehicle purchases will allow the Danish car sharing arrangements to purchase hybrid cars without having to pass a high registration tax onto their members.

Our group has composed a case that may be used by Danske Delebiler as a starting point to make a proposal to the Danish government to reform the tax structure of car purchases for car sharing organizations and to propose incentives for purchases of hybrid cars for car sharing organizations.

Case for Tax Break:

Proposal: Introduce a tax break for Car Share Organizations purchasing environmentally friendly vehicles.

Definitions: These would need to be well defined before presenting the case

-Tax break- 1/3 of the current tax would bring the cost of a Prius to relatively the same price as a gasoline Fabia

-Car Share Organization-

-Environmentally friendly vehicle- A vehicle which is rated for over 21 km/l and meets high emissions standards in regard to CO_2, CO, NOx and particulate matter.

Argument:

It is understood that the current tax on vehicles in Denmark is a necessity in the financial operation of the country. The new legislation is effective in pushing for consumers to purchase more fuel efficient vehicles but is not sufficient in regard to highly efficient vehicles such as hybrids. These vehicles produce significantly better fuel

economy and the lowest emissions of any gasoline vehicle without sacrificing vehicle size. This makes hybrids the most environmentally friendly vehicles capable of satisfying the needs of most consumers.

What is proposed is that the tax on highly efficient vehicles be reduced for car sharing organizations so that these vehicles can compete with traditional cars. It is not being asked that the tax be eliminated but simply reduced to encourage more environmental vehicles. The following reasons support why it would be beneficial to assist the introduction of hybrid vehicles into Danish car sharing.

Car sharing removes vehicles from the streets of cities without impacting the revenue gained from vehicle taxes. Many car share users join because it is cheaper than traditional vehicle ownership. Members do not typically use the vehicles every day and when they previously owned vehicles they were typically older less expensive vehicles. By using car sharing these members now have access to nicer vehicles and potentially more environmentally friendly vehicles, if they could be made available, than what the customer would be able to purchase on their own. Since the vehicles are shared it means the lifetime of the vehicle, in respect to time, is decreased. This suggests that even though there are fewer vehicles on the road, nearly just as many vehicles would be purchased and the vehicles purchased would be of higher cost. This also inherently helps to improve situations in cities regarding parking and traffic. With car sharing, a single vehicle parked in the city can replace numerous personal vehicles. Also the number of vehicles which can be used at any one time is limited by the number of cars each CSO owns, since very few members own a personal vehicle after joining a CSO. The availability of vehicles limits the amount of traffic at all times.

By reducing the taxes on environmentally friendly vehicles only for CSO's there will not be a significant drop in tax revenue. In reality the government would still see a comparable amount of revenue for each vehicle purchased but the CSO would be getting a vehicle worth more. We can use the Toyota Prius and Toyota Aygo to provide a quick example, all numbers are rounded to the nearest thousandth. The Prius is an advanced hybrid vehicle while the Aygo is a small efficient vehicle. The current cost of a Prius before taxes is 143,000 Kroner and the Aygo 41,000 Kroner. These are both examples of alternative environmentally friendly vehicles. In order to make the Prius in competition with similar vehicles the price would need to be roughly 220,000 Kroner which makes tax revenue come out to 77,000 Kroner. While the typical tax revenue of an Aygo would be around 81,000 Kroner. Because this reduction would only be available for CSO's the decreased revenue would be a small price to pay (4,000 Krone per car) for how much more environmentally friendly these vehicles are.

Making these vehicles cheaper for car sharing is not going to otherwise impact the purchasing of vehicles by the public. The purpose of this incentive is not to actually decrease the cost of car sharing but to simply lessen the impact of using a vehicle on the environment. It is understood that it would not make sense for the government to introduce a tax incentive which would provide an alternative that drastically reduced the purchase of vehicles. Car sharing by nature does not meet everyone's needs. For example a person who uses their vehicle every day or likes the convenience of a vehicle right outside their door would not be willing to join a CSO. Car sharing is also not practical for people who live in rural areas. For these reasons people who currently purchase vehicles privately would still do so.

Furthermore, by assisting car share organizations to introduce these vehicles it will increase the general awareness in regards to hybrid vehicles. Study within Danish car share organizations has shown that few people even realize that hybrid vehicles are regularly produced and available. Putting more of these vehicles on the road through car sharing allows many people to learn how to use these vehicles since they are slightly different from traditional vehicles.

In conclusion, assisting in the introduction of these vehicles into car sharing would greatly help the environmental impact of driving a vehicle. Providing a tax break for CSO's purchasing one of these highly efficient vehicles can have a significant impact on the environment and car sharing without greatly damaging the revenue gained from car sales.

Future Recommendations:

In 2009, the EU will enforce new emissions standards. Emissions filters that will largely eliminate NOX and particulate matter will be required for all diesel vehicles. At this time, diesel vehicles will likely be an excellent option for car share arrangements seeking to improve environmental efficiency. Diesel cars already have excellent fuel efficiency, but their toxic and high level emissions currently make them an unfavorable choice.

Depending on membership and market trends, electric cars may also become a viable alternative. Electric cars are excellent for short, in-city trips, but are not suitable for the longer trips that many car share members currently take on weekends. If member driving trends shift to show more in-city use, car share organizations should consider

incorporating electric cars into their fleets that are specifically for city and/or short trip use.

There is an addendum to this report in which individualized charts and recommendations were given to the eleven individual Car Share Organizations that comprise Danske Delebiler. For reasons of confidentiality these reports are not included or available with this report. However, there is a sanitized, i.e. with names removed, sample of one such Car Share report to give readers some idea of the information and suggestions provided to the CSOs. That sample can be found in Appendix I.

WORKS CITED

Barrett, Rick. "Fuel Sipping Smart Cars may Rival Hybrids." Milwaukee Journal Sentinel 1 Oct 2006 2006, sec. Business: 1.LexisNexis14 Feb 1007.

Briceno, Tania et al., "Using Life Cycle Approaches to Evaluate Sustainable Consumption Programs." *Norwegian Program for Industrial Ecology*, 2005. Available: http://www.indecol.ntnu.no/indecolwebnew/publications/papers/workingpaper05/workingpaper2_05web.pdf

Burkhardt, Jon et al. "Car Sharing: How and When it Succeeds." TCRP Report 108, 2005 Available: http://www.trb.org/news/blurb_detail.asp?ID=5634

Byrne, Michael R., and Michael J. Polonsky. "Impediments to Consumer Adoption of Sustainable Transportation and Alternative Fuel Vehicles." *International Journal of Operations & Production Management*, 21:12 (2001): 1521-1538.

Chan, C. C. "The State of the Art of Electric and Hybrid Vehicles." - 90.- 2 (2002): - 275.

Chon, Gina. "Cleaning Up Diesel's Image." The Associated Press 29 Nov 2006 2006, sec. Business News:LexisNexis13 Feb 2007.

Danish Environmental Protection Agency (DEPA). "Evaluation of Car Sharing in Denmark." Environmental Project No. 572 (2000). Available: http://glwww.mst.dk/publica/projects/2001/87-7944-312-5.htm

"Danish Tax Ministry":http://www.skm.dk/foreign/english/taxindenmark2007/section1howistaxrevenuegenerated/

"Danish Tax Ministry" http://www.skm.dk/foreign/english/taxindenmark2007/5344/

"Danske Delebiler." . <http://www.danskedelebiler.dk/>.

European Commission, 2001. European Transport Policy 2010, Brussels.

"ETA Car Buyers Guide." . 2007. <http://www.eta.co.uk/>.

Fischer, Carolyn. Kerr,Suzi. Toman, Michael. "Using Emissions Trading to Regulate U.S. Greenhouse Gas Emissions: An Overview of Policy Design and Implemntation Issues." (1998):

Gleisner, B.B.. "Cars, carbon, and Kyoto: evaluating an emission charge and other policy instruments as incentives for a transition to hybrid cars in New Zealand." New Zealand Journal of Social Sciences Online 1(2006): 81-89.

“Handbook for IQP Advisors and Students”. < http://www.wpi.edu/Academics/Depts/IGSD/IQPHbook/>

Heiskanen, Eva. Jalas, Mikko. "Can Services Lead to Radical Eco-Efficiency Improvements? - A Review of the Debate and Evidence." Corporate Social Responsibility and Environmental Management 10(2003): 186-198.

Homeister, Nancy L. "Vehicle Emissions Standards Around the Globe." Ford Motor Company. 27 July 2001 2001. 28 March 2007 <http://www.worldenergy.org/wec-geis/global/downloads/NZConf/03.pdf>.

"Honda of Denmark." . <http://www.honda.dk>.

Incantalupo, Tom. "Combining Cleaner Diesel Fuel with New Technology could Result in a Car that Gets 90 Miles to the Gallon." Newsday 24 Oct 2006 2006, Nassau and Suffolk ed., sec. Business & Technology: A59.LexisNexis4 Feb 2007 <http://web.lexis-nexis.com/universe/document?_m=59610d44c2890a526a49c067256ecadf&_docnum=9&wchp=dGLbVzb-zSkVb&_md5=90fff9cb7dba33b83a602836dc9f1229&taggedDocs=Z2,8Z29,>.

Jaccard, Mark. Sustainable Fossil Fuels: The Unusual Suspect in the Quest for Clean and Enduring Energy. Cambridge: Cambridge University Press, 2005.

Karl, Thomas R., et. al.. "Modern Global Climate Change." Science 302(2003): 1719-1723.

Koerner, Brandan I. “Rise of the Green Machine.” Wired, Apr. 2005, 96-105

Meijkamp, Rens. "Changing Consumer Behavior Through Eco-Efficient Services: An Emperical Study of Car Sharing in the Netherlands." Business Strategy and the Environment 7(1998): 234-244.

Nicolai, T.. "Pollution, environmental factors and childhood respiratory allergic disease." Toxicology 181-182(2002): 317-321.

Nielsen, Lars Henrik, and Kaj Jørgensen. Electric Vehicles and Renewable Energy in the Transport Sector- Energy System Consequences. Roskilde: Risø National Laboratory, 2000. 5 Feb 2007 <http://www.risoe.dk/rispubl/SYS/syspdf/ris-r-1187.pdf>.

Rank, Jette, Jens Folke, Per Homann Jespersen. "Differenes in cyclists and car drivers exposure to air pollution from traffic in the city of Copenhagen." The Science of the Total Environment 279(2001): 131-136.

Simon, Bernard. "Motorists Gear Up for Switch to Clean-Burn Diesel Fuel." Financial Times 13 Oct 2006 2006, 1 ed., sec. The Americas: 6.LexisNexis14 Feb 2007.

Spadaro, Joseph, V., Rabl, Ari. "Damage costs due to automotive air pollution and the influence of street canyons." Atmospheric Environment 35(2001): 4763-4775.

Strattan, R. D. "The Electrifying Future of the Hybrid Automobile." - 23.- 3 (2004): - 7.

"US Fuel Economy." . 5 Feb 2007 2007. <http://www.fueleconomy.gov>.

Zipcar, “Environmental and Community Impact.” Oct. 2006. Accessed Feb. 2007. Available: http://www.zipcar.com/press/onlinemediakit/environmental_and_community_impact.pdf

INTERVIEWS:

3-14-07 Interview with Martin Lidegaard of Danish Parliament

3-16-07 Meeting with Danske Delebiler

3-19-07 Interview with Morten Franch, the director of Århus Delebilklub

3-26-07 Interview with Mr. Henriksen, Fleet Manager of Hertz Delebilen

3-29-07 Interview with Villads Hansen of Kobenhavn Delebiler

3-30-07 Weekly Meeting with Project Group and Sponsors

4-10-07 Weekly Meeting with Project Group and Sponsors

4-13-07 Weekly Meeting with Project Group and Sponsors

4-23-07 Weekly Meeting with Project Group and Sponsors

4-30-07 Weekly Meeting with Project Group and Sponsors

APPENDICES

Appendix A: Surveying and Interviewing[52]

Surveys are powerful means of gathering information when properly implemented. Several factors such as sampling, response rates, the wording of questions, type and design of a survey, and how the survey is used affect the accuracy of the data collected.

It is important to select an appropriate sample for a survey to ensure that it is representative of the population being analyzed. Subjects should be selected randomly. Sample size depends upon the size of the population being surveyed, and how much sampling error is acceptable for the study. Sample size increases as smaller margins of error are acceptable.

The response rate is the number of responses to the survey. Ideally, this number should be high, and close to the actual number of surveys administered. If too few responses are collected, the data may not be accurate – it is reasonable to assume that non-respondents may have returned different opinions or answers than respondents. Non-response error can be decreased by calling (if for a telephone survey) or mailing (for a mail survey) multiple times until a large enough response is obtained. Demonstrating that their response is important will also help to decrease non-response error. Generally, a good response rate is between 60% and 70%. Often times, mailings and phone calls will have to be done several times to receive an acceptable response rate. Attaching a cover letter to a mail survey, and making it clear within the first couple of questions that the data being collected from participants is important will help to increase the response rates, as well.

[52] "Handbook for IQP Advisors and Students". < http://www.wpi.edu/Academics/Depts/IGSD/IQPHbook/>

Telephone and mail surveys are the two most common types of surveys conducted. When choosing which type of survey is most appropriate, researchers should consider the amount of time available and also the resources available. Mailings typically take several weeks and substantial monetary resources to conduct, but don't require much labor after surveys are sent out. Telephone surveys do not cost as much and can be conducted in a short period of time, but require people to make the calls and administer surveys to participants. Researchers should also consider the complexity of the questions, and if participants will be more likely to respond on paper or in person. Questions that may require explanation are best reserved for telephone surveys, while questions that participants may feel uncomfortable answering to another person should be posed in a mail in survey. Also, any questions that would be easily biased in a discussion or explanation should be asked in a mail in survey.

Types of questions that should be included in a survey include demographic questions, background questions for the subject matter being surveyed, and questions to gather data on the topic being researched. All survey questions should be straight forward and easy to answer without much explanation. Questions can be opened-ended (ie. free response) or closed ended questions. When a longer explanation is needed for a question, open responses are appropriate. They should be used in moderation, however, as free response questions take more time to answer – a survey of all open response questions may turn a participant off to taking it. When wording questions, it is best to seek answers about people's actions rather than their opinions. Doyle states that people often don't know their opinions, and opinions are subject to change. Data collected on actions will be a more accurate representation of a population's attitudes on a particulate issue.

Doyle strongly recommends "debugging" all questions that will be included in a survey. If a question passes the seven questions below, it is likely a good survey question:

"1. Is the question one which respondents can easily answer based on their experience?

2. Is the question simple enough, specific enough, and sufficiently well-defined that all of the respondents will interpret it in the same way?

3. Does the question contain any words or phrases which could bias respondents to answer one way over another?

4. Is it clear to respondents exactly what types of answers are appropriate?

5. Does the question focus on a single topic or does it contain multiple topics that should be broken up into multiple questions?

6. Are any listed response options mutually exclusive?

7. Are any assumptions implied by a question warranted?[53]"

To get a good idea of how to compose a survey, a researcher might consult previously conducted surveys that were well received by the group of participants. Surveys should also be pre-tested to ensure that questions are worded clearly, and that there are not mistakes in the survey before it is given to participants. In a pretest, a small group of people takes the survey, and then reports back to researchers what they were thinking about while answering questions. Pre-testing can also help to identify and remove any unintentional biased in questions.

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[53] "Handbook for IQP Advisors and Students".< http://www.wpi.edu/Academics/Depts/IGSD/IQPHbook/>

There are a few ethical considerations that must be addressed before any survey is given. Participants must be told, and must feel that their response to the survey and to any question is voluntary. Confidentiality of participants must be protected, and their identities should never be presented to the public, nor associated with their responses. Lastly, if any promises (such as access to the final results of the survey) are made to participants, those promises must be kept.

Interviews are another method of collecting data. Interviews are appropriate for situations where narrative answers are needed, such as gathering information on cultures, history, and life experiences.

Interview questions may be composed in a similar manner to survey questions. An interview allows for greater explanation of questions, however care should be taken that an explanation does not introduce any bias.

A researcher may gain valuable information from people's non-verbal cues, such as how they dress and how they speak. It is important that the interviewer does not present many non-verbal cues, as this may introduce bias. The participant may be swayed to take the interview more or less seriously depending on how the interviewer is dressed, and if he or she is acting in a professional or a more casual manner.

There are three main types of interviews: in-depth qualitative interviews, focus groups, and standardized interviews. In-depth qualitative interviews are unstructured, and are more conversational than the other interviewing methods. In this type of interview, it is important to keep an accurate record of what questions are asked, and what the participant says. Records are easily taken with a tape recorder, which allows for the

interviewer to focus more on the conversation and the participant's actions than on note taking.

A focus group is similar to a qualitative interview, with several people having a discussion about a topic of interest. In this interview format, the interviewer guides discussion, but mostly observes and records participants' reactions, interacting as little as possible. Focus groups are best used when a topic is likely to generate extensive discussion.

A standardized interview is structured and follows a strict format. This type of interview is similar to a mail or telephone survey.

The same ethical concerns involved in conducting a survey must also be taken into consideration with interviews. It is important to assure confidentiality, and to obtain consent before the interview is started. As with surveys, any promises made to participants must be kept.

Appendix B: Zipcar Interview Questions

Zipcar Operations:

What are the most recent numbers of Zipcar members and vehicles?

How quickly is membership growing in the U.S. and in London?

Which cars are most popular with Zipcar members?

Have you received any feedback about why members prefer certain cars?

How is the car sharing business in London different from that in the U.S.?

Zipcar and Hybrid/Alternative-Fuel Vehicles:

How do hybrid vehicles fit into the Zipcar fleet compared to conventional vehicles?

How do you choose which vehicles to buy with regards to hybrid vs. conventional vehicles?

Do customers tend to use exclusively hybrid or exclusively conventional, or switch based on availability/convenience?

Have hybrid vehicles always been a part of the Zipcar fleet? If not, when, how, and why were they integrated?

Has the introduction of hybrid vehicles caused any noticeable reactions (i.e. increased membership, member satisfaction)?

Is the Ford Escape a hybrid?

Have you considered using electric cars? Why or why not?

Zipcar's Environmental Policy:

What is the company's general policy on environmental friendliness?

What priority are environmental concerns compared to other concerns (cost, availability

of new cars) for Zipcar as a company? For your membership?

What kind of government incentives or partnership opportunities does Zipcar receive for using hybrid or high efficiency cars?

What are your plans for the future with regards to increasing the fuel efficiency of your fleet?

Appendix C: Interview/Meeting Notes

14-3-07 Meeting at Parliament

Martin Lidegaard – social liberal politician (radikale venstre) very progressive movement with lots of freedoms for ordinary people.

- *last week – as in week before we got here* meeting on energy saving goals. See if we can get a hold of this article
- Car taxing is a huge issue in Denmark, 200% mark up. Car shares pay the same tax.
- Best incentive: reduce tax rates for newer cars
- Bio ethanol cars (favored solution by some): can't do it everywhere however-> doesn't solve the problem entirely because of agricultural biomass and overuse of land (Denmark doesn't have the landmass that the United States does!)
    - Also more efficient to burn (85% more so) hay for heat than to make bioethanol.
    - Less CO2 from burning than burning as bioethanol.
- Favors car sharing and electric cars.
- Contact Prof. at DTU – article in 13.03 paper that we should try to read.

16-3-07 First Meeting with Danske Delebiler

- clarify goals of project vs. goals of Danske Delebiler
- Switzerland car share founded in 1948, sparked from shortages after the war
- Mention City Car Share, and then mention they are non-profit
- No paperwork thing is an all car share thing
- Convert $ to Kr.
- Get info for Danske Delebiler similar to what we got for Worcester
- Look at benefits slide: number of cars, reduced fuel consumption not always true
- We should obtain and read the old IQP more carefully for any extra information
- VW lupo 34 km/L
- Clarify emissions permits and include information about emissions regulations n Denmark
- Tax incentives renewal early adopters who would be buying hybrids anyway – why?
- Ministry of Traffic = more info on politics
- Tax system changed from weight tax to green tax (mild shift) small part (our equivalent of excise tax) reduced.
- Look into government energy plan
- Bioethanol. Environmental and traffic politics and history
- Fleet manager of hertz -> idea of cars in Denmark that are available
- Traffic Agency of Denmark: Lists all available cars in Denmark

- Copenhagen Delebiler uses 100% diesel due to long trips outside of the city – is that correct??

19-3-07 Meeting in Århus

- March 1998 founded. Oct. 1998, with 38 members and 5 cars
- Reservations: booking online (as of 2 years ago)
- *maybe think about having a Danish and English version of the power point?*
- So many bikes because of $ reasons, not so much environmental reasons
- Maybe tax cut just for car sharing purposes?
- Traffic: both pollution and congestion problem in Denmark
- *Zipcar 1:20 car reduction rate not really the same case in Denmark
- Hertz, Farum, Århus: biggest car sharing companies
    - Hertz more for business use, Århus more for private use
- Started by leasing cars through Euro Car
- Copenhagen car share started same concept as Farum
    - Now lease cars (as does Århus) from Euro Car
- Danske Delebiler unifies car share programs for political goals
    - Århus worked with City Car share to get a system like Inverse (also Copenhagen Car share). More companies are interested.
- City Hall- Århus car share "reserved" parking, only a few months. City Hall couldn't continue (police afraid of problems w/ car share exclusive rights).
- New law: special deals for car share companies up to each city. Not in Århus, but yes in Copenhagen
    - Current traffic minister doesn't believe in car sharing
- Århus has slips filled out every time you drive: date, car, km, and type of trip. They do the same thing in Copenhagen
- Target group of customers is 30-50, composing 65% of membership. Too expensive for students and student rebates would push young people to drive more than they already do.
    - Mostly weekend use. Week use needs to target businesses and elderly
    - Many Danish companies have an environmental clause written into their mission statements
- Must have 40% average booking
    - Summertime peaks. People take cares for extended periods of time
- 230Kr. Monthly memberships (30 Kr. Insurance). No deductible for accidents
- Talk to Eric Jensen
- Diesel cars are very popular in Denmark and newer filter systems aren't yet commonly used.
- Cars: Fiat Punto, Skoda Fabia, Citroen Berling, Peugot Partner, Toyota HiAc
- Odense – first car share
- Farum – 10 miles north of Copenhagen, one of the biggest, different kind of company.

26-3-07 Meeting with Hertz Delebiler

- Danish Car share started in 1997 non-profit
- Hertz car share founded in 1998, Oct. 1.
    - Got a call from city of Copenhagen because of parking and city traffic problems
    - 11 "places" with 24 cars were set up. Places of cars were based on the # of private flats in the area
    - No one knew about car sharing. Getting people educated about it is still a major issue
    - No there are 24 places with 55 cars
- Now 3,000 members, potential for 50-60,000 members. Now 85 cars, 90% used for personal use, 10% used for business reasons. 80% use car sharing because it is cheaper.
- Hertz policy: 7+ people want a car placed in an area and Hertz will place the car central to the 7 people
- Had Prius for 1 year. Prius too expensive for private owners, it's not easy to drive, people "don't know how to start it", not very user friendly
    - The Prius is used, but not any more than any other car sharing cars, likely because of driving difficulty. People don't really understand the environmental aspects
    - Prius is 350,000kr. After taxes.
- Comparable cars cost 210,000kr. Far less than the Prius
- No Honda hybrids in Denmark yet
- Fiat Panda is the cheapest car to rent. 18.5 km/L
- Fabia most popular because of space
    - Rented my many members that have families
- A cars: 22dkr/hr
    - Ford Fiesta: 16.9 km/L
    - Fiat Panda: 18.5 km/L
    - Fiat Punto: 17.5 km/L
    - Renault Clio: 16 km/L
- C cars: 28dkr/hr
    - Skoda Fabia: 15 km/L
- Cars always sold out on the weekends
- Car share mostly because it's cheap, not or environmental reasons. People still don't seem to use the Prius even with consumer education
- Reduced taxes could make reduced prices, getting members more used to hybrid vehicles
- FDM – car owners organization. They point out problems with taxation laws
- Electric cars are not used
- Car ownership is a status symbol in Denmark
- Taxi prices (taxes) are cheaper (1/3); unfair competition for car share programs

29-3-07 Meeting with Villads of København Delebiler

Questions:

- booking and billing
- key system
- Why diesel cars?
    - What kind of results have you had with these cars?
- Future plans for expansion?
- What do people think about the VW Lupo?
- More about the history of Danske Delebiler?
- What kinds of trips to members typically take?
- What does "good gas mileage" translate to here?
- Get old IQP book to look over.

Meeting Notes:

Defining points of organization
- differ in size. Largest of non-profit CSOs

Booking and Billing:

- old fashioned, planning on switching to same system as City Car Share in San Francisco
- current system is from Farum
    - all manual entries by hand
    - lots of room for error, not designed for a large organization

Booking Process

- book on website and check car availability
- book car (days to weeks in advance)
- go to location of car and find key box (not always right near the car)
    - one car has been stolen, and was later found
    - Århus has had 3 cars stolen
- Get the right key for your car (suggested to print reservation so that you take the right key for your reserved car)
    - Sometimes problems arise with members taking the wrong car
    - Some designated parking places, but not always (have to get them through DD negotiations with the city of Copenhagen, and pay DD a fee for negotiations with the city).
    - Members are encouraged to leave a slip of paper saying where the car is when they return it.
    - Sometimes have to call emergency line to find out where a car is
        - Other members are sometimes late
        - Late member may have to pay for a taxi for the other member
        - Encouraged to call if late

        - Also possible wrong car is taken. Then member with the wrong car is billed twice: once for the car they booked, and once for the one they are driving
- Cars typically parked in groups of two or more
    - Skoda Fabia (majority of fleet)
    - VW Polo
    - VW Lupo
    - Ford Transit (large van)
    - VW Cady (7 seater)
    - 1 gas car, but not often used unless switched with other cars
- No stats (current) on driving patterns

Expansion:
- joining with Århus to make fund
    - met with chairman of Århus (Morten French)
    - fund to finance new booking system from city car share
    - also to become large enough to keep low prices when they get newer cars
    - **look at Euro Car to se what types of cars are available
- Cars are leased on a 3 yr. basis, then they get new cars. Hoping to reduce price by working with Århus.
- Lupos are not very popular with customers. Not used to automatic cars. Engine stops at stop lights for better fuel economy. Some sorts of reasons customers don't seem to like the Prius.

- using diesel cars for better mileage
- hoping to get more Skoda Fabias
    - diesel cars wont be up to emissions standards until 2009
- VW polo (3-4 at KD) is a smaller car
- Recently been discussing electric cars. New Norwegian model coming out
    - Reserved lots for electric cars with free electricity were built at one point. Most are still around, but aren't used.
    - Response would depend on how difficult it is to drive the electric car
    - Early members of KD joined for environmental reasons, but later members for economic reasons. May soon see a shift back to environmental reasons

Tax System:
- check if tax ministry website is in English
- Kathleen Seymour – see if she knows anything about it

- Opal Mervia – new cars being introduced for Easter and the summer months

30-3-07 Weekly Meeting Minutes

Agenda:
- Briefing on survey
- Focus Groups
- CSO visits
- Contacting government authorities (will email Monday)
- General plan for remaining weeks

Surveys:
- questions that were omitted from survey will be included in focus group questions
- survey needs to be retranslated to English
- be aware in survey analysis that multiple checks on questions were not possible.
- Get a hold of SBSS or SAS to be able to do thorough analysis of survey data
    - Possible to get through WPI?
    - Available at DTU?
- Confidentiality:
    - Only students will have access to all data
    - CSO data will go to individual CSOs, and overall data will go to CSOs
    - Confidentiality statement will be drafted and sent out this asap
- Data needs to be backed up on CD or thumb drive asap (completed)

Focus Group:
- need to look at demographics to determine appropriate locations for focus groups
- multiple times depending on demand
- look at how participants answered survey questions and build from there with focus group questions
- 10-12 people per group. Call 15 max. Focus groups could be scheduled in evening or late afternoon, with 2 to 3 sessions held to accommodate interest
- Set of focus groups in week 4, after Easter
- Run focus group in English, sent notice to participants that this will be the format
- Look into transportation expenses and feasibility of holding focus groups outside of Copenhagen

CSO Visits:
- Farum
- Køge
- Munksøgård
- Do phone interviews or email discussions with all CSOs
- Visit at least one small CSO for comparison
- Trying to do visits/phone calls next week before Easter break
    - Talking to groups about CSO aspirations and plans for expansion, how the program is set up (leasing vs. buying cars), and if they feel they have a role in contributing to improving the environment
    - Mention Climate Conference in Denmark, 2009 – how do CSOs see themselves in relation to this?

Contacting authorities:

- Contacting Martin Lidegaard. John Z. has emailed, we will email on Monday
- researching current political system at EU level and Danish level – what are current and future regulations
- What is the current political state of these issues?

General Plan:

- focus group moved to first full week after Easter (week 5)
- week after Easter – analysis of survey results, work on questions and forming focus groups
- next week – visiting/calling CSOs

4-10-07 Weekly Meeting Minutes

Agenda:
Survey translations
Focus group schedule
Filters for survey
Final presentation time
Friday 2pm meeting agenda

Notes:

- one woman unable to take survey. We will contact here with an alternate solution if she still wants to take the survey.
- Write email to CSOs for "ordinary member" numbers. Send to Carsten to sent out
- Also compose thank you for CSOs

Analysis

- 1st round of filters up to us, send to Carsten
- Get email for any survey results – what kind of things are the CSOs looking for and hoping to learn from the survey?

Focus Groups

- 1 meeting for Århus
- 1 meeting for outside Copenhagen
- 2-3 meetings in Copenhagen (1 with Hertz, 1-2 with all Copenhagen members)
- Next week: Monday through Thursday (16th-19th) from 5-6:30pm and 7:30- 9pm
    - Try to get money to go to Århus
    - See if we can get a rental car to go outside Copenhagen
- Contact host CSO sabot hosting focus groups, then contact individuals. Draft emails tonight and send out.
- Assign note takers and discussion leader
- Email Carsten tonight with decisions about focus groups and draft email for CSOs

- final presentation at DTU on 8th in the afternoon (2/3pm)
    - Århus, KD, Hertz, JZ, DTU, any others who want to attend
- Friday meeting: presentation of analysis, presentation of new information
- Signed Agreement of Confidentiality. Copy in office at KD, will be given to Liselotte on Friday
- We have been invited to have space to work at KD
- Make sure in surveys that "organization" is translated to "arrangement"

4 -13-07 Weekly Meeting Minutes

Present: John Z., Alex, Kyle, Carsten, Gen, Michael

Agenda
- Data Presentation
- Focus Groups
- Final Presentation
- CSO visits

Data Presentation:
- calibrate figures with numbers from CSO
    - ordinary members
    - KD – 356 ordinary members
- 4.2: access to car against duration of membership
- Make everything we can and think about individualized reports for the final deliverable
- 5.2 cross tabs with CSO and in town/out of town
    - Interesting not used for picking up children
- 5.3 cars not used much for commuting and business, also not much for picking up children
    - Cross tab: sold or don't have a car
- 5.4: cross tab with 3 latest trips??
- 6.3 cross tab with individual trips
    - Location of vehicle important
    - Vehicle familiarity MUCH lower than expected
        - May not be considering the Prius (only Hertz) and the Lupo as something that wouldn't be familiar to them
- Consider "mapping" cars to see how far members have to travel to get to a vehicle
- Trip study
    - Kopje data is somewhat strange
        - May be interesting to reanalyze without long trips
        - Look at where the longer trips came from (what CSOs)
- 14.3: go to Hertz/København: list of business members
- 15.3: cross tab with other environmental interests of businesses
- 6.1/15.1: cross tab with membership duration

    - Don't need many businesses to balance week day/weekend
- 6.2/15.2: correlate with location of car
    - Businesses seem to be able to get car more often -> revering for a weekday vs. a weekend
    - Cross tab with environmental friendliness and location (?)
- See Carsten's notes on the survey. Please add your own.
- For 3 pros and cons to Carsten and see if other CSOs want them as well.
- See about confidentiality and cross tabbing different CSOs with each other

Focus Group:
- maybe 2nd interview with Århus over the phone? No focus group
- talk and get phone number for Albertslund – got number and email from Carsten on Friday
- Please make not to CSOs that only three students will be present in the room when focus groups are being conducted.

Final Presentation:
- May 8th at 3pm, at DTU. Please mark your calendars
- Inviting other CSOs
- Michael will email with room capacity and room location

CSOs:
- meeting with Bryggebilen as soon as possible

General:
- trying to get in touch with Martin L. to talk more about political situation and possible government incentives
- will be visiting dealerships. At this point, we have a pretty good feel for the car market in Denmark
- look at if diesel are most suitable for the trips that customers are taking
    - how will this be affected in 2009 when particulate filters are required on all cars?
- Interesting that people point to global warming but not local air pollution as a major environmental issue
- Actual #s with CO2 and NOX output might be interesting for marketing newer cars to members
- Electrical cars not mass produced yet. Mostly good for city driving
    - Not so great for highway driving or long distances
    - Also may cut down on productivity of CSOs because cars will need to be charged. Money lost in time charging may not balance with the price of the car.
    - Not yet a feasible solution

Next meeting:
Monday April 23rd at 2pm at Kobenhavn Delebiler

4-23-07 Weekly Meeting Minutes

Present: Gen, Kyle, Alex, Carsten, Liselotte, Michael, and John

Agenda:
1. Debriefing of Focus Groups
2. Results
3. Case for Government

- consider looking at report from Carsten for survey of all Copenhagen CSOs from last year
- discussed results of focus group
- discussed results in paper and cross tabs thus far
- cannot say that focus groups confirm what we found in the survey because it's the same people
- send out notes from focus groups to everyone (is this breaching confidentiality??)
- understand each member who participated in the focus groups as a "mini case"

- people who joined car share are either forced or by nature very organized. Point that Carsten made that we should keep in mind.
- (Carsten) calculation of economy of hybrid cars. More expensive to buy but fuel economy may outweigh the initial cost (Kyle will put numbers back into the paper).
- Discussion today in government about tax regulations. Watch papers for any news articles
- Possibility of talking to the government to get their current position on the tax structure.
- Working on outline for DD to possibly build on to take to the government
- Ultimate point: Now we know habits/desires of members, then suggest cars, show a break even point w/prices and taxes to show to the government

- Kyle presented case that is being built for the government. Case may make a big fuss with private owners, may be better to argue for tax breaks for all hybrids, not just CSOs.
- w/incentive for "car sharing" we run into the problem of how car sharing will be defined. Danske Delebiler is still working on this
- important to discuss supply of cars, reliability, how manageable they are
- member course at KD was lots of work and lots of people didn't want to do it. Lupo course provided at VW. Hertz has directions in the car on how to use it.
- Cars need to be hyped up! Need to get members interested in using them
- Know what is available in the car market
- Should get pros and cons translated and analyze by category – get someone outside of project to translate everything if CSOs won't

- Don't break down compared results y CSO. This shouldn't be public because it is market analysis
- Make individual analysis of survey for each car share (start immediately!)
- For overall results, keep very general and do individual reports so CSOs can compare.
- Ask Munksøgård about putting their private data and analysis into the report. Consider taking out Munksøgård from other data because they are a clear outlier when everything is separated by CSO
- Consider grouping results by city, suburbs, and town, which could be helpful to actual report. Draw conclusions from individual reports, and just can't put them in the final paper.
- Change current results and send out asap!

NEXT MEETING: Monday April 30th at 3pm at København Delebiler.

4-30-07 Weekly Meeting Minutes

Present: Kyle, Gen, Alex, John, Michael, Liselotte, Carsten

Agenda:
- Discuss what is finished with the paper
- CSO individual reports
- Results presentation
- Final delivery/printing of the report

Final Report:
- pdf. File
- cd
- printed copies for each CSO, sponsors, and WPI

Results:
- fix names in first table to say car share names
- make sure tables are clearly labeled in results so they are understandable
- double check on mileage (?) do in terms of emissions ratings with regards to the tax structure as this is more helpful.
- Do a little more cost analysis and tax structure. How can we make this more efficient?
- Maybe higher tax on diesel? Discourage use because of high emissions
- Diesels put out less CO2, but hybrids are an excellent alternative to other fuels.
- Make argument for reducing CO2. This is what the new conference and political focus is now, so let's see if we can focus in on this to help this case.
- Anything to support CO2 efforts
- Be sure to emphasize that 2009 is helping with NOX and particulate matter, not CO2 emissions. Prius is still better than diesel cars.

- Maybe make a case on current emissions standards and how gap isn't really big enough. Things aren't balancing out.
- Still should break up analysis into city, suburban, and town.
- Send all CSO individual data to Michael asap
- Look into data per CSO and burn to a cd with individual reports
- Get overall data to Michael on a CD/email
- Get CDs

- Meeting on Thursday at 8am at DTU to print individual reports.
- Send reminder for CSOs to rsvp to attend final presentation.

Appendix D: Car Share Survey

Business Survey

Spørgeskema til delebilsbrugere

Worcester Polytechnic Institute
Danske Delebiler

Danske Delebiler er en paraplyorganisation med 10 delebilsordninger som medlemmer, heriblandt din. Danske Delebiler arbejder for at forbedre forholdene for delebilsordninger, for eksempel ved at øge den samlede viden om delebilisme, så de enkelte delebilsorganisationer vil få et bedre overblik over medlemmernes brug af delebilerne.

En gruppe amerikanske studerende fra Worcester Polytechnic Institute i Massachusetts hjælper i foråret 2007 Danske Delebiler med en undersøgelse, hvori dette spørgeskema indgår. Deltagelse i undersøgelsen er selvfølgelig frivillig, men ved at deltage hjælper man sin delebilsordning til at kunne orientere sig om hvilken retning ordningen skal udvikle sig i. Resultaterne af undersøgelsen vil blive offentliggjort af Danske Delebiler i løbet af maj 2007.

1. Hvilken type delebilsmedlemskab har du?
    - □Privat medlem
    - □ Erhvervsmedlem

12) Generelle Oplysninger:

1. Antal ansatte: _____
2. Antal ansatte som bruger delebil: _____
3. Branche:
    - □ Landbrug
    - □ Fremstilling og industri
    - □ Electricitet, gas and vand
    - □ Byggeri
    - □ Detailhandel
    - □ Transport, post, telecommunikation
    - □ Offentlig eller private tjenestydelser
    - □ Andet

4. Delebilsorganisation: _____

5. Har de ansatte adgang til at bruge virksomhedens delebilsordning til private formål

13) Bilejerskab:

1. Ejede virksomheden en bil før I meldte jer ind i en delebilsordning?
    - □ Ja □ Nej

2. Hvis ja, hvor mange? _____

3. Ejer virksomheden stadig en bil?
□ Ja □ Nej

4. Hvis ja, hvor mange? _____

5. Ville virksomheden eje flere biler hvis I ikke var medlem af en delebilsordning?
□ Ja □ Nej

14) Delebilsmedlemskab

1. Hvor længe har virksomheden været medlem af en delebilsordning?

□ Mindre end 3 måneder
□ 3 - 12 måneder
□ 1-2 år
□ 3-5 år
□ Mere end 5 år

2. Hvad var grunden(e) til at virksomheden meldte sig ind i en delebilsordning?

Marker hvor vigtig hver mulighed var for dit valg	Meget vigtigt	Vigtigt	Mindre vigtigt	Ikke vigtigt
Billigere end almindeligt bilejerskab	□	□	□	□
Mere bekvemt (ingen vedligeholdelse mm)	□	□	□	□
Adgang til nem parkering	□	□	□	□
Medvirke til mindre trafik/parkering i byen	□	□	□	□
Skåne miljøet	□	□	□	□

3. Hvilke transportformål bruger virksomheden delebilen til:

	Ofte	Somme tider	Sjældent	Aldrig
Udelukkende persontransport	□	□	□	□
Varetransport	□	□	□	□

4. Hvilken slags kørsel anvender virksomheden delebil til:

	Altid	Ofte	Sjældent	Aldrig
Bykørsel	□	□	□	□
Lande-/motorvejskørsel	□	□	□	□
	□	□	□	□
Korte ture (under 15km)	□	□	□	□
Mellemlange ture (15-30km)	□	□	□	□
Lange ture (over 30km)	□	□	□	□

15) Brug af delebilsordning

1. Hvor ofte bruger virksomheden delebilsordningen?
   - □ Hver dag
   - □ 2-4 gange om ugen
   - □ En gang om ugen
   - □ En eller to gange om måneden
   - □ Mindre end en gang om måneden

2. Kan virksomheden reservere den foretrukne bil når der er behov for det?
   - □ Altid
   - □ Oftest
   - □ Sommetider
   - □ Sjældent

3. Hvor vigtige er følgende aspekter for dig i dit valg af en bestemt type delebil?

	Meget vigtigt	Vigtigt	Mindre vigtigt	Ikke vigtigt
Pris	□	□	□	□
Udseende	□	□	□	□
Passende til formålet	□	□	□	□
Afhentningssted	□	□	□	□
Kendskab til bilen	□	□	□	□
Miljøvenlig	□	□	□	□

4. Nævn de 3 bedste ting ved din delebilsordning:
   1. _____
   2. _____
   3. _____
5. Nævn 3 ting som du synes burde forbedres i din delebilsordning:
   1. _____
   2. _____
   3. _____

16) Dine seneste 3 delebilsture

Angiv venligst følgende oplysninger for virksomhedens seneste 3 delebilsture. Der er et afsnit for hver af de tre ture:

Tur 1:

Hvor mange % bykørsel:

Hvor mange % lande-/motorvejskørsel:

Hvor mange kilometer var turen:

2. Hvilken slags bil brugte virksomheden:
   a) Lille personbil (max 5 sæder)
   b) Stor personbil (mere end 5 sæder)

c) Varevogn

3. Hvorfor valgte virksomheden denne type bil?

Pris	□
Udseende	□
Passende til formålet	□
Afhentningssted	□
Kendskab til bilen	□
Miljøvenlighed	□

4. Hvad transporterede I?

Udelukkende persontransport	□
Varer	□

17) Dine seneste 3 delebilsture

Angiv venligst følgende oplysninger for virksomhedens seneste 3 delebilsture. Der er et afsnit for hver af de tre ture:

Tur 2:

Hvor mange % bykørsel:

Hvor mange % lande-/motorvejskørsel:

Hvor mange kilometer var turen:

2. Hvilken slags bil brugte virksomheden:
   a) Lille personbil (max 5 sæder)
   b) Stor personbil (mere end 5 sæder)
   c) Varevogn

3. Hvorfor valgte virksomheden denne type bil?

Pris	□
Udseende	□
Passende til formålet	□
Afhentningssted	□
Kendskab til bilen	□
Miljøvenlighed	□

4. Hvad transporterede I?

Udelukkende persontransport	□
Varer	□

18) Dine seneste 3 delebilsture

Angiv venligst følgende oplysninger for virksomhedens seneste 3 delebilsture. Der er et afsnit for hver af de tre ture:

Tur 3:
Hvor mange % bykørsel:
Hvor mange % lande-/motorvejskørsel:
Hvor mange kilometer var turen:

2. Hvilken slags bil brugte virksomheden:
   a) Lille personbil (max 5 sæder)
   b) Stor personbil (mere end 5 sæder)
   c) Varevogn

3. Hvorfor valgte virksomheden denne type bil?

Pris	□
Udseende	□
Passende til formålet	□
Afhentningssted	□
Kendskab til bilen	□
Miljøvenlighed	□

4. Hvad transporterede I?

Udelukkende persontransport	□
Varer	□

19) Miljøvaner:
1. Er miljøhensyn en del af virksomhedens officielle politik og forretningsmetoder?
□ Ja □ Nej

2. Vælger virksomheden at handle med virksomheder som tager miljøhensyn, selv om det ind imellem kan betyde højere omkostninger?
□ Ja □ Nej

3. Fremhæver virksomheden miljøspørgsmål og fremhæver virksomhedens miljøpolitik i sin markedsføring?
□ Ja □ Nej

Tak fordi du har gennemført spørgeskemaet!
Har du interesse i at deltage I en gruppediskussion om delebilisme?
1. □ Ja, I kan kontakte mig på følgende e-mail: _____
□ Nej tak

21)
Tak, vi har ikke flere spørgsmål.
Undlad venligst at trykke på tilbage-tasten på denne side, da den vil lede dig ind på sider der ikke skal besvares.

English Translation of Business Survey

Business Survey
Questionnaire for Car Share Members

1. Introduction
Danske Delebiler (DD) is an umbrella organization with 10 individual car share organizations as members, among these yours. DD is working to improve the conditions for car share organizations, for example by expanding the information base on car share programs so that the individual CSOs will get a better overview of the members' use of car sharing vehicles.

A group of American students from Worcester Polytechnic Institute in Worcester Massachusettes, are this spring assisting DD with study, of which this survey is a part. Participation in this survey is optional, but by completing the survey, you will help your CSO program to form a better idea of what direction you as a CSO member would like to see the car share program go in. Results of this survey will be made available though Danske Delebiler in May 2007.

1) Which type of car share membership do you hold?
- □Private Member
- □Business Member

12) General Information:
1. Number of Employees: _____
2. Number of Employees who use car share transportation: _____
3. Sector of Business:
   - □ Agriculture
   - □ Manufacturing and Industry
   - □ Electricity, gas and water
   - □ Construction
   - □ Retail
   - □Transport, Post, telecommunications
   - □Public or Private Services
   - □Other

4. Car Share Organization: _____
5. Do your Employees use the car share membership for private use?
   □ Yes □ No

13) Car Ownership:
1. Did your business own vehicles before joining the program?
   □ Yes □ No

2. If yes, how many? _____

3. Does your business still own vehicles?

□ Yes □ No

4. If yes, how many? _____

5. Would the company own more vehicles if you were not a member of a car share organization?

□ Yes □ No

14) Car Share Membership

1. How long has your business been a member of car share?

□ Less than 3 months
□ 3 months – 1 year
□ 1-2 years
□ 3-5 years
□ More than 5 years

2. What are the reason(s) your business joined the car share organizations?

Please mark how important each aspect was for your choice	Very Important	Important	Less Important	Not Important
Cheaper than traditional car ownership	□	□	□	□
More convenient (no maintenance etc.)	□	□	□	□
Access to easier parking	□	□	□	□
Contributing to less traffic/parking in town	□	□	□	□
Reduced impact on environment	□	□	□	□

3. Which transport purposes does your business use the car share vehicle for?

	Often	Sometimes	Rarely	Never
Exclusively employee transport	□	□	□	□
Transport of materials/goods	□	□	□	□

4. What kind of driving does your company use the car share vehicle for?

	Always	Mostly	Rarely	Never
City Driving	□	□	□	□
Highway* Driving	□	□	□	□
Short Trips (less than 15km)	□	□	□	□
Medium Trips (15-30km)	□	□	□	□
Long Trips (over 30km)	□	□	□	□

* Lande-/motorvejskorsel

15) Use of Car Share Arrangement

1. How often do you use the car share arangement?

□ Every day
□ 2-4 times a week
□ Once a week
□ Once or twice every month

□ Less than once a month.

2. Can your business reserve your preferred vehicle whenever you need it?
□ Always
□ Most of the time
□ Sometimes
□ Rarely

3. How important are the following aspects for your business in your choice of a specific type of car share vehicle.

	Very Important	Important	Less Important	Not Important
Price	□	□	□	□
Look	□	□	□	□
Suitable for the purpose	□	□	□	□
Location of vehicle	□	□	□	□
Vehicle Familiarity	□	□	□	□
Environmentally Friendly	□	□	□	□

4. Mention the three best things about your car share arrangement.
1.
2.
3.

5. Mention the 3 things you think ought to be improved in your car share arrangement:
1.
2.
3.

16) Recent Car Share Trips (last 3 trips)
Please indicate the following information for your business's lates3 car share trips. There is a section for each of the 3 trips.

Trip 1
Distance traveled -
Percent City Driving -
Percent Highway Driving -

2.What kind of car did you take?
a) small car max 5 seats
b) large car more than 5 seats
c) van
3. Why did the company choose this type of car?

Price □
Look □
Suitable for the purpose □
Location of vehicle □
Vehicle Familiarity □
Environmental Friendliness □

4. What were you transporting?
Exclusively Personal □
Goods □

17) Recent Car Share Trips (last 3 trips)
Trip 2
Distance traveled -
Percent City Driving -
Percent Highway Driving -

2. What kind of car did you take?
a) small car max 5 seats
b) large car more than 5 seats
c) van
3. Why did the company choose this type of car?
Price □
Look □
Suitable for the purpose □
Location of vehicle □
Vehicle Familiarity □
Environmental Friendliness □

4. What were you transporting?
Exclusively Personal □
Goods □

18) Recent Car Share Trips (last 3 trips)
Trip 3
Distance traveled -
Percent City Driving -
Percent Highway Driving -

2.What kind of car did you take?
a) small car max 5 seats
b) large car more than 5 seats
c) van
3. Why did the company choose this type of car?

Price □
Look □
Suitable for the purpose □
Location of vehicle □
Vehicle Familiarity □
Environmental Friendliness □

4. What were you transporting?
Exclusively Personal □
Goods □

19) Environmental Habits:
1. Are environmental concerns part of your business's policy or operating principles?
□ Yes □ No

2. Does your business choose to trade with environmentally responsible companies, even if it occasionally increases costs?
□ Yes □ No

3. Does your business emphasize environmental concerns and positive environmental policy in its advertising?
□ Yes □ No

Thank You For Your Time!
Can we contact you about a group discussion regarding car share?

1. □ Yes Email Address _____

□ No

21) Thank you we have no more questions. Please do not click the back button as it will lead to pages not in the survey.

Private Survey

Spørgeskema til delebilsbrugere

Worcester Polytechnic Institute
Danske Delebiler

Danske Delebiler er en paraplyorganisation med 10 delebilsordninger som medlemmer, heriblandt din. Danske Delebiler arbejder for at forbedre forholdene for delebilsordninger, for eksempel ved at øge den samlede viden om delebilisme, så de enkelte delebilsorganisationer vil få et bedre overblik over medlemmernes brug af delebilerne.

En gruppe amerikanske studerende fra Worcester Polytechnic Institute i Massachusetts hjælper i foråret 2007 DD med en undersøgelse hvori dette spørgeskema indgår. Deltagelse i undersøgelsen er selvfølgelig frivillig, men ved at deltage hjælper man sin delebilsordning til at kunne orientere sig om hvilken retning ordningen skal udvikle sig i. Resultaterne af undersøgelsen vil blive offentliggjort af Danske Delebiler i løbet af maj 2007.

1. Hvilken type delebilsmedlemskab har du?
   - □Privat medlem
   - □ Erhvervsmedlem

2) Generelle Oplysninger:

1. Køn:
   - □Mand □Kvinde
2. Alder:
   - □18-21 □22-29 □30-39 □40-49
   - □50-59 □60-69 □70+
3. Delebilsordning: _____
4. Fødeland: _____
5. Husstandens indkoms 2006: _____kr
6. Uddannelse:
   - □ Folkeskole
   - □ Gymnasium
   - □ Faglært
   - □ Kortere videregående uddannelse (max 3 år)
   - □ Længere videregående uddanelse (mindst 5 år)

7. Antal delebilsmedlemmer i husstanden (inkl. tillægsmedlemmer): _____

3) Bilejerskab:

1. Ejede din husstand en bil før I meldte jer ind i en delebilsordning?
   - □ Ja □ Nej

2. Ejer din husstand stadig en bil?

□ Ja □ Nej

3. Hvis ja, hvilken årgang er bilen produceret?

4. Ville I eje en bil hvis I ikke var medlem af en delebilsordning?

□ Ja □ Nej

4) Delebilsmedlemskab

1. Hvor længe har du været medlem af en delebilsordning?

□ Mindre end 3 måneder
□ 3 - 12 måneder
□ 1-2 år
□ 3-5 år
□ Mere end 5 år

2. Hvad var grunden(e) til at du meldte dig ind i en delebilsordning? (Marker hvor vigtig hver mulighed var for dit valg)

Marker hvor vigtig hver mulighed var for dit valg	Meget vigtigt	Vigtigt	Mindre vigtigt	Ikke vigtigt
Billigere end almindeligt bilejerskab	□	□	□	□
Mere bekvemt (ingen vedligeholdelse mm)	□	□	□	□
Adgang til nem parkering	□	□	□	□
Medvirke til mindre trafik/parkering i byen	□	□	□	□
Reducere påvirkningen på miljøet	□	□	□	□

5) Transportmønstre

1. Bruger du følgende transportformer mere eller mindre nu, i sammenligning med før du blev delebilsmedlem?

	Mere	Samme	Mindre	Bruges ikke
Gang	□	□	□	□
Tog	□	□	□	□
Bus	□	□	□	□
Taxi	□	□	□	□
Cykel	□	□	□	□
Bil	□	□	□	□

2. Hvor ofte bruger du delebil til disse formål:

	Meget ofte	Ofte	Sjældent	Aldrig
Besøg hos familie og venner	□	□	□	□
Indkøb	□	□	□	□
Ferie	□	□	□	□
Fritidsaktiviteter	□	□	□	□

Hente og bringe børn	□	□	□	□
Pendling	□	□	□	□
Erhverv	□	□	□	□

3. Har dit delebilsmedlemskab forandret din brug af bil til følgende formål:

	Mere brug af bil	Samme brug af bil	Mindre brug af bil
Besøg hos familie og venner	□	□	□
Indkøb	□	□	□
Ferie	□	□	□
Fritidsaktiviteter	□	□	□
Hente og bringe born	□	□	□
Pendling	□	□	□
Erhverv	□	□	□

4. Hvilken slags kørsel anvender du delebil til:

	Altid	Ofte	Sjældent	Aldrig
Bykørsel	□	□	□	□
Lande-/motorvejskørsel	□	□	□	□
	□	□	□	□
Korte ture (under 15km)	□	□	□	□
Mellemlange ture (15-30km)	□	□	□	□
Lange ture (over 30km)	□	□	□	□

6) Brug af delebilsordning

1. Hvor ofte bruger du delebilsordningen?
   - □ Hver dag
   - □ 2-4 gange om ugen
   - □ En gang om ugen
   - □ En eller to gange om måneden
   - □ Mindre end en gang om måneden

2. Kan du reservere din foretrukne bil når du har brug for den?
   - □ Altid
   - □ Oftest
   - □ Sommetider
   - □ Sjældent

3. Hvor vigtige er følgende aspekter for dig i dit valg af en bestemt type delebil?

	Meget vigtigt	Vigtigt	Mindre vigtigt	Ikke vigtigt
Pris	□	□	□	□
Udseende	□	□	□	□

Passende til formålet	□	□	□	□
Afhentningssted	□	□	□	□
Kendskab til bilen	□	□	□	□
Ringe miljøpåvirkning	□	□	□	□

4. Nævn de 3 bedste ting ved din delebilsordning:
   1.
   2.
   3.

5. Nævn 3 ting som du synes burde forbedres i din delebilsordning:
   1.
   2.
   3.

7) Dine seneste 3 delebilsture

Angiv venligst følgende oplysninger for dine seneste 3 delebilsture. Der er et afsnit for hver af de tre ture:

Tur 1:
Hvor mange kilometer var turen: -
Hvor mange % bykørsel
Hvor mange % lande-/motorvejskørsel:

2. Hvilken slags bil brugte du:
   a) Lille personbil (max 5 sæder)
   b) stor personbil (mere end 5 sæder)
   c) varevogn

3. Hvorfor valgte du denne type bil ?

Pris	□
Udseende	□
Passende til formålet	□
Afhentningssted	□
Kendskab til bilen	□
Lille miljøpåvirkning	□

4. Hvad var formålet med turen?

Besøg hos familie og venner	□
Indkøb	□
Ferie	□
Fritidsaktiviteter	□
Hente og bringe born	□
Pendling	□

Erhverv	□

8) Dine seneste 3 delebilsture
Tur 2
Hvor mange kilometer var turen: -
Hvor mange % bykørsel
Hvor mange % lande-/motorvejskørsel:

2. Hvilken slags bil brugte du:
   a) Lille personbil (max 5 sæder)
   b) stor personbil (mere end 5 sæder)
   c) varevogn

3. Hvorfor valgte du denne type bil?

Pris	□
Udseende	□
Passende til formålet	□
Afhentningssted	□
Kendskab til bilen	□
Lille miljøpåvirkning	□

4. Hvad var formålet med turen?

Besøg hos familie og venner	□
Indkøb	□
Ferie	□
Fritidsaktiviteter	□
Hente og bringe born	□
Pendling	□
Erhverv	□

9) Dine seneste 3 delebilsture
Tur 3
Hvor mange kilometer var turen: -
Hvor mange % bykørsel
Hvor mange % lande-/motorvejskørsel:

2. Hvilken slags bil brugte du:
   a) Lille personbil (max 5 sæder)
   b) stor personbil (mere end 5 sæder)
   c) varevogn

3. Hvorfor valgte du denne type bil?

Pris	□
Udseende	□
Passende til formålet	□

Afhentningssted	□
Kendskab til bilen	□
Lille miljøpåvirkning	□

4. Hvad var formålet med turen?

Besøg hos familie og venner	□
Indkøb	□
Ferie	□
Fritidsaktiviteter	□
Hente og bringe born	□
Pendling	□
Erhverv	□

10) Miljøvaner:

1. Aflever du papir/aviser, glas, flasker, dåser og batterier til genbrug?
   - □ Altid
   - □ Ofte
   - □ Sjældent
   - □ Aldrig

2. Angiv hvor alvorlig du synes de følgende miljøproblemer er:?

	Meget alvorligt	Alvorligt	Mindre alvorligt	Ikke alvorligt
Vandforurening	□	□	□	□
Global opvarmning	□	□	□	□
Spredning af miljøfremmede stoffer	□	□	□	□
Lokal luftforurening	□	□	□	□
Hormonforstyrrende stoffer i miljøet	□	□	□	□
Udryddelse af truede plante- og dyrearter				

3. Køber du sædvanligvis følgende økologiske produkter?
   - □ Mælk
   - □ Grøntsager
   - □ Kød
   - □ Ingen af dem

4. Køber du sædvanligvis miljømærkede produkter (fx Svanemærket, Ø-mærket, Blomsten, Energimærket)?
   - □ Altid
   - □ Ofte
   - □ Sjældent
   - □ Aldrig

5. Er du medlem eller giver du bidrag til miljøorganisationer som fx Greenpeace, NOAH, WWF, Danmarks Naturfredningsforening?

□ Ja □ Nej

Tak fordi du har gennemført spørgeskemaet!
Har du interesse i at deltage I en gruppediskussion om delebilisme?

1. □ Ja, I kan kontakte mig på følgende e-mail: _____
   □ Nej tak

English Translation of Private Survey

Survey for car share members

1. Introduction

Danske Delebiler (DD) is an umbrella organization with 10 individual car share organizations as members, among these yours. DD is working to improve the conditions for car share organizations, for example by expanding the information base on car share programs so that the individual CSOs will get a better overview of the members' use of car sharing vehicles.

A group of American students from Worcester Polytechnic Institute in Worcester Massachusettes, are this spring assisting DD with study, of which this survey is a part. Participation in this survey is optional, but by completing the survey, you will help your CSO program to form a better idea of what direction you as a CSO member would like to see the car share program go in. Results of this survey will be made available though Danske Delebiler in May 2007.

1) Which type of car share membership do you hold?

□Private Member
□Business Member

2. General Information:

1. Gender:

□Male □Female

2. Age:

□18-21 □22-29 □30-39 □40-49
□50-59 □60-69 □70+

3. Car Share Organization: _____
4. Country of Birth:

□ Denmark
Other:_____

5. Yearly Household Income 2006: DKK_____
6. Level of Education:
   □ Folkeskole (9-10 yrs.)
   □ Gymnasium (additional 3 years)
   □ Vocational
   □ Shorter Continuing max 3 years
   □ Longer Continuing at least 5 years
7. Number of car share members in household: _____ including add on members

3) Car Ownership:

1. Did your household own a car before joining the program?
   □ Yes □ No

2. Does your household still own a vehicle?
   □ Yes □ No

3. If so what is the year? _____

4. Would you own a car if you were not a member of a car share organization?
   □ Yes □ No

4) Car Share Membership

1. How long have you been a member of car share?

□ Less than 3 months
□ 3 – 12 months
□ 1-2 years
□ 3-5 years
□ More than 5 years

2. What are the reason(s) you joined the car share organizations?

Please mark how important each aspect was for your choice	Very Important	Important	Less Important	Not Important
Cheaper than traditional car ownership	□	□	□	□
More convenient (no maintenance etc.)	□	□	□	□
Access to easier parking	□	□	□	□
Contributing to less traffic/parking in town	□	□	□	□
Reduce impact on environment	□	□	□	□

5) Transport Patterns

1. Do you use the following modes of transport now more or less then before you became a car share member:

	More	Less	Same	Not used
Walking	□	□	□	□
Train	□	□	□	□
Bus	□	□	□	□
Taxi	□	□	□	□
Bicycle	□	□	□	□
Car	□	□	□	□

2. How often do you use a car share vehicle for these purposes:

	Very Often	Often	Rarely	Never
Visiting family/friends	□	□	□	□
Shopping	□	□	□	□
Vacation	□	□	□	□
Leisure	□	□	□	□
Picking up children	□	□	□	□
Commuting	□	□	□	□
Business	□	□	□	□

3. Has your car share membership changed your use of a car for the following purposes:

	More use of car	Same use of car	Less use of car
Visiting family/friends	□	□	□
Shopping	□	□	□
Vacation	□	□	□
Leisure	□	□	□
Picking up children	□	□	□
Commuting	□	□	□
Business	□	□	□

4. What kind of driving do you use the car share vehicle for:

	Always	Mostly	Rarely	Never
City Driving	□	□	□	□
Highway* Driving	□	□	□	□
	□	□	□	□
Short Trips (less than 15km)	□	□	□	□
Medium Trips (15-30km)	□	□	□	□
Long Trips (over 30km)	□	□	□	□

* Lande-/motorvejskorsel

6) Use of Car Share Arrangement

1. How often do you use the program?

□ Every day
□ 2-4 times a week
□ Once a week
□ Once or twice every month
□ Less than once a month.

2. Can you reserve your preferred car whenever you need one?
□ Always
□ Often
□ Sometimes
□ Rarely

3. How important are the following aspects for you in your choice of a specific type of car share vehicle.

	Very Important	Important	Less Important	Not Important
Price	□	□	□	□
Look	□	□	□	□
Suitable for the purpose	□	□	□	□
Location of vehicle	□	□	□	□
Vehicle Familiarity	□	□	□	□
Environmental Friendliness	□	□	□	□

4. Mention the three best things about your car share arrangement:
1.____
2. ____
3. ____

5. Mention the three things you think ought to be improved in your car share arrangement:
3.____
2.____
1.____

7) Recent Car Share Trips (last 3 trips)

Please fill out the following information for your latest 3 car share trips. There is a section for each of the 3 trips.

Trip 1
Distance traveled- (km)
Percent City driving-
Percent Highway driving-

2. What kind of car did you take?
a) small car personal transport max 5 seats

b) large car more than 5 seats
c) van

3.Why?
Price □
Look □
Suitable for the purpose □
Location of vehicle □
Vehicle Familiarity □
Little Environmental Impact □

8) Recent Car Share Trips (last 3 trips)

Trip 2
Distance traveled- (km)
Percent City driving-
Percent Highway driving-

2. What kind of car did you take?
a) small car personal transport max 5 seats
b) large car more than 5 seats
c) van

3.Why?
Price □
Look □
Suitable for the purpose □
Location of vehicle □
Vehicle Familiarity □
Little Environmental Impact □

9) Recent Car Share Trips (last 3 trips)

Trip 3
Distance traveled- (km)
Percent City driving-
Percent Highway driving-

2. What kind of car did you take?
a) small car personal transport max 5 seats
b) large car more than 5 seats
c) van

3.Why?

Price	□
Look	□
Suitable for the purpose	□
Location of vehicle	□
Vehicle Familiarity	□
Little Environmental Impact	□

10) Environmental Habits:

1. Do you always hand in items such as paper/newspaper, glass, bottles, cans and batteries for recycling?

□ Always
□ Often
□ Rarely
□ Never

2. Rate how serious you see each of the following environmental problems?

	Very Serious	Serious	Less Serious	Not Serious
Water Pollution	□	□	□	□
Global Warming	□	□	□	□
Chemical Residues in food products	□	□	□	□
Local air pollution	□	□	□	□
Hormone disturbances*** substances in the environment	□	□	□	□
Eradication of endangered plant and animal species	□	□	□	□

3. Do you usually buy the following organic items?

□ Milk
□ Vegetables
□ Meat
□ None of these

4. Do you buy or use environmentally certified products? Examples: Svanemaerket, O-maerket, Blomsten, Energimaerket)?

□ Always
□ Often
□ Rarely
□ Never

5. Do you belong to or give financial support to any environmental organizations? Examples: Greenpeace, NOAH, Friends of the Earth, WWF, Danmarks Naturfredningsforening.

□ Yes □ No

Thank You For Your Time!

Are you interested in participating in a group discussion about car sharing?

1.□ Yes you can contact me on the following email address _____

□ No, thanks

Appendix E: Focus Group Questions:

Environment

- What are your feelings on air pollution? What do you think are major implications?

- Should anything be done to curb air pollution? What are some of your thoughts on ways to do this?

- How can we spread awareness about pollution and ways to lower pollution?

Car Share

- What sort of trips do you typically use the car share program for?

Hybrids

- What do you think about hybrid vehicles? Would you purchase one? Why or why not?

- What would your feelings be regarding using hybrid vehicles in the car share program?

- Would you be wiling to pay more to be part of the car share organization if it used hybrid vehicles? Approximately how much

Appendix F: Focus Group Notes:

Focus Group Guidelines

Step 1: Planning

First we must set out our goals for the focus group. The most important part of the planning stage is deciding what information we hope to get from the focus group, because this question will help determine all the other factors including who to invite as participants, how many participants to invite, and what structure the discussion will take. There are several key pieces of information we hope to get from our focus group. The first and most important is whether or not car sharing members are willing to pay a slightly higher price or make other sacrifices in order to have access to more environmentally friendly vehicles in Denmark. Although we could ask people outright, it is unlikely that we would receive an honest, useful response.

This is not because the focus group participants would lie to us willingly, but because of a number of factors implicit in the structure of the focus group and the question itself. The question leads the participants in that it suggests the ideal response- that is to say, it may give participants the idea that they *should* answer "Yes," and that answering negatively would be deviant behavior. To compound the problem, the focus group subjects each participant to the immediate and personal scrutiny of their peers, which can drive answers toward homogeneity (Silverman). Even if a focus group responded resoundingly that they would pay a premium for hybrid or environmentally friendly cars, the participants themselves may balk when actually faced with the decision later. Thus, the focus group data is meaningless.

So, to find an answer to our question, we will ask several other questions, and try to encourage discussion in order to help participants give useful information. First, we need to know why the participants chose to join a car sharing arrangement. People join for a variety of reasons including saving money, saving time and hassle, using less gasoline and driving less often, or just the chance to try new cars. Some people may have joined for all these reasons, or for a reason we hadn't considered. Each of these motivations suggests a different attitude toward car sharing and personal transportation habits, and understanding these attitudes is essential to determining whether or not alternative vehicles would succeed. After some time (and without changing the subject too radically) we can discuss what role car sharing plays in the daily lives of members. This topic provides an ideal transition to a discussion of transportation patterns before and after car sharing.

The intent of this discussion is to determine how people used different forms of transportation (most notably walking/bicycling, bus/train, or cars) before they joined car sharing and how these patterns have changed since they joined. Cars are typically best suited for one kind of journey, but most car share organizations cannot afford a large enough fleet to specialize so they offer one or two models to accomplish all tasks. Having a better understanding of how members are using their cars (or how members would *like* to be using their cars) will give them a chance to choose more appropriate vehicles.

Toward the end of the session, the discussion about CSOs will be temporarily closed and conversation will turn to environmental issues and fuel consumption. We need to know how Danish CSO members feel about environmental issues and the protection of the environment and how this relates to their personal gas consumption and fuel use.

This data is much more qualitative than quantitative and since we have very little hard data or real conclusions on the subject the discussion must be extremely open-ended. Rather than having specific questions about the environment and their concerns, we need to hear what they want to tell us.

Lastly, at the end of the session the discussion will turn back to CSOs for a moment and, if the discussion has gone well and the participants are functioning as a group, we may ask them to answer the question outright- how would they feel about using less gas and paying a little bit more money and attention to their driving? It is important to remember that this is not an advertisement but a question. It is easy to lead people into agreement, but this data would be incorrect and could be disastrous down the line.

Once these objectives have been identified, we must use them to craft a set of precise and open-ended yet unambiguous set of talking points for the discussion, which can be found in Step 3 below.

Step 2: Preparation

In order for a focus group to be successful the participants must feel physically and psychologically comfortable. To this effect, it is important to establish a neutral setting where moderators and participants can mingle, sit in comfort, and interact casually before, after, and during the focus group. Additionally, it is important to provide water, coffee, tea, and light snacks such as fruit or pastries, both for the comfort of participants and as a small token of thanks. Each participant should also be provided with a small pad of paper and a pencil in order to write down ideas or comments so that they can

remember them instead of shouting impulsively. Our situation is unique because most participants will be speaking in a second language, so it is vital that at least one translator be on hand at all times to address any confusion due to the language barrier. Lastly, it is important to find out if any participants have any disabilities or special needs and provide for them before the time of the focus group so that everything will go slowly and no time will be wasted. When it's time to begin the discussion, one team member will act as the moderator (directing the discussion, answering questions) and the other two team members will take notes.

Step 3: Discussion

On the day of the discussion, the facility should be prepared an hour or two in advance. It is important to ensure that there is adequate parking available, that the conference room is clean and prepared with space for coats, and that guests can access bathroom facilities easily. These responsibilities, along with the preparation of food and drinks and the distribution of note-taking materials, can be distributed among the group members.

When participants start arriving, they should be met in the parking lot by a member of the group and directed into the meeting room. Once inside, they can be invited to enjoy snacks or coffee and meet some of the other participants. The time in between the arrival of the first and last participants should be reserved for casual chatting and getting settled. Once everyone is present and ready to begin, the moderator can begin the program with a short, scripted presentation. While it is not vital to stick to the script, hopefully there will be no reason to deviate from it appreciably.

Moderator: "Welcome everyone, and thank you very much for coming out to the focus group today. My name is (name) and these are my partners (name) and (name). This is (name) who will available as a translator if there are any language questions. As you have heard, we are students from Worcester Polytechnic Institute in the United States, and we've been living in Denmark for the past (five or six) weeks working with Danske Delebiler and trying to create a plan to reduce the environmental impact of car sharing arrangements in Denmark. So far we've had a great time and we're enjoying a lot of success with our work, due in no small part to your participation here tonight.
We are holding this discussion because, along with Danske Delebiler, we'd like get a better idea how you all feel about your car sharing organization, how you use delebils, and what role car sharing plays in your lives. We'd also like to know how you feel about environmental issues in Denmark and your own fuel consumption, both as a driver and as a nation.

The way this discussion works is pretty simple. First, I'd like to go around the room and give everybody a chance to introduce themselves, let us know who you are, where you're from, and anything else that's on your mind. Afterward, I will introduce a topic and I'd like everyone to feel free to either think about it for a few moments or just let us know how you feel about it. Please feel free to discuss between your selves, agree or disagree with the person next to you, raise questions or volunteer answers- we're interested in what you think, and I'll speak up if things get off track. I would like to say that at any point, if anyone has an opinion that isn't being voiced or an idea we haven't heard yet, or if you really just disagree with something that's been said, please speak up.

For every person in this room there are hundreds of people in Denmark who feel the same way. You represent those people in this discussion, so it's important that we hear from you.

At this point everyone will have a chance to introduce themselves and say hello, and when everyone is done, the moderator will introduce the first topic.

List of Topics:

These are a list of phrases the moderator can use to introduce a new topic or keep people on track within the current topic.

Reasons for joining a car share program:

"Tell me about why you joined a car sharing program."

"What was it that convinced you about to join the program?"

"I'd like to hear about your concerns or reservations about joining the CSO and what helped you to overcome those concerns."

"Could you talk about what was the #1 most important thing on your mind when you joined?"

Role of Car sharing in daily life

"Describe to me the role that car sharing has in your daily life."

"Think for a moment about what it's like being a car share member."

"Compare your life now and your life before car sharing, in terms of how much money you spend on transportation, how much time and energy it takes, and how you feel about transportation."

Transport patterns before and after car sharing

"Talk a little bit about how you got around before you joined car sharing, where you went and how you got there."

"Now that you're in a car share organization, things have obviously changed a little. Tell me how things have changed."

Environmental awareness and impact

"As a group, could you all discuss for a little while how you feel about environmental issues, and what impact they have on your daily life?"

"Tell me a little about how environmental concerns and issues influence your purchasing decisions."

"Think of a recent instance where you modified your behavior due to concerns about the environment and share it with the group."

"I'd like to hear more about how concerns about car pollution affect your driving decisions, or fuel consumption."

Note: This section will be the most difficult to "steer" and will require that the moderator adapt their line of questioning to the particular group and the responses the group is generating.

Car Sharing and Hybrid Cars

"Your CSOs have expressed interest in purchasing hybrid or alternative-energy vehicles, or more fuel-efficient vehicles. Many of these vehicles come with a trade-off: They sometimes operate differently than cars you are used to, and they may be slightly more expensive. I'd like everyone to think for a little while about this transition and what it means, and how you would feel about this."

Step 4: Finishing the discussion and beginning the analysis.

After the discussion has been going for an hour and a half or so, the moderator will ask everyone if they have any closing thoughts or questions. When everyone has spoken their mind, the moderator will thank everybody warmly for their time and energy, invite everyone to have another pastry or coffee, and let them know that the results of the project will be available through the CSO within a month or two.

After everyone has left, the team can begin their analysis by casually discussing the results and experiences for a few moments, then going through the notes to make sure they represent a complete record of the focus group so any changes can be made while memories are fresh.

Focus Group 1

Focus Group 1:
Date: 4/17/07
Start time: 5:05
End time: 6:00
Number of attendees: 2
1 Hertz, 1 KD

Start Group:

Alex: went over topics
Q1. Why are you members?

1.
- price of cars in Denmark, very expensive
- don't need car everyday, good intermediate solution
- old car broke down last year, expenses didn't add up to buying a new car

2.
- family didn't need car everyday, just holidays and weekends
- too expensive to have a car sitting in the driveway or street
- wife and 2 kids often use bikes, trains, and buses to get further
- no interest in owning a car
- question of the environment
- much time (1hr.) by car to work, much faster by bike

Alex: Are errands faster by bike?

2:
- Yes
- Bike wagon for young kids, then ½ cycle, now kids have their own bikes
- For Copenhagen, bikes are a good way to get around, to get to school and around the area.

Alex: Did you have doubts about car sharing?

1:
- heard from a friend, said it was very good
- worried initially about cost

2:
- concerns about location, availability, condition of cars
- member for 2 years
- always can get a car when needed
- cars in good condition
- cars typically located ½ km from house
- booking system is good

Alex: Pricing Structure – less expensive? Fits needs? Location?

1:
- selects closest, then cheapest car
- need small car, would pay more for "sexy car". Likes the mini cooper and would pay more for it, especially for a weekend trip

- Mercedes, BMW, more luxury “nice cars” would be nice

2:

- small cars, needs are not big
- skoda/fabia wagon works well
- takes larger cars when needs are different

Kyle: Is the Skoda the smallest you would use?

2:

- not much smaller for needs. Skoda is a good size.

Alex: Describe role car sharing plays, what is life like now compared to life before membership?

1:

- not much different, uses about 2x a month
- used personal car pretty infrequently
- sometimes can’t get a car, out too late, needs to plan ahead

2:

- good idea to plan to use a car, esp. when you can use a bike instead

Kyle: found that people in car share will use public transportation more. Cost of environmentally friendly cars very high in Denmark

1:

- wouldn’t pay more for a hybrid car

Kyle: trying to bring down cost of these cars

1:

- not much to do with car sharing specifically…

Kyle: tax cuts/price cuts on these cars for car sharing specifically

2:

- car share is too small to make huge case to the government

Kyle: using data to try to help with this. 180 fewer cars in Copenhagen alone because of car share membership

Alex: Noticed any parking issues??

1:

- really hard to find parking, esp. after 7pm at night

- often paid parking bills as a result

2:
- not a huge problem- space at house to park a car share car

Alex: describe a typical car share trip

1:
- shopping, out of town with friends for an evening, never taken for business
- often could do without, but enjoys the comfort of the car

2:
- larger cars for furniture shopping, cheaper than cargo transportation
- with friends to the country side, occasionally shopping for big things

1:
- often will go with a friend who has a car

Alex: any friends that are members?

1:
- yes, 1 who recommended car sharing to him
- expensive to rent a car for a whole week
- really likes cooper mini
- pricing structure 300kr can be annoying – would be nice if there were a discount for taking the car for more miles or taking it frequently

2:
- KD small non profit, 200kr fee, $ for time rental/km price

1:
- formula to calculate price for km- very annoying calculations

Alex: time spent thinking about fuel costs?

1:
- uses website sometimes if renting for a whole day -> sometimes easier to take train or bus
- usually has a good idea of the price before taking out the car

2:
- decide mode of transportation then checks for car availability

Alex: ever used the Lupo?

2:
- no

- neither have used (one nodded head in agreement with 2)

Alex: help save on fuel, has anyone ever told you about the Prius?

1:
- thought it was still a prototype car
- is it more expensive?

Alex: no

1:
- wouldn't pay more to use it

Kyle: do you know what they look like?

1:
- ya
- hybrid cars, why do they look weird?
- Fiat car a few years ago looked strange
- Seems to be the case with a lot of hybrid cars

2:
- don't really care about trying one
- if price is okay, why not? If good for environment, good for me too
- location is still important

Kyle: talked about how car starts. Would this turn you off to driving one?

2:
- probably would get accustomed to it, not really sure because he's never tried one

Alex: Priority of driving environmentally friend car? Next Step: figure out fuel efficient cars, get into the car share fleets. Think about what would get you interested in these types of cars.

1:
- should be cheaper than other cars because they are using less fuel. Maybe tax reduction in beginning
- not scared of pushing buttons instead of using keys
- savings on fuel should be passed onto members

2:
- lets try them, see how they work

1:

- if goes further, would expect lower cost per km on trip cost because of fuel savings

2:

- or at least same $/km as smaller cars
- would take best car for environment if all other factors are equal

1:

- fun to drive

2:

- sexy to drive, maybe

Kyle: check out Prius, try it out

1:

- ya, definitely

Kyle: explained how hybrid engine in the Prius worked

2:

- in Skoda, there is an economy light. If on the highway, and not in a hurry, tries to get the best fuel efficiency/liter

1:

- buses that run on gas and some on electricity
- how come cabs aren't environmentally friendly? Are Mercedes good/bad for the environment?

Kyle: Mercedes has the Smart Car, but very expensive

1:

- seems like ALL taxis are Mercedes. Crazy!

Alex: ever heard government talk about environmental issues?

2:

- all the time now
- yellow plates on big cars, low taxes!

Kyle: explained emissions and hybrids, noticed yellow plates and what our initial impression of yellow plates was when we got here.

Alex: What cars would you like to see if you could pick?

1:

- more sexy cars, convertibles, sports cars, but not same about price

2:

- different sizes of cars would be nice
- occasionally wants a small car
- big car for weekends would be nice

1:

- aweful radios with cassette players. Put in a normal stereo!
- Mirror adjustments always seem to be broken

Kyle: would the hybrid Civic be an attractive car for you to want to drive?

1:

- looks nice
- would be an improvement over older vehicles
- also please remove corporate logos. I don't feel like being an advertisement when I'm driving

Any questions or comments?

2:

- nice if on holiday that you could get a car in another country. Membership in Denmark, but could rent a car in Italy.

Kyle: explained end goal of project

Focus Group 2

Focus Group 2:
Date: 4/17/07
Start time: 7:07
End time: 7:55
Number of attendees: 2
1 Hertz, 1 KD

Start Group:

Alex: introduced project goals and why we are doing a focus group. Introduced report and how we'll be making recommendations

Alex: Why did you join car share? What was driving like before you joined?

1:

- because very expensive to have a personal car
- had car before, then work commute was small, no need for car and sold it
- uses public transportation and taxis sometimes
- used to hire cars for a whole day
- saw advertisement in a bus, read into it and thought "car on demand" was a great idea
- easy to use and book
- good network of cars

2:

- live and work in Copenhagen, gets around easily by bike
- no urgent need or use for car, also expensive
- got married and thought of having kids – also taking more trips outside of Copenhagen
- buying things not easily transported by bus
- googled Delebiler and found KD
- convinced by economical breakdown figures of what kinds of transportation to use
- obvious it was a good idea with four cars on his street

Alex: Any doubts about car sharing? What convinced you to become a member?

1:

- no doubts, well explained, investigated different companies and found Hertz was the best for him

2:

- only economy, consideration of how often he and family would use the car
- nice organization, non-profit, and sharing of cars was nice

Alex: Describe how you got around before, and how has that changed now?

2:

- hasn't changed
- occasionally take shared car once a month
- daily transportation pretty much the same
- more just another option that is used sometimes, not for normal transportation

1:

- changed in that taxi use is much less, often used before
- for ½ yr, Hertz car was 2 min. from home, almost like having his own personal car
- before used to take a bike more, but car is much faster

Alex: What's your thought process in choosing to use a shared car?

1:

- specific dates, birthdays
- make reservations for special occasions a month or so ahead

Alex: In terms of public transport vs. car share

1:

- also will decide sporadically to use car if they are available, would have taken a taxi for this before

2:

- need to go to hospitals or run errands and shopping, visiting people outside Copenhagen (lack of public transportation), then makes reservations
- typically makes reservations a week or month ahead of time. Same day reservations especially for weekends are always booked

Alex: Is location of the car important in choosing what car to take

1 and 2: yes

A: price?

1:

- yes

2:

- doesn't seem like much variance in price from website among cars that he's tried

1:

- Hertz classes of cars are all differently priced. Price/hour and price/km are different by class

Alex: is type of car a factor?

2:

- depends on situation, no situation where couldn't use the smallest car he wanted

1:

- normally choose smallest car, just him and wife using the car
- also easier to park a smaller car in Copenhagen
- if picking up big things, use station car. Used when moving to another house

2:

- KD has Lupo, didn't want to take for a while because of special features
- Took a small course and tried the Lupo, wasn't as great a driving experience.

- If same cost, would choose the Polo over the Lupo because it's more convenient for his needs.

Alex: Increased fuel efficiency of the Lupo?

1:
- knows it is significant

Alex: fuel efficiency a factor?

1:
- no, I don't think about it. Would not know which cars are better

2:
- glad that it's gas saving
- consider myself to use very little gasoline already because he drives so little, so feels like being in share car program is already enough
- might consider it if it were cheaper to use a more efficient car than another car

Kyle: If price and location is same would you choose this car our would special driving things deter you?

2:
- Lupo is okay, but Polo is nicer to rive.
- Not an important issue

1:
- same to me
- asked 2 what a Lupo was, 2 explained economy features of the Lupo

Kyle: Toyota Prius intro. Explained what we're looking into with efficient cars and hybrids

Alex: members say Prius and Lupo are difficult to drive. Would you try a Prius even if it's different?

1:
- not sure. I like the cars they have right now

2:
- question of habit. Feel safer in a car that's familiar. (1 nodded head in agreement)
- taken steps towards it, but not yet part of routine. Afraid of making a mistake driving the car

1:
- not really sure of automatic first time he drove one, but became more familiar

Kyle: said about how we took a bit of time to use the Prius

Kyle: do you think if they were more common more people would use them?

2:

- yes, also reward for taking car will help make it more normal to people
- put member education on website or courses

Kyle: what would have change with environmental cars for you take one?

1:

- would take better car if in location
- not really thought about it before, not really aware
- no real information from Hertz about Prius

2:

- was told of Lupo and instruction when he became a member

Kyle: introduced talking to government and tax structure in Denmark – wanting to bring tax breaks to car share

2:

- bill for tomorrow, very simple step to tax reform
- good idea

Kyle: talked about yellow plates
Both members laughed

2:

- very stupid law
- house market good – sell house and buy a huge car, and pay very low taxes

Both:

- cars are status symbols and people "feel safe" in huge cars

2:

- website of people giving the finger to Hummers and big cars - we all laughed!

Alex: now a status symbol in the US to drive a hybrid. Also low emissions stickers on cars. What would make it like this in Denmark?

2:

- in terms of life style, would have to have some chicness about it.
- Never get landrover drivers to switch over, it's an entirely different target group
- Has some prestige, or its something some people care about

- Make them cheap and make them have a “coolness factor”

Both:
- neither have seen the Prius. Showed them a picture on Alex’s computer.

Kyle: explained look and inside and regenerative breaking system

2:
- coolness factor here!

Kyle: talked a little about Civic and Prius and how the engine system works

2:
- doesn’t have to look normal, just has to function [drive] normal

Alex: can you see yourself driving one?

2:
- yes

Alex: What would you think about driving a Civic?

2:
- cool, would have to try it out

1:
- ya, same. Would have to try it

Questions/Comments:

2:
- website needs more information, even if its member only info section
- 10 things to remember for driving a Lupo would make a nice addition to the site
- In general how to use systems and such – like a guide to car share for new members would be great.
- Pretty happy otherwise

1:
- Hertz could change booking
- Some of locations of cars, only one car, others have 2-3
- Suggests where only one car, possibly only to have car for a short time, otherwise no cars are available in that location
- Frequently needs a car and some are out for a week in the closest location
- If longer rental is needed, make it so they have to go to a place that has 2 or 3 cars so they aren’t tying up the only car in a given location

Alex: explained more on the project

1: member for 2 years
2: member for 2 years

Focus Group 3

Hertz Focus Group: 3
Start time: 6:15
End time: 7:10
Number of Members present: 2

Start focus group:

Alex: explained purpose of focus group and basic goals of project, and how focus group will work

Alex: reactions for joining car share program

2:
- trial member, not a permanent member
- new option, testing to see if it's convenient

Kyle: how long have you been a member?

2:
- 3 months

Alex: still own a car?

2:
- yes, uses bike most of the time for transportation
- planning to sell car if car share works out well

1: (answers to all above questions)
- to expensive to own a car in Denmark
- cheap to join car share
- cheaper to ret car than buy train tickets for four people
- major point is economic

Alex: member for how long?

1:
- member for 1 ½ years (is this right?? Kyle?)

Alex: any concerns about program? If yes, how did you move past them?

2:

- with contract on insurance
- looked at website, clear, but contract not as clear on paper
- should be a bit more clear in the package, especially because Hertz is a big company
- not overly concerned though because Hertz is a big company

1:

- has called about insurance policies before, always gotten a positive response
- always calls with any problems, always gets a good response
- no charge when car wasn't available and needed a car for the weekend took from rental fleet when possible
- (sounded very pleased with responses to calls and concerns)

Alex: What role does car share have in day to day life? When do you use car share?

2:

- weekends during week, family visits, holidays, not shopping
- is expensive, but not as much as having your own car
- rentals are cheaper in Sweden and Germany

1:

- nice cars, but can't rent unless you're from that country
- uses car share primarily for longer trips

Alex: Decision process and renting the delebil

2:

- convenience mainly
- prices are high, but fair
- nice to choose between variety of cars for different purposes

Alex: Hertz has five car levels, how do you pick between these cars?

1:

- sometimes late reservations, so what's available
- normally what will fit what is needed
- usually takes a 5 seat or station car

2:

- only a few cars around house
- has to do cost/benefit all the time, especially for longer trips, will go to the "right car" for the trip rather than the closest car

Alex: If location wasn't an issue what would determine which car you use?

2:

- price

1:

- same, price

Kyle: vehicle familiarity?

2:

- not really considered

1:

- all cars seem pretty standard

Alex: Do you think about gas consumption?

2:

- short distances, not really, for long distances then yes because gas is expensive
- gas cost is included in the price of rental

1:

- for cars that use more gas, prices are higher
- pricing structure seems quite good

Alex: Questions on issues of environment – Discuss these issues and your daily life, how often do you think about them and with regards to transportation?

1:

- faster to use bike to get to work, even than bus, car, or train
- biking by highway may not be healthy though!

2:

- one plane trip = driving car for one year (read in an article)
- kind of contradictory
- not really a factor in choosing mode of transportation
- car is still typically a last resort, but sometimes a car is necessary
- choosing what's most convenient

1:

- don't want to miss things because of train schedule!
- Want to be able to enjoy family events

2:

- Emissions should be controlled at the state level more and we'll all do what we can

1:

- Danes use/waste most energy
- (me) even more than US??!!
- Yes! (per reading in an article)
- Lots of good energy campaigns, and still seems that Denmark is using too much energy
- Cars that get better mileage should be cheaper

2:

- Green tax – fixed fee so the longer you drive the less it means. Tax people for driving a varying range of miles. Tax should be on gas

Alex: what have you heard about hybrid cars?

1:

- costs too much on Danish market
- why pay so much if you can just get a small car

Alex: what have you heard about the Prius?

- neither knew Hertz had one

Alex and Kyle: explained Prius availability

2:

- hopefully new law will change taxes on hybrid cars

Kyle: yellow plate law and surprise when we first arrived

1:

- if you can buy a scooter, pollution is 4x of a normal car – craziness

Alex: Back to low emissions cars. Prius is in middle of price range – what are your feelings on this car?

2:

- convenience and price are the 2 most important things
- not going to chase down a car just because it's a hybrid
- if lower price to get them on the streets, yes
- if at a premium, no

1:

- agree with 2

Alex: what would make you want to use one on a daily basis?

2:

- if price and location are the same, would pick the better car
- like energy efficient light bulbs, easy choice
- wouldn't pay more than like 10% premium
- air pollution common problem, everyone should chip in
- so should government, to help get cars seen on the street

1:

- if possible (location), and same price, ya of course would take the better car
- everyone should do this though, feel like everyone is chipping in somehow
- we pay enough taxes already, make it easier for people who are trying to help the environment

Alex/Kyle: talked a bit about the Prius and trying it, and how it works

Questions and Comments:

2:

- How to decide about where cars are placed?
- Any incentives schedules for using the car more?? Like the more you use the system, get a bonus at the end of the year for being a steady client
- Booking car, booked for a period of time and if not needed, still have to pay for time booked but not used if returned early. Understands the logic, but some refund would be nice

Kyle: explained project more with environmentally friendly cars and tax breaks for car share

Both nodded in agreement

1:

- if price is the same and everything, I think people would choose this car (the hybrid)
- not sure if government is ready to help with this
- city gets ALL fees like a hidden tax, and all city roads are "public" so government roads

Kyle: Tax break only for car share

1:

- look at Swedish tax system on hybrids. Something like that would be nice in Denmark

Kyle: do people bring in cars from other countries?

1 and 2:

- from Germany, yes, but still have to pay tax.

2:

- tax left over from WW2 when a car was considered a luxury
- EU is chasing government on this tax

Alex: are cars luxury items today?

1:

- not today no

2:

- people may buy more expensive cars, but everyone can have one usually if they want one

1 and 2:
- don't think public transportation is great anymore

1:

- not as many trains/ buses, higher prices

2:

- they could do more, much more
- Funen (?) did free buses, ended up taking lots of cars off the road
- Now talk of taxes to get into cities
- Maybe incentives for efficient delebils, get more hybrids visible so that people see them and now they are here
- Tolls to enter the city will be bad for the economy, barriers will drive people away and it will be only tourists in the cities

1:

- car sharing is a great idea, but it needs more promotion and maybe some incentives to join/use better cars

Appendix G: Agreement of Confidentiality

Agreement of Confidentiality

Information gathered for the Worcester Polytechnic Institute D Term Denmark IQP sponsored by Danske Delebiler and DTU will be analyzed solely by the three students completing the project. Data on individual CSOs will be reported to the appropriate CSO, along with an analysis of the overall data. At no point during or after the project will any CSO have access to individual data collected on other CSOs or their members unless the data is released to Danske Delebiler for distribution at the discretion of the individual CSO and its members.

Date: _____

_____
Genevieve Desaulniers

_____
Alex Dismore

_____
Kyle Gauthier

Appendix H: Survey Results

Listed below are survey results which were used through cross tabulating or for general data but did not provide any direct answers for the analysis.

Personal Member Results

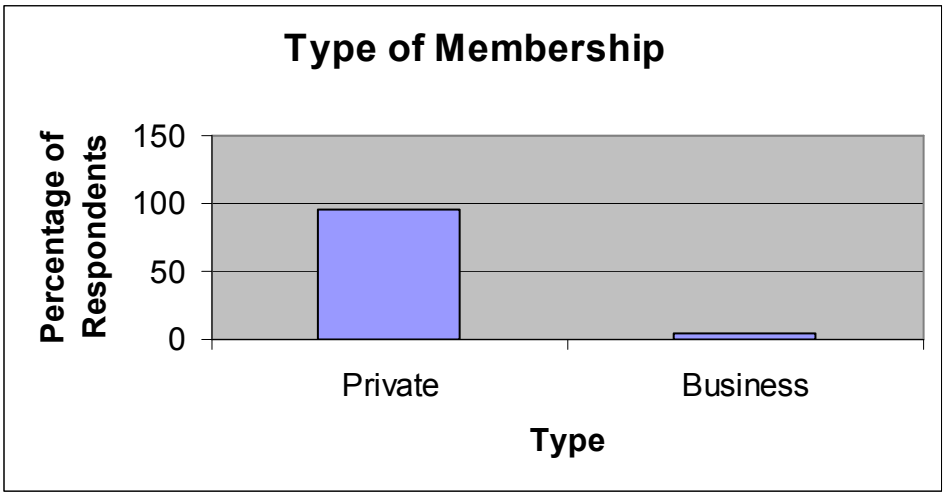


Figure 18: Type of Membership

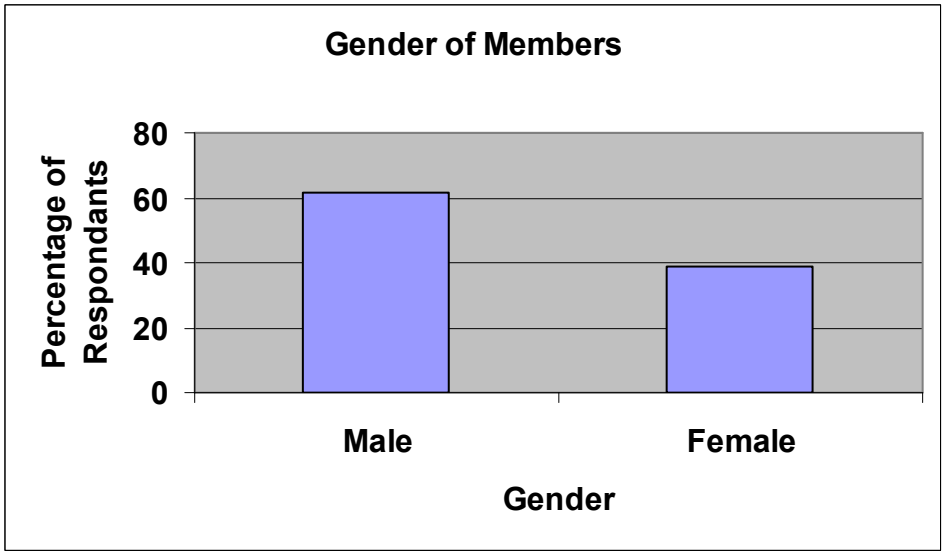


Figure 19: Gender of Members

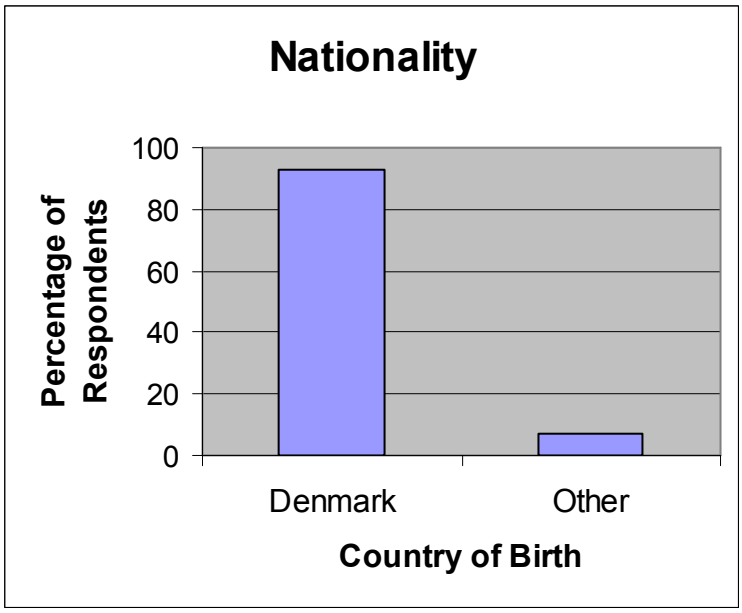


Figure 20: Nationality

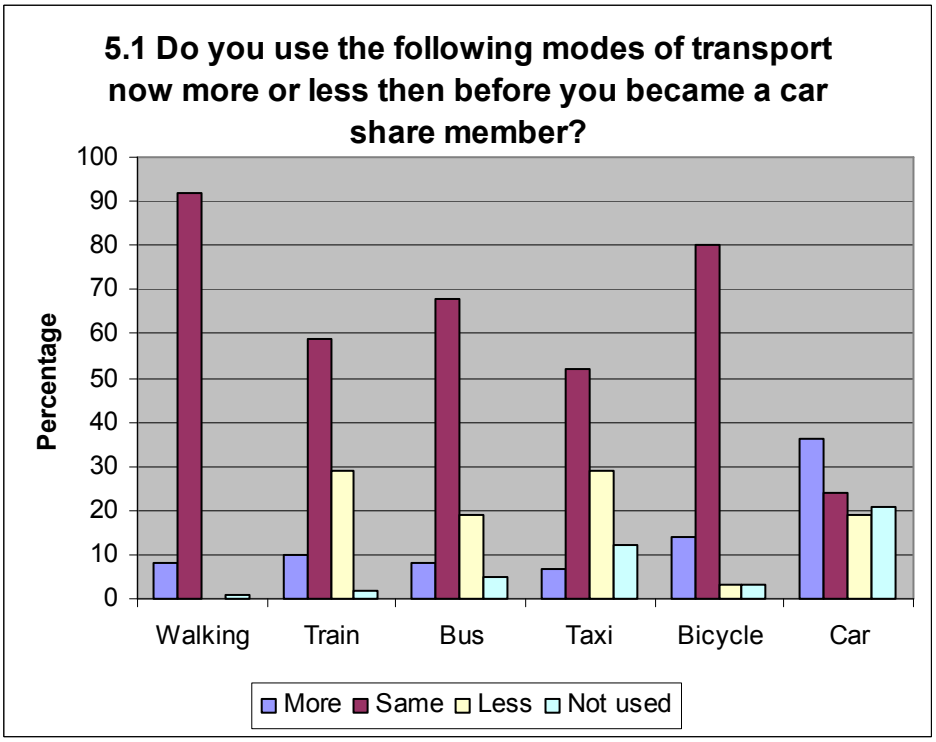


Figure 21: Member Transportation Habits

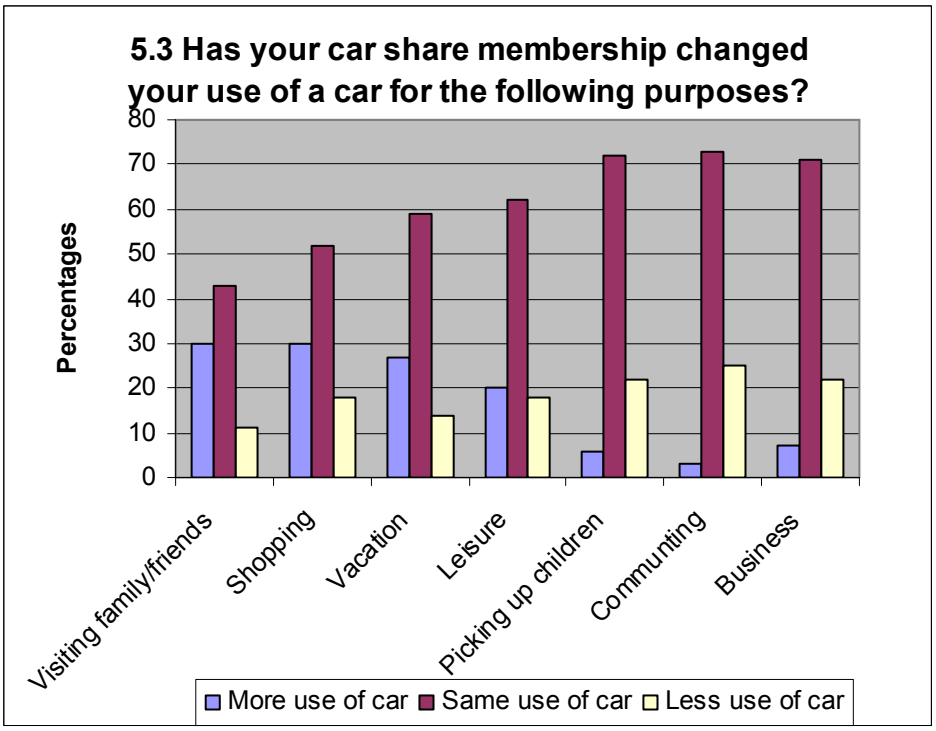


Figure 22: Car Sharing's Impact on Vehicle Use

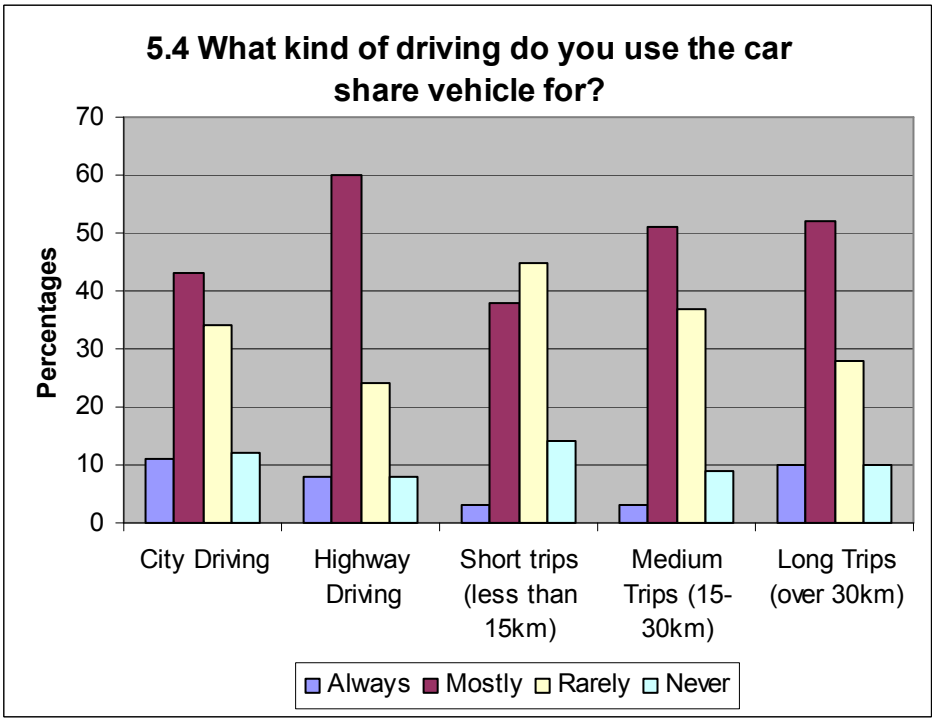


Figure 23: Driving Patterns of Car Share Vehicles

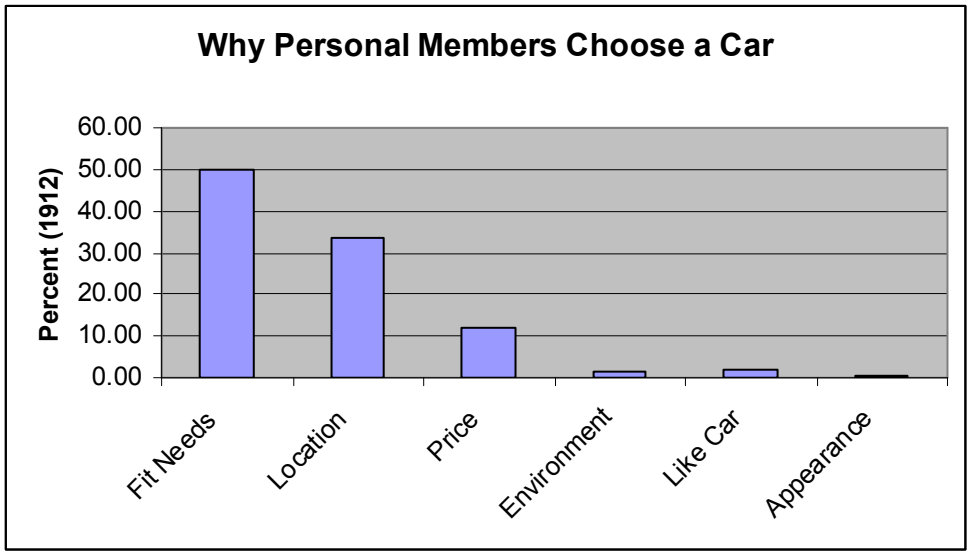


Figure 24: Why Personal Members Choose the Vehicle

Figure 25: Member Recycling Habits

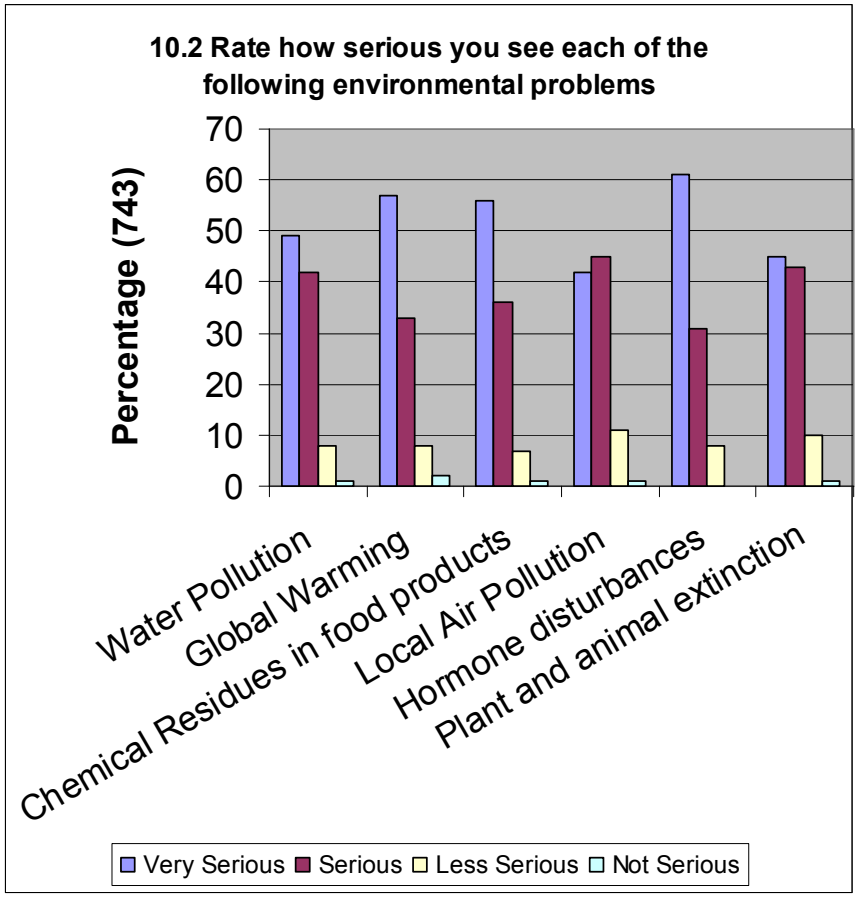


Figure 26: Member Environmental Concerns

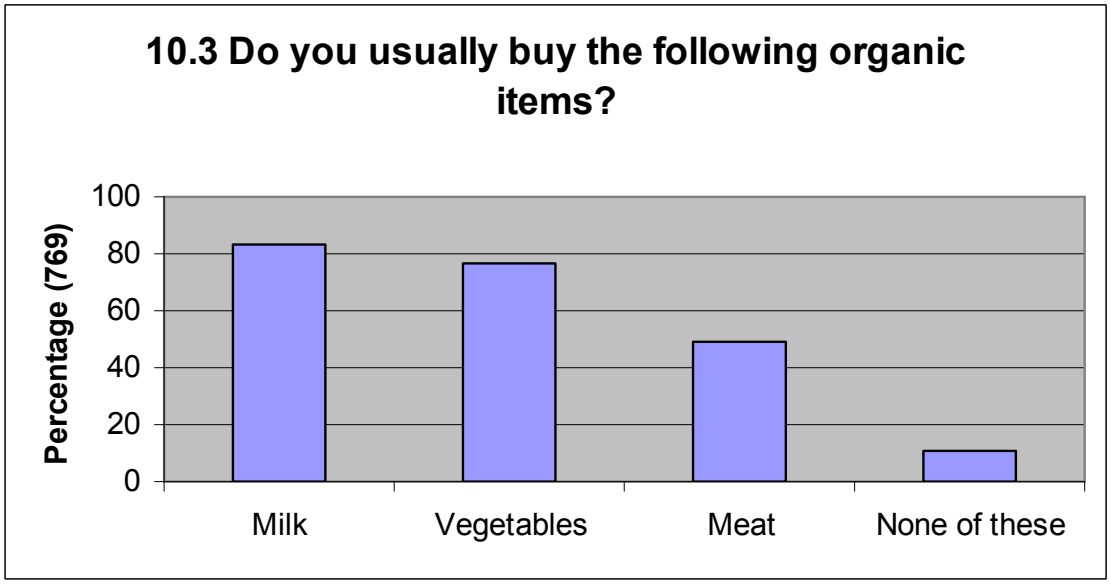


Figure 27: Car Share Members Habits Regarding Organic Items

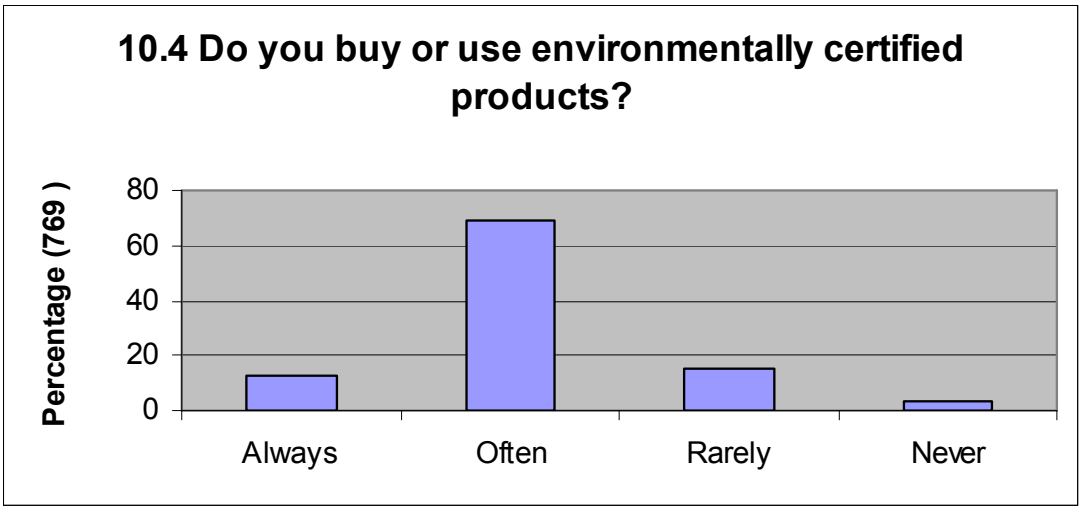


Figure 28: Car Share Members Habits Regarding Environmentally Certified Products

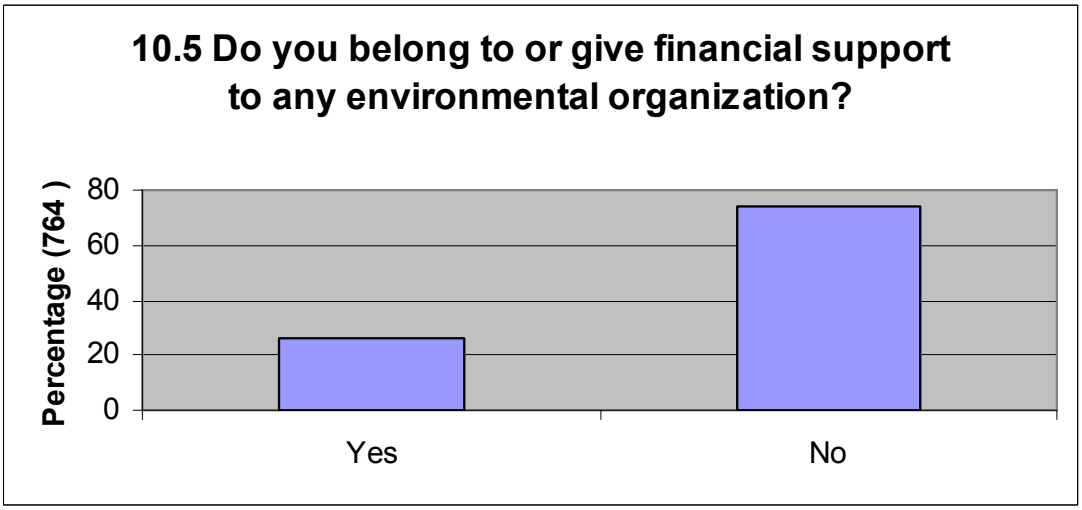


Figure 29: Car Share Members and Environmental Organizations

Business Member Results

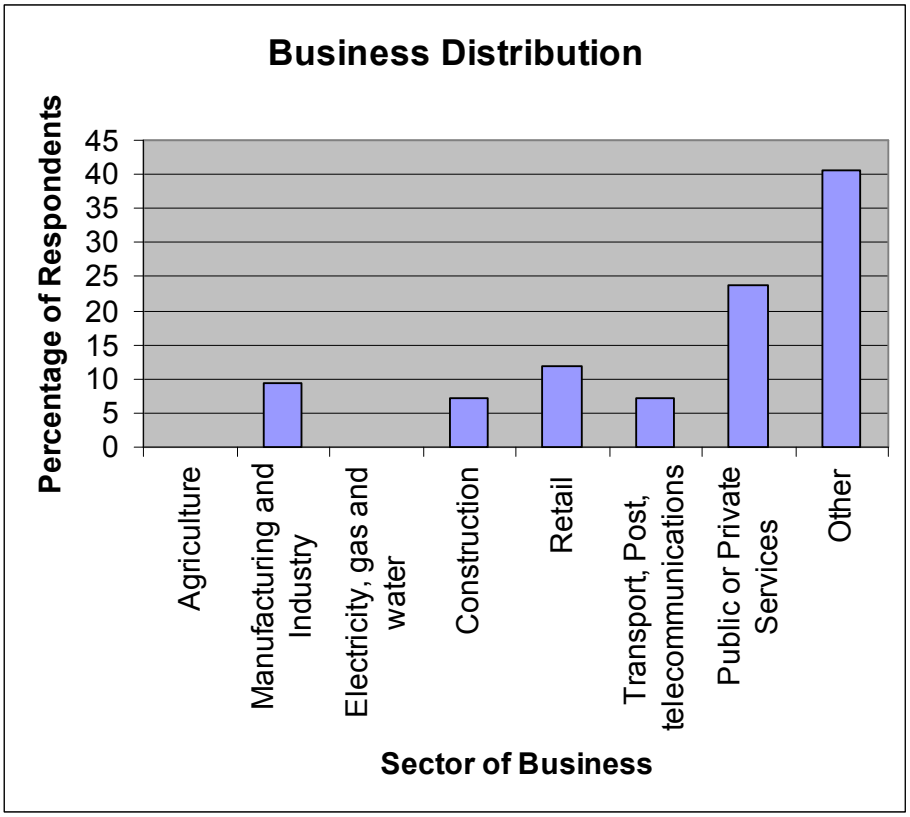


Figure 30: Business Sector Distribution

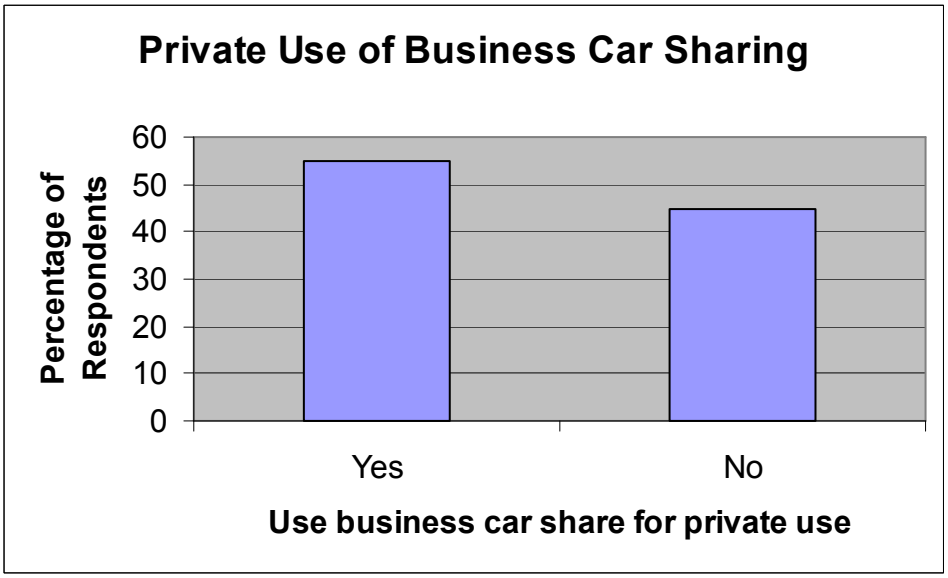


Figure 31: Private Use of Business Car Sharing

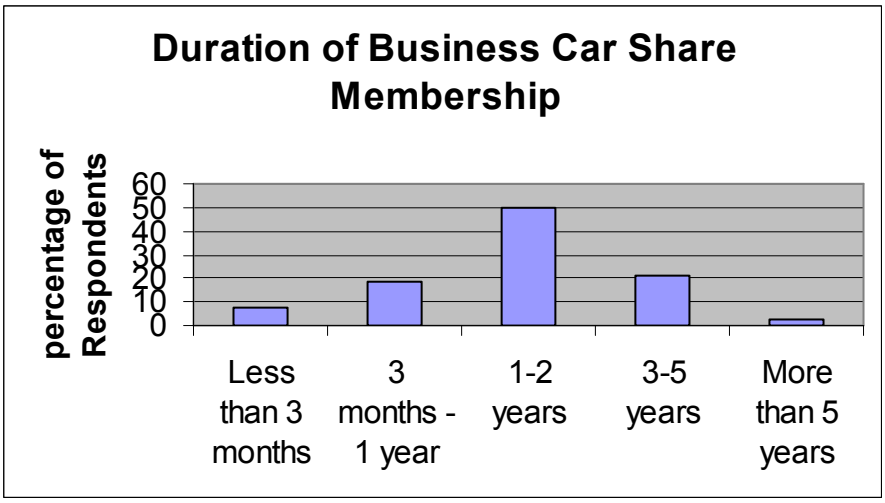


Figure 32: Duration of Business Car Sharing Membership

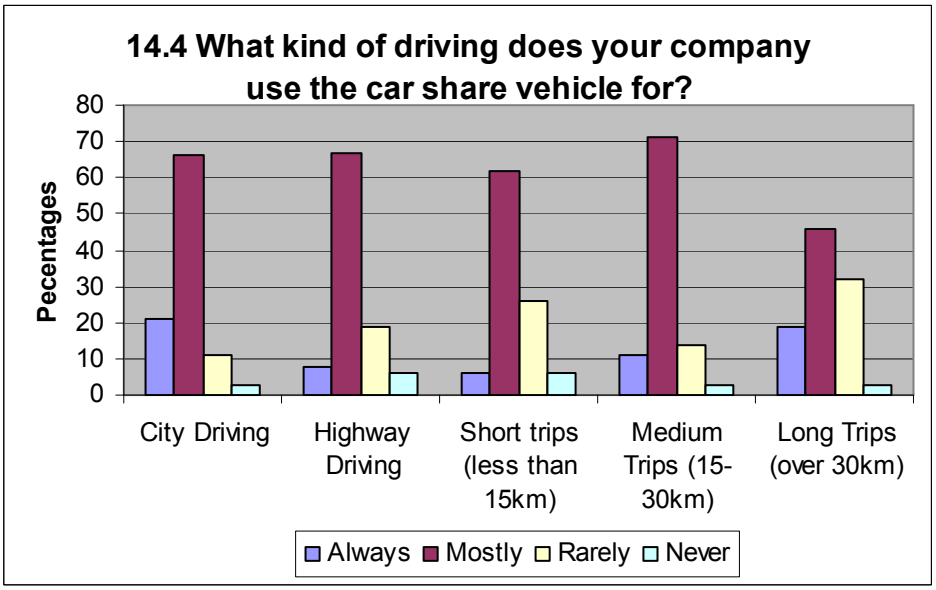


Figure 33: Business Member Driving Patterns

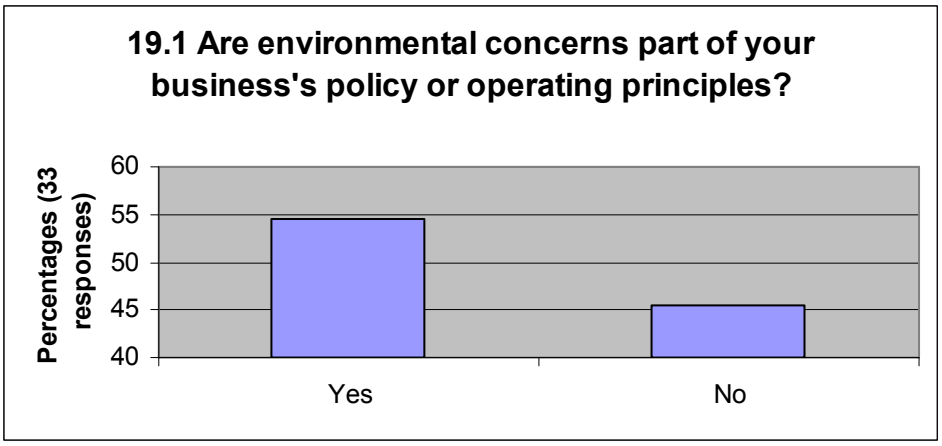


Figure 34: Business Environmental Concerns

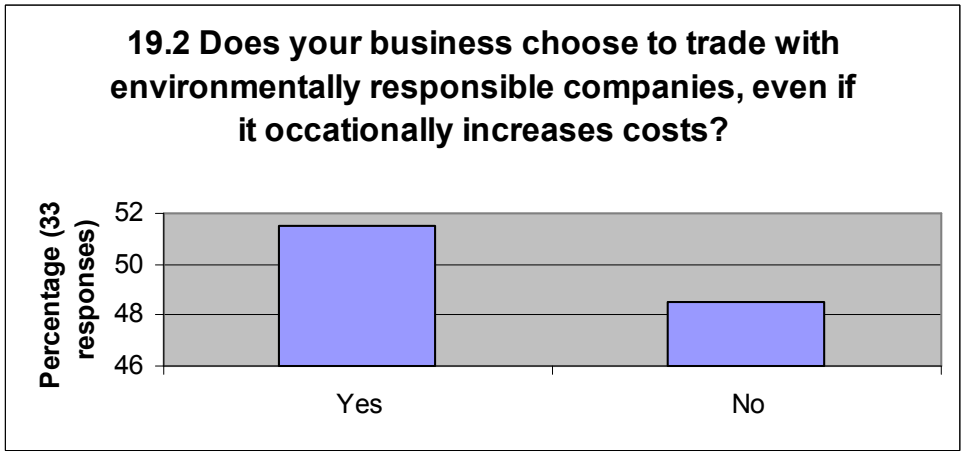


Figure 35: Business Trades in Regards to Environment

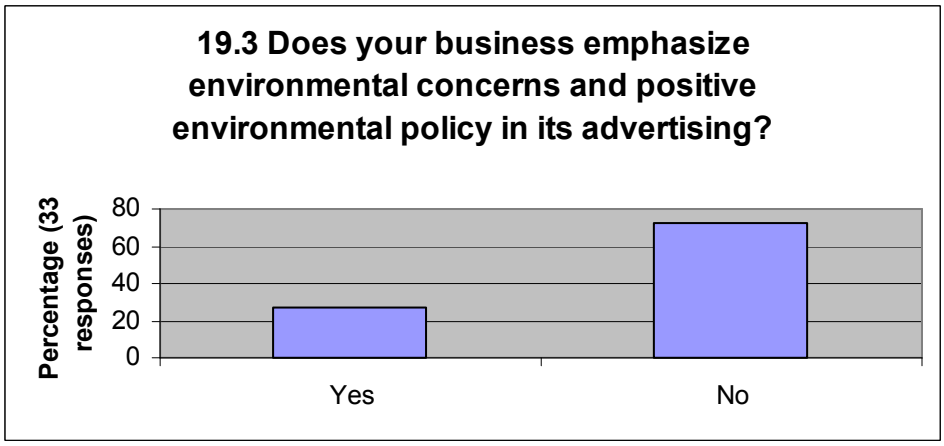


Figure 36: Business Environmental Advertising

Cross Tabulation Results

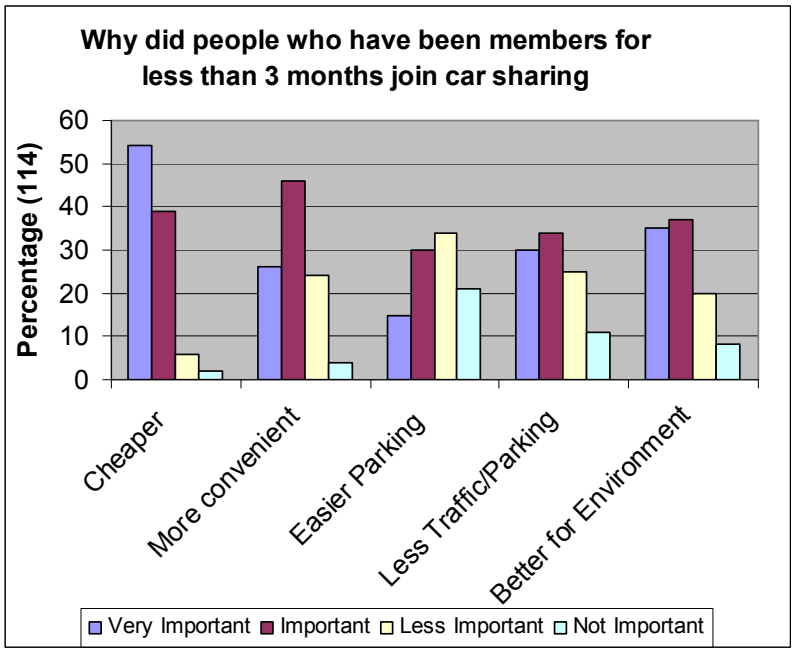


Figure 37: Why Members of < 3 Months Joined Car Sharing

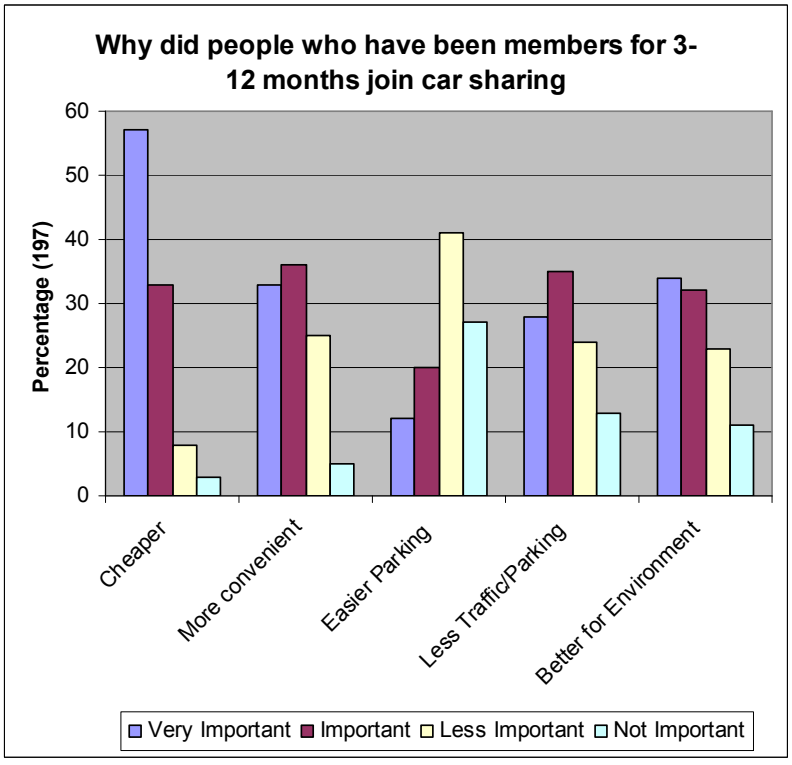


Figure 38: Why Members of 3-12 Months Joined Car Sharing

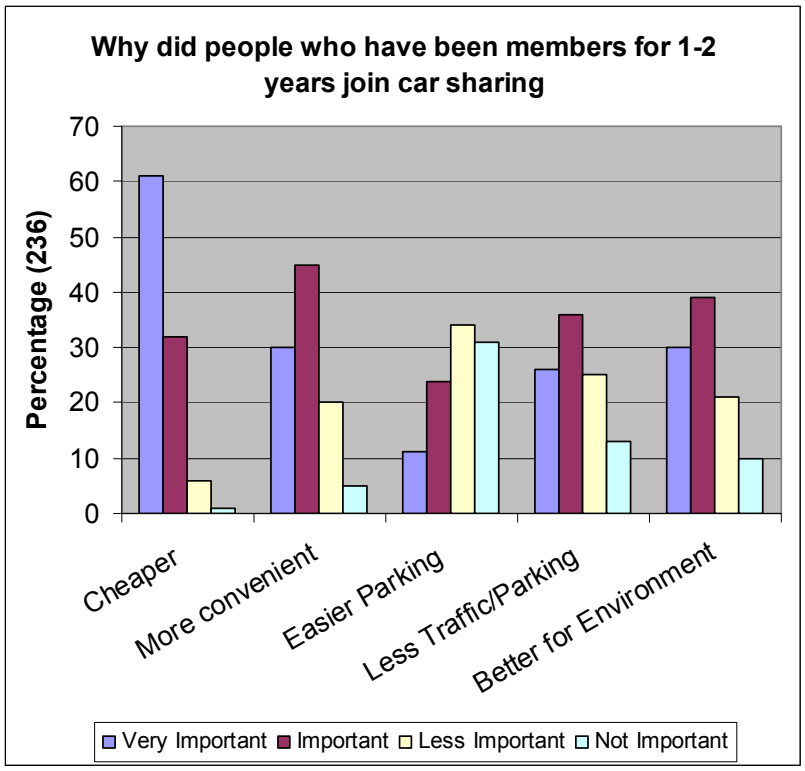


Figure 39: Why Members of 1-2 Years Joined Car Sharing

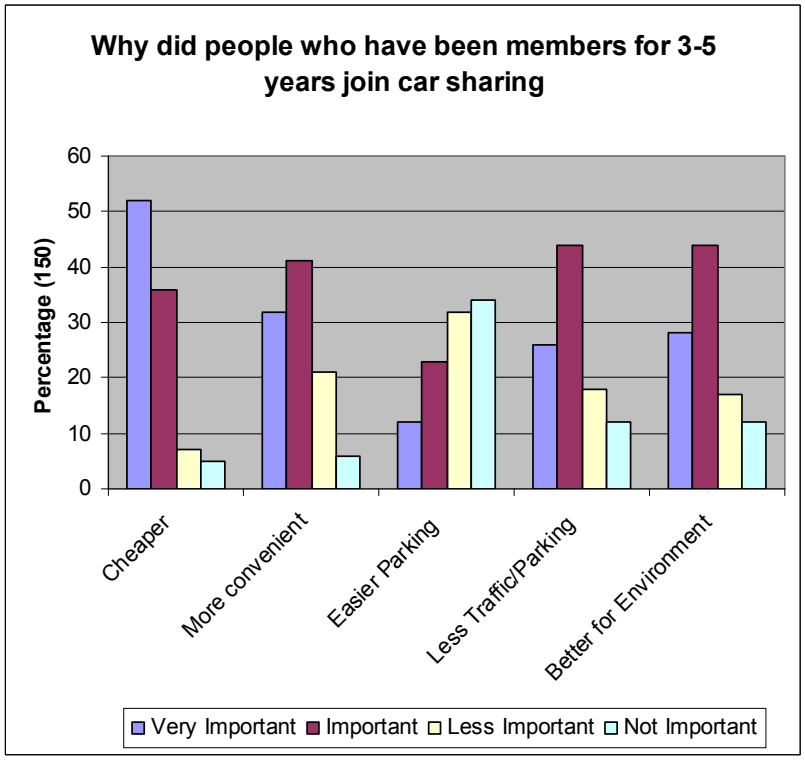


Figure 40: Why Members of 3-5 Years Joined Car Sharing

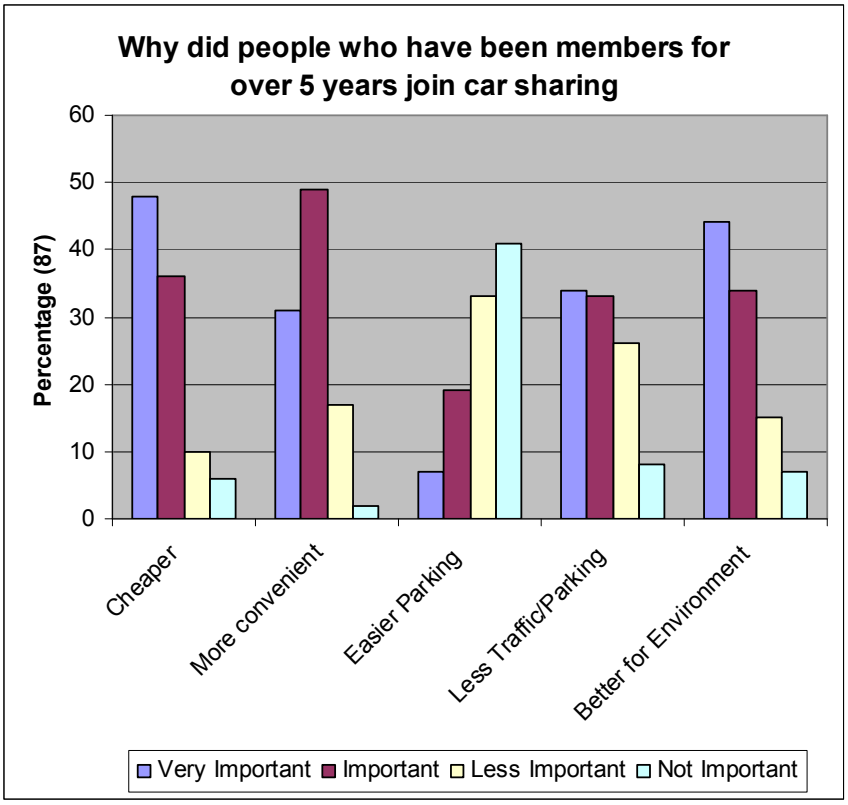


Figure 41: Why Members of over 5 Years Joined Car Sharing

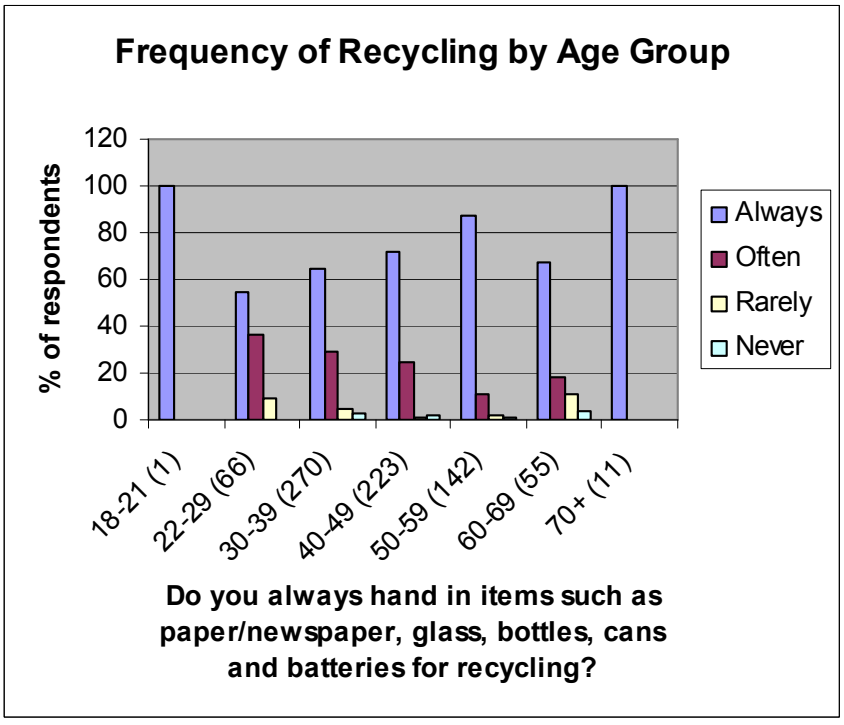


Figure 42: Frequency of Recycling by Age

Figure 43: Participation in Environmental Organizations by Age

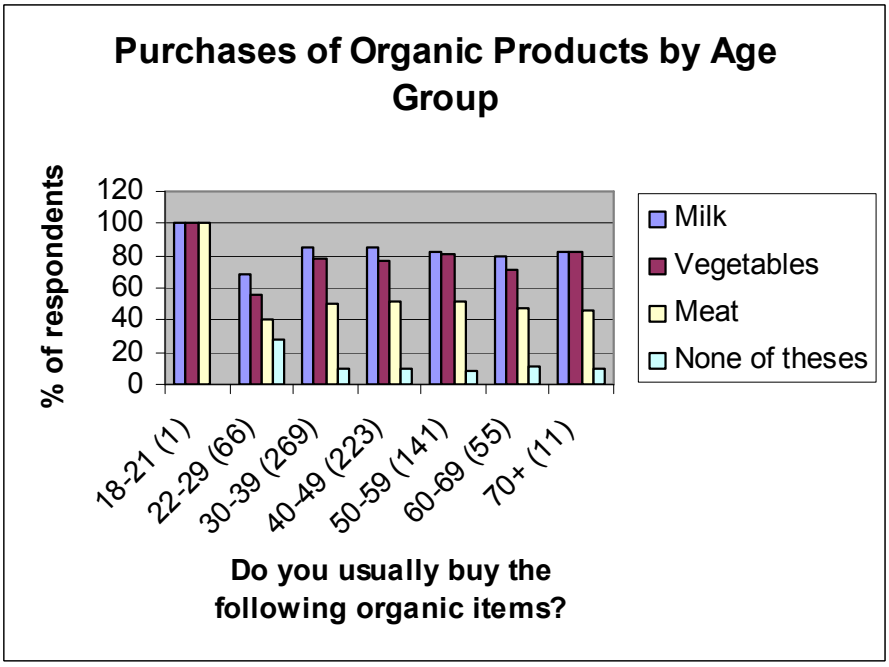


Figure 44: Purchases of Organic Products by Age

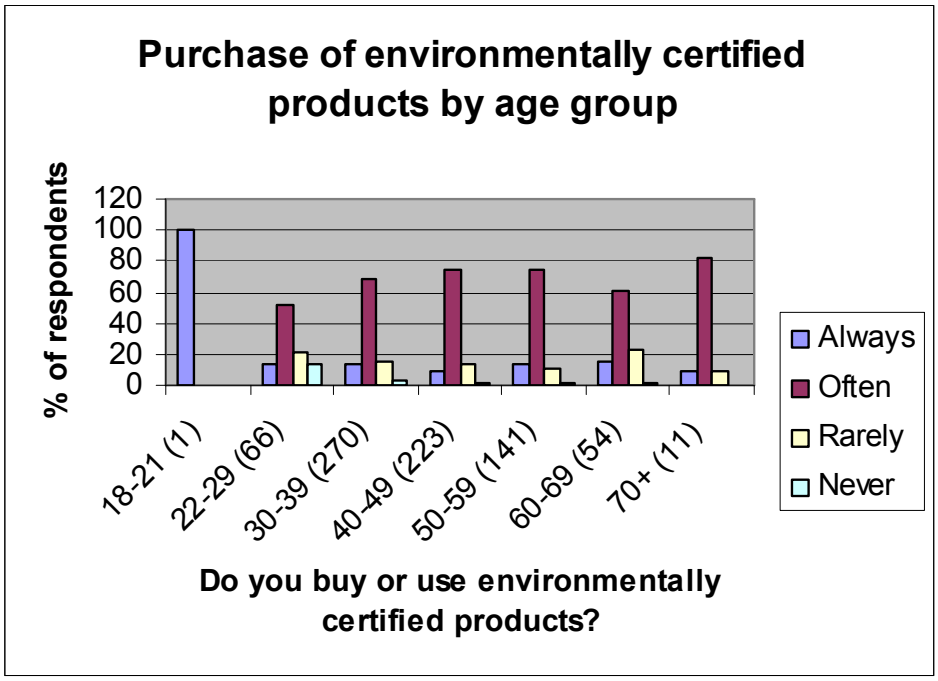


Figure 45: Purchase of Environmentally Certified Products by Age

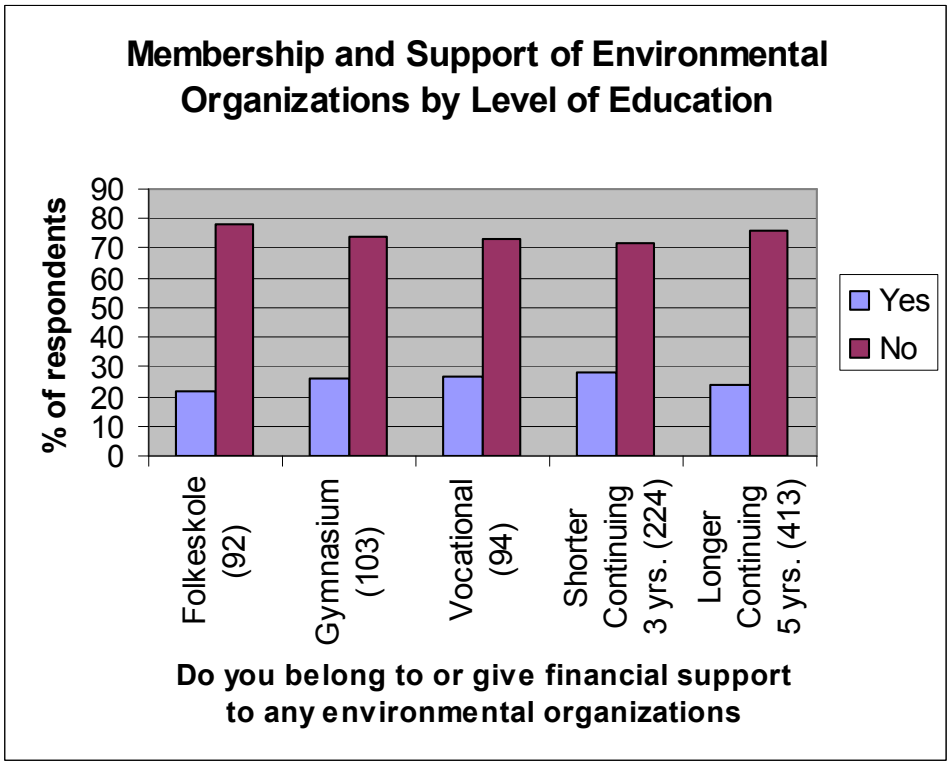


Figure 46: Support of Environmental Organizations by Education

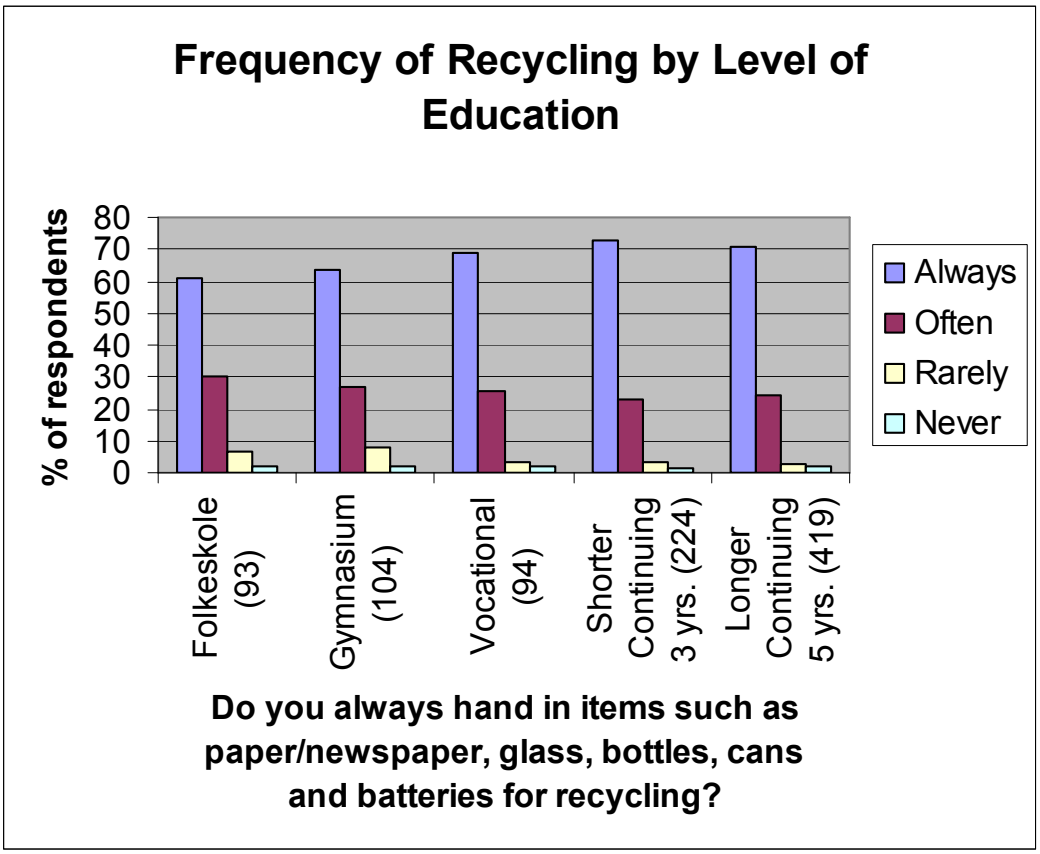


Figure 47: Frequency of Recycling by Education

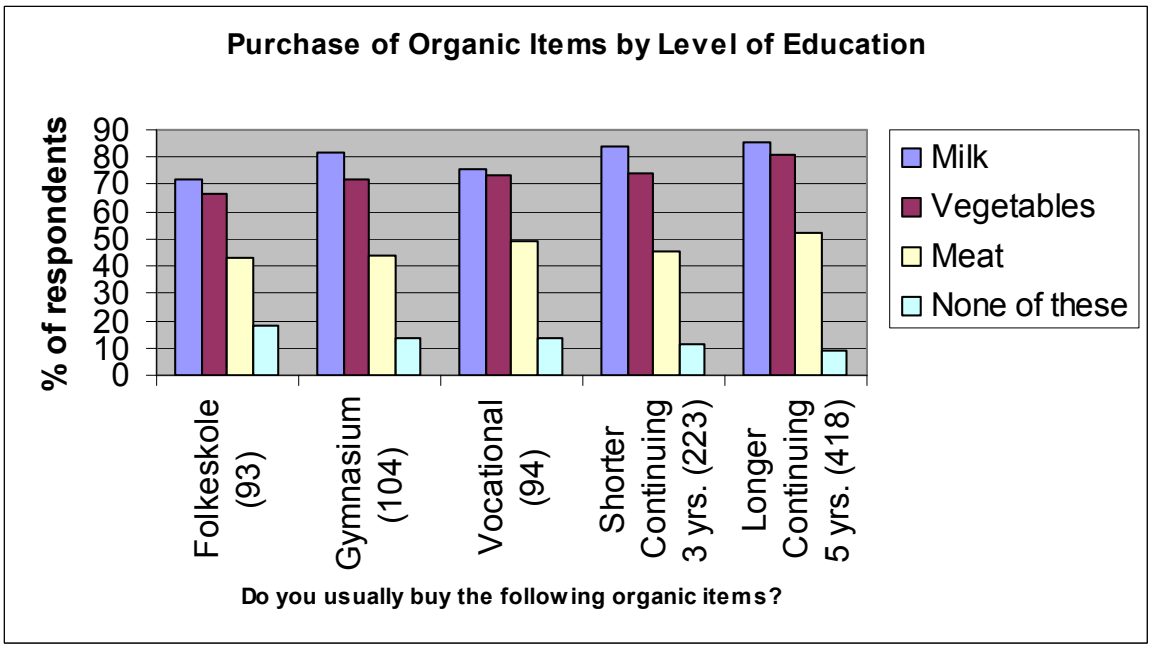


Figure 48: Purchase of Organic Items by Education

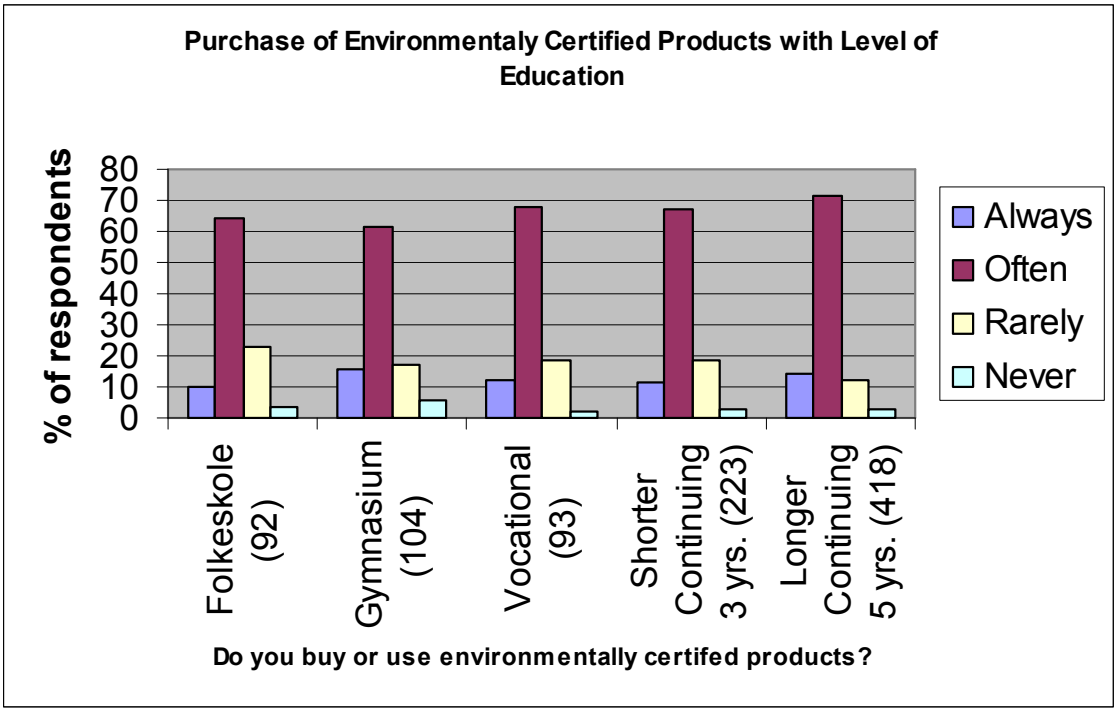


Figure 49: Purchase of Environmentally Certified Products by Education

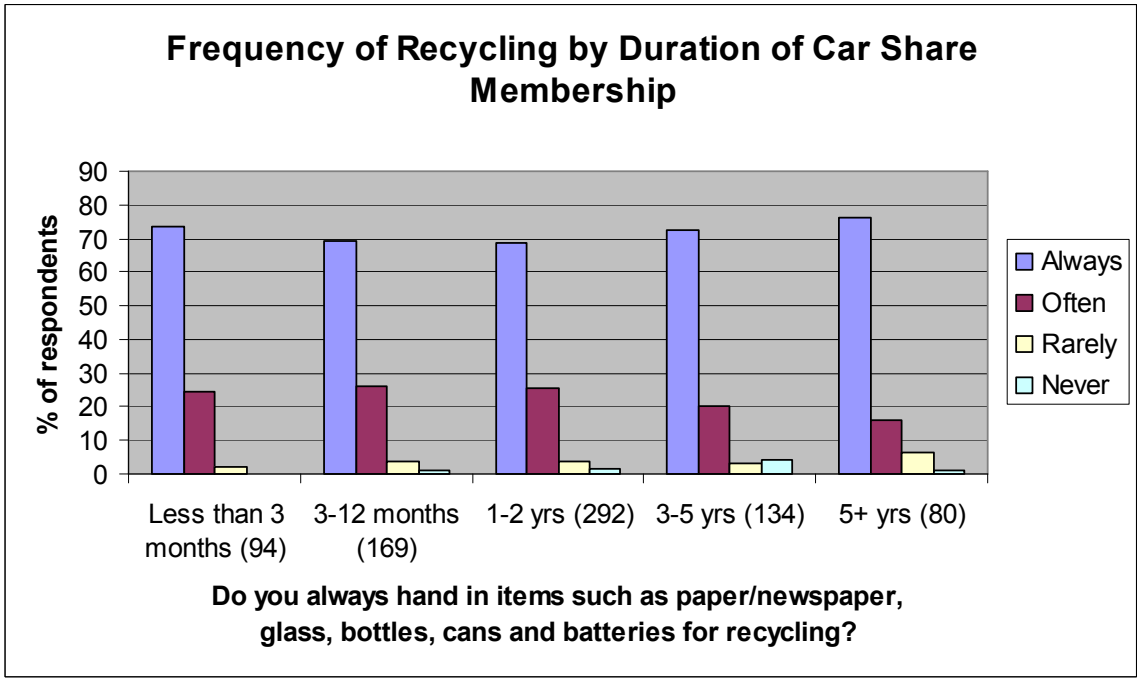


Figure 50: Frequency of Recycling by Duration of Car Share Membership

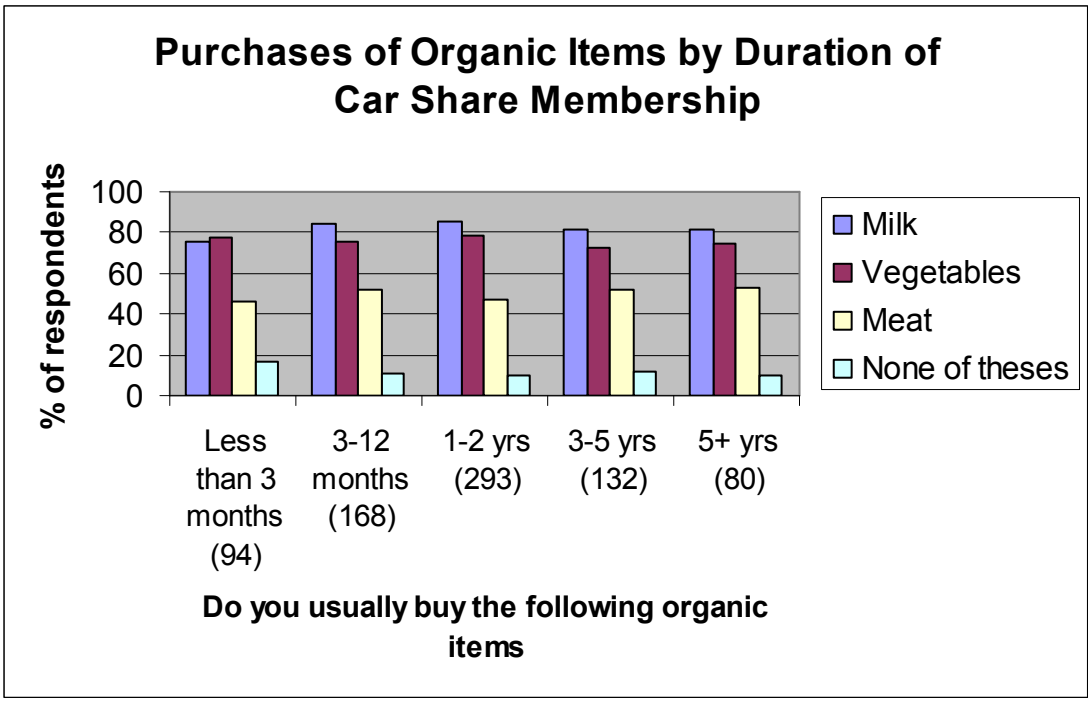


Figure 51: Purchases of Organic Items by Length of Membership

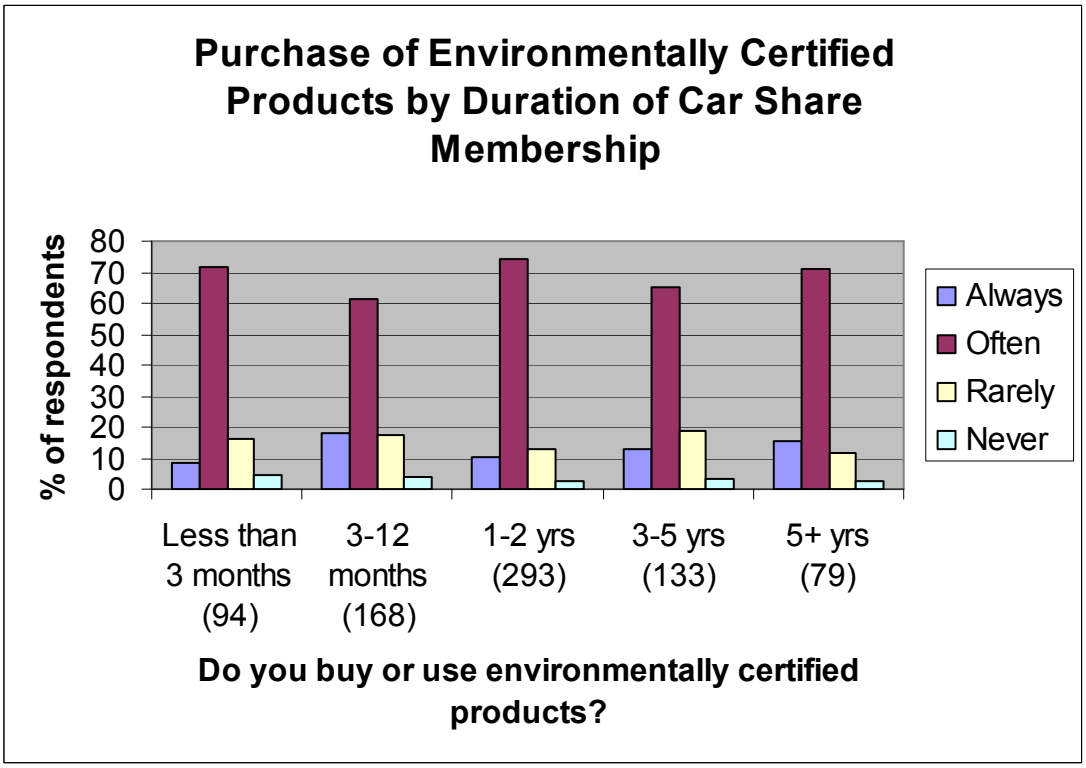


Figure 52: Purchase of Environmentally Certified Products by Length of Membership

Figure 53: Support of Environmental Organizations by Length of Membership

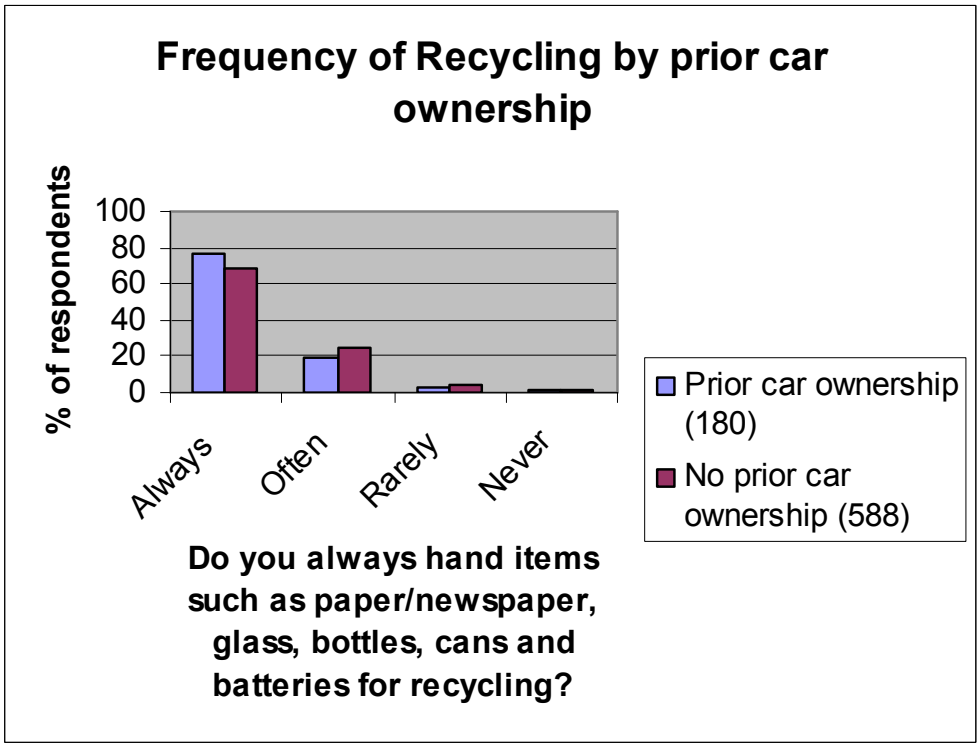


Figure 54: Frequency of Recycling by Prior Car Ownership

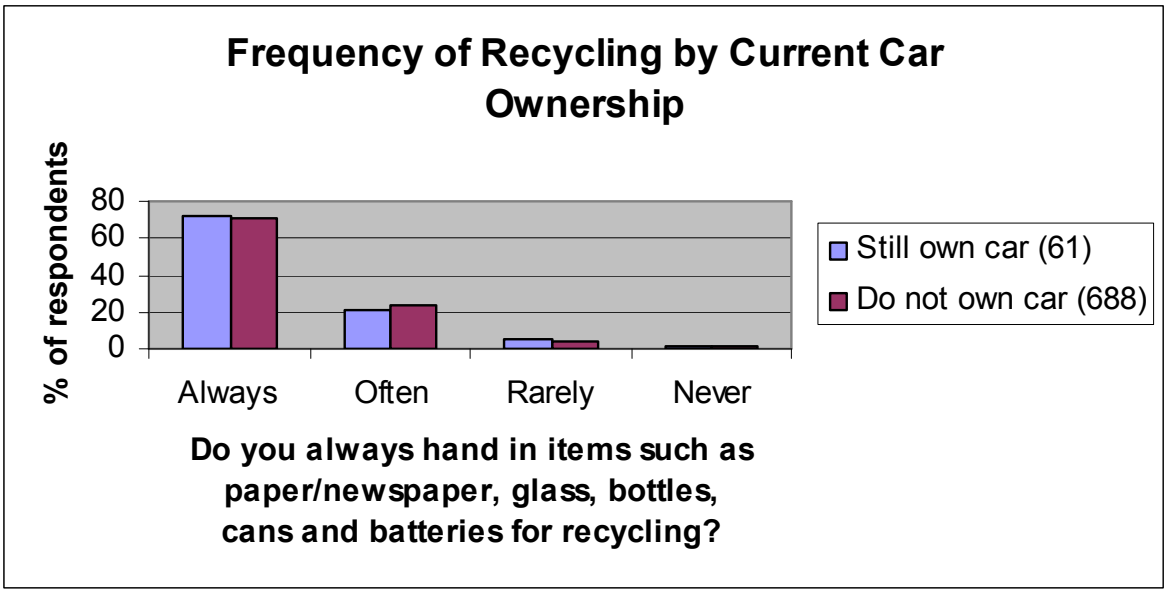


Figure 55: Frequency of Recycling by Current Car Ownership

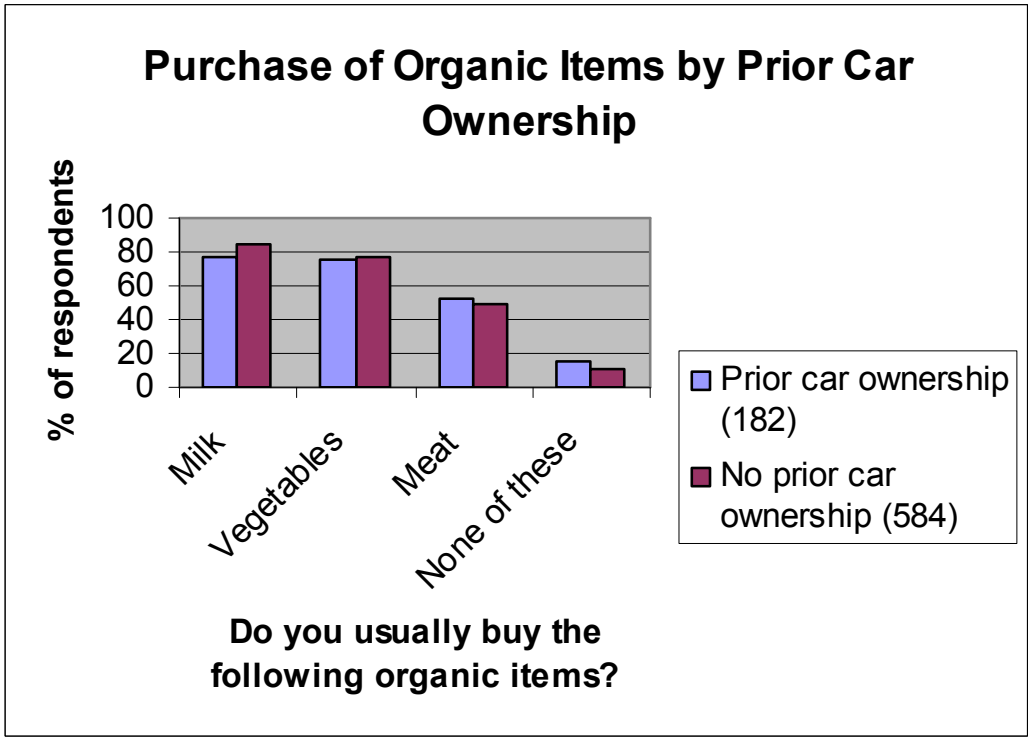


Figure 56: Purchase of Organic Items by Prior Car Ownership

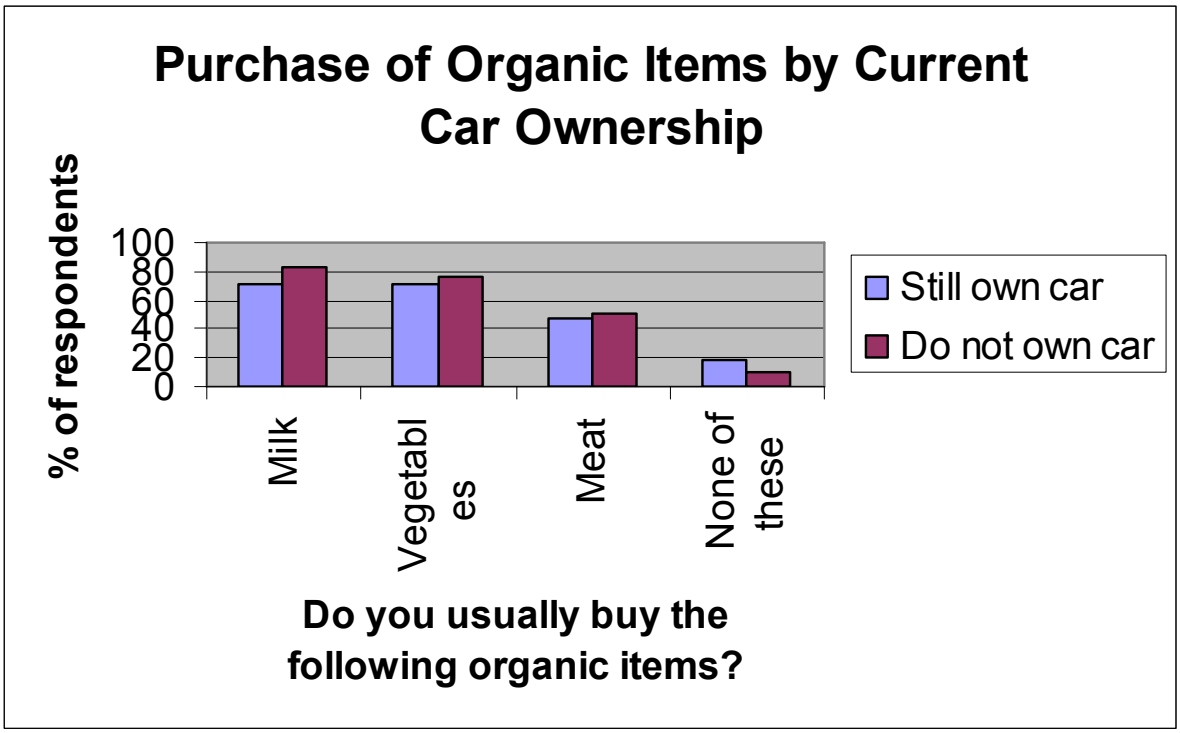


Figure 57: Purchase of Organic Items by Current Car Ownership

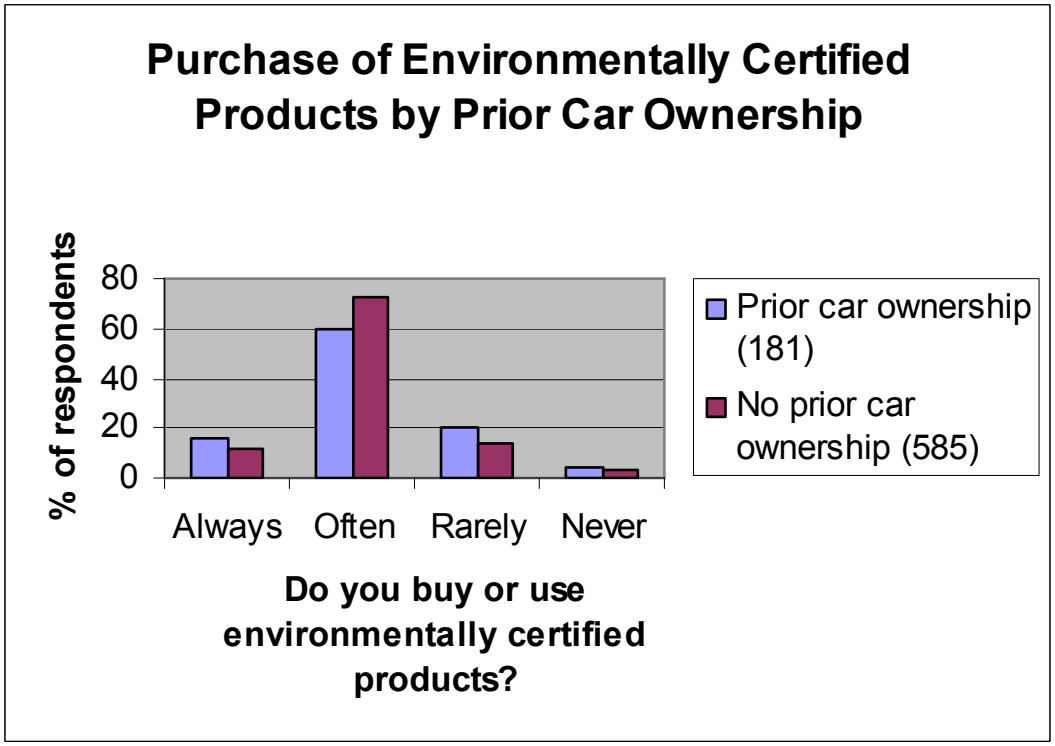


Figure 58: Purchase of Environmentally Certified Products by Prior Car Ownership

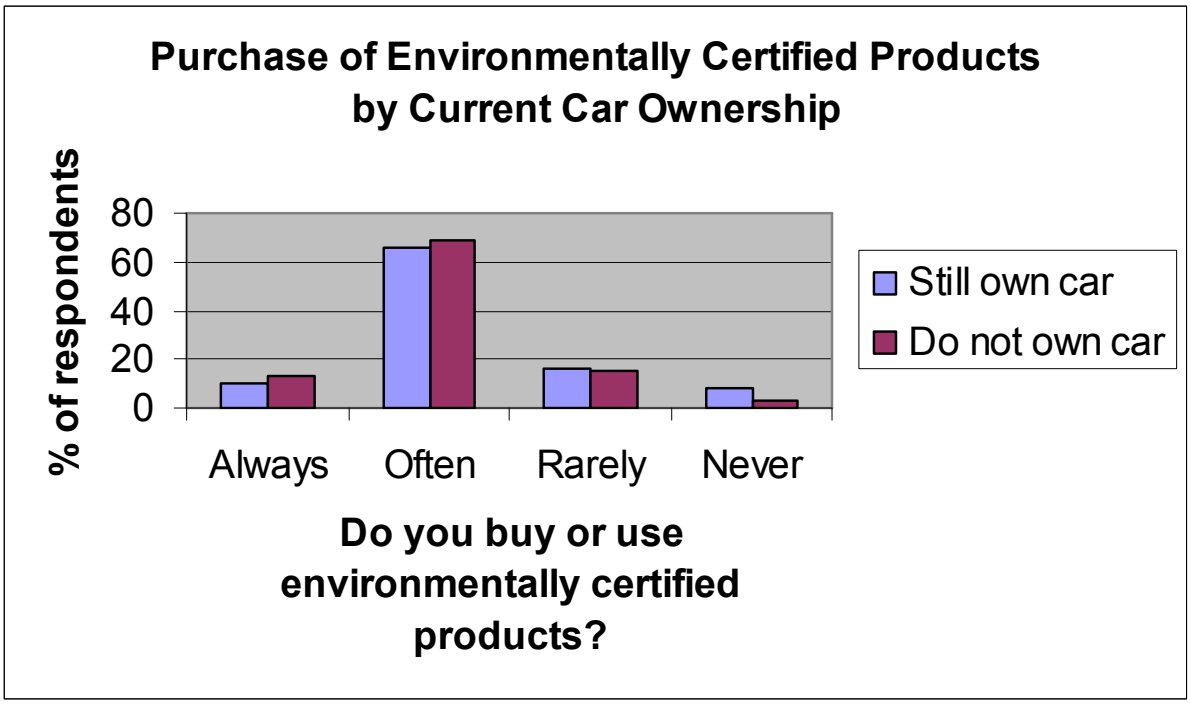


Figure 59: Purchase of Environmentally Certified Products by Current Car Ownership

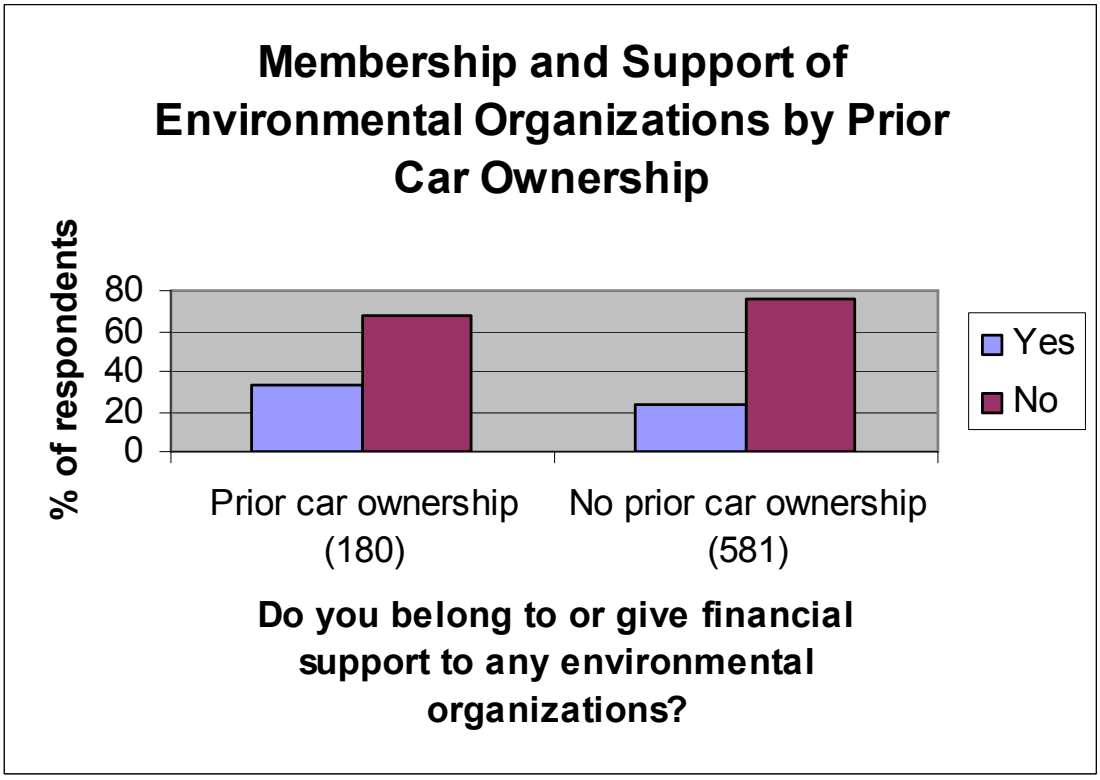


Figure 60: Support of Environmental Organizations by Prior Car Ownership

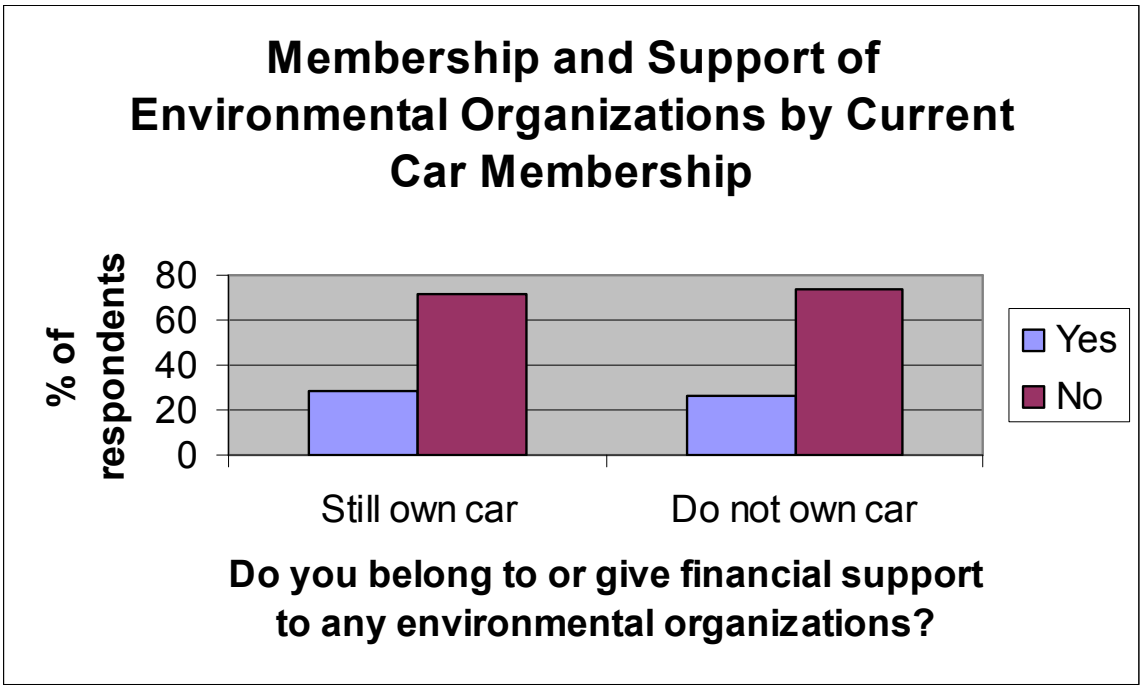


Figure 61: Support of Environmental Organizations by Current Car Ownership

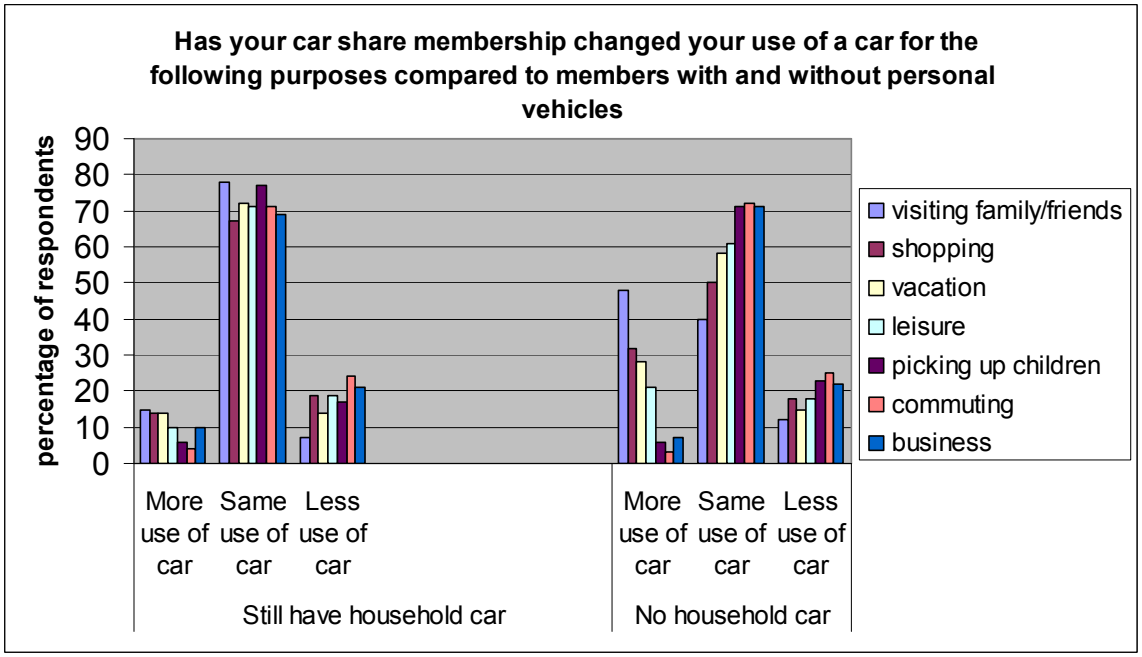


Figure 62: Use of Vehicle Compared to Current Vehicle Ownership

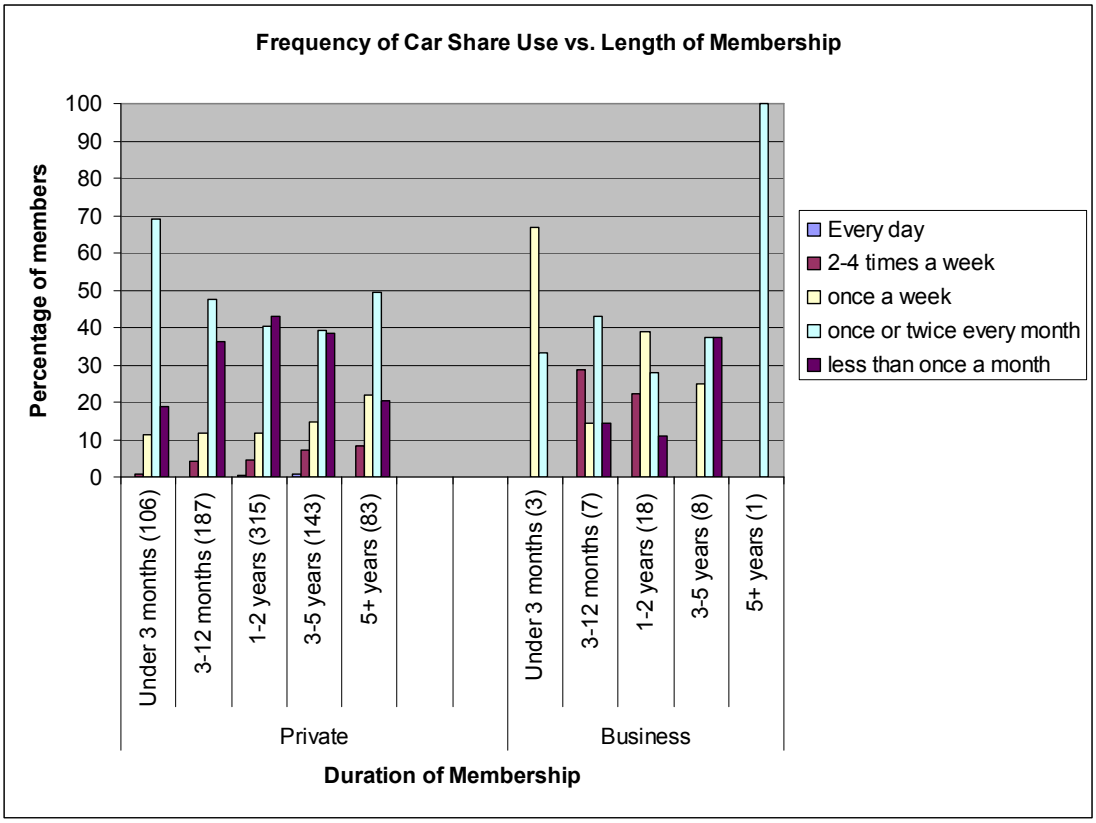


Figure 63: Frequency of Vehicle Use vs Length of Membership

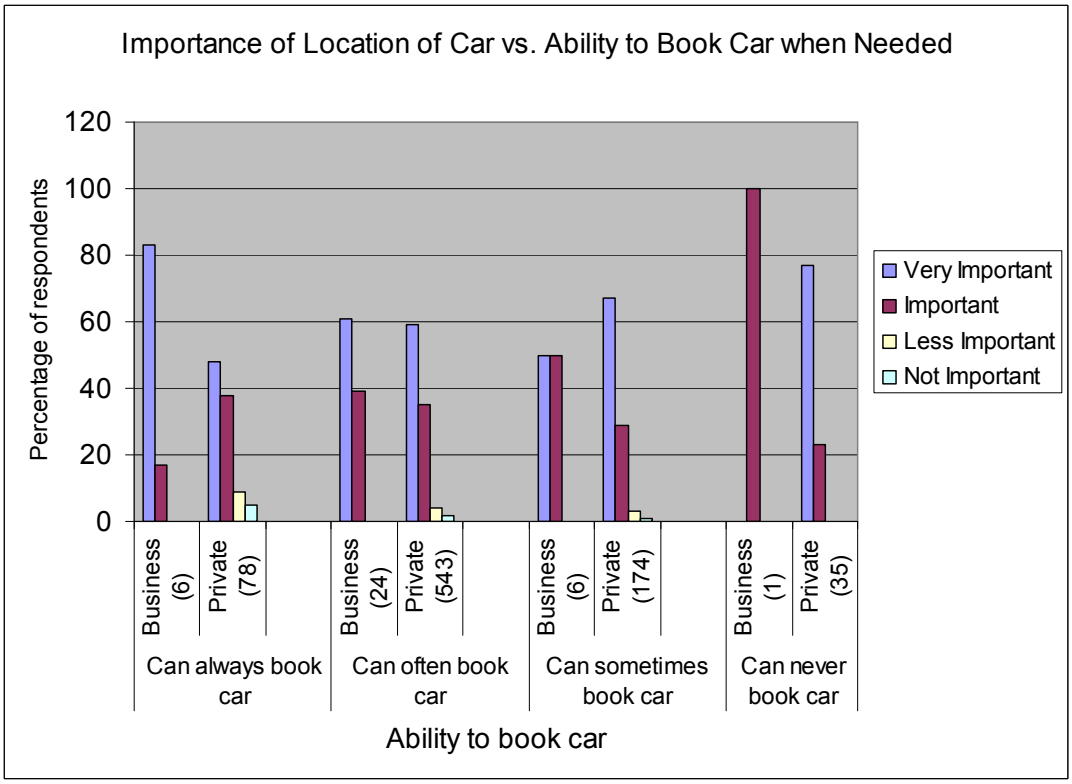


Figure 64: Importance of Location vs Ability to Book Vehicle

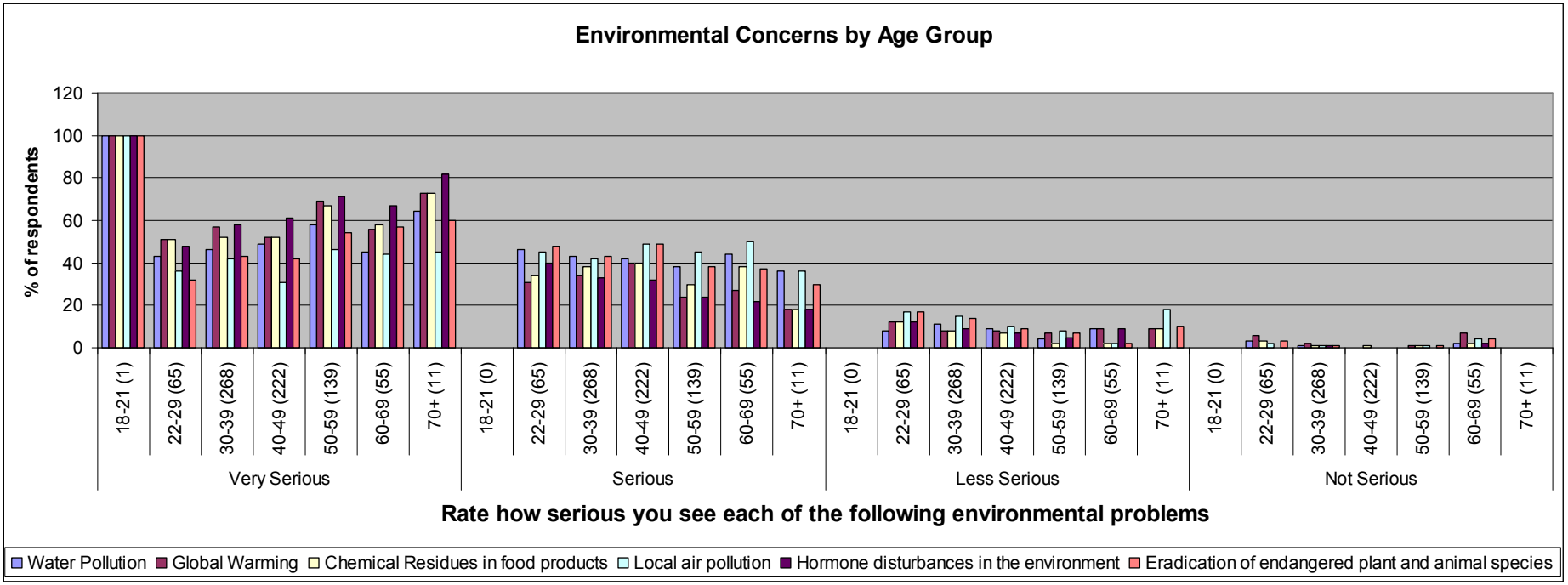


Figure 65: Environmental Concerns by Age

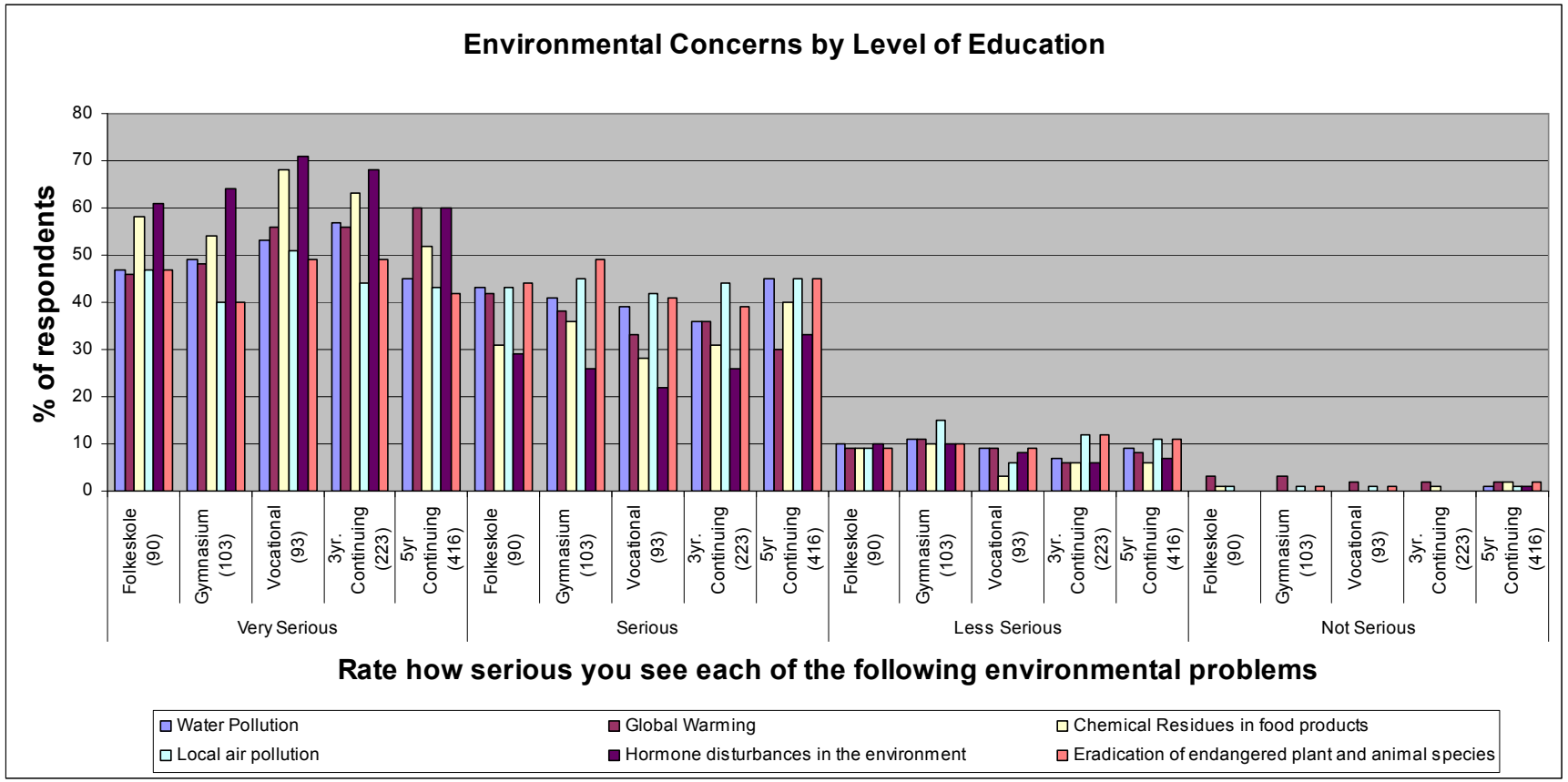


Figure 66: Environmental Concerns by Education

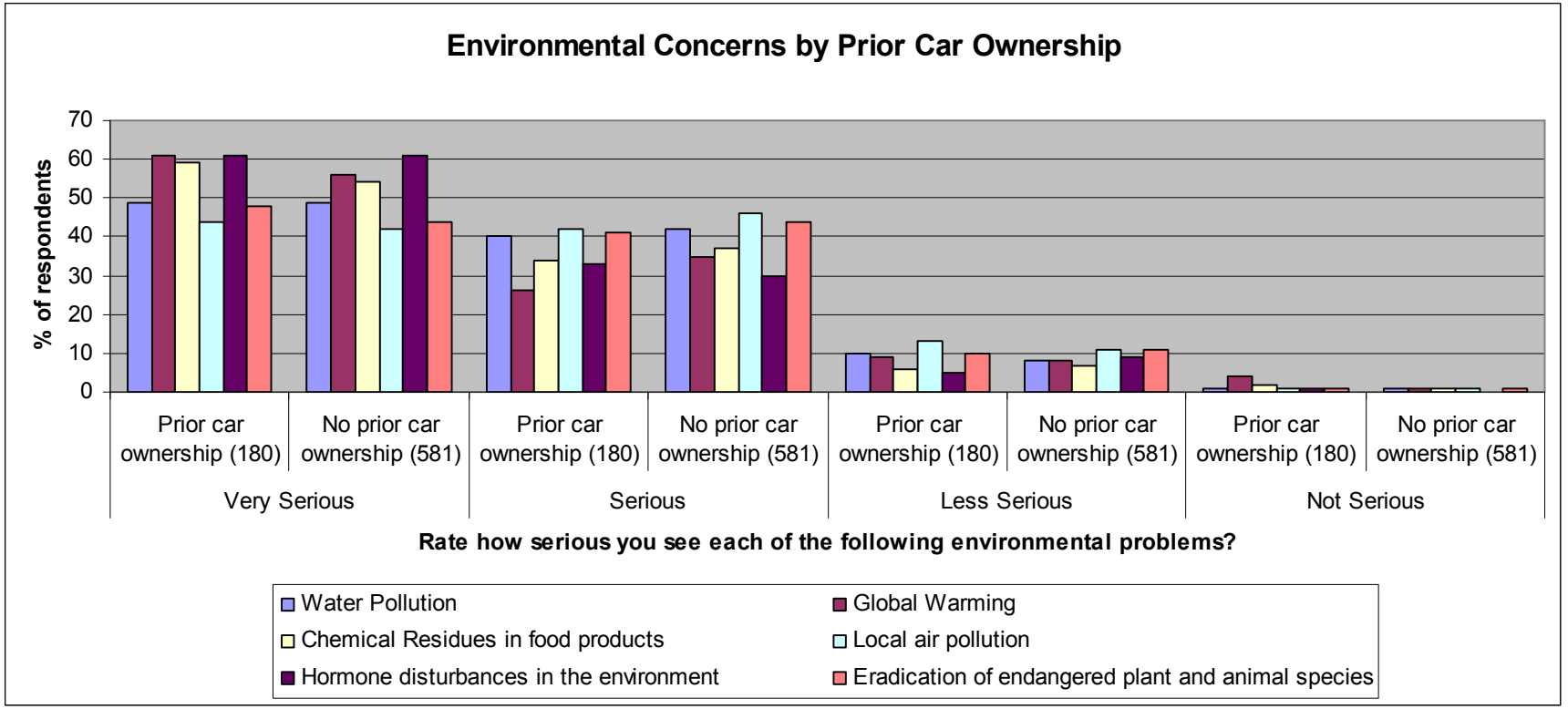


Figure 67: Environmental Concerns by Prior Car Ownership

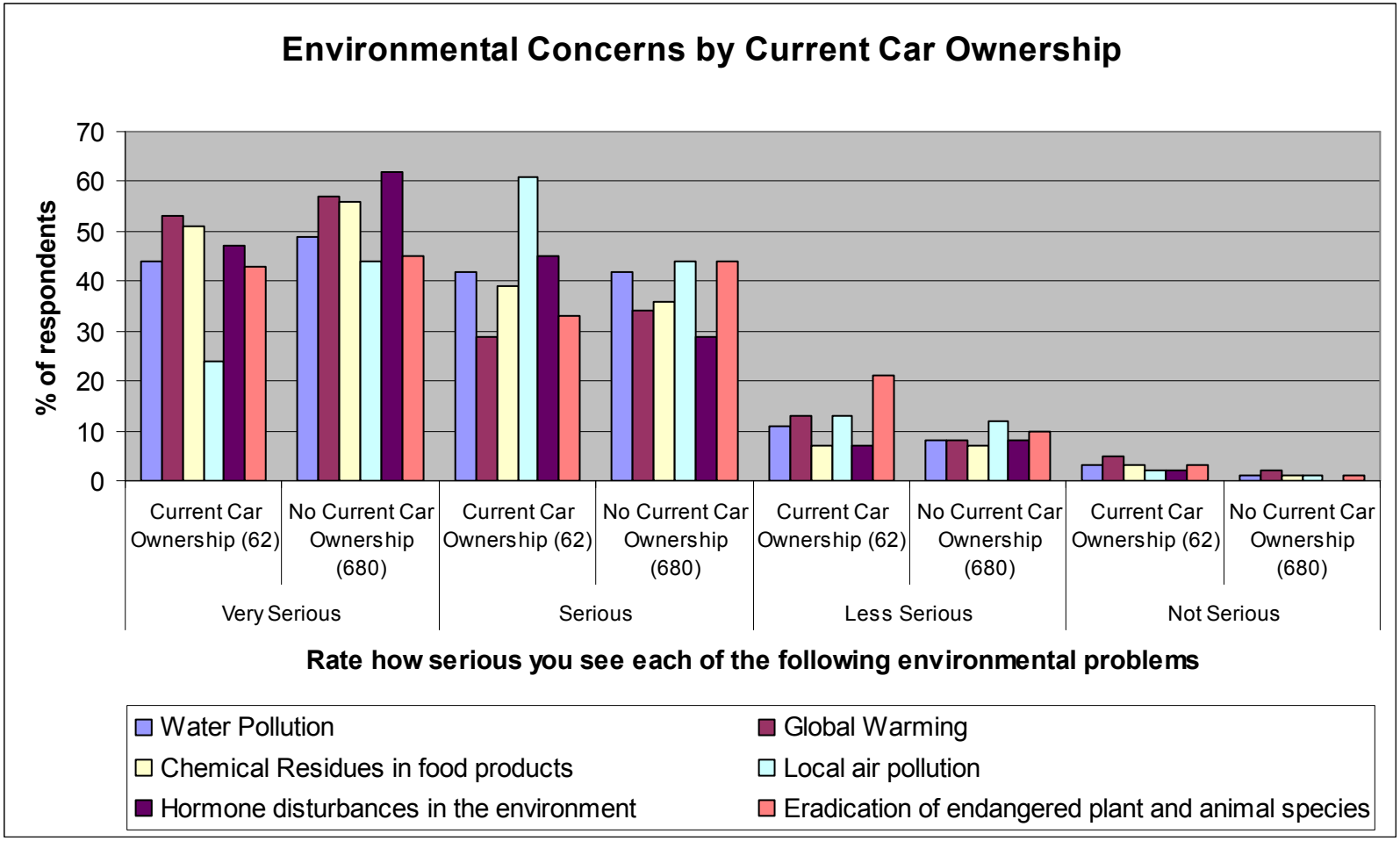


Figure 68: Environmental Concerns by Current Car Ownership

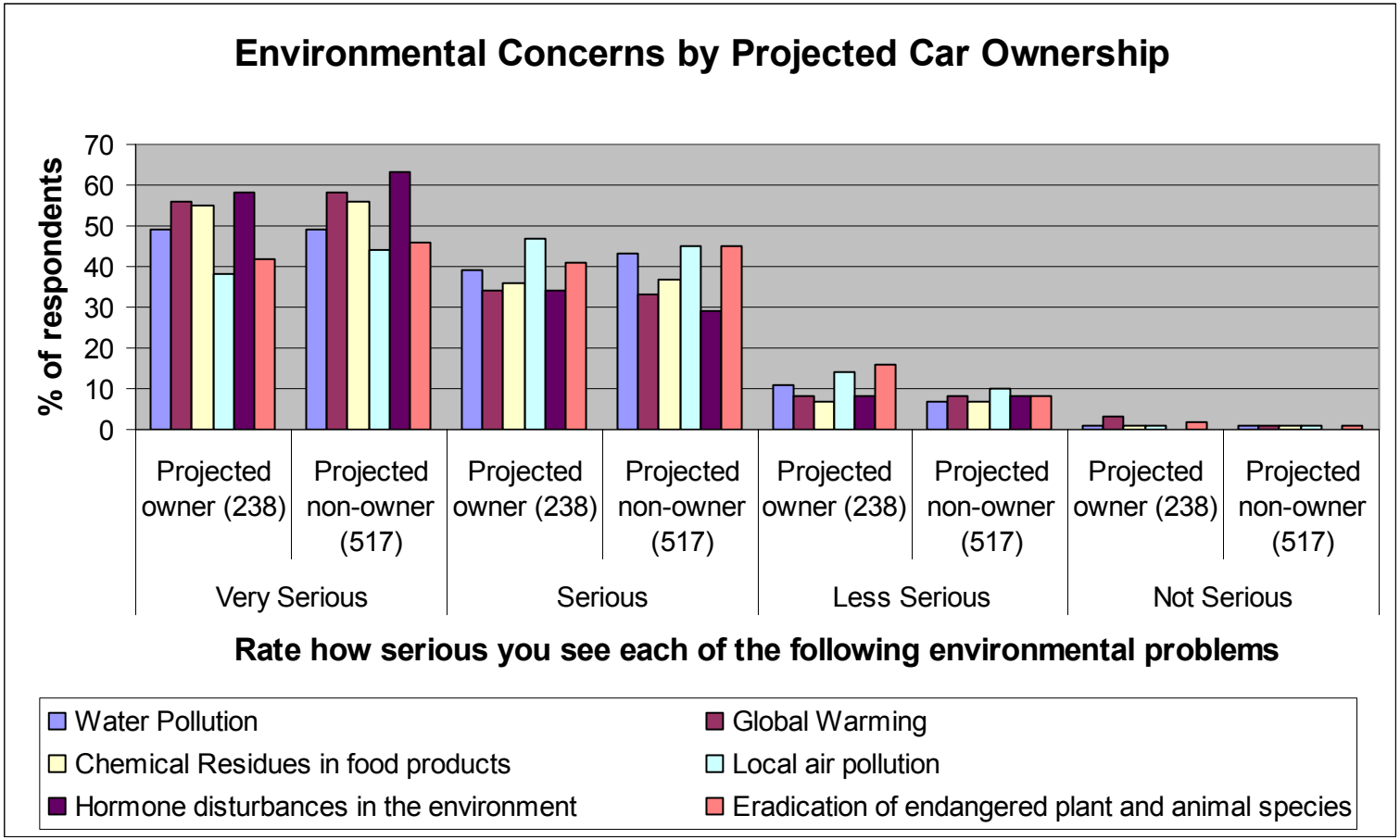


Figure 69: Environmental Concerns by Projected Car Ownership

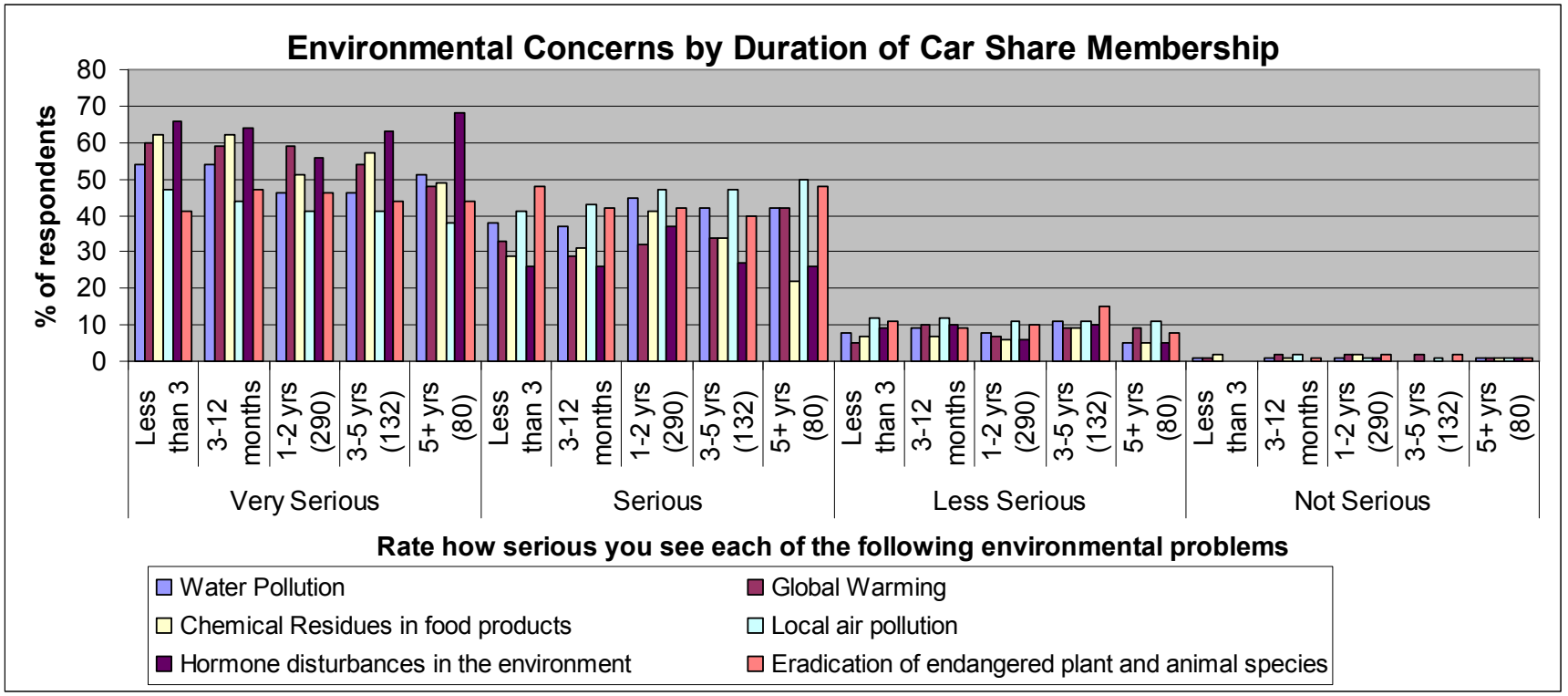


Figure 70: Environmental Concerns by Duration of Membership

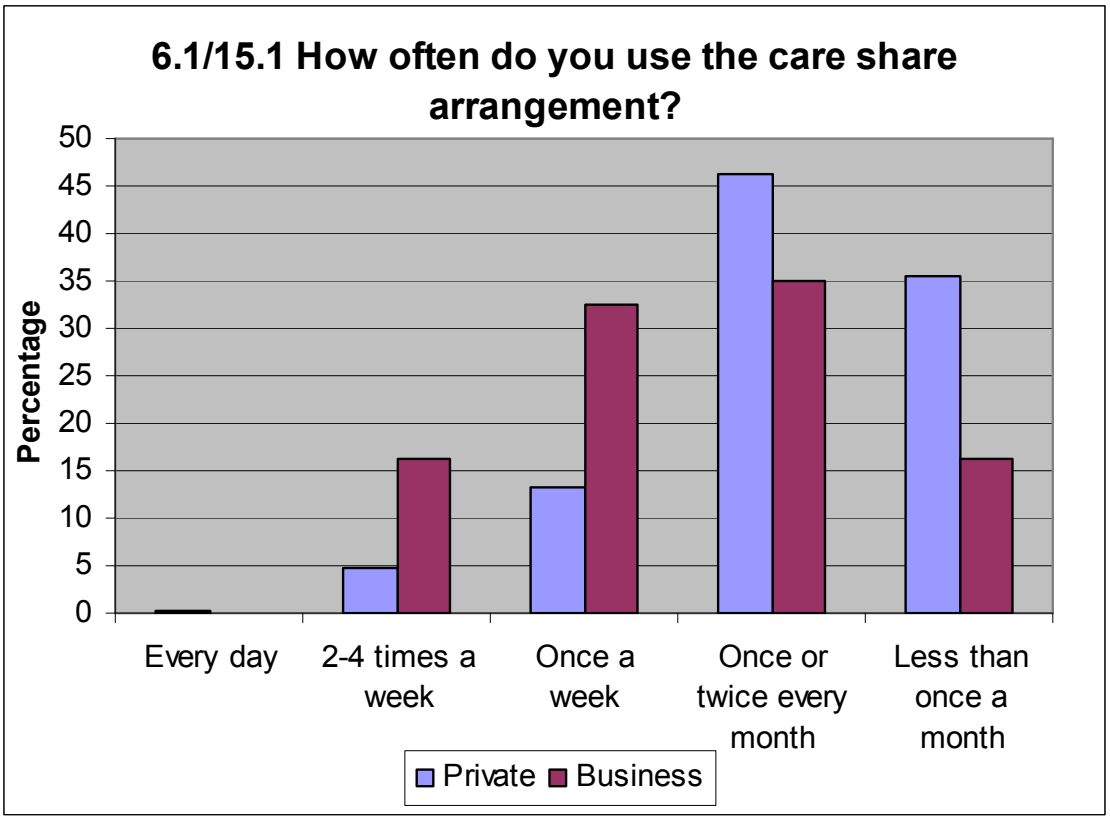


Figure 71: How Often Members Use Car Sharing

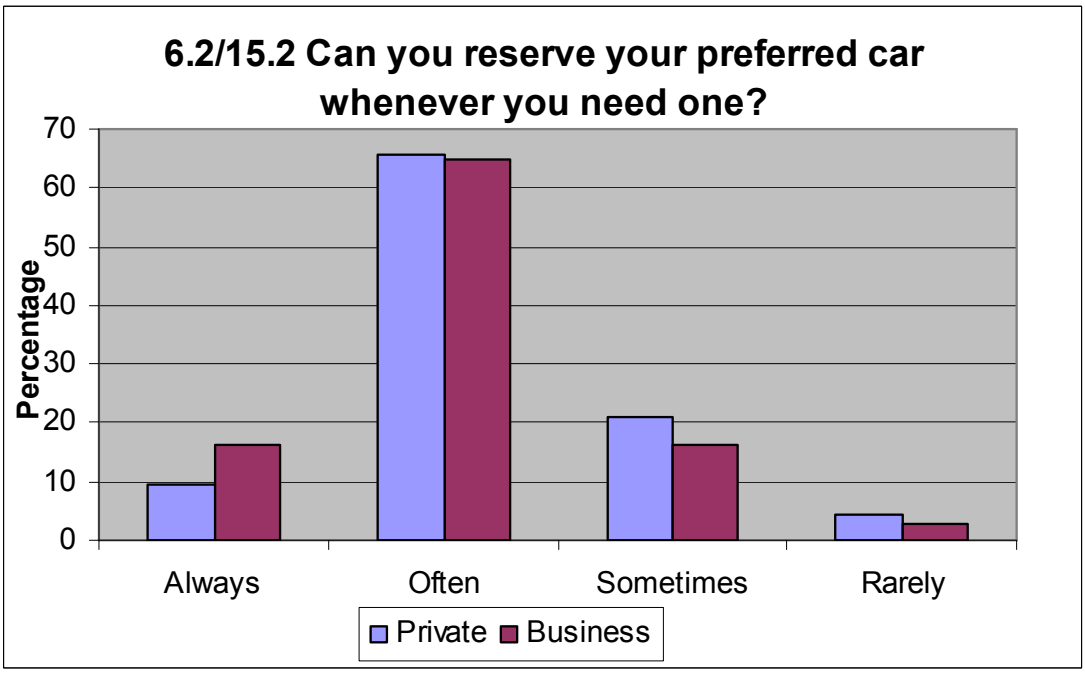
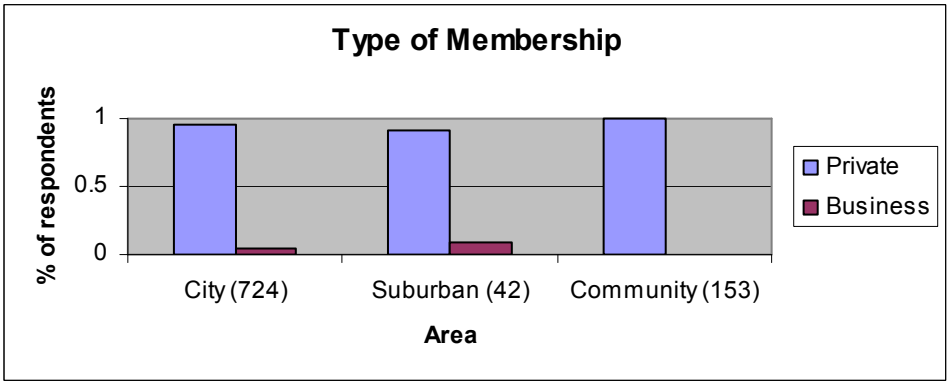


Figure 72: Can Members Reserve Their Preferred Car

Grouped CSO Data:

Private Survey Data:

Figure 73: Grouped CSO Type of Membership



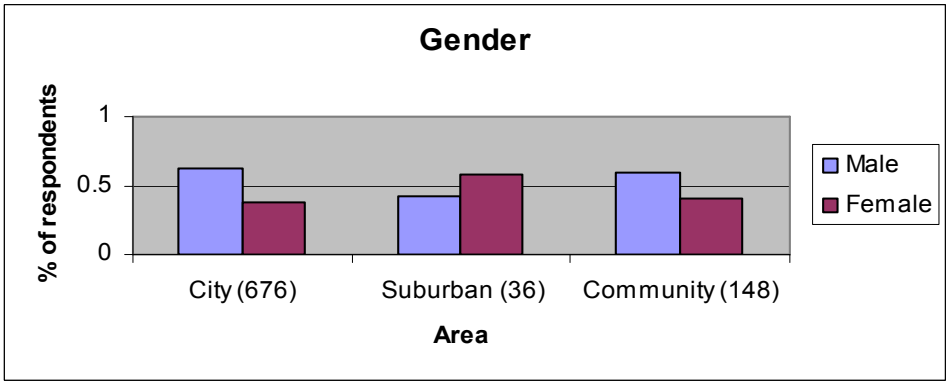


Figure 74: Grouped CSO Gender

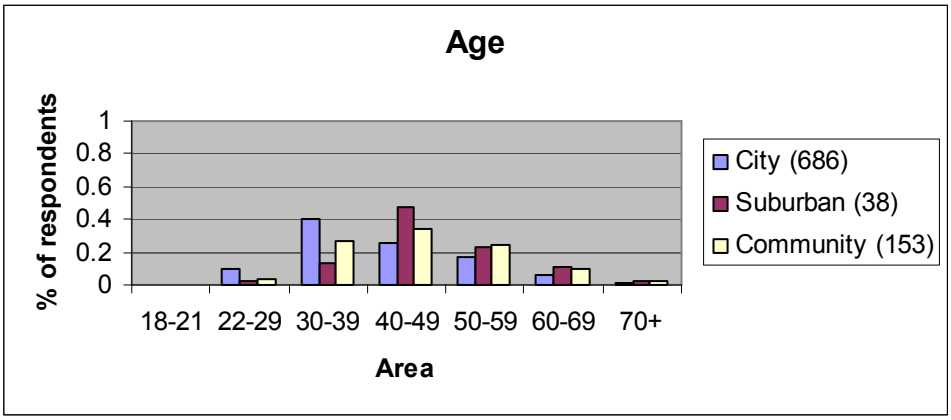


Figure 75: Grouped CSO Age

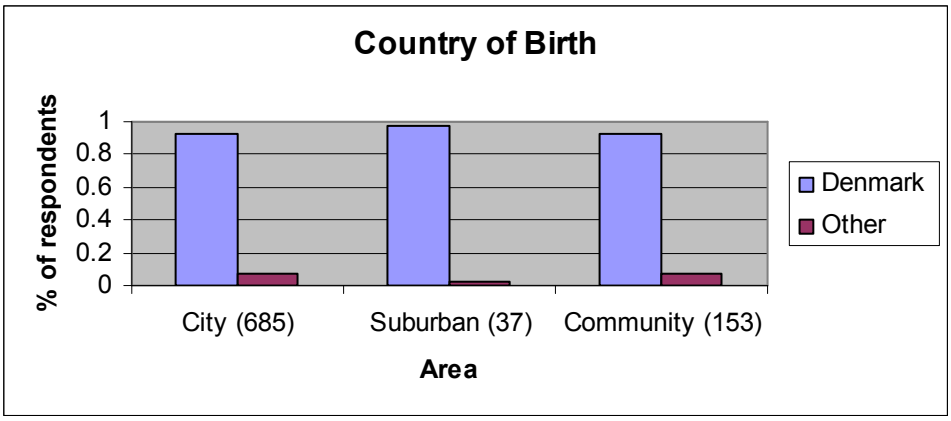


Figure 76: Grouped CSO Country of Birth

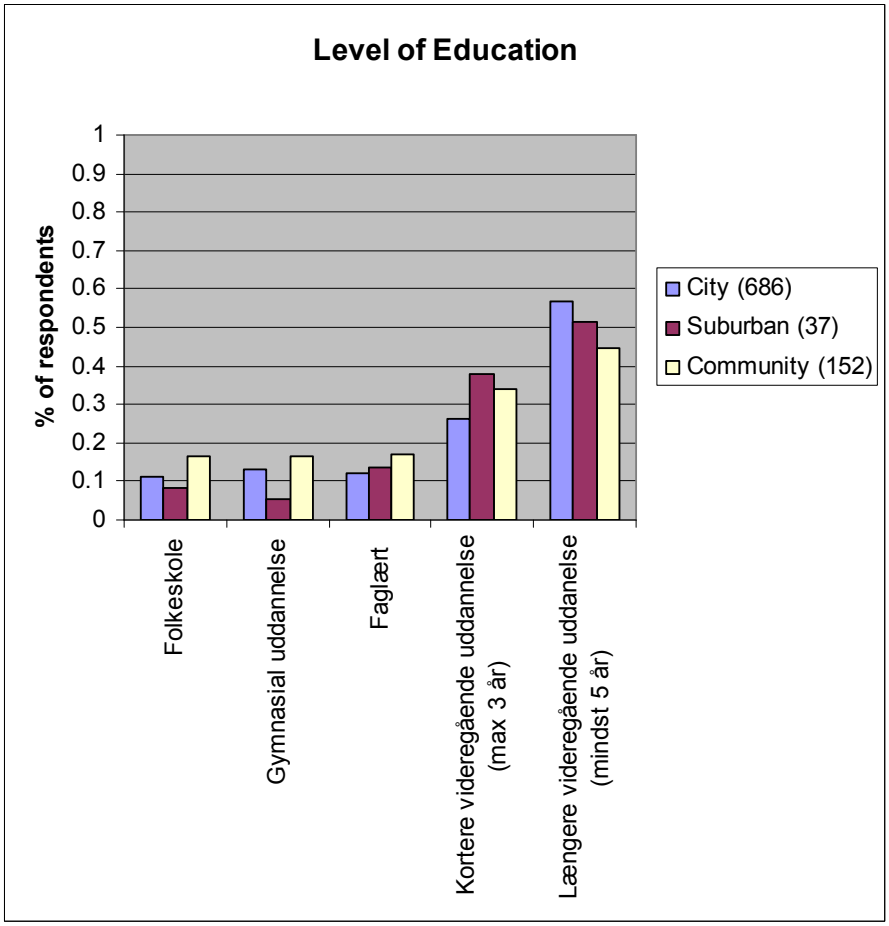


Figure 77: Grouped CSO Level of Education

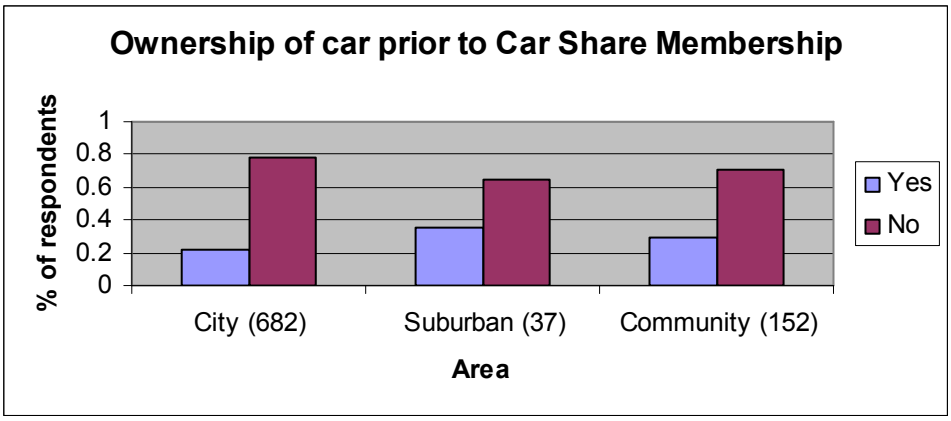


Figure 78: Grouped CSO Prior Car Ownership

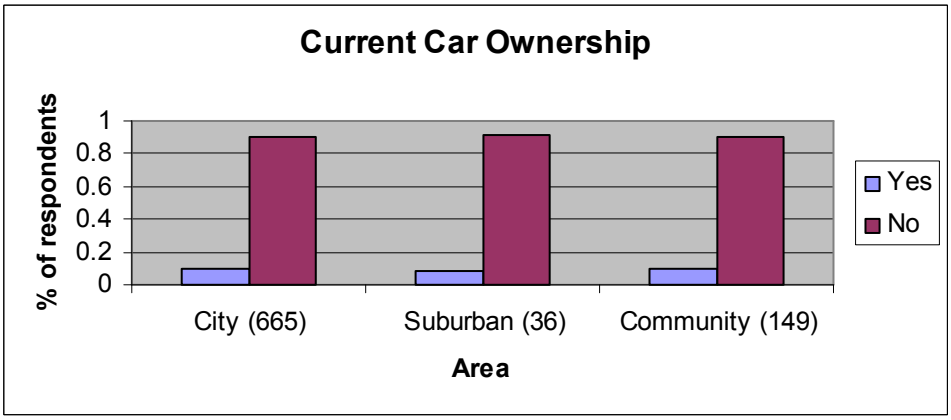


Figure 79: Grouped CSO Current Car Ownership

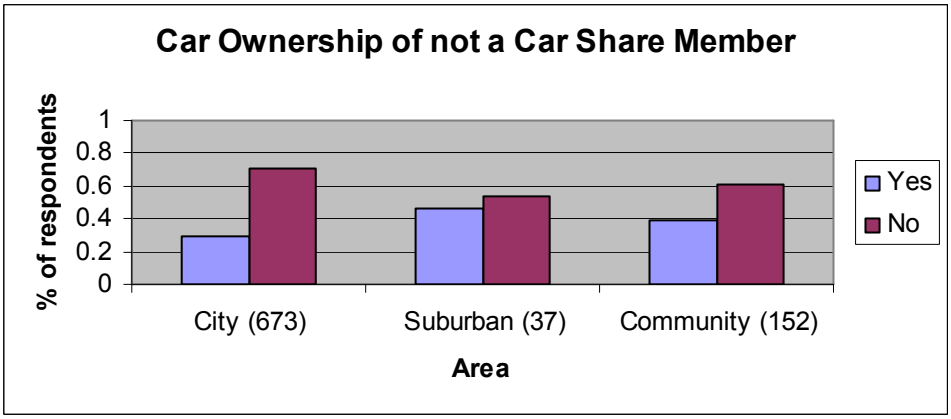


Figure 80: Grouped CSO Projected Car Ownership

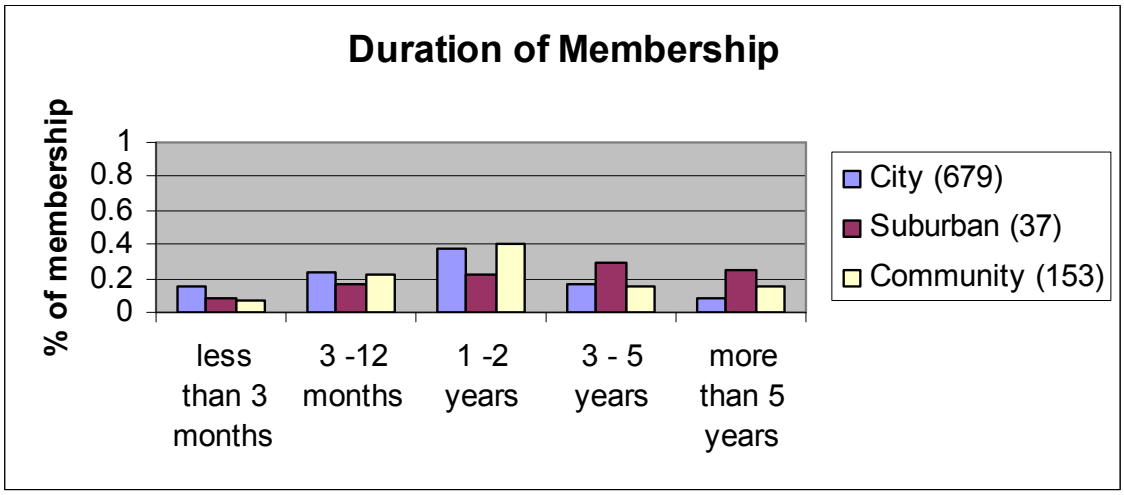


Figure 81: Grouped CSO Duration of Membership

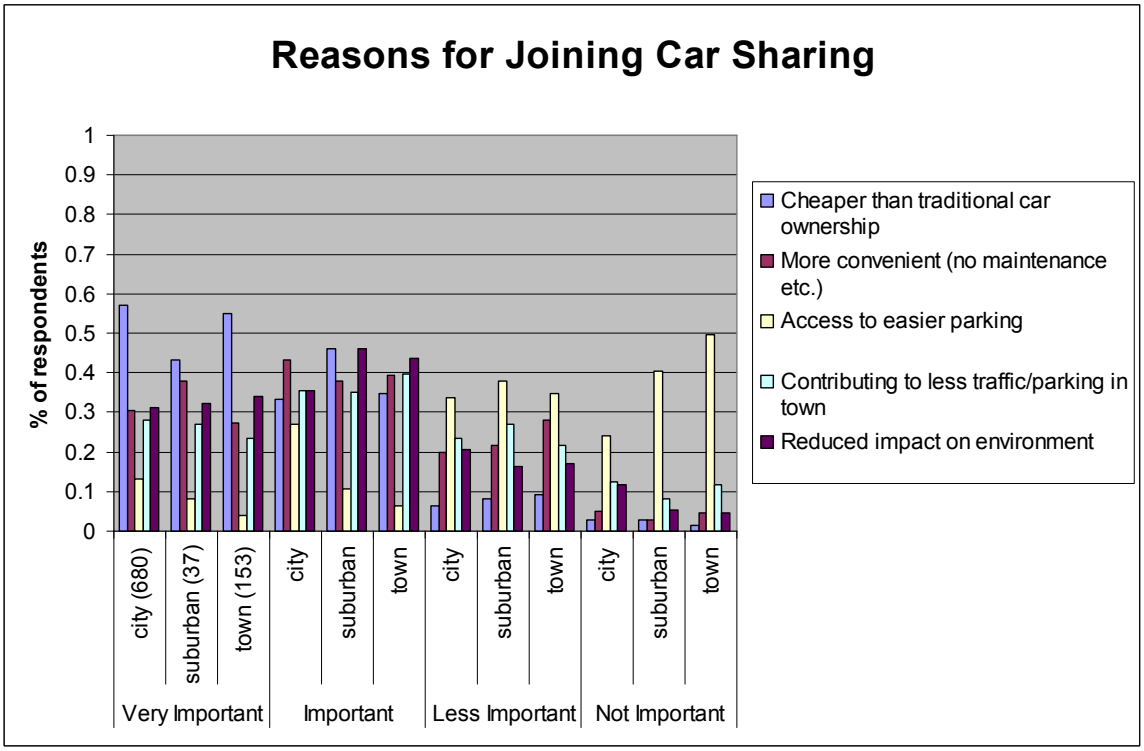


Figure 82: Grouped CSO Reasons for Joining Car Sharing

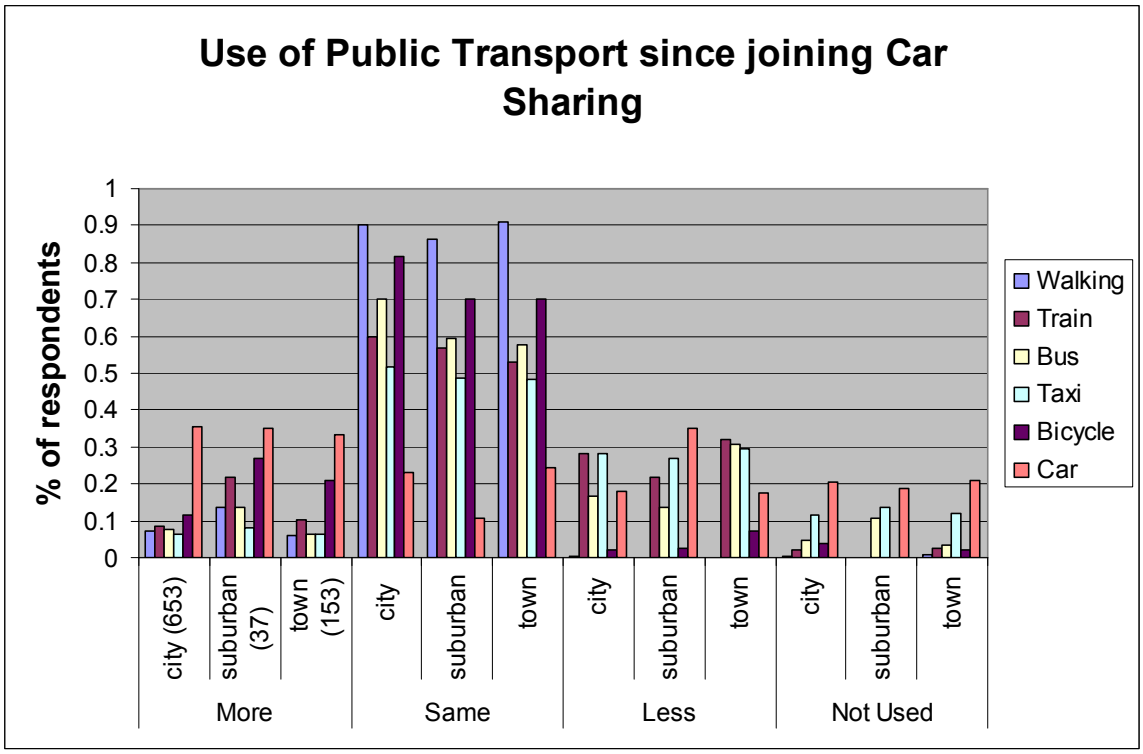


Figure 83: Grouped CSO Use of Public Transport

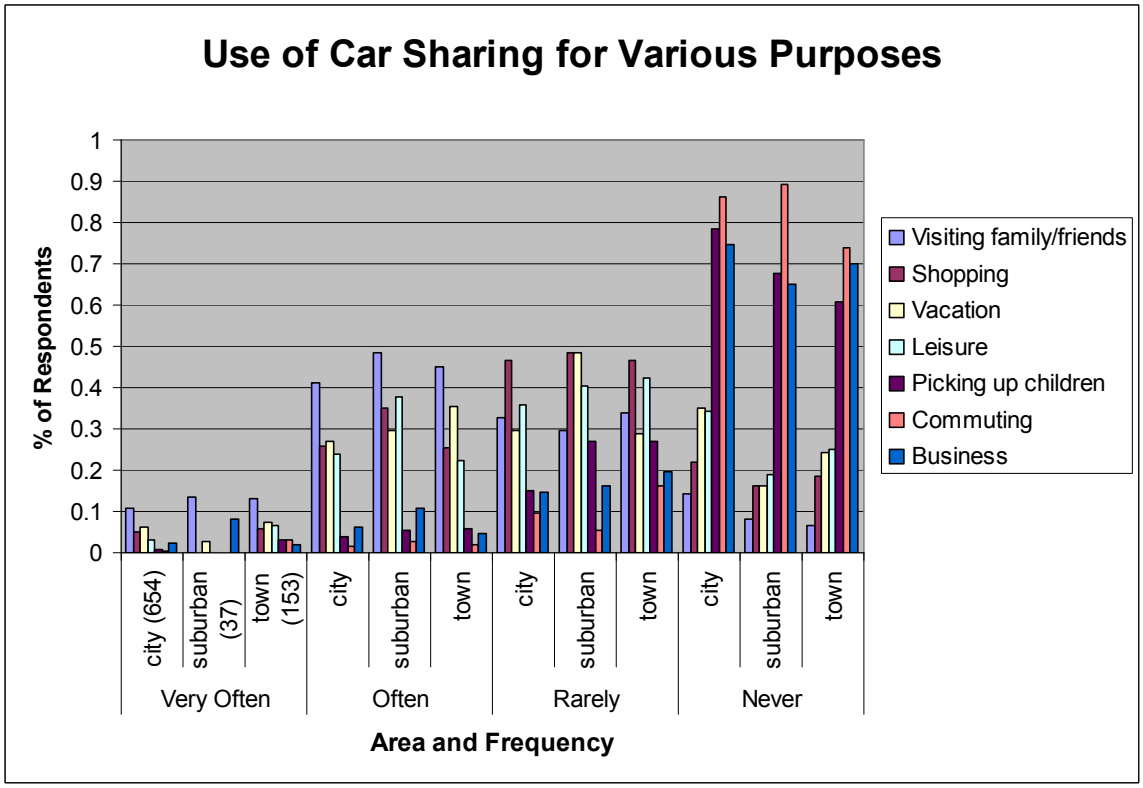


Figure 84: Grouped CSO Use of Car Share

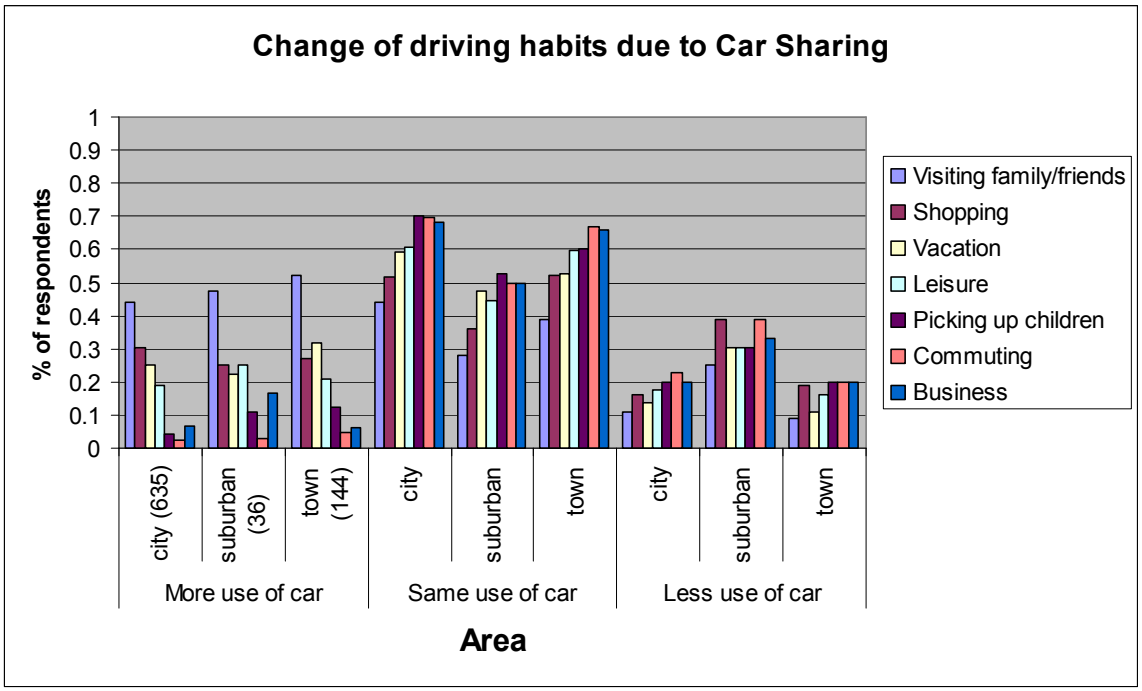


Figure 85: Grouped CSO Change of Driving Habits

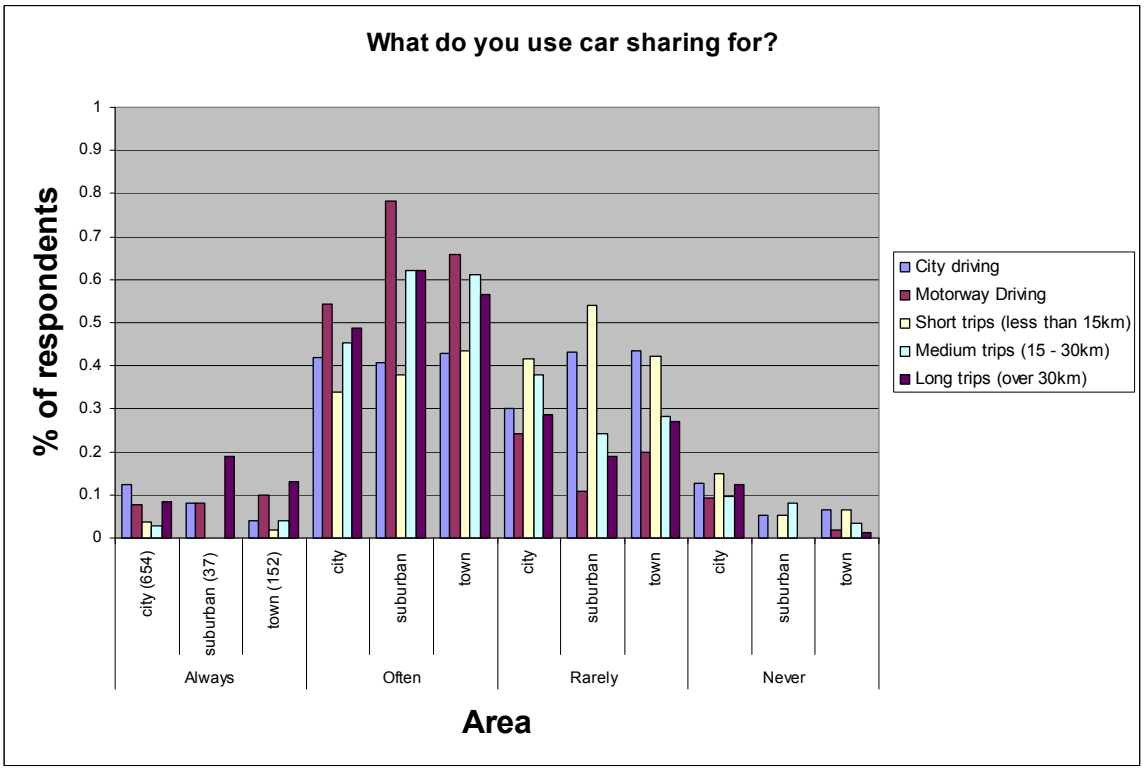


Figure 86: Grouped CSO Use of Car Sharing

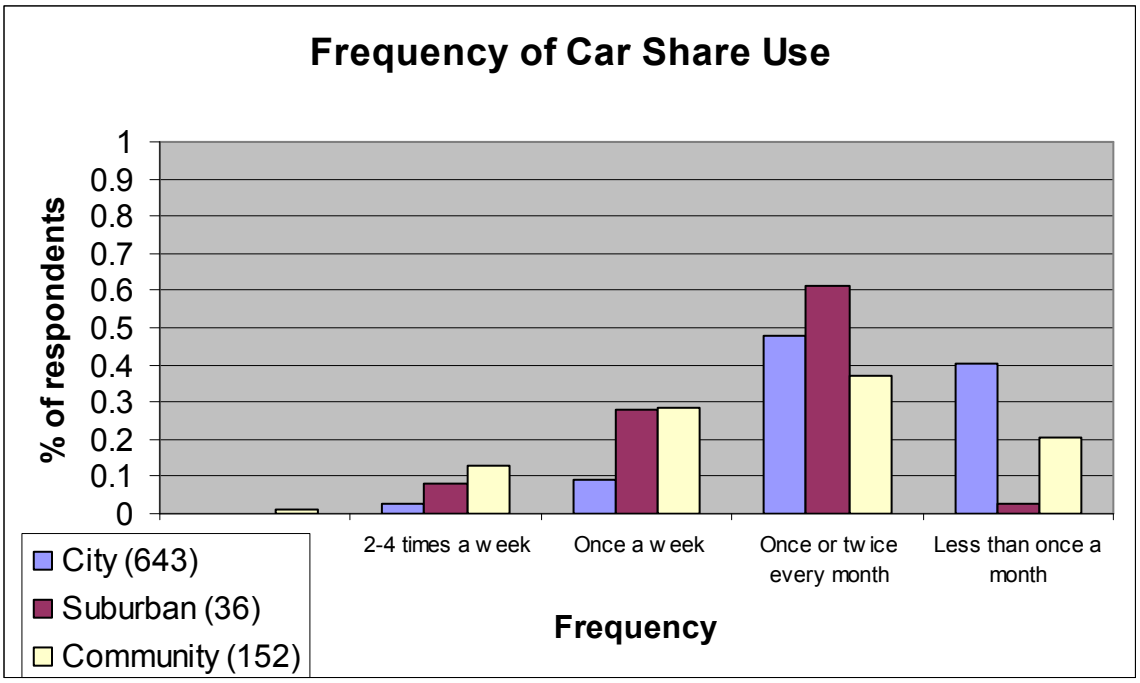


Figure 87: Grouped CSO Frequency of Car Share Use

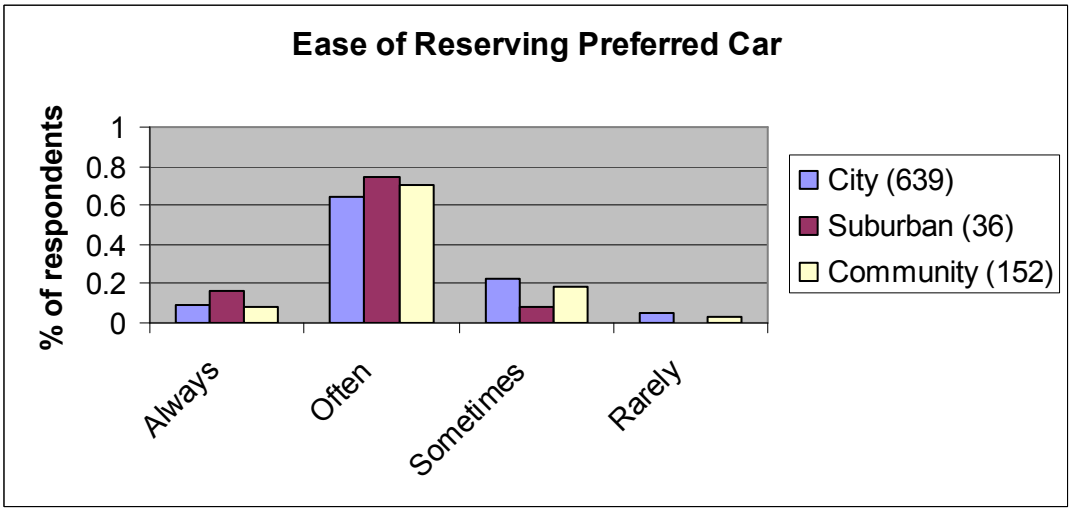


Figure 88: Grouped CSO Ease of Reserving Preferred Car

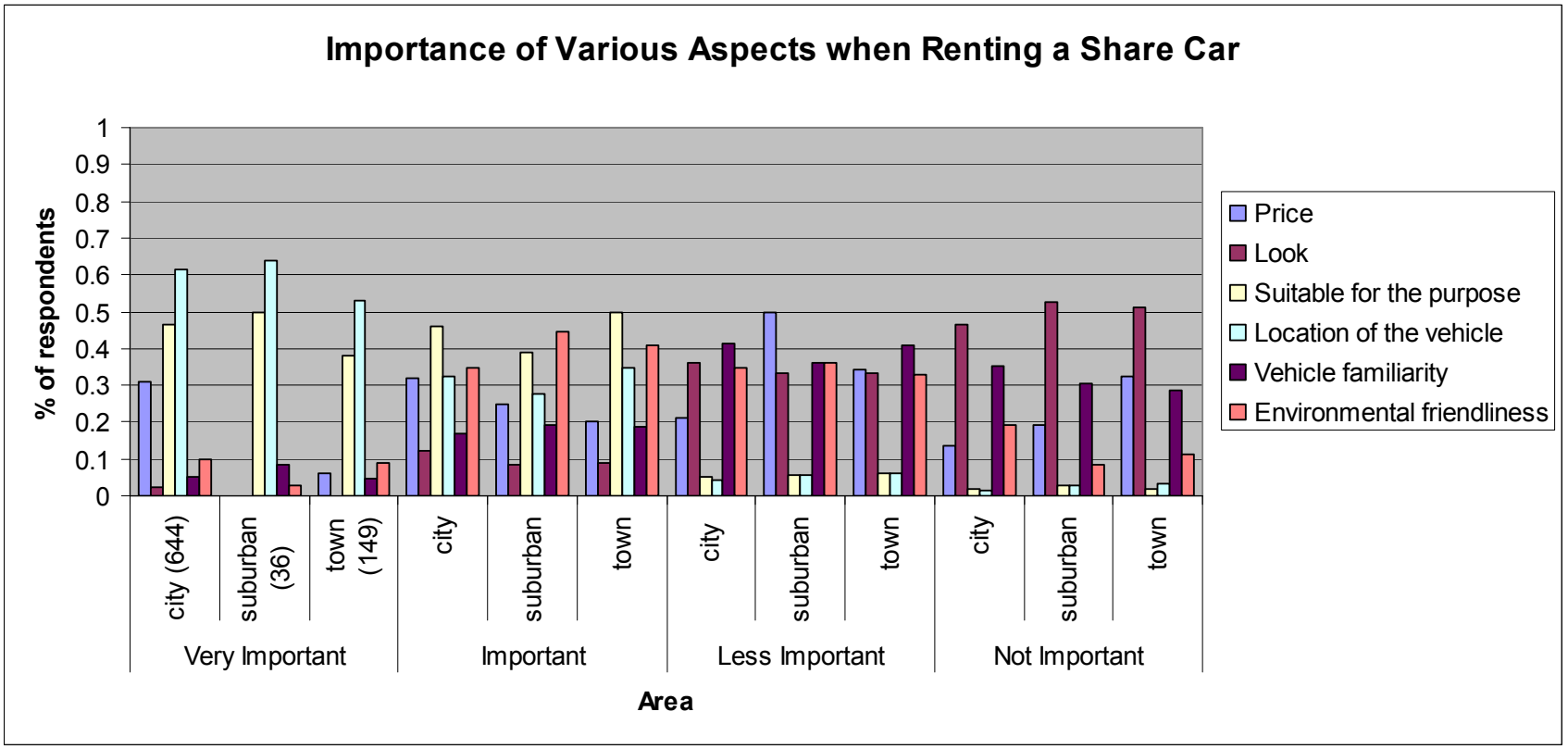


Figure 89: Grouped CSO Importance of Various Aspects when Renting a Share Car

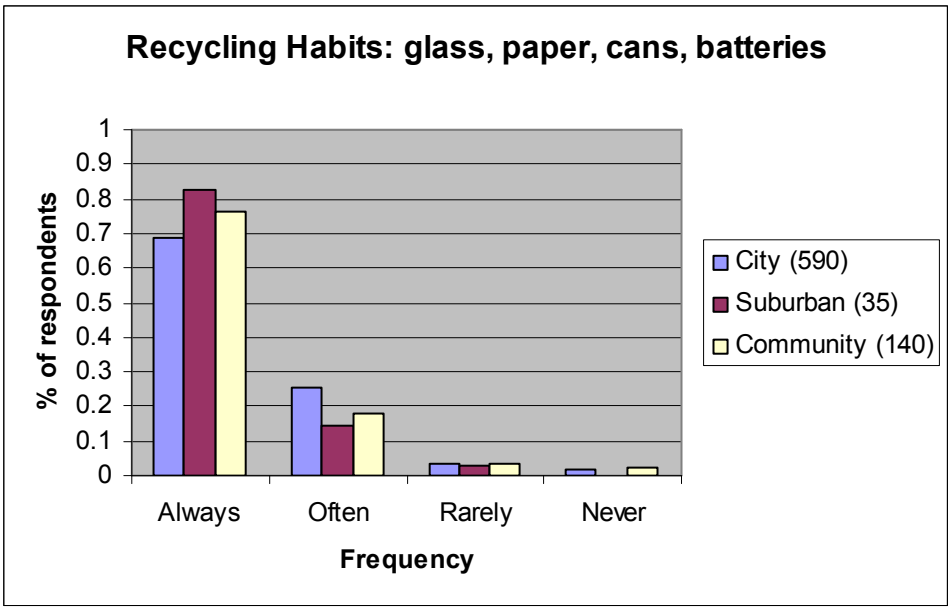


Figure 90: Grouped CSO Recycling Habits

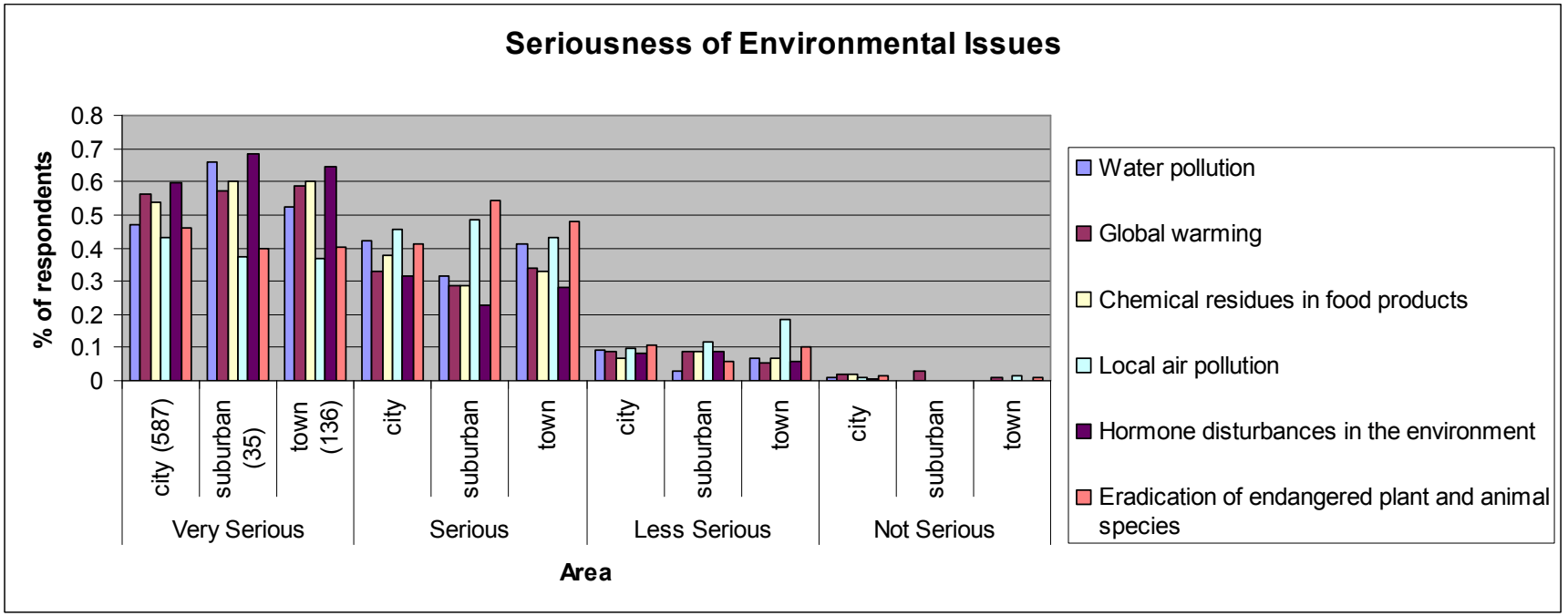


Figure 91: Grouped CSO Seriousness of Environmental Issues

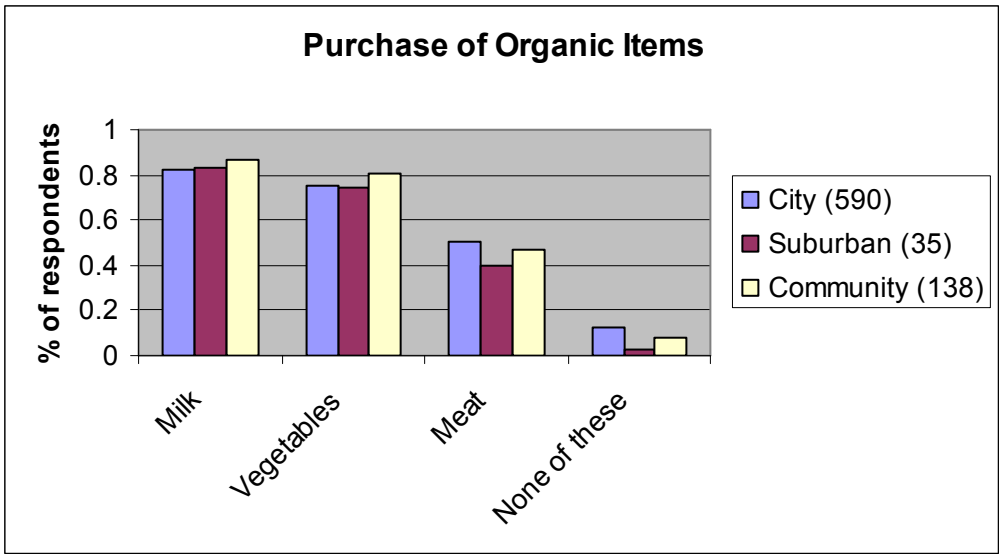


Figure 92: Grouped CSO Purchase of Organic Items

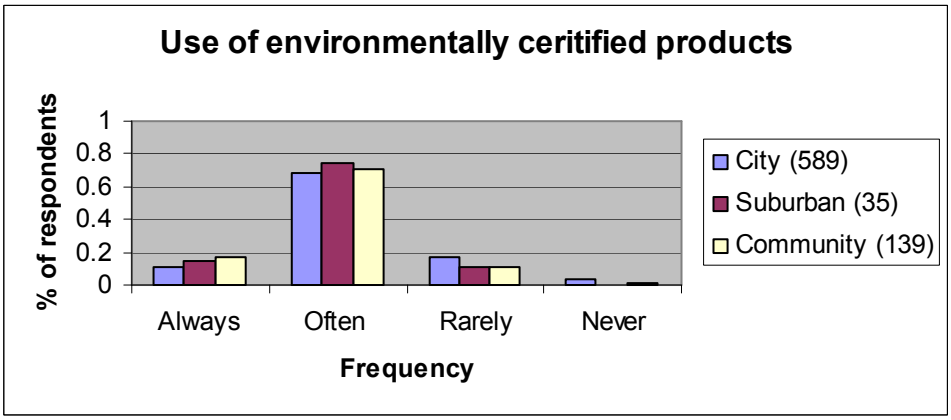


Figure 93: Grouped CSO Use of Environmentally Certified Products

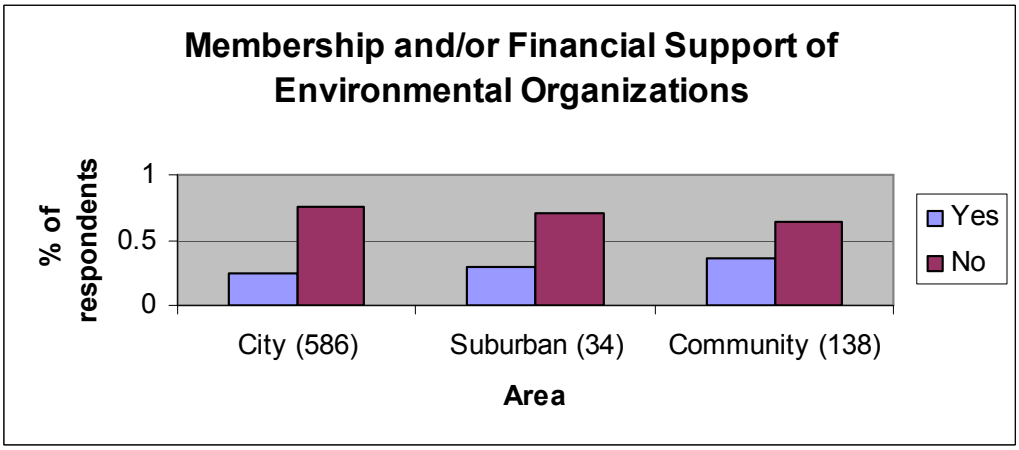


Figure 94: Grouped CSO Support and Membership of Environmental Organizations

Business Survey Data:

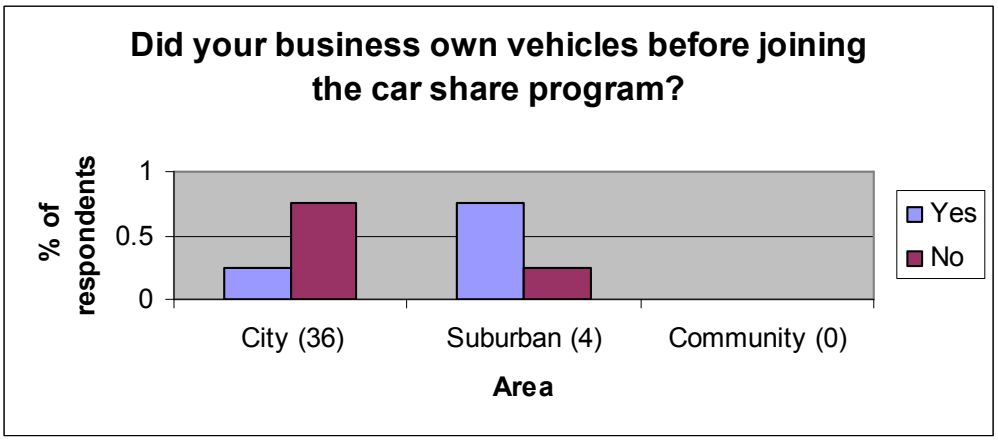


Figure 95: Grouped CSO Business Prior Car Ownership

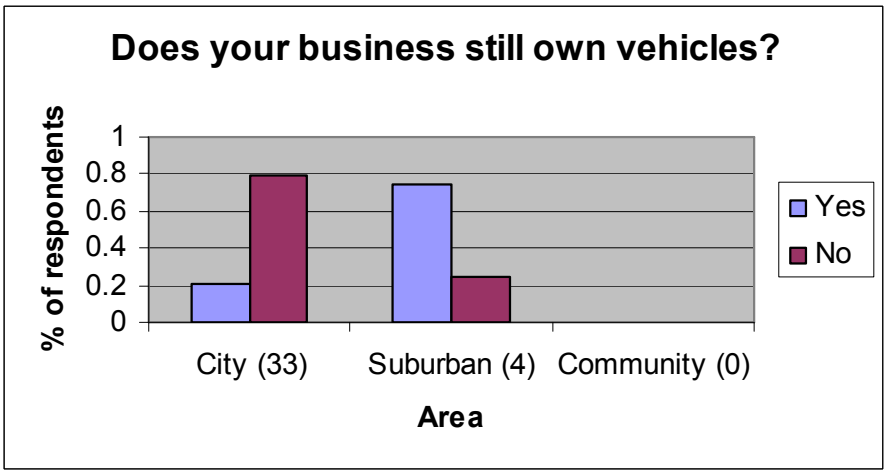


Figure 96: Grouped CSO Business Current Car Ownership

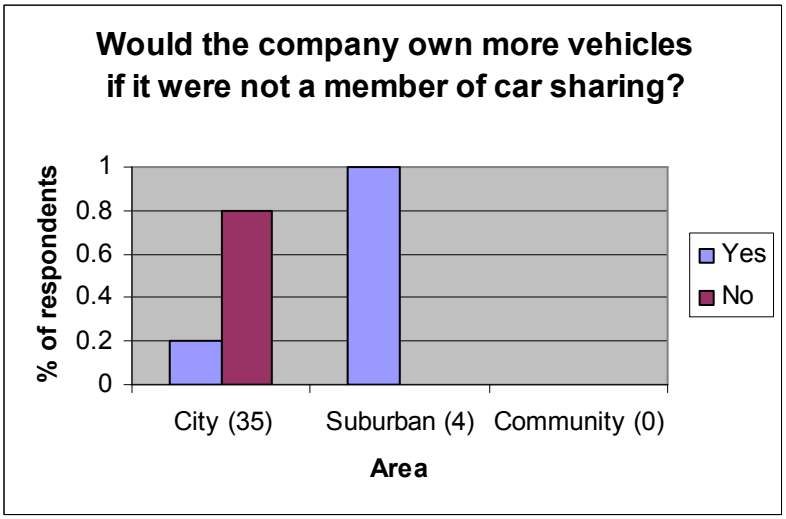


Figure 97: Grouped CSO Business Projected Car Ownership

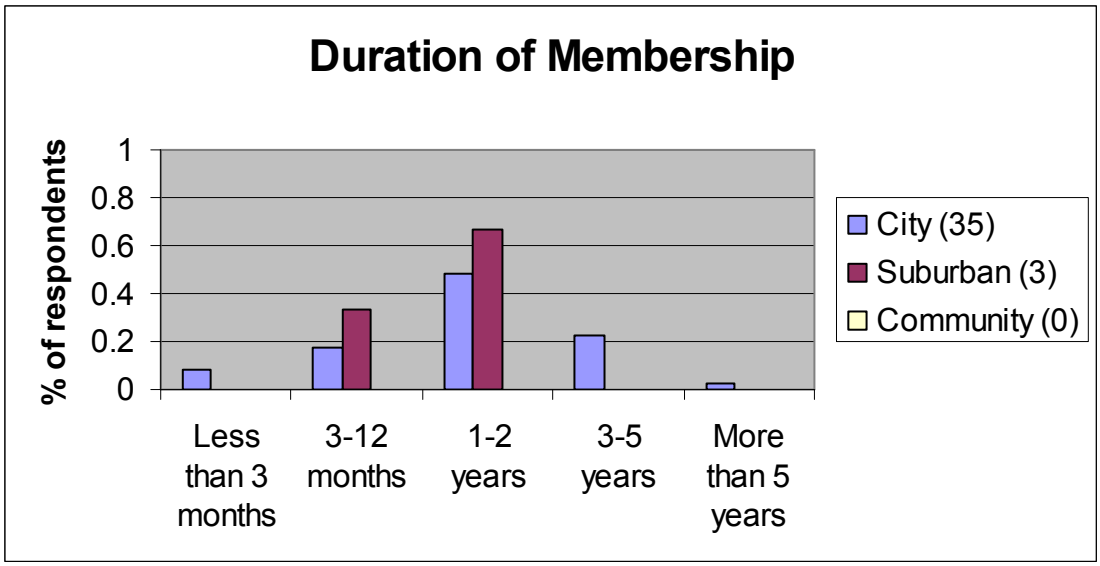


Figure 98: Grouped CSO Business Duration of Membership

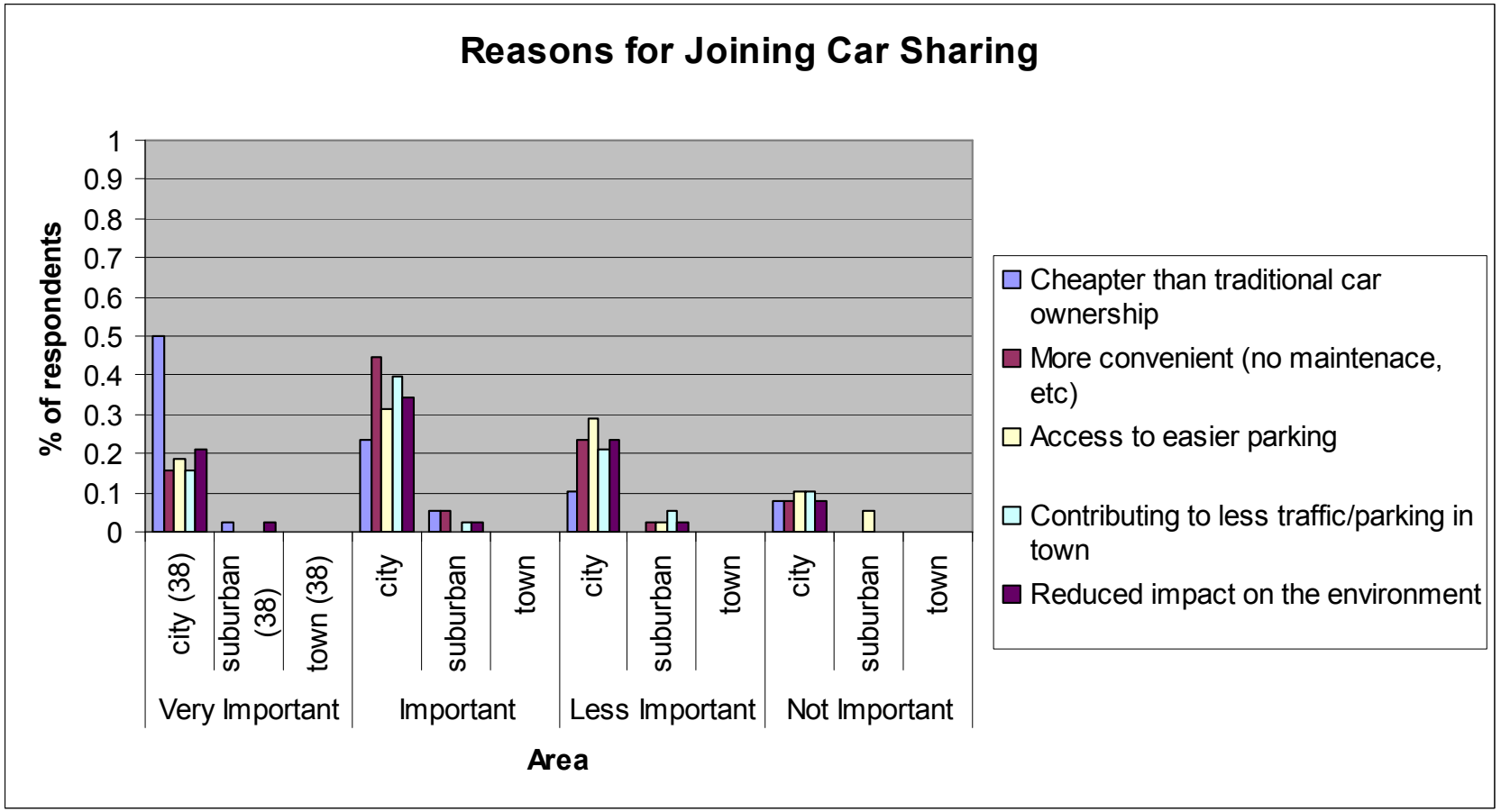


Figure 99: Grouped CSO Business Reasons for Joining Car Sharing

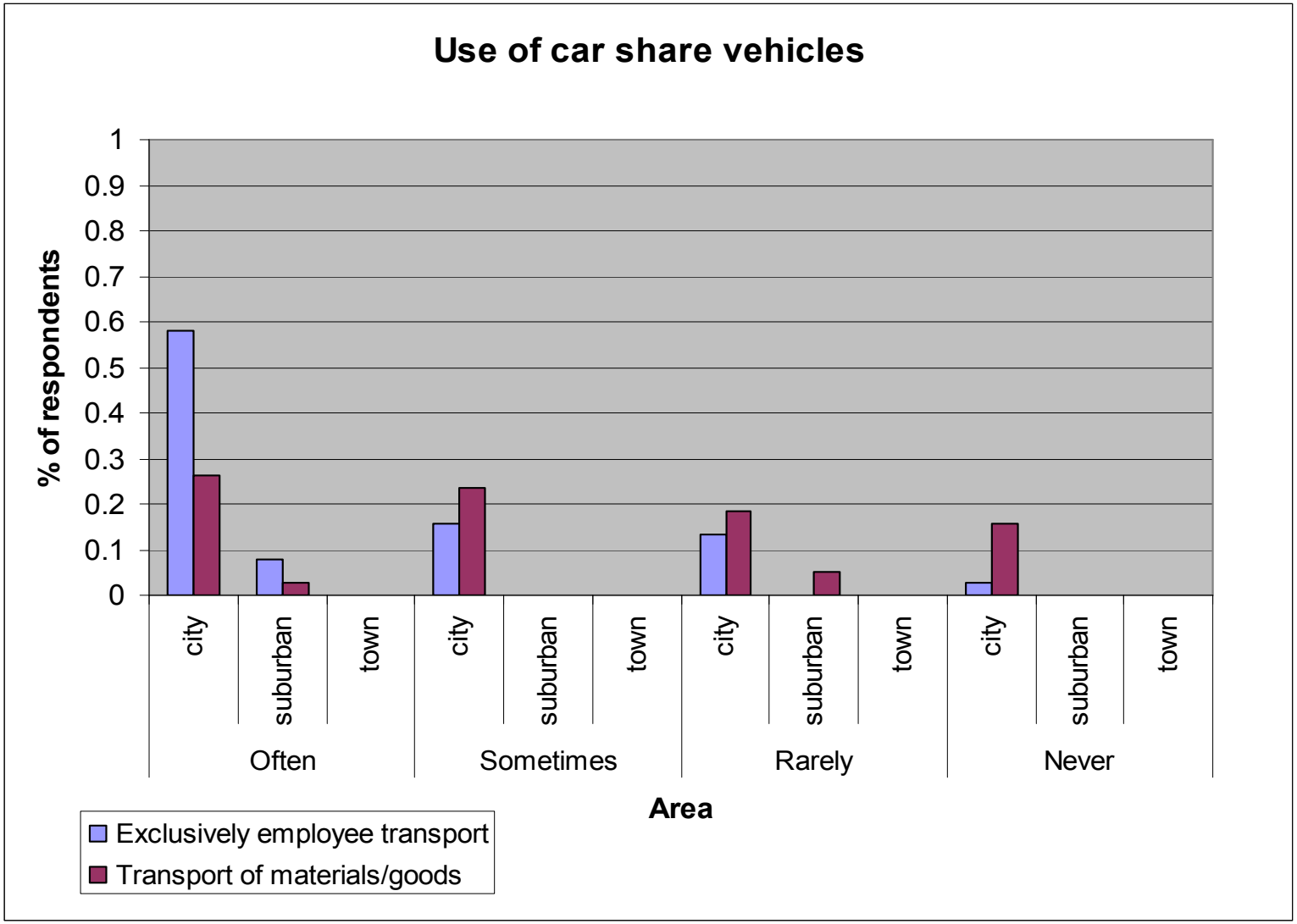
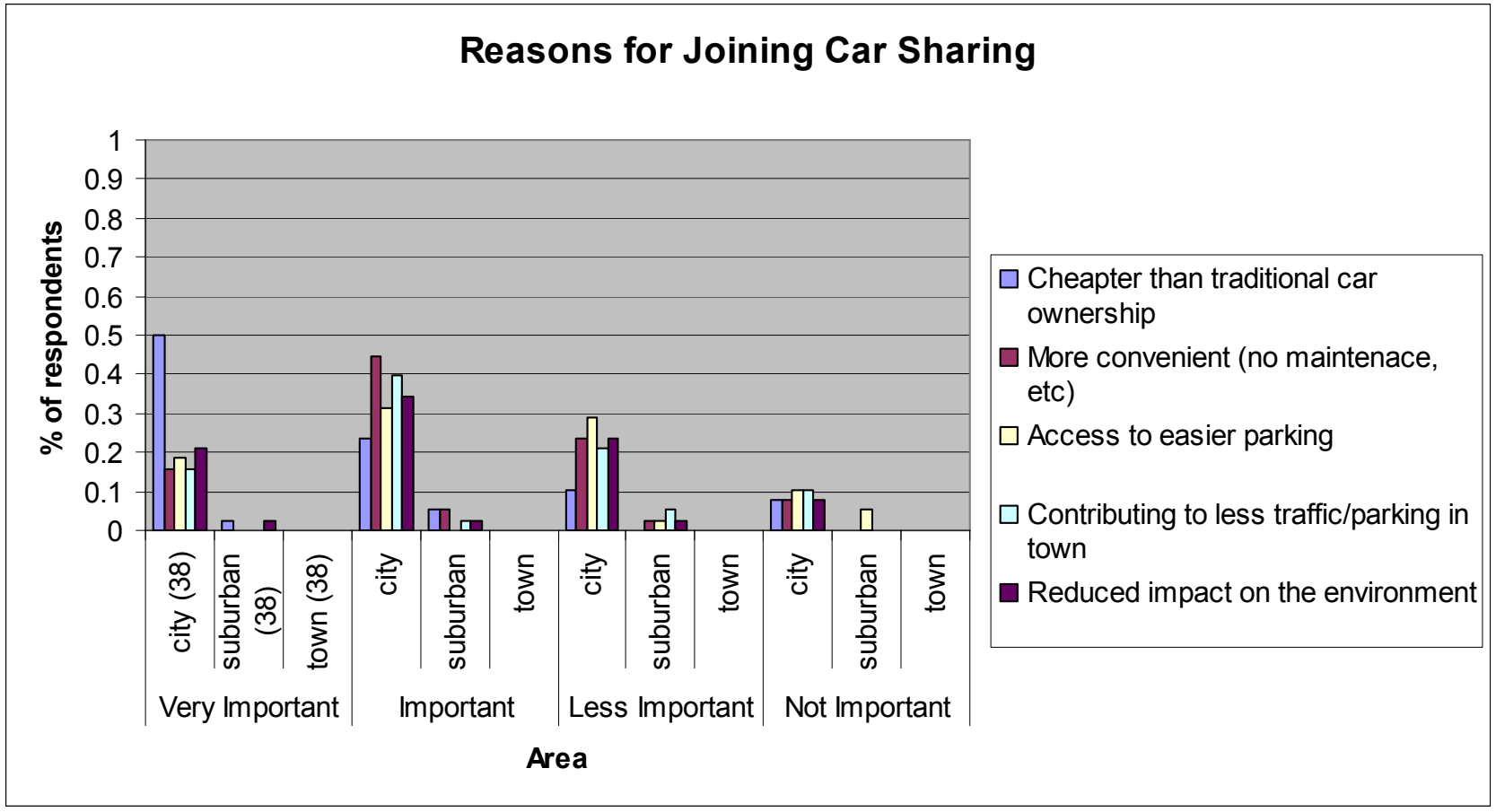


Figure 100: Grouped CSO Use of Car Share Vehicles


Reasons for Joining Car Sharing
% of respondents
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
city (38)
suburban (38)
town (38)
city
suburban
town
city
suburban
town
city
suburban
town
Very Important
Important
Less Important
Not Important
Area
Cheapter than traditional car ownership
More convenient (no maintenace, etc)
Access to easier parking
Contributing to less traffic/parking in town
Reduced impact on the environment

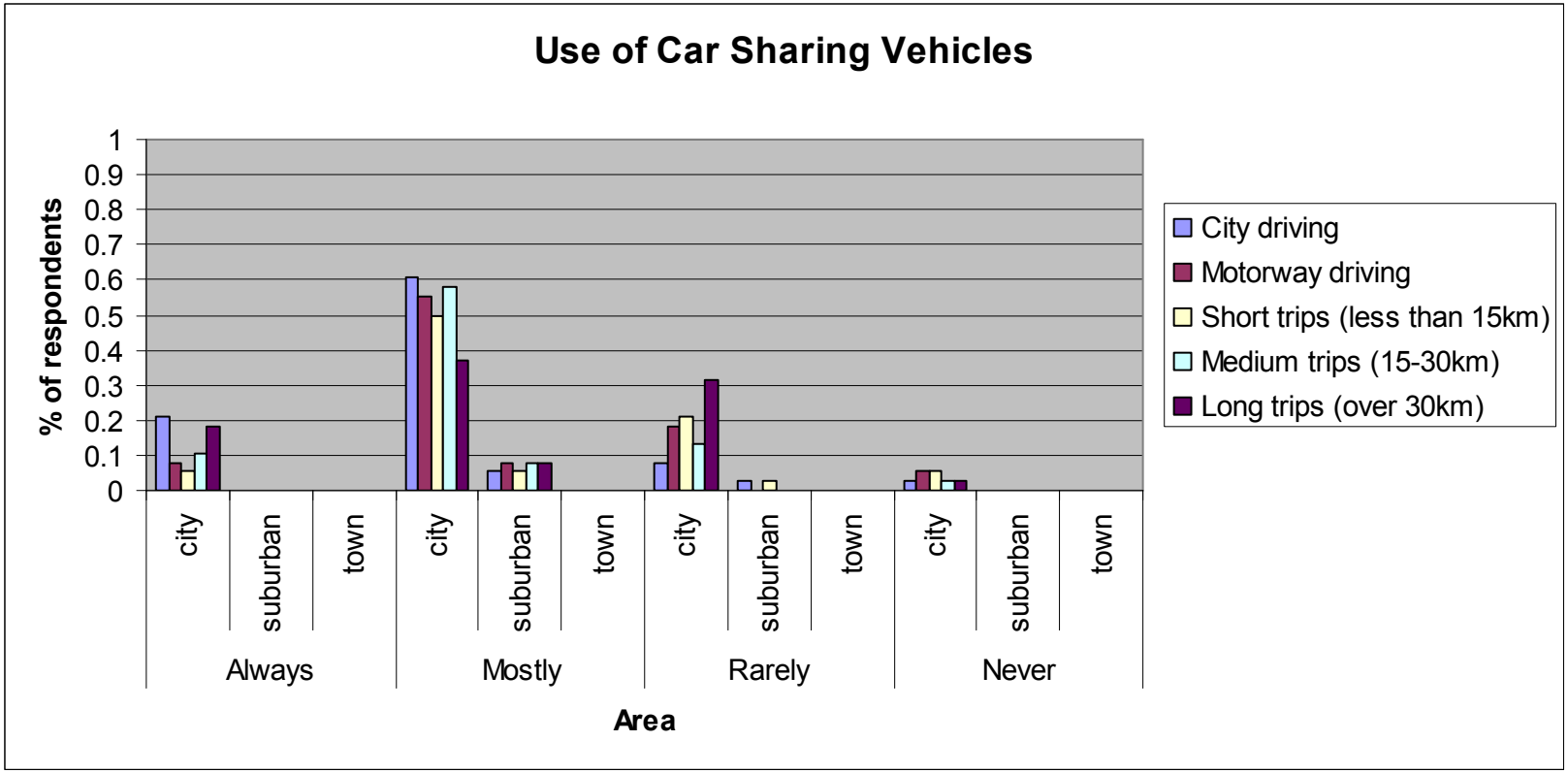


Figure 101: Grouped CSO Use of Car Sharing Vehicles

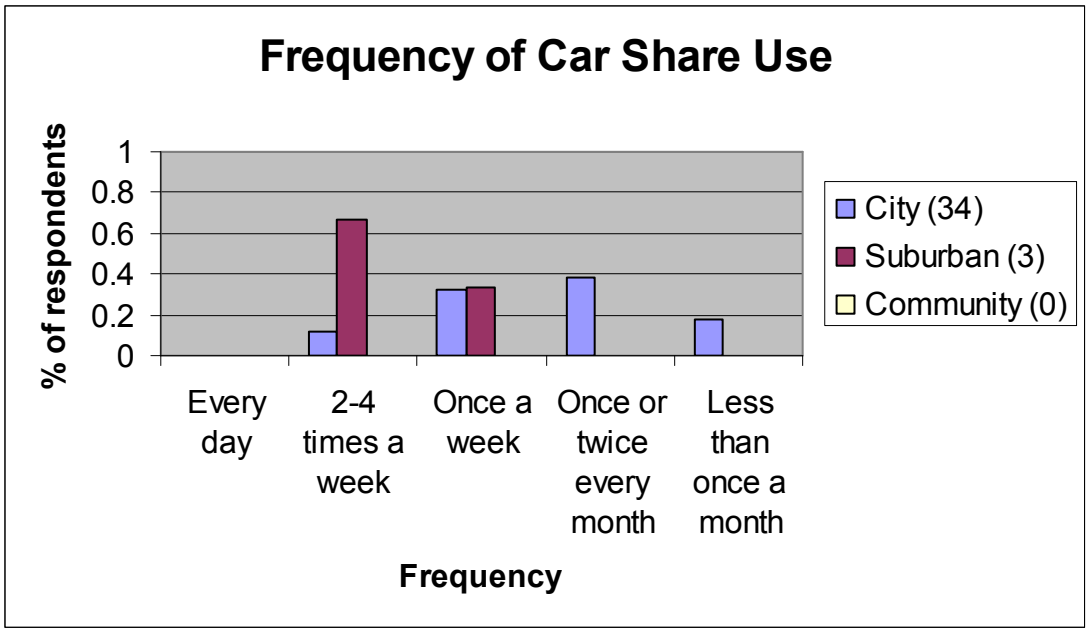


Figure 102: Grouped CSO Frequency of Car Share Use

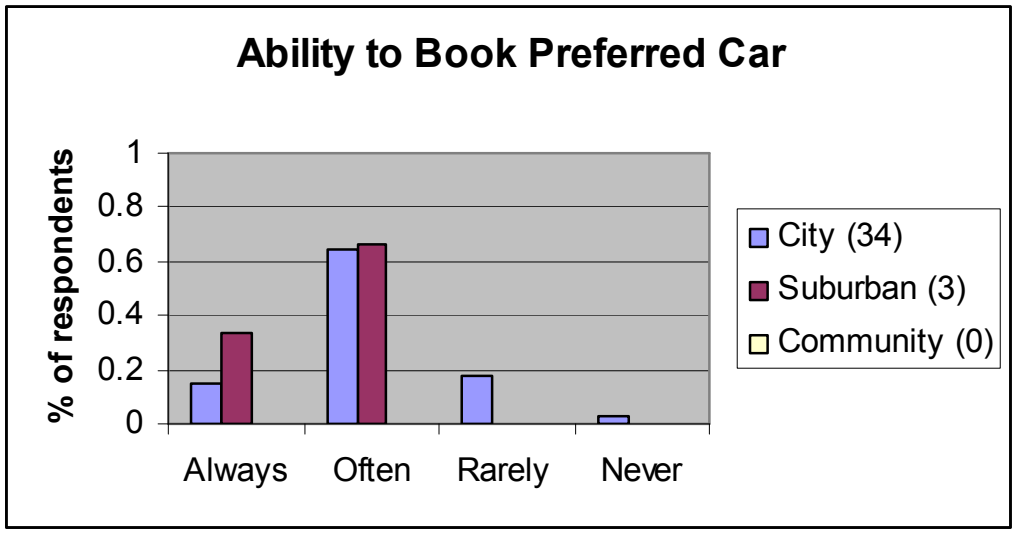


Figure 103: Grouped CSO Ability to Book a Preferred Car

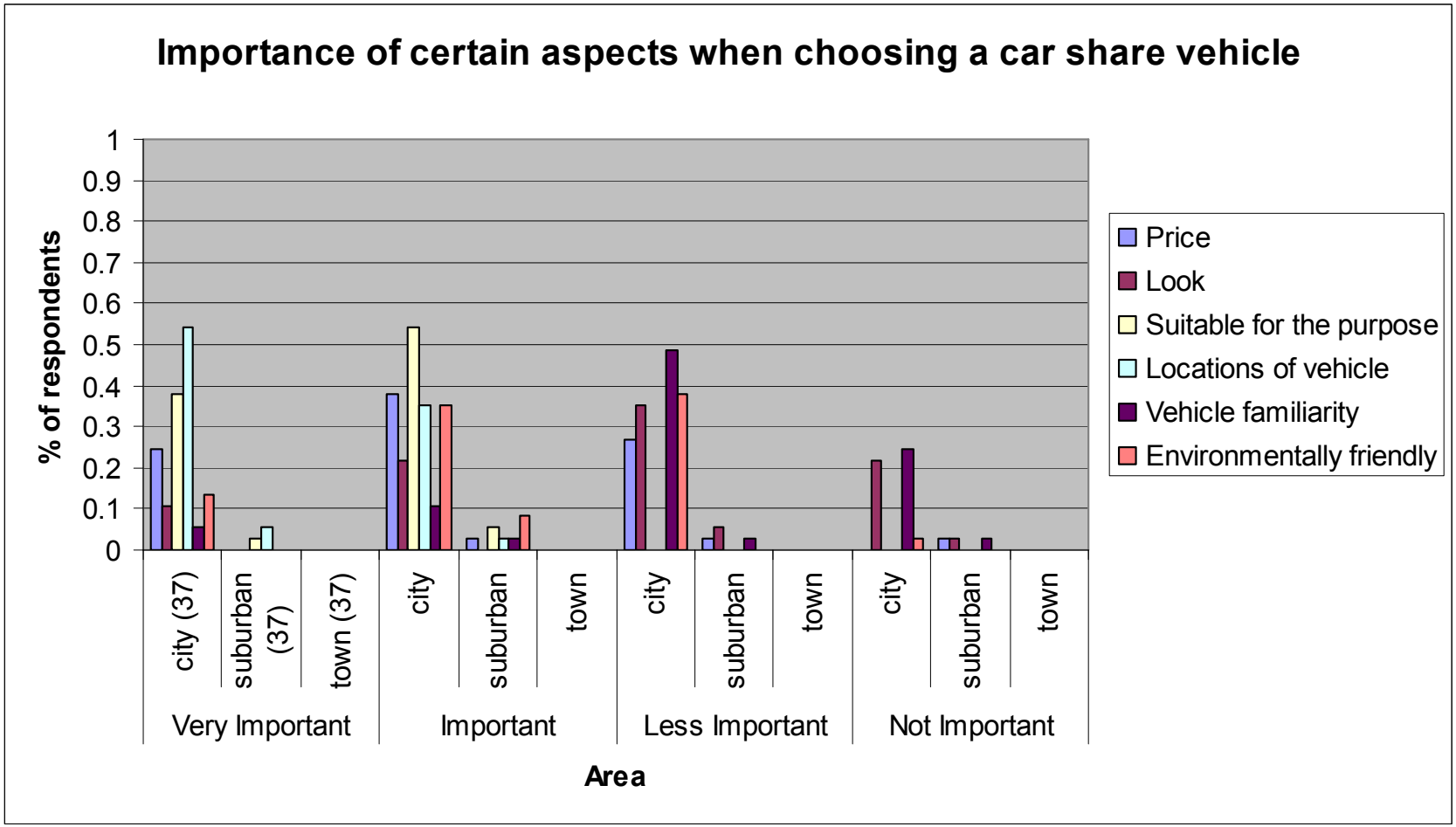


Figure 104: Grouped CSO Importance of Aspects when Choosing a Share Car

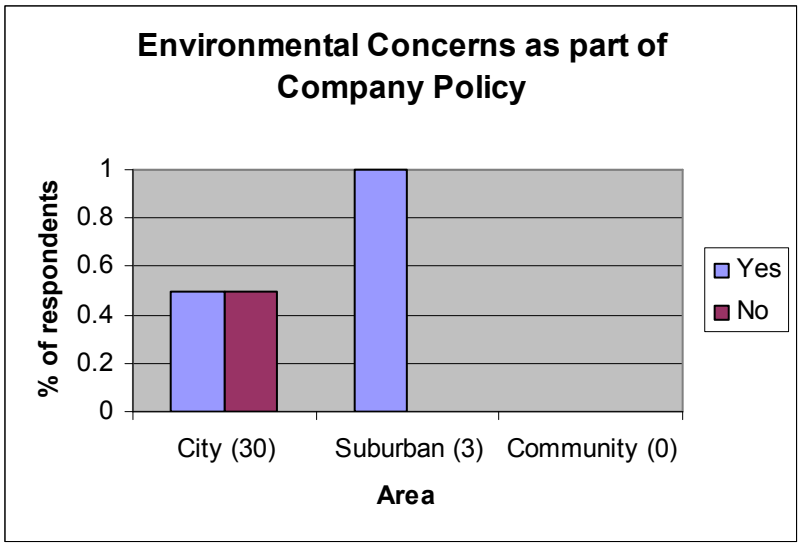


Figure 105: Grouped CSO Environmental Concerns in Company Policy

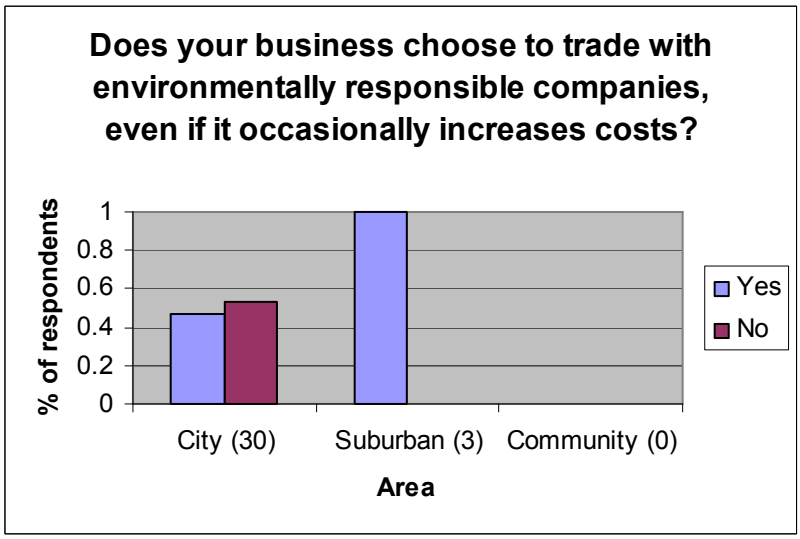


Figure 106: Grouped CSO Trading Policies

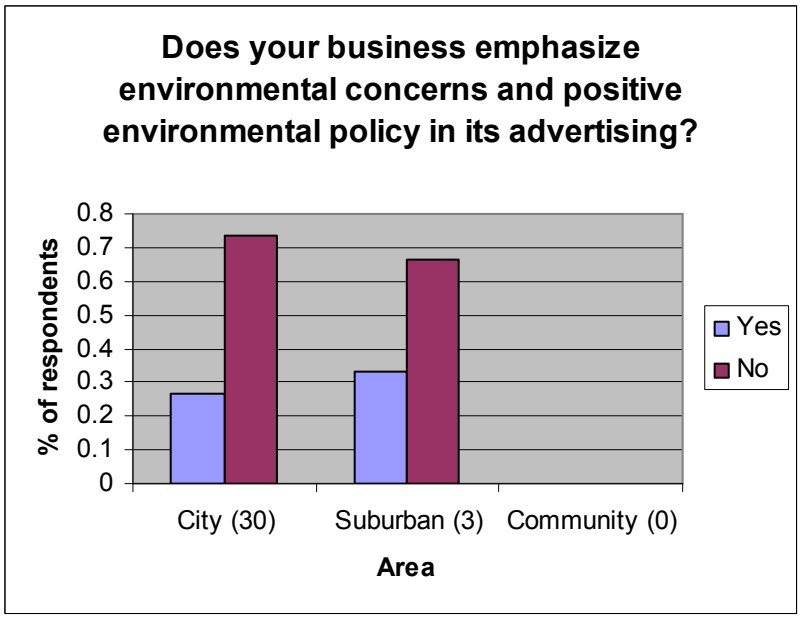
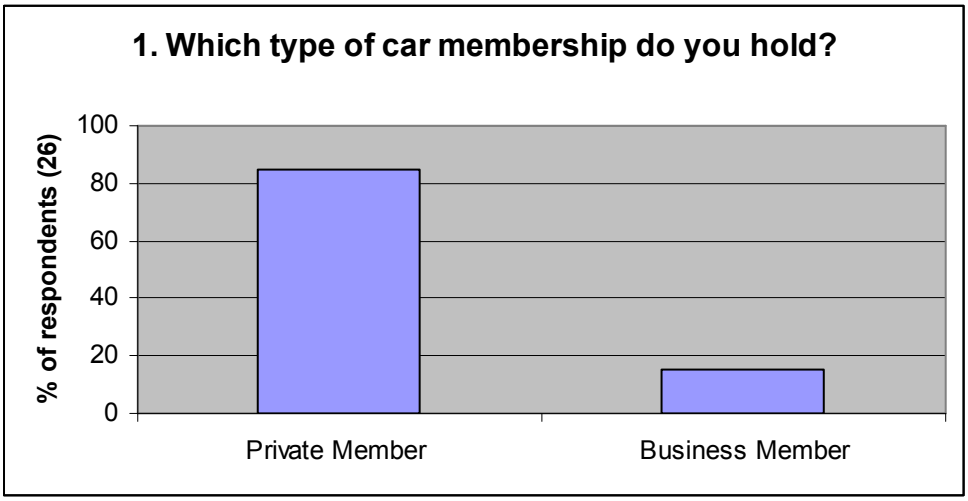
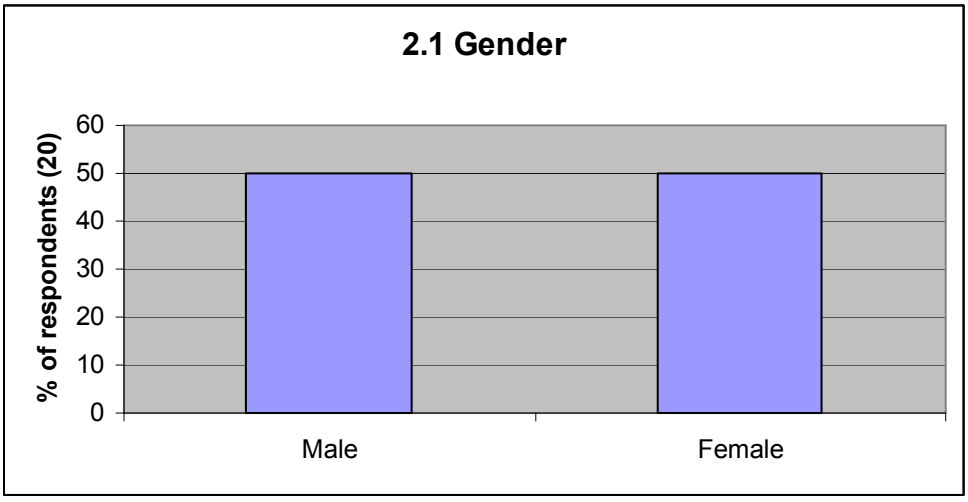


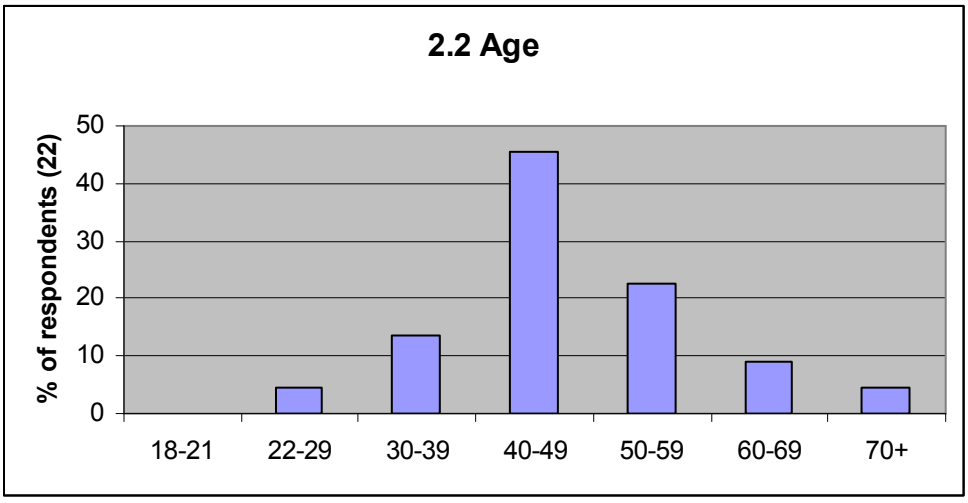
Figure 107: Grouped CSO Environmental Concerns and Business Advertising

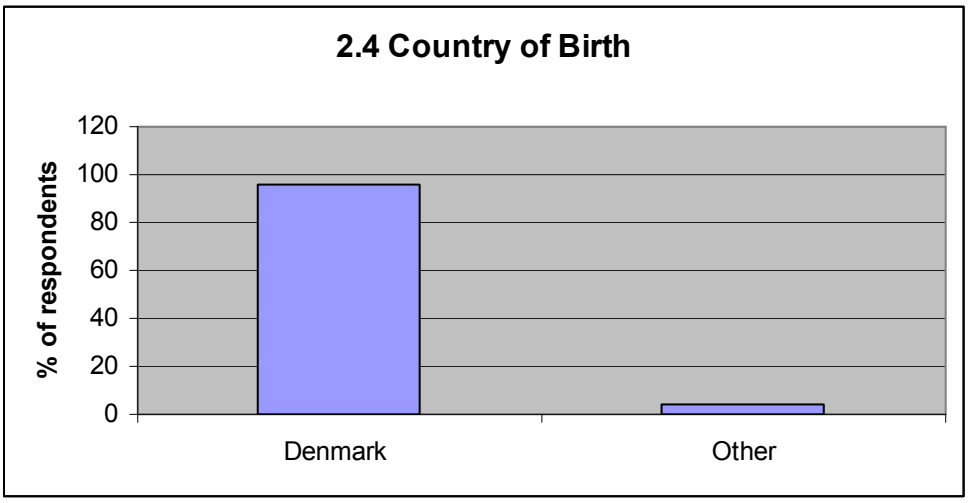
Appendix I: Sample Individual CSO Report



Private survey responses:

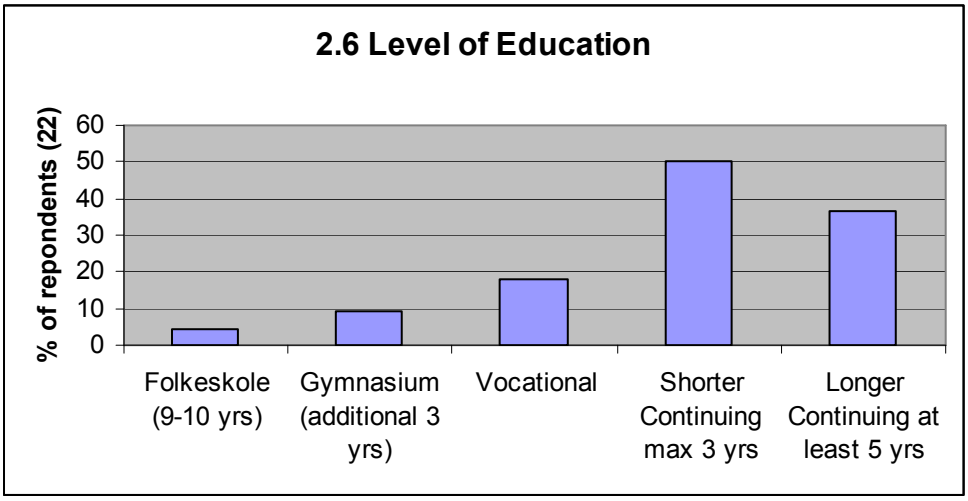


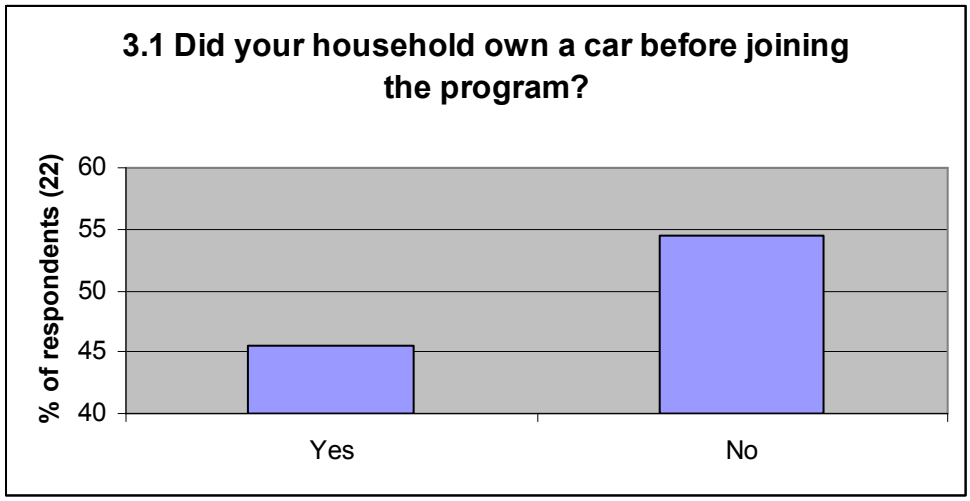


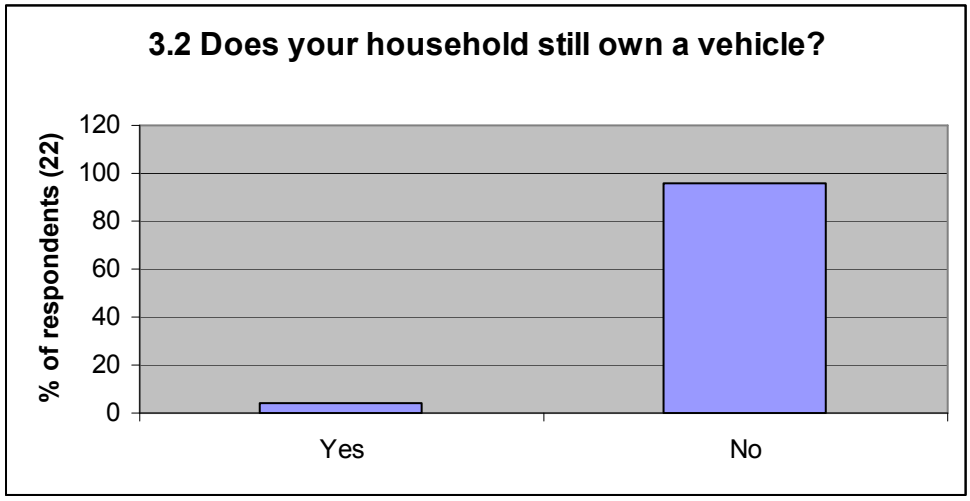


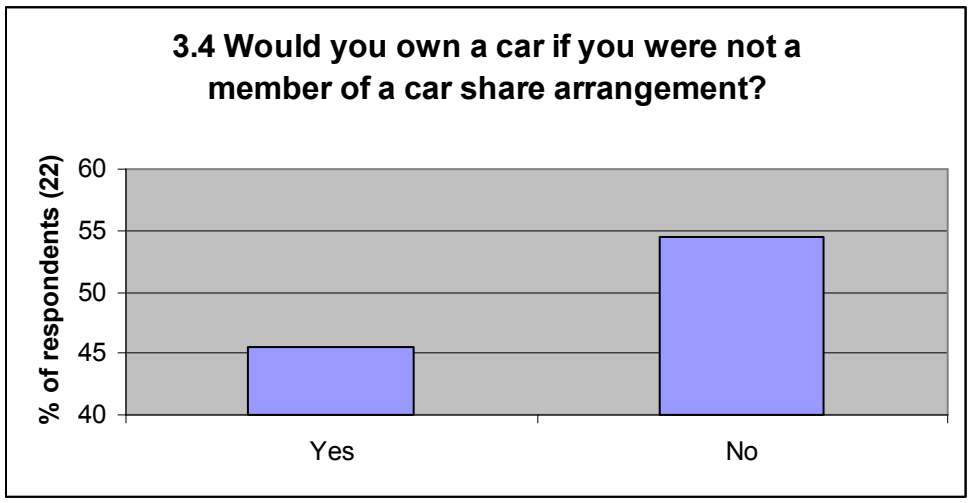
2.5 Income Data

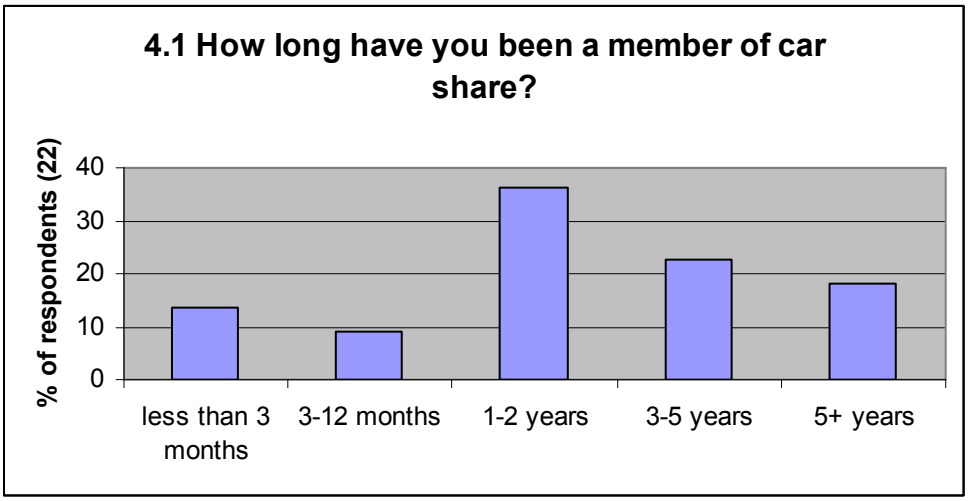
Average: _____ DKK

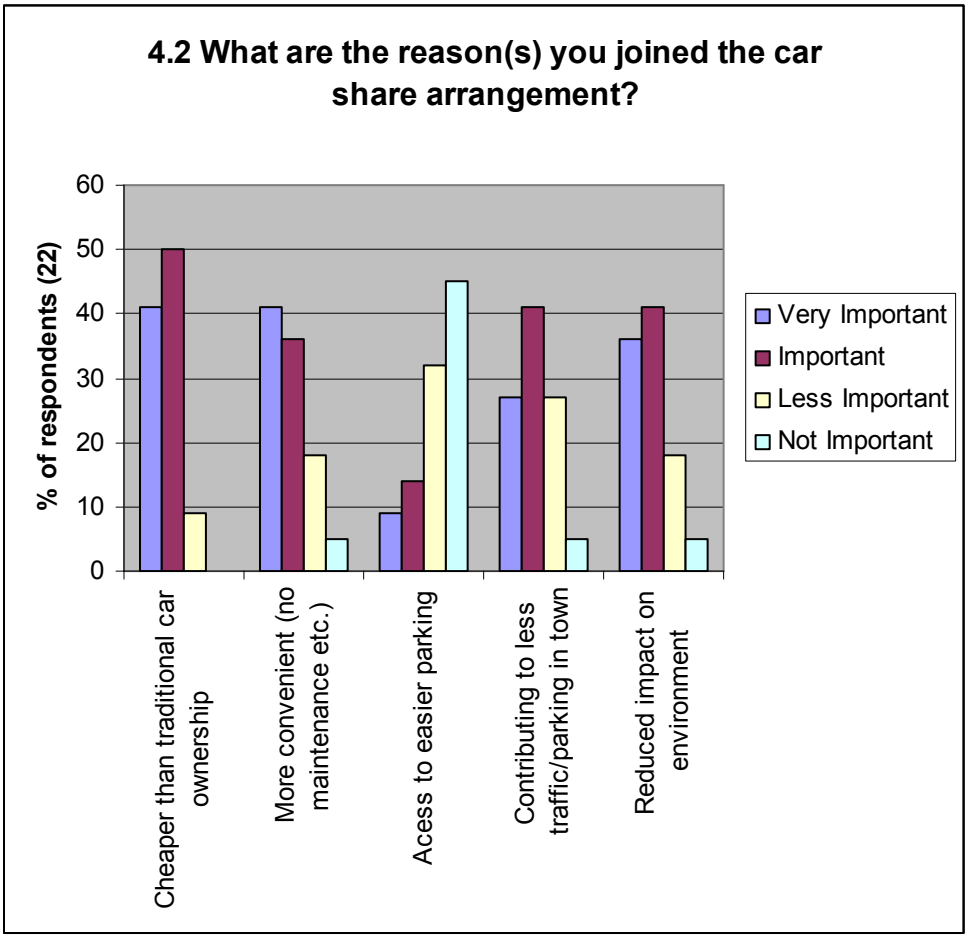


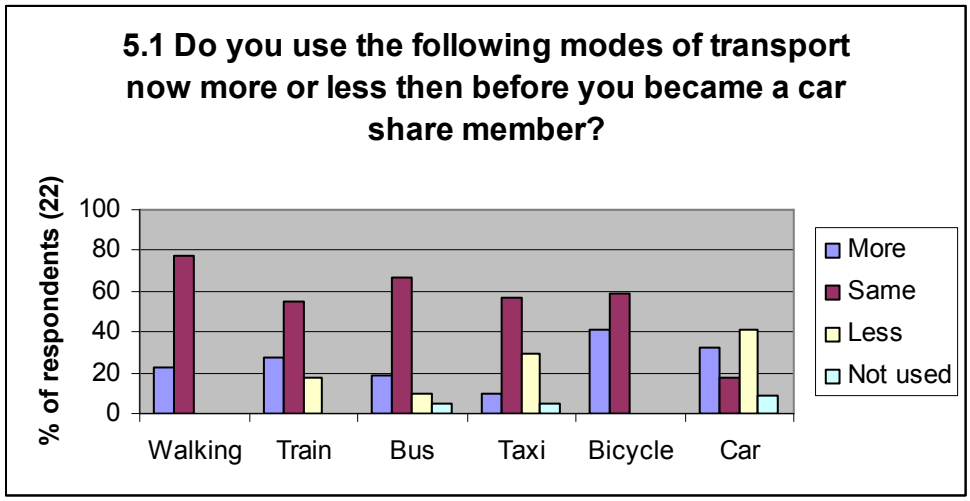

3.1 Did your household own a car before joining the program?
% of respondents (22)
60
55
50
45
40
Yes
No

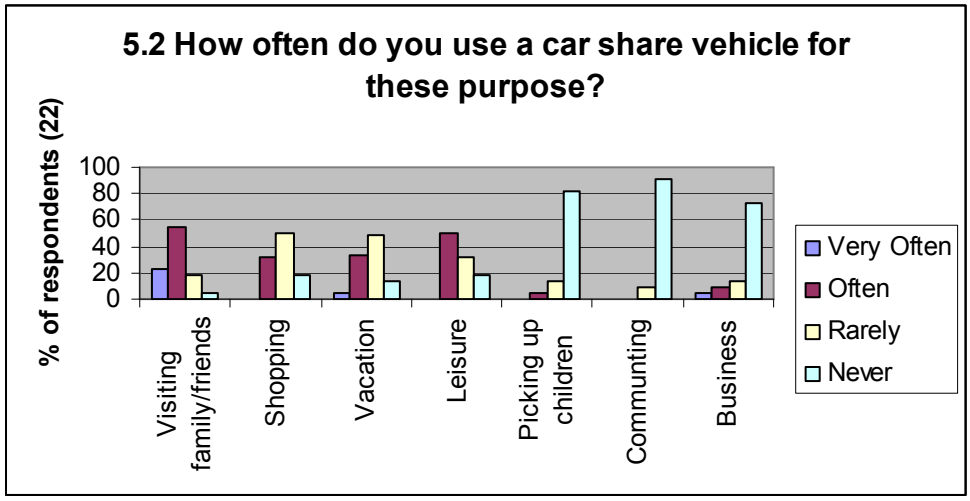

3.2 Does your household still own a vehicle?
% of respondents (22)
120
100
80
60
40
20
0
Yes
No

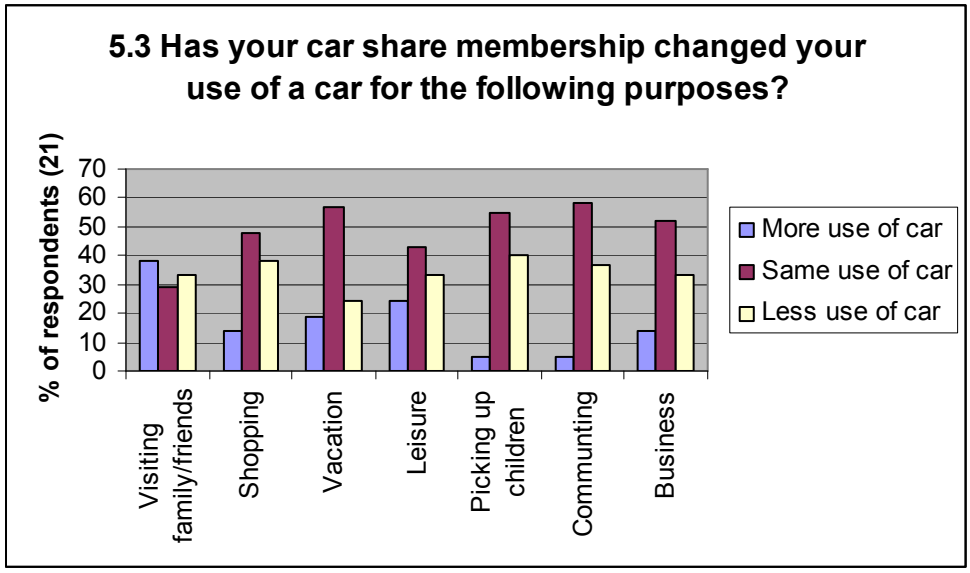

3.4 Would you own a car if you were not a member of a car share arrangement?
% of respondents (22)
60
55
50
45
40
Yes
No

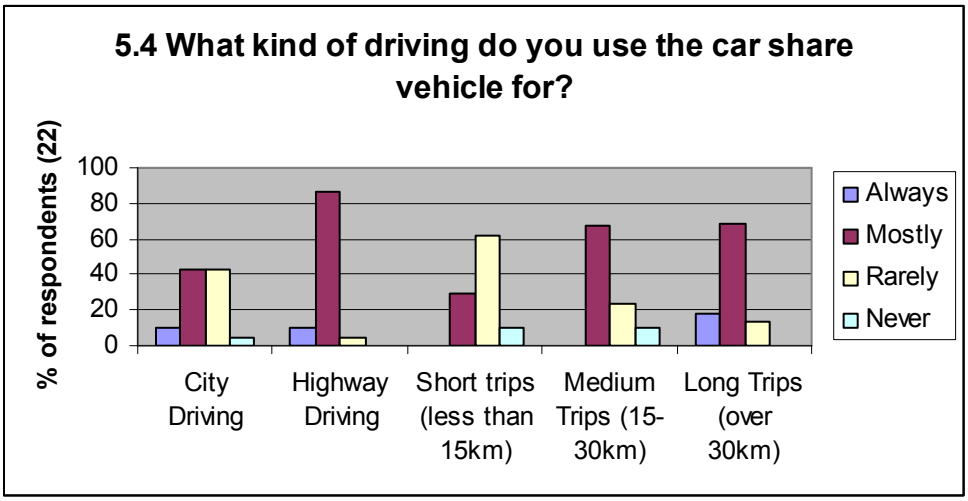

4.1 How long have you been a member of car share?
% of respondents (22)
40
30
20
10
0
less than 3 months
3-12 months
1-2 years
3-5 years
5+ years

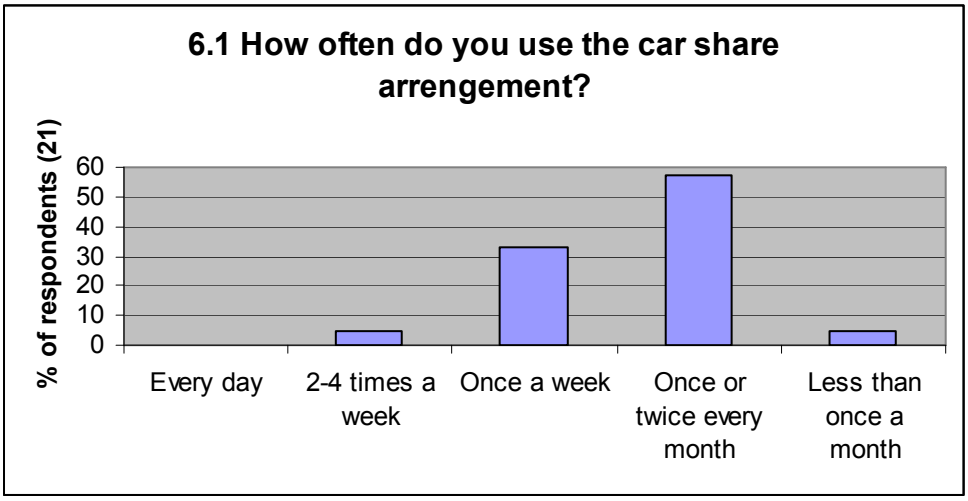

4.2 What are the reason(s) you joined the car share arrangement?
% of respondents (22)
60
50
40
30
20
10
0
Very Important
Important
Less Important
Not Important
Cheaper than traditional car ownership
More convenient (no maintenance etc.)
Acess to easier parking
Contributing to less traffic/parking in town
Reduced impact on environment


5.1 Do you use the following modes of transport now more or less then before you became a car share member?
% of respondents (22)
100
80
60
40
20
0
Walking
Train
Bus
Taxi
Bicycle
Car
More
Same
Less
Not used

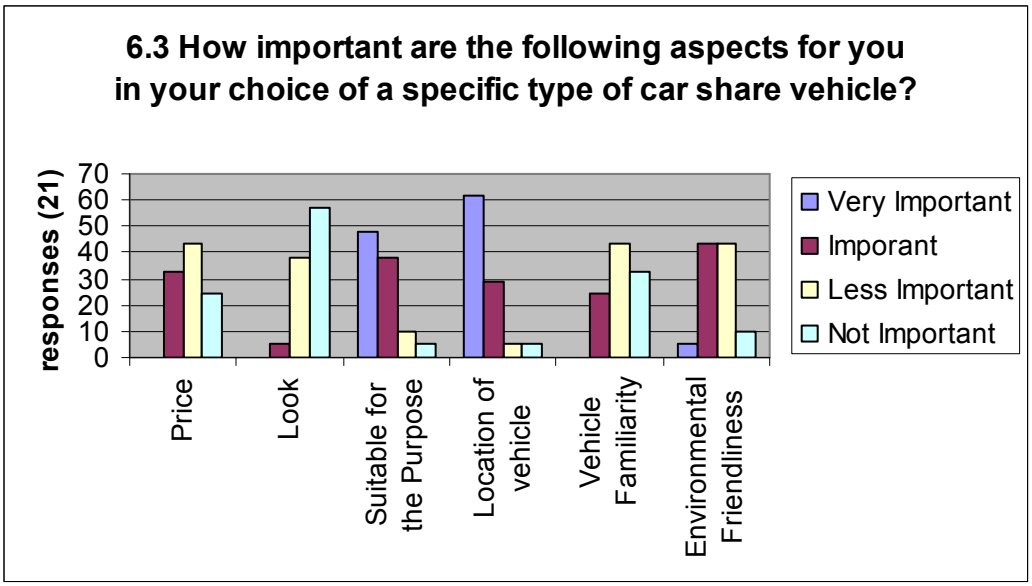

5.2 How often do you use a car share vehicle for these purpose?
% of respondents (22)
100
80
60
40
20
0
Visiting family/friends
Shopping
Vacation
Leisure
Picking up children
Communting
Business
Very Often
Often
Rarely
Never

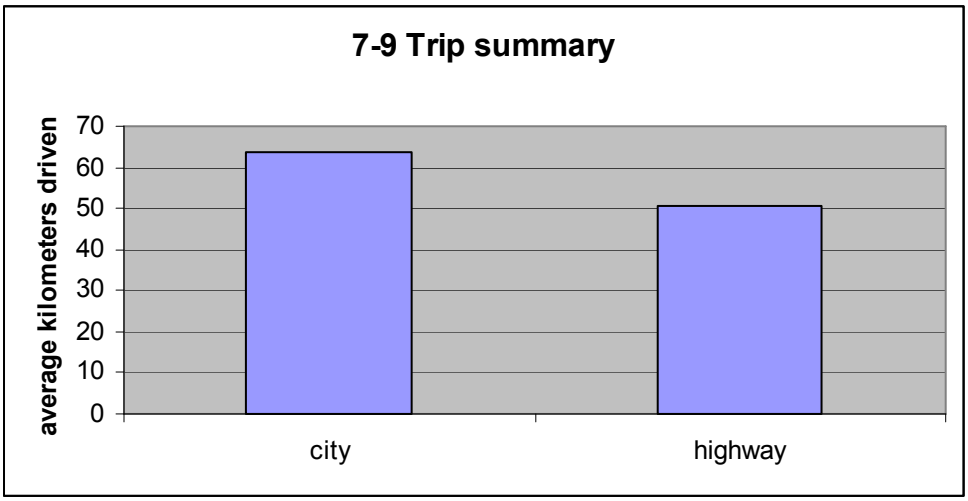

5.3 Has your car share membership changed your use of a car for the following purposes?
% of respondents (21)
70
60
50
40
30
20
10
0
Visiting family/friends
Shopping
Vacation
Leisure
Picking up children
Communting
Business
More use of car
Same use of car
Less use of car

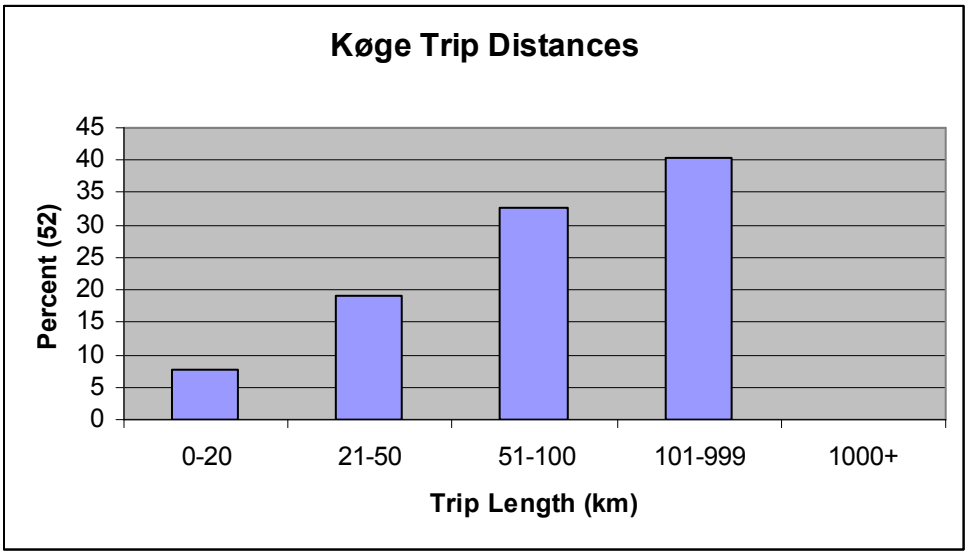

5.4 What kind of driving do you use the car share vehicle for?
% of respondents (22)
100
80
60
40
20
0
City Driving
Highway Driving
Short trips (less than 15km)
Medium Trips (15-30km)
Long Trips (over 30km)
Always
Mostly
Rarely
Never

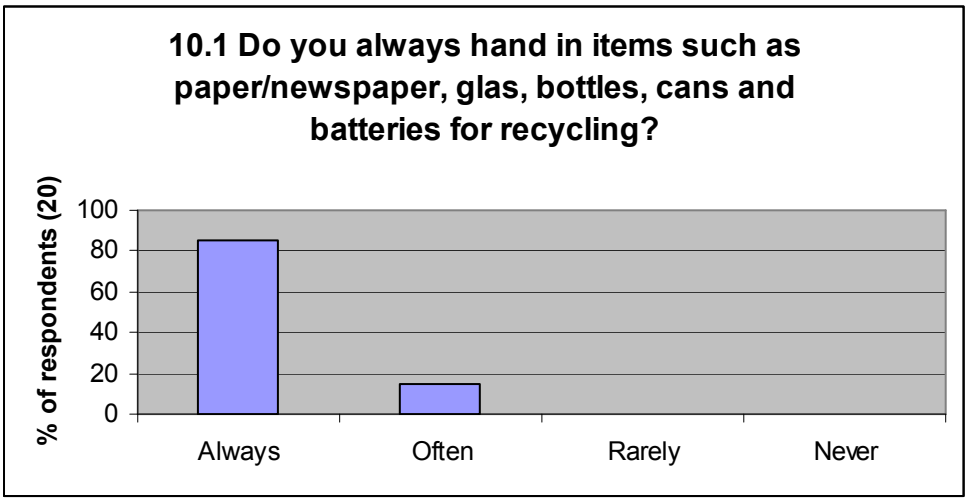

6.1 How often do you use the car share arrengement?
% of respondents (21)
60
50
40
30
20
10
0
Every day
2-4 times a week
Once a week
Once or twice every month
Less than once a month

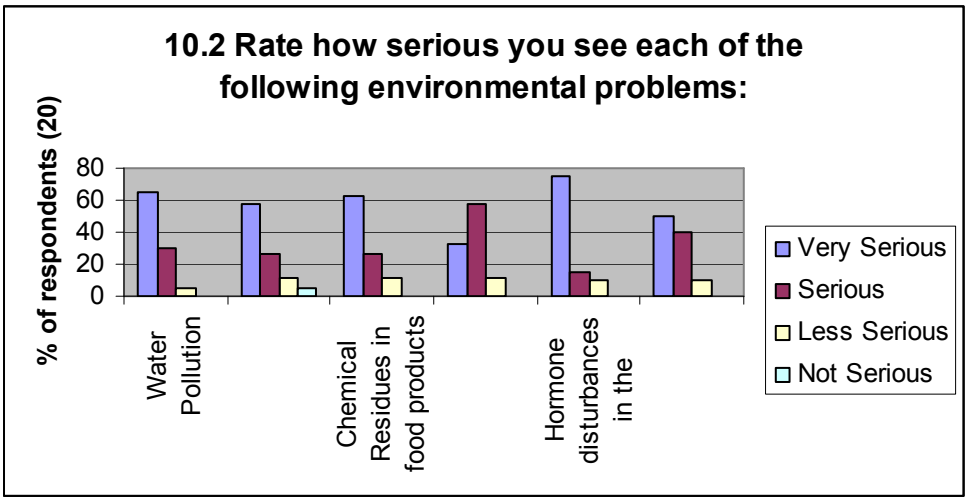

6.2 Can you reserve your preferred car whenever you need one?
% of respondents (21)
100
80
60
40
20
0
Always
Often
Sometimes
Rarely

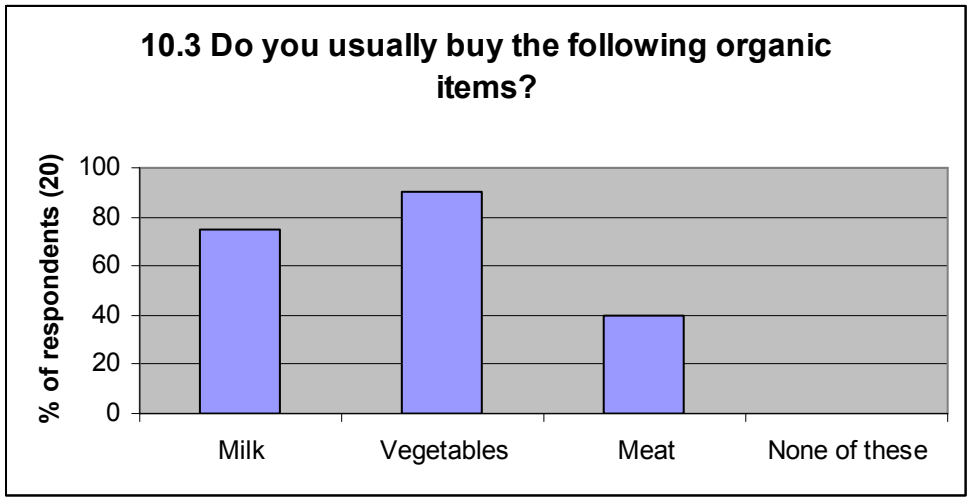

6.3 How important are the following aspects for you in your choice of a specific type of car share vehicle?
responses (21)
70
60
50
40
30
20
10
0
Price
Look
Suitable for the Purpose
Location of vehicle
Vehicle Familiarity
Environmental Friendliness
Very Important
Imporant
Less Important
Not Important

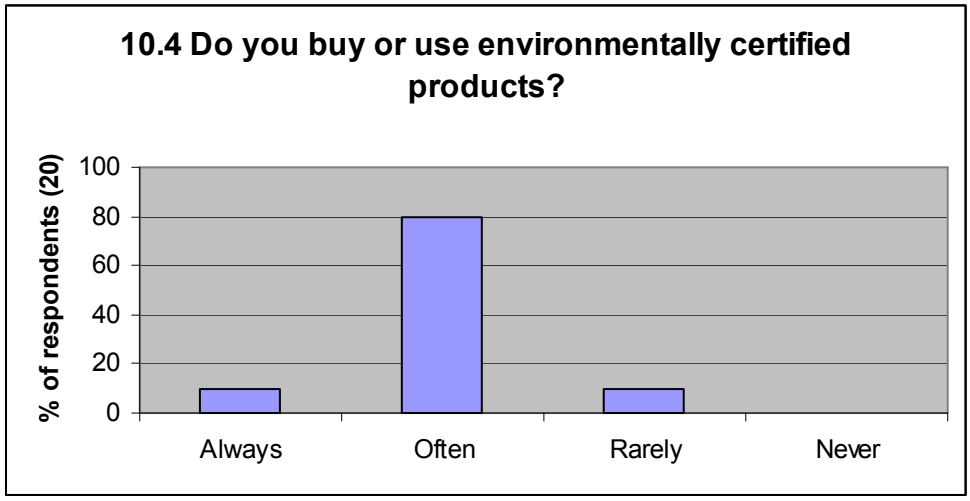

7-9 Trip summary
average kilometers driven
70
60
50
40
30
20
10
0
city
highway

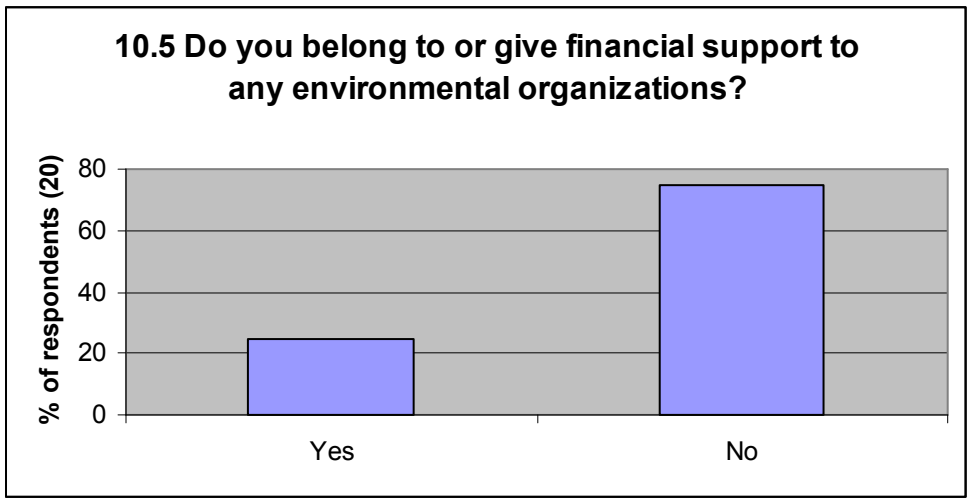

Køge Trip Distances
Percent (52)
45
40
35
30
25
20
15
10
5
0
0-20
21-50
51-100
101-999
1000+
Trip Length (km)


10.1 Do you always hand in items such as paper/newspaper, glas, bottles, cans and batteries for recycling?
% of respondents (20)
100
80
60
40
20
0
Always
Often
Rarely
Never

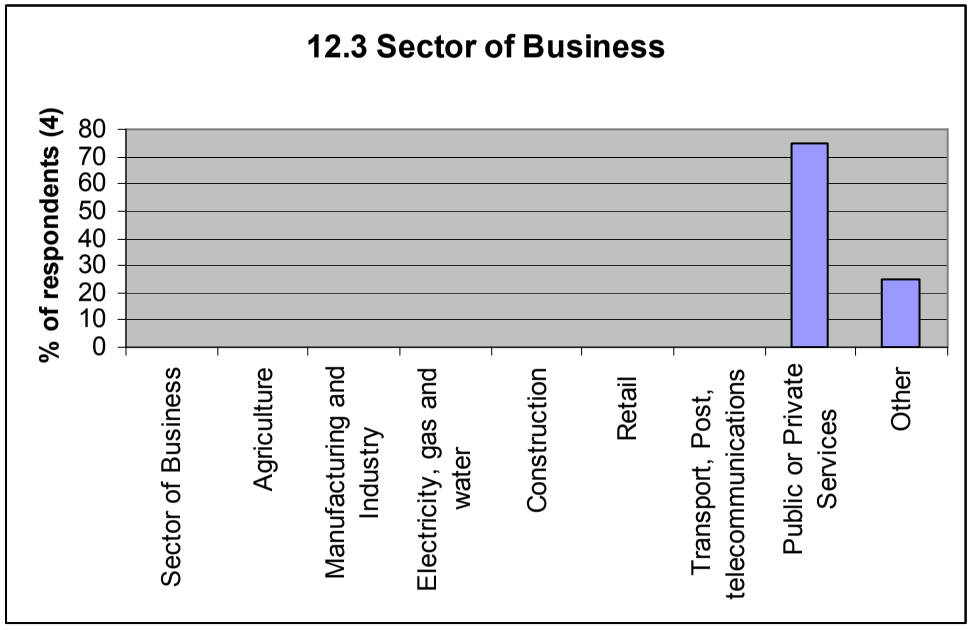

10.2 Rate how serious you see each of the following environmental problems:
% of respondents (20)
80
60
40
20
0
Water Pollution
Chemical Residues in food products
Hormone disturbances in the
Very Serious
Serious
Less Serious
Not Serious

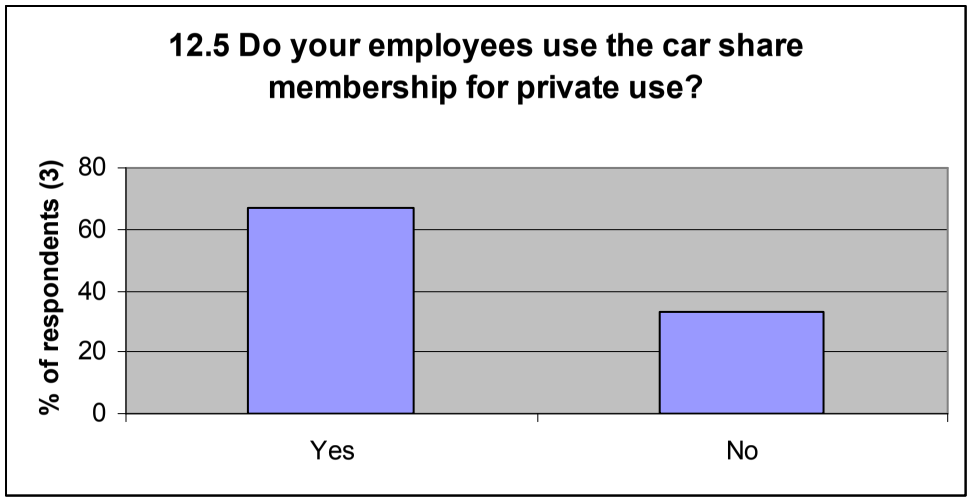

10.3 Do you usually buy the following organic items?
% of respondents (20)
100
80
60
40
20
0
Milk
Vegetables
Meat
None of these

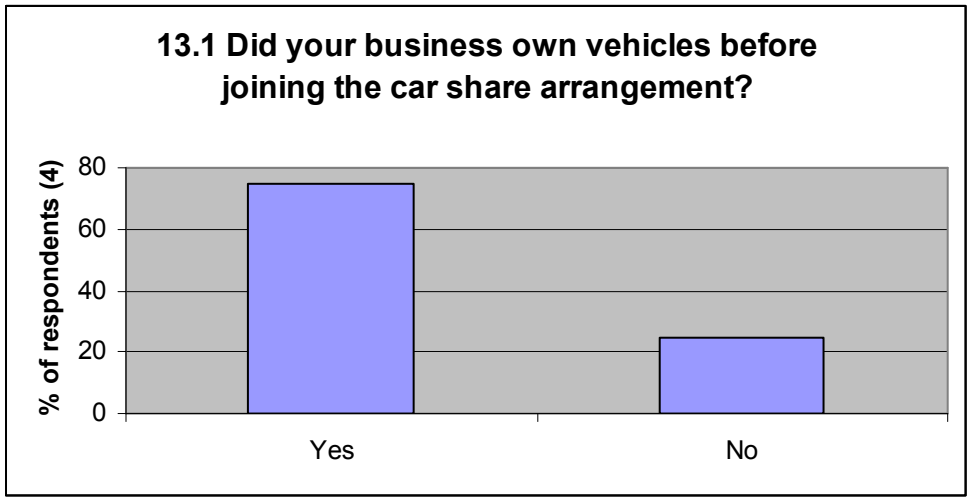

10.4 Do you buy or use environmentally certified products?
% of respondents (20)
100
80
60
40
20
0
Always
Often
Rarely
Never

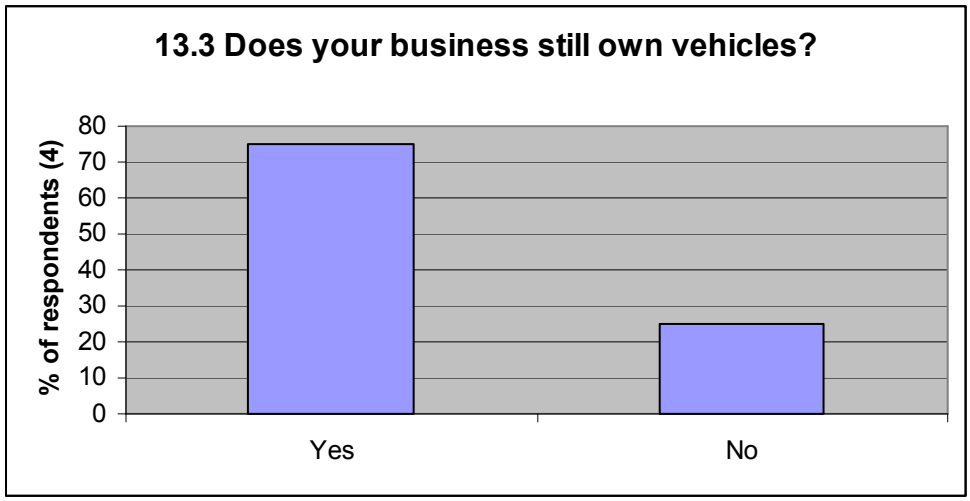

10.5 Do you belong to or give financial support to any environmental organizations?
% of respondents (20)
80
60
40
20
0
Yes
No

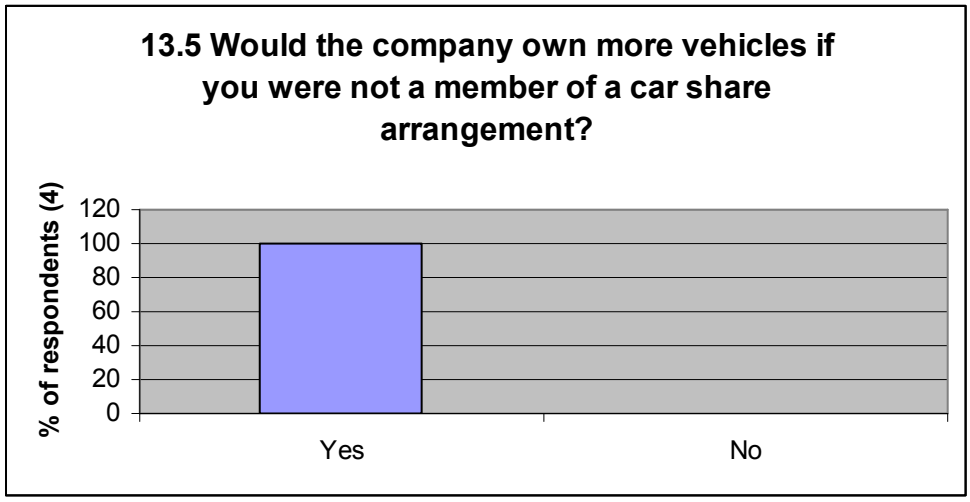
Business Survey Responses:

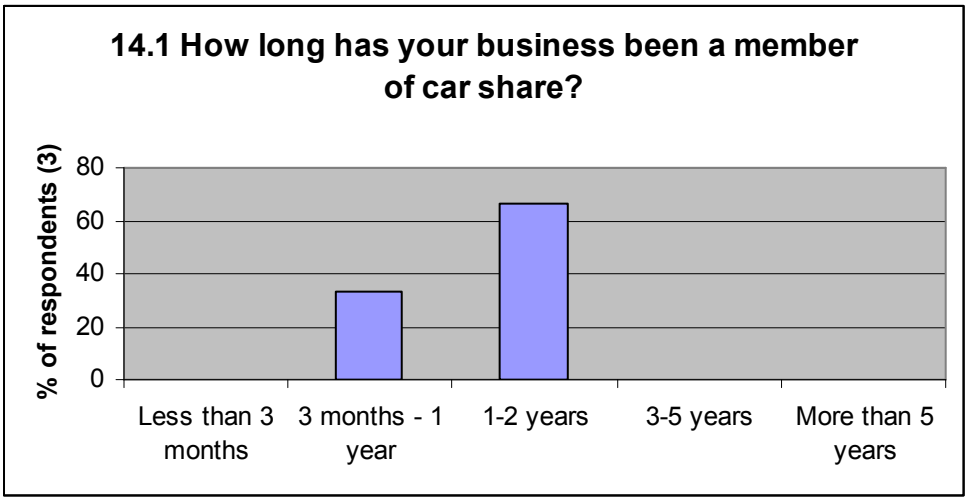


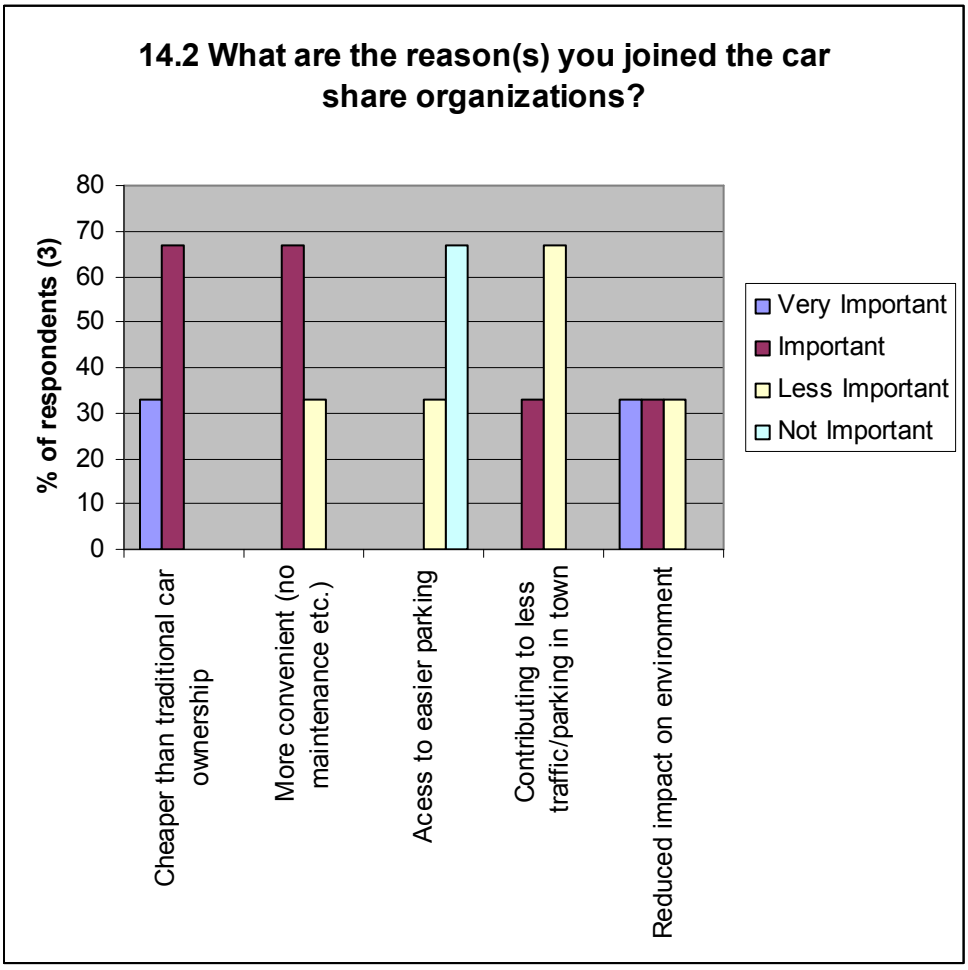


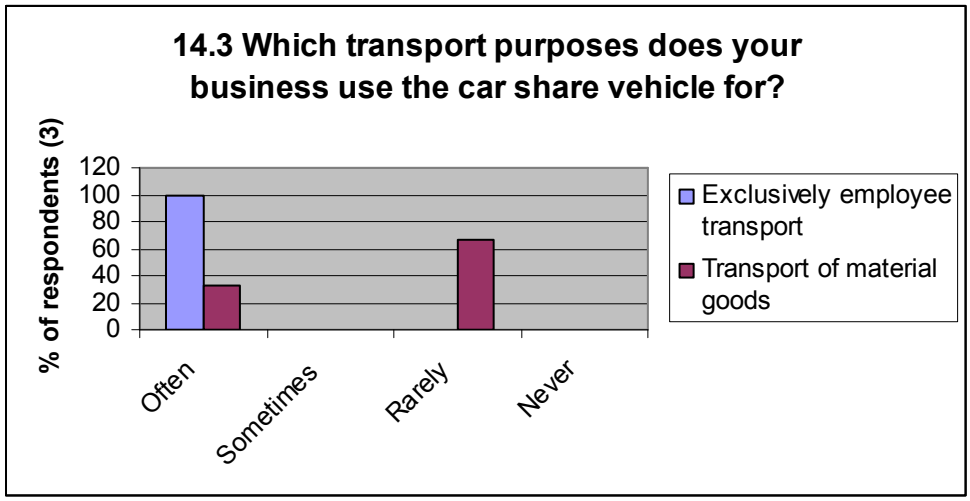

13.1 Did your business own vehicles before joining the car share arrangement?
% of respondents (4)
80
60
40
20
0
Yes
No

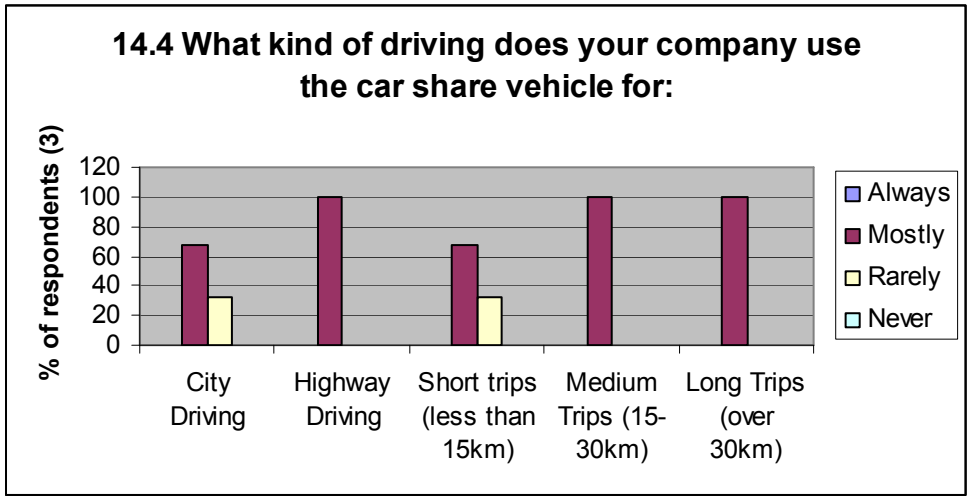

13.3 Does your business still own vehicles?
% of respondents (4)
80
70
60
50
40
30
20
10
0
Yes
No

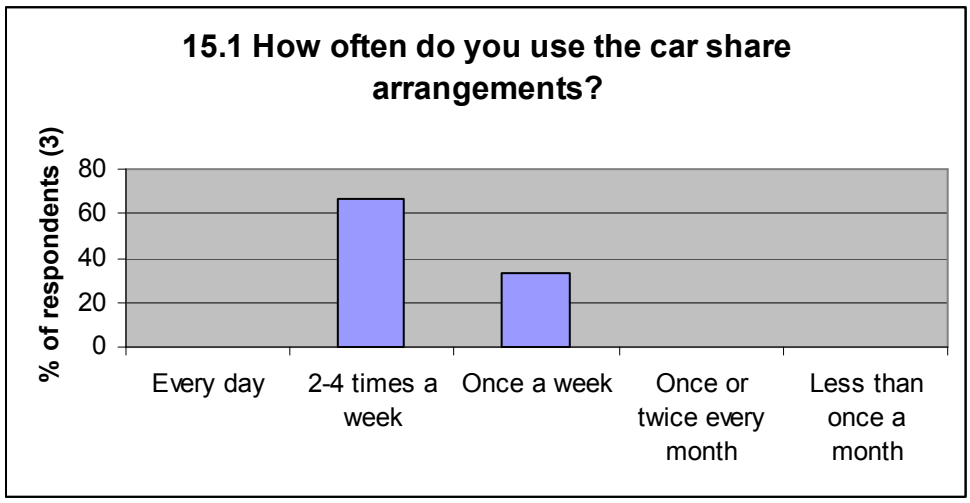

13.5 Would the company own more vehicles if you were not a member of a car share arrangement?
% of respondents (4)
120
100
80
60
40
20
0
Yes
No

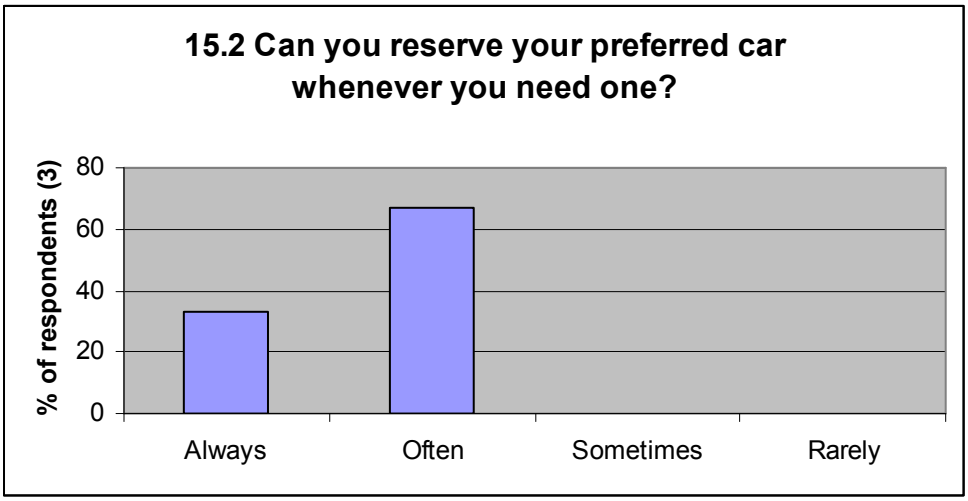

14.1 How long has your business been a member of car share?
% of respondents (3)
80
60
40
20
0
Less than 3 months
3 months - 1 year
1-2 years
3-5 years
More than 5 years

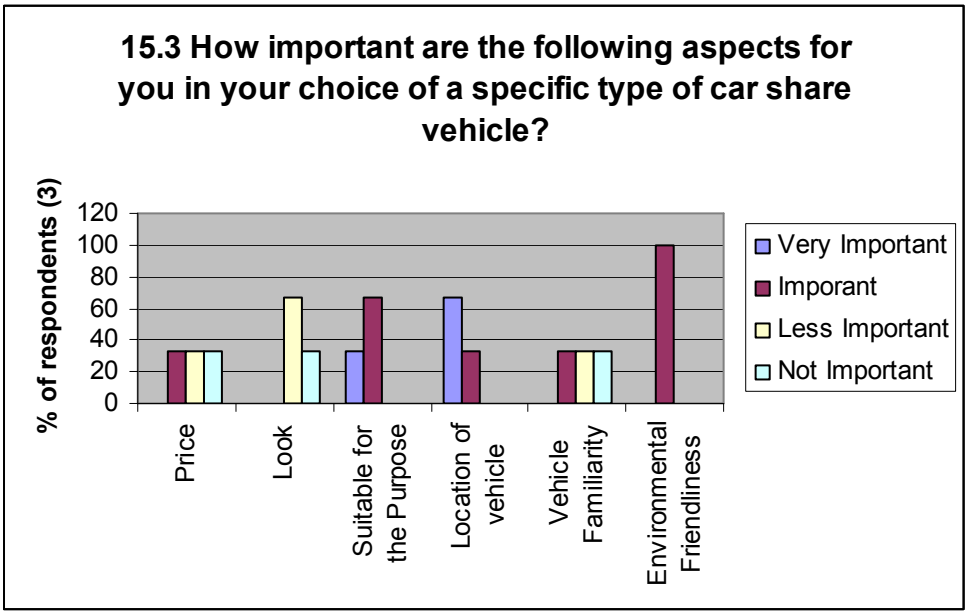

14.2 What are the reason(s) you joined the car share organizations?
% of respondents (3)
80
70
60
50
40
30
20
10
0
Very Important
Important
Less Important
Not Important
Cheaper than traditional car ownership
More convenient (no maintenance etc.)
Acess to easier parking
Contributing to less traffic/parking in town
Reduced impact on environment

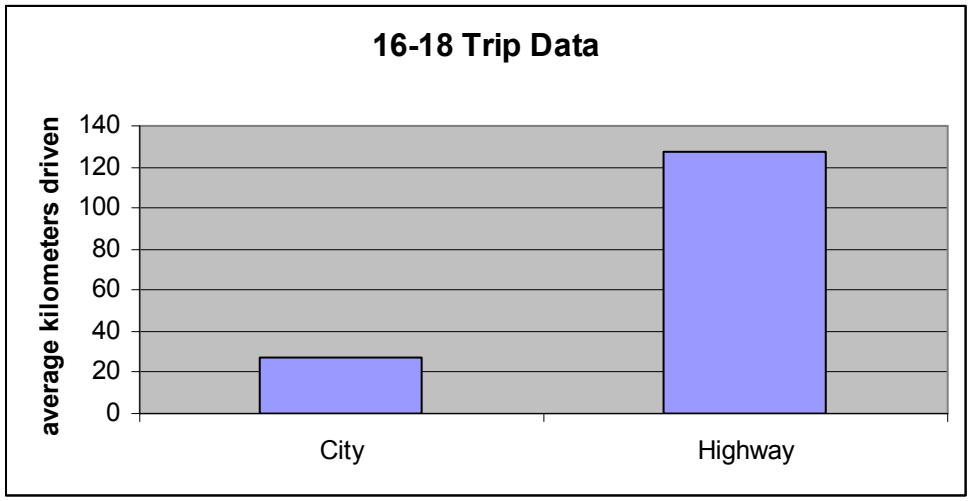

14.3 Which transport purposes does your business use the car share vehicle for?
% of respondents (3)
120
100
80
60
40
20
0
Often
Sometimes
Rarely
Never
Exclusively employee transport
Transport of material goods

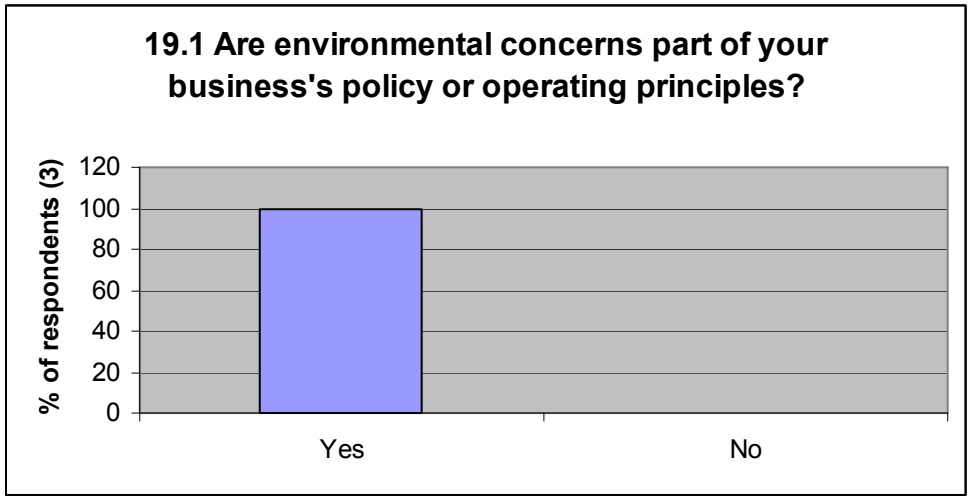

14.4 What kind of driving does your company use the car share vehicle for:
% of respondents (3)
120
100
80
60
40
20
0
City Driving
Highway Driving
Short trips (less than 15km)
Medium Trips (15-30km)
Long Trips (over 30km)
Always
Mostly
Rarely
Never


15.1 How often do you use the car share arrangements?
% of respondents (3)
80
60
40
20
0
Every day
2-4 times a week
Once a week
Once or twice every month
Less than once a month

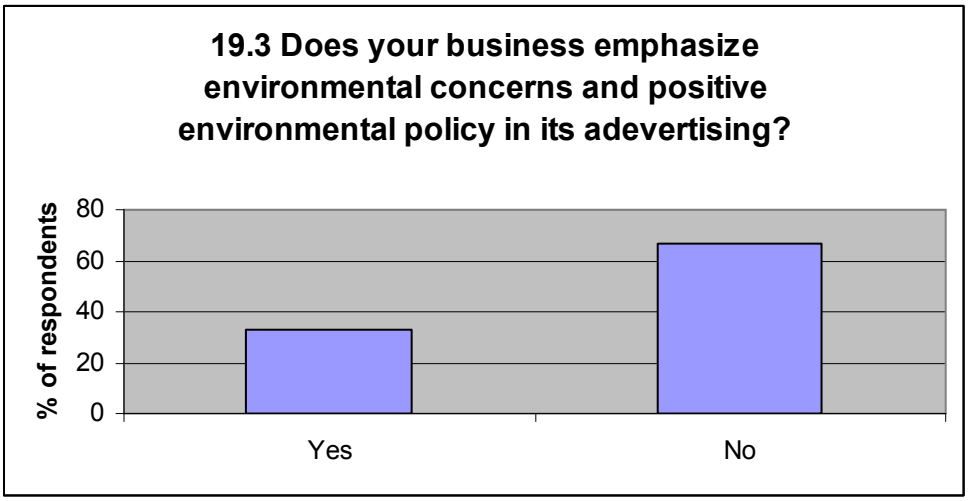

15.2 Can you reserve your preferred car whenever you need one?
% of respondents (3)
80
60
40
20
0
Always
Often
Sometimes
Rarely


15.3 How important are the following aspects for you in your choice of a specific type of car share vehicle?
% of respondents (3)
120
100
80
60
40
20
0
Price
Look
Suitable for the Purpose
Location of vehicle
Vehicle Familiarity
Environmental Friendliness
Very Important
Imporant
Less Important
Not Important


16-18 Trip Data
average kilometers driven
140
120
100
80
60
40
20
0
City
Highway


19.1 Are environmental concerns part of your business's policy or operating principles?
% of respondents (3)
120
100
80
60
40
20
0
Yes
No


19.2 Does your business choose to trade with environmentally responsible companies, even if it occasionally increases costs?
% of respondents
120
100
80
60
40
20
0
Yes
No



Recommendations:

(CSO)'s responding members are mostly _____ members with some _____ members, mostly between the ages of _____. When asked why they joined car sharing, most private members listed _____as the most important factors. Business members reported that they joined primarily to _____. Most private members take trips to _____. When choosing a car to use, both business and private members consider _____ _____ _____. Private members tend to drive slightly more city kilometers than highway kilometers. Business members take mostly highway trips. Trips taken tend to be longer distances, though shorter trips also compose a significant amount of total trips taken.

We recommend that (CSO) incorporate either the Toyota Prius or the Honda Civic hybrid into the car share fleet. Both of these vehicles are mid-sized hybrids that get excellent fuel economy and have low emissions ratings. The mid-sized vehicles are well suited for both city and highway driving, and will provide enough room for passengers and cargo for trips such as vacations, and visits to friends and family. Currently both

vehicles are too expensive due to taxes for CSO's to reasonably incorporate into car sharing. However, there are efforts underway to make this possible, please contact Danske Delebiler if you would like to help make this possible.

Appendix J: Conversion Tables

Common Conversions

This is a list of common conversion factors used in this report. All numbers are accurate to the degree necessary to understand the report. Currency conversion rates were provided by Citibank N.A. on 4 May 2007 and represent the average rates which applied during most of the duration of the project.

European to American	American to European
10 DKK = $1.82 USD	$1 USD = 5.42 DKK
1 EUR = $1.35 USD	$1 USD = 0.735 EUR
1 liter = 0.264 US gallons	1 US gallon = 3.78 liters
10DKK/liter = $6.905/gallon	$1 USD/gallon = 1.45DKK/liter
1 kilometer = 0.621 miles	1 mile = 1.60 km
10 km/liter = 23.52 miles/gallon	10 miles per gallon = 4.25 km/liter

Note: Many fuel efficiency statistics are given in liters per 100km, an inversion of the American measure of distance/volume. An average reading of 5 liters/100km is equivalent to about 47 miles per gallon.