



CHALLENGING THE STATUS QUO – CAR OWNERSHIP AND THE GENERATION Y

An analysis of the German market

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Dissertation written under the supervision of
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Abstract

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Purpose – This work aims to identify how people of the Generation Y in Germany see the future of mobility with a special focus on car ownership. Furthermore, determinants influencing car ownership are analyzed and implications for the automotive industry are drawn.

Design/Methodology – The research relies on primary data collected through an online survey among 20 – 27 years old people in Germany. In order to draw valid conclusions, the data was analyzed carrying out logistic regressions.

Findings – Two main factors that influence the likelihood if people own a car were identified. Living in rural areas and being employed are positively associated with car possession, while no significant relationship between environmental attitude and car ownership could be identified.

Research limitations – The older part of the Generation Y, those above 27 years, was not covered by the data, therefore no general conclusions on the behavior of the whole generation and international differences can be drawn.

Practical implications – This research can help corporations in the automotive and mobility industries to further understand and differentiate their target segment. People of the Generation Y cannot be seen as one homogenous group but need to be identified as fragmented subgroups with entirely different needs and desires.

Originality – To the knowledge of the author, this is the first study that combines the topics of Generation Y and sharing economy with the trends in the automotive industry to identify peoples' perception of mobility.

Keywords: Generation Y, car ownership, automotive, sharing economy, consumer behavior

Paper category: Master's Thesis

Resumo

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Proposta – O objetivo deste trabalho é identificar como a geração Y alemã vê o futuro da mobilidade com especial atenção na compra de automóveis. Além disso, os fatores que influenciam a compra de carro privado são analisados assim como o impacto que causam na indústria automóvel.

Metodologia – A pesquisa é baseada em dados primários que foram recolhidos através de um questionário online. A população alvo são alemães entre os 20-27 anos. Com o objetivo de obter conclusões válidas, a data foi analisada através de regressões logísticas.

Resultados – Os dois fatores que influenciam a probabilidade de as pessoas comprarem carro privado foram identificadas. Viver em áreas rurais e ter um emprego estão associadas positivamente à posse de carro, no entanto não existe uma relação significativa entre atitude ambiental e ter carro.

Limitações de Pesquisa – A parte mais velha da geração Y, ou seja, acima dos 27 não foi usada para a data, o que significa que não é possível tirar conclusões gerais no comportamento completo da geração Y e pode haver diferenças internacionais.

Implicações práticas – Esta pesquisa pode ajudar empresas na indústria automóvel e de mobilidade a perceberem melhor e diferenciar o seu segmento objetivo. A população da geração Y não pode ser vista como um grupo homogêneo, tem que ser identificado como um grupo fragmentado com diferentes necessidades e objetivos.

Originalidade – Para conhecimento do autor, esta pesquisa é o primeiro estudo que combina tópicos sobre a geração Y e economia da partilha com as tendências da indústria automóvel para identificar a percepção que as pessoas tem sobre mobilidade.

Palavras Chave: Geração Y, Automóvel Particular, Automóvel, Economia da partilha, Comportamento do consumidor

Categoria de Pesquisa: Tese de Mestrado

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List of abbreviations

GDP	Gross Domestic Product
ICT	Information and Communication Technologies
MaaS	Mobility as a Service
OEM	Original Equipment Manufacturer
USA	United States of America
USD	US Dollar

1 INTRODUCTION

For decades, the business models of automobile manufacturers remained nearly unchanged. Original Equipment Manufacturers (OEM) were engineering, designing, assembling and selling the vehicles (Jacobides, Knudsen, & Augier, 2006). This traditional structure of the industry is likely to be shaken up by the changed customer behavior of the Generation Y, those people born between 1981 and 1999 (Howe & Strauss, 2009). In western societies, this generation tends to refuse seeing vehicles as a symbol of social status and car ownership is being perceived as less appealing than for previous generations (Belk, 2014). Additionally, this Generation is said to put more value on accessing goods and services than actually possessing them which is generally termed as ‘sharing economy’ (Eckhardt & Bardhi, 2015; Möhlmann, 2015).

Paired with the emergence of young technology companies that push into the automotive market and innovate the industry through intelligent, connected and autonomous vehicles, these trends pose a challenge for established players (McKinsey and Company, 2016). Therefore, pure manufacturing might not suffice in order to stay a dominant force in the market and new business concepts are required. The most promising solution is a shift from pure manufacturing towards providing mobility as a service. This paper will focus on the perception of university students and young professionals of Generation Y in Germany regarding the future of mobility, specifically focusing on vehicle ownership.

While scholars generally agree on the fact that car use and ownership are declining in many western countries, the reasons for this seem to be ambiguous and diverse. Attempts to explain this trend reach from individual financial constraints (van Wee, 2015; Klein & Smart, 2016) to environmental consciousness (van Wee, 2015; Kuhnimhof, Buehler, Wirtz, & Kalinowska, 2012), from refusal of the concept of ownership (Belk, 2014) to the geographic location of living in rural or urban areas (Hjorthol, 2016; Metz, 2013) or the shift to other means of transportation (Kuhnimhof, Zumkeller, & Chlond, 2013).

In parts, the findings of these studies contradict each other and come to fundamentally different conclusions. This clearly poses a necessity for further research on the topic. This study aims to contribute to this research through identifying the factors that influence car ownership among young professionals and students in Germany. The goal of this work is to answer the following two research questions that build up on each other:

RQ1: How does Generation Y see the future of mobility and car ownership?

RQ2: What challenges does Generation Y bring for the automotive industry?

In order to answer these questions, a quantitative survey was distributed among students and young professionals in Germany. This survey focused on determining the general attitude of young Germans towards driving a car, car ownership and future mobility trends. The whole spectrum of Generation Y reaches from people with the age of 19 to 37. It is very likely that the youngest ones are in completely different stages in life as their older counterparts and therefore their answering behavior would likely differ. Therefore, the research was intentionally targeted at the younger part of Generation Y.

The findings of this study are particularly interesting for managers of automobile companies, since the Generation Y is becoming a main target market in the near future. The younger part of this generation, specifically people between 20 and 27 years old, are currently entering the job market with a generally high level of education and thus relatively high purchasing power (Metz, 2013). It is therefore vital to gain an understanding of their needs and desires regarding the future of mobility to effectively target products and services to this generation. The expectations and priorities of these people will be analyzed to draw conclusions on how the industry will need to adapt to meet these expectations. This research will mainly focus on the concept of car ownership and identifies the factors that influence the decision whether or not to own a car. Furthermore, this study takes a short look in the future to identify the perception of young people regarding new technology trends such as autonomous vehicles.

The main conclusion of this study will allow to draw some general implications about recommended shifts in the automotive industry to fulfill the demand of the Generation Y target group. On the other hand, it will also indicate some required steps of the automobile companies regarding customer education to fully gain trust and acceptance.

In the following, an overview about the recent literature on Generation Y, sharing economy and trends in the automotive industry will be presented, followed by a brief introduction of the tested hypotheses and applied methodology. The main contributions of this paper are the analysis of the findings from the conducted survey and an in-depth discussion of results, limitations and managerial implications drawn from it.

2 LITERATURE REVIEW

In order to gain a full understanding of the topic to be analyzed it is important to distinguish between the three main fields of research that influence this work. The demographic focus on Generation Y requires an investigation of the recent literature of the particularities of this generation. Associated with the characteristics of this generation, the concept of sharing economy will play a major role in this study. In addition, a general overview about the current state of the automotive industry regarding future topics such as peak car, autonomous vehicles and alternative mobility concepts will be provided.

2.1 Generation Y

Since there is no natural segmentation of birth cohorts into different generations, the defined birth years for Generation Y differ greatly. While Mangelsdorf (2015) limits this generation to the years 1980 to 1995, Howe and Strauss (2009) consider the years 1982 to 2002 as the boundaries of this generation. In general, Generation Y, also called Millennials (Howe & Strauss, 2009), follows the generations of Baby Boomers and Generation X (Bolton, et al., 2013). In their comprehensive work *'Millennials rising'*, Howe and Strauss (2009) identify Generation Y as people born between 1981 and 1999. This definition will be also applied in the course of this paper. According to this definition, the millennial generation will consist of nearly 20 million people in Germany by 2018, corresponding to 24 percent of the German population (Statistisches Bundesamt, 2015). These numbers underline the importance of this generation for both academic research and the corporate world.

It is said that this generation is defined by several particularities that differentiate them from other generations and receives a high degree of attention both in academic research and mass media (Noble, Haytko, & Phillips, 2009; Stahl, 2016; Bolton, et al., 2013). First of all, and probably most defining are the circumstances they grew up with. Constantly surrounded by technology such as the use of computers, video games or mobile phones led to the term 'digital natives'. They are the counterpart to what Prensky (2001) defines as 'digital immigrants', the predecessor generations that had and have to learn the use of new technology. Being digital natives, opens up completely new possibilities and leads to a totally different mindset than former generations. Furthermore, Millennials prefer to live in dense

urban areas that provide a high quality public transport system (van Wee, 2015). This desire can also be explained through the fact that this generation focuses on high quality education, which leads to longer studying times at university, which are usually located within major cities. This extended study time leads to deferred adulthood and families are founded at later stages in life, compared to previous generations (Hjorthol, 2016). While the mother's mean age for the first child in Germany was 22.9 years in the 1980s (The Social Issues Research Centre, 2012), it rose to 29.4 in 2015 (Central Intelligence Agency (CIA), 2018). In their insightful research, Hershatter and Epstein (2010) characterize the millennial generation and their entrance in the job market. They find that these young people value environmental and ethical responsibility and seek meaningful and impactful challenges at work. It has to be noted that the vast majority of the presented research on millennials focuses on the US and other western cultures. Despite the public discussion of an emergence of a global culture and the disappearance of national cultures, research suggests that national identity will remain important in the future (Cleveland, Rojas-Méndez, Laroche, & Papadopoulos, 2016; Bird & Stevens, 2003). Therefore, all implications regarding Generation Y within this research correspond to western societies, and more specifically Germany.

The Generation Y heavily engages in online activities and therefore 'actively contributes, shares, searches for and consumes content – plus works and plays – on social media platforms' (Bolton, et al., 2013, p. 6). The constant contact with information and communications technologies (ICT) facilitated the creation of 'Collaborative Consumption' (Hamari, Sjöklint, & Ukkonen, 2016) and the way new businesses are founded. Belk (2013) even suggests that humanity might enter a 'post ownership economy'. This refusal of ownership has, specifically, been analyzed in the case of vehicle ownership. Due to their urban lifestyle and the possibilities of mobile technologies, young people tend to focus on electronic gadgets and connectivity instead of cars (Metz, 2013).

2.2 Sharing economy

Although the general concept of sharing has a long tradition in nearly every culture (Belk, 2010), the rise of Generation Y brought up a new phenomenon, which is commonly referred to as sharing economy (Belk, 2014; Möhlmann, 2015; Hamari, Sjöklint, & Ukkonen, 2016). During the past years, several industries have been disrupted by ICT based sharing offers such as Uber which challenges the taxi businesses, airbnb that targets the hotel industry (Parente,

Geleilate, & Rong, 2018) or Wikipedia which made printed encyclopedias redundant (Hamari, Sjöklint, & Ukkonen, 2016).

This collaborative behavior is expected to have a high impact on society and business environments, which led Botsman and Rogers (2010) to the suggestion that sharing could be as important as the industrial revolution regarding the definition of ownership. Indeed, previous literature suggests that the generation Y loses interest in ownership (Belk, 2014). In this vein, many new business models have been emerging during the past years that try to address people's desire to access products and services without the costs and liabilities of ownership (Eckhardt & Bardhi, 2015). The success of mobile devices, customer's regards for environmental sustainability as well as financial uncertainty fueled the international success of companies like Airbnb, Lyft and WeWork with their asset-lite business models (Parente, Geleilate, & Rong, 2018). In their contextualizing research, Parente et al. (2018) identify three pillars that frame sharing business models. First, the business intends to create value through the access to unused or underutilized assets. Second, through an online service, customers pay for temporary access. And third, network effects and social interaction among the players are the main drivers of success.

Eckhardt and Bardhi (2015) note that most of the business models that are constantly classified as 'sharing', do not fulfil the classic definition of sharing as a social exchange without profit. According to their suggestion, these businesses should rather be classified as 'access based' since users value utility, low price and flexibility instead of community belonging or other social benefits. Möhlmann (2015) reaches a similar conclusion and finds that customers of the car sharing service car2go in Germany primarily focus on rational aspects such as high utility and the possibility to save money. Furthermore, trust in the service plays a crucial role in the overall success of sharing business models since it strongly influences the question if users will use the service again (Möhlmann, 2015).

Among many industries, the transportation sector is heavily being influenced by new players that provide mobility services without the need of vehicle ownership. While Uber revolutionizes the taxi industry and car sharing services such as car2go reduce the need of car ownership, the fastest growing trend in mobility sharing in 2012 however, were bike sharing offers that emerged worldwide (Möhlmann, 2015).

2.3 Trends in the automotive industry

Along with the digitalization of other industries, the automotive sector experienced revolutionizing changes. Declining car use and ownership, autonomous vehicles and new mobility concepts are changing the structure of the industry.

2.3.1 Peak car

As already mentioned above, recent research suggests that among other products and services, today young people tend to refuse ownership of cars more than previous generations. Many researchers focus on the declining number of cars, stagnating driver's license rates or a decline of total travelled kilometers by car (Kuhnimhof, Buehler, Wirtz, & Kalinowska, 2012; Klein & Smart, 2016; Hjorthol, 2016). Kuhnimhof et al. (2012) find that car ownership among young Germans declined in the past decade. For previous generations, the analyzed age group of people between 18 and 29 tended to be very focused on car ownership, but since the year 2000 the number of cars per capita decreased significantly. According to Kuhnimhof et al. (2012), there used to be a gap in total kilometers traveled by car between women and men in Germany for many decades. Since the late 1980s however, the rate of registered cars per capita for young men started declining until 2000 when they nearly reached the level of young female car owners. Since then, the ratio of cars per capita for both men and women of the analyzed age group kept falling similarly.

This goes in line with the research of Millard-Ball & Schipper (2011) who analyzed the assumption of 'peak travel', the 'levelling out or saturation of total passenger travel since the early years of the twenty-first century' (p.363). In their study, they find that car ownership stagnated or declined within eight industrialized countries in the past decade. While vehicle ownership had constantly been growing alongside a growth of the countries' GDPs, this trend appeared to reverse during the past decade. In their research they list various possible explanations for this trend which reach from parking constraints over taxes for vehicle ownership to generally aging populations.

Interestingly, Kuhnimhof et al. (2013) find in their research that general travel activity in Germany increased for all age groups from 1997 to 2007 despite decreasing car ownership rates. This clearly indicates a modal shift in travel behavior, from single car use to a combination of different transportation modes such as rail, bus and bike. This hypothesis is confirmed by Metz (2013), who states that the average time people spend traveling per day stayed rather stable during the past decades. People seem to change the mode of traveling

towards faster means of transportation which allows them to make longer journeys, but the average time of one hour per day appears to stay constant. In his study, Metz analyzes the travel behavior of young Britons and finds that the share of car trips to the total number of trips decreased from 50 percent in 1993 to 38 percent in 2012.

While the fact of declining car use and ownership in several industrialized countries is confirmed by various studies, the explanations for this trend vary greatly. Headicar (2013) suggests that the distribution of populations to dense areas can impact the rate of car use. Grimal et al. (2013) find that mainly economic factors influence car use, which goes in line with the findings of Klein and Smart (2016). Apart from the financial situation, Hjorthol (2016) also suggests to consider personal living conditions of young people, such as better public transport in urban areas and extended adolescence.

2.3.2 Autonomous vehicles

Starting in the 1980s, first attempts were made in order to develop vehicles that can communicate with each other and control themselves autonomously in complex situations without the need for a human driver (Campbell, Egerstedt, How, & Murray, 2010). In the mid 1990s, a partly autonomous car successfully drove from Munich, Germany to Odense, Denmark. First successes with fully automated cars were made around ten years later after intense research efforts (van Brummelen, O'Brian, Gruyer, & Najjaran, 2018). This early research on self-driving cars accelerated massively during the past years and automobile companies invest heavily to access the market of the future. In 2025 the projected market size for partially and fully automated vehicles will be over 40 billion USD (BCG, 2015). It is not the purpose of this work to discuss the technical opportunities and challenges this technology might bring. It will rather focus on the impact self-driving cars might have on future mobility.

Generally, it has to be distinguished between five different levels of autonomous driving (National Highway Traffic Safety Administration (NHTSA), 2013). These levels range from '*No-Automation (Level 0)*' to '*Full Self-Driving Automation (Level 4)*'. Level 3 requires a human driver that can occasionally take over control in critical situations, level 4 however, does not require any human involvement apart from stating the designated route or address and applies for both occupied and unoccupied vehicles. Within this research, level 4 is assumed when autonomous vehicles are mentioned.

Recent research projects a vast range of potential benefits that autonomous vehicles can bring to urban transport. Among others it is expected that automatized vehicles will increase the

general safety of car travel, decrease costs and environmental impact and open up a comfortable and fast travel opportunity for a broad customer base including children, elderly and disabled people (Fagnant & Kockelman, 2015; Meyer, Becker, Bösch, & Axhausen, 2017). Childress et al. (2015) suggest in their study that a fully automated fleet of vehicles in the city of Seattle, USA, could lead to 30 percent increases of road capacity and on average shortened travel times by 35 percent. Other researchers even project much a much higher impact of a fully automated fleet that could potentially replace public transport as it is commonplace today (Meyer, Becker, Bösch, & Axhausen, 2017). However, all these models need to deal with several uncertain assumptions which explains the great variety within the findings. On the contrary, Meyer et al. (2017), suggest that a fully automated fleet of vehicles without public transport would lead to increased travel times and congestion due to a higher number of trips taken.

Apart from the chances and advantages presented, many researchers agree on the challenges that are yet to be solved. These range from significant introduction costs to technical difficulties in critical driving situations (Fagnant & Kockelman, 2015). While it is statistically proved that the majority of road accidents result from human mistakes, there is still a high level of mistrust in automated cars resulting from strongly overconfident drivers (Meyer, Becker, Bösch, & Axhausen, 2017). Additionally, laws and registrations need to be adapted to the new environment. Currently, regulators require a human driver to be present and able to take control in every situation (Fagnant & Kockelman, 2015). The state of California, USA, recently adapted its regulation for motorized vehicles. From April 2018 onwards, companies can apply for tests of driverless cars on the roads of California (Department of Motor Vehicles, 2018).

The absence of human drivers leads to one of the main challenges that are yet to be solved in the case of self-driving cars, the question of liability and guilt. Until today it had always been humans that were in full control of the vehicles and therefore also liable for any damage and in the worst case also for injuries and deaths (Sparrow & Howard, 2017). The case of autonomous vehicles leads to various ethical questions. For example, it has to be decided how the vehicle should prioritize in case a crash is unavoidable. Are the lives of two children worth more than the life of one adult? While humans are usually not held responsible for situations that are out of their control, the high degree of technology within the car is expected

to take the best decision and therefore must prioritize between several parties that are involved (Fagnant & Kockelman, 2015; Sparrow & Howard, 2017).

These recent developments in the research of autonomous driving might in the long run disrupt the entire industry. Combining this technology with other trends such as shared rides and vehicles are likely to change the general concept of mobility from cars as subjects of possession towards on-demand mobility providers (Fagnant & Kockelman, 2015).

2.3.3 Mobility as a service

Many industry observers expect the automotive industry to shift from pure manufacturing to a more holistic approach of offering mobility as a service (MaaS). Therefore, the car technology will focus more and more on IT processes and very specialized competences such as cloud security systems (Coppola & Morisio, 2016). Multiple car manufacturers start to explore new fields of business, away from the production and sale of vehicles. Along with the trend of less appealing car ownership and the success of car sharing offers, manufacturers explore the possibility of shifting their focus towards providing MaaS. Since literature regarding this rather new field of research is still limited, this section will mainly rely on press releases, publications of car companies and public organizations and industry-related consultancy reports.

Generally, MaaS describes a seamless combination of various modes of transport, such as public transport, car and bike sharing or car rentals that offers a personalized transport solution (MaaS Alliance AISBL, 2017). The customer is regarded as the center of the business model and the ultimate goal is to provide a single point of contact for all sort of mobility options with integrated payment solutions. In order to successfully compete in this environment, established players adapt their businesses and often enter collaborative agreements with competitors or companies from related industries (Hietanen, 2014).

The concept of offering MaaS is strongly connected to the increasing importance of connected mobile devices that are expected to serve as the central touchpoint for all services (MaaS Alliance AISBL, 2017). While established players are currently learning to adapt to the changed requirements, technology giants like Google, Apple, Tesla or Uber are aggressively challenging traditional industry structures and therefore force established players to reevaluate their businesses (McKinsey and Company, 2016).

A broad range of global players in the automotive industry already announced shifts in their current business models towards more service-oriented solutions. In this vein, Volkswagen focuses in its strategy 2025 on ‘redefining mobility’ (Volkswagen AG, 2017), Daimler enhances its effort in developing connected, electric and autonomous cars (Daimler, 2017) and Toyota invests in research and development of connected cars that use artificial intelligence (AI) to better communicate with other participants of local traffic (Toyota Motor Corporation, 2017). In 2016, the three German automobile manufacturers BMW, Volkswagen and Daimler bought the mapping service ‘HERE’ developed by Nokia as part of a joint program to access a crucial resource for autonomous vehicles (Newcomb, 2016). Additionally, car manufacturers invest in car sharing concepts to meet the changing demand and to target untapped customer segments (Hietanen, 2014).

2.3.4 Car sharing

Many German car manufacturers already established their own car sharing services, such as car2go by Mercedes Benz (Daimler, 2017) or DriveNow by BMW (BMW, 2017). Usually, car sharing services offer the opportunity to rent cars on hourly or even minutely rates that are parked at several spots of the served area. This is the main point of differentiation from traditional car rentals which usually offer daily rates and central pick-up and drop-off locations. Car sharing platforms generally make use of information technologies such as mobile platforms to facilitate access to the service (Crane, Ecola, Hassell, & Nataraj, 2012). Although the term car sharing is widely recognized and accepted, it can be misleading. Generally, users do not share their own cars with strangers but access cars provided by car sharing corporations (Bardhi & Eckhardt, 2012).

In 2014, more than 90.000 cars were available for car sharing services worldwide. The number of people accepting the offer has been growing from 1.16 million in 2010 up to nearly five million in 2014 (Frost & Sullivan, 2014). This goes in line with Russel Belk’s (2013) finding that young people lose their focus on vehicle ownership as a status symbol for self-definition. The associated costs and inconveniences seem to outweigh the advantages that come with owning a car. Cohen (2013) came to a similar conclusion and suggested that the lifestyle of Millennials is becoming less automobile-oriented than for previous generations.

Car sharing furthermore, gains acceptance as major cities aim to reduce traffic within the city by introducing speed limits, charging congestion fees or limiting parking opportunities (Transport for London, 2017; Buehler, Pucher, Gerike, & Götschi, 2016). This significantly

increases the level of uncomfortableness of car drivers which incentivizes the search for alternatives (Belk, 2014). In many cases this includes investments in the public transport systems of cities to increase the convenience of travel. In this vein, the largest cities in Germany, Austria and Switzerland managed to decrease traffic over the past 25 years (Buehler, Pucher, Gerike, & Götschi, 2016).

Due to its early stage of development, none of the available car sharing concepts offer self-driving vehicles as of right now, but it is expected that the availability of this technology will further increase the number of customers. This goes in line with prior studies regarding the acceptance of fully autonomous vehicles, which suggest that car manufacturers should invest in shaping the public opinion about self-driving vehicles as it defines the acceptance of these systems. (Kyriakidis, Happee, & de Winter, 2015)

Recent developments in the German automotive industry underline that the manufacturers identified the need to join forces in order to successfully compete with global technology companies. Thus, Daimler and BMW announced the merger of car2go and DriveNow which is expected to be concluded in 2018 (Reuters, 2018). This merger is perceived as the attempt to challenge the global success of Uber. DriveNow and car2go are the biggest car sharing players in Germany with one million and three million international users, respectively (Reuters, 2018). This cooperation clearly shows a new mindset in an industry that had always been dominated by fierce competition for the amount of sold vehicles.

3 THEORY AND HYPOTHESES DEVELOPMENT

The question of car ownership proves to be rather complex and determined by a large variety of influencing factors. Figure 1 displays three main influencers that were identified in prior research. These factors are the location of living (urban/rural), the individual financial situation and the level of individual environmental consciousness.

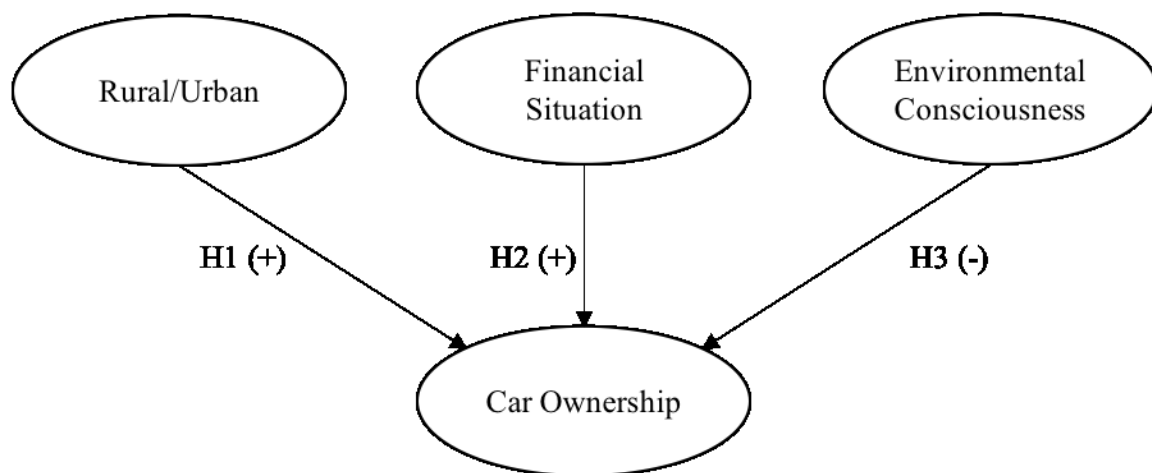


Figure 1 - Framework of determinants for car ownership

The first component is the geographical location of living in rural or urban environments. Hjorthol (2016) states that in the course of urbanization, many young people intentionally choose not to possess a car and use different modes of transportation. This goes in line with the findings of Metz (2013) who concludes that increased popularity of urban environments paired with the omnipresence of mobile devices and internet lead to lower levels of car ownership among young adults. Other research however, suggests that geographical location is not a factor for car ownership (Klein & Smart, 2016). These contradictory findings suggest that a general consensus has not been reached yet and further research is required. Therefore, it is hypothesized that

H1: Living in rural areas is positively associated with car ownership.

The second factor that is assumed to influence car ownership is the individual financial situation. Klein & Smart (2016) reach the conclusion that personal economic factors are to a large degree responsible for question of vehicle possession. Van Wee (2015) finds similar results and proposes that situational factors like the high costs of obtaining a driving license and the purchase costs of the vehicle lead to lower rates of car ownership. This leads to the second hypothesis, stating that

H2: The individual financial situation is positively associated with car ownership.

The third influencing factor is the individual environmental consciousness, which is less tangible and therefore more challenging to measure. Research suggests that the high degree of environmental awareness among young people of the Generation Y has an impact on decreased levels of car ownership (van Wee, 2015; Kuhnimhof, Buehler, Wirtz, & Kalinowska, 2012). Although it could not be scientifically proved yet that environmental awareness is a main driver, the researchers agree that it is of importance for the individual decision. Therefore, it is hypothesized that

H3: Environmental consciousness is negatively associated with car ownership.

The decision whether or not to purchase a car is dependent from a large variety of tangible, intangible, rational and irrational factors. Therefore, it will not be possible to predict with certainty if someone will decide to buy a car. These hypotheses however, are expected to explain a large part of the factors that influence the decision of vehicle possession.

4 RESEARCH METHOD

To identify German Millennials' attitude towards car ownership and the future of mobility, a quantitative online survey was used and distributed via social networks and direct messaging services. Participants were asked to further distribute the survey within their social networks to increase the size and variance of the sample. The period of data collection lasted from January 15 to February 15 2018 and the survey language was German.

In order to be able to receive reliable results, a validated survey by the German research institute infas was slightly adapted for this paper. The original survey has been used in the creation of the Continental Mobility Study 2015 (Continental AG, 2015).

Since 2011 the German tire manufacturer and automotive supplier Continental AG has conducted four studies on different mobility related topics. In 2015 the study's title was "Driving beyond 2020 – Reason or Emotion?". Within this representative cross-country study, participants from Germany, France, the U.S., Japan and China were surveyed through an online questionnaire and telephone interviews. The research questions behind the initial survey were the following:

- "How significant is driving worldwide?
- In the future, will the motives behind mobility be more rational than emotional?
- Do young people even want to own cars anymore?
- How accepted are new technologies like electromobility, digitalization, and automated driving?" (Continental AG, 2015, p. 2)

The questionnaire used for the representative telephone survey was developed by the research institute infas and provided to the author by Continental AG. This questionnaire was slightly adapted for the needs of this research and mainly demographical questions were added (Appendix 1). The distributed questionnaire contained 38 questions in seven main categories.

1. General attitude and identifications of car drivers [5 questions]

The survey starts with identifying the participants' attitudes regarding several aspects of everyday life ranging from the importance of nutrition or electronic gadgets to car driving or environmental issues. Furthermore, respondents were asked if they own a driving license and if not the reasons behind that. Participants that do not own a driving

license were directed to the demographic questions since the main part of the survey was targeted to car drivers.

2. General questions for car users: driving behavior and motivation [6 questions]

Within this category participants were asked if they own a car and about the frequency of driving. People that responded that they never drive were directed to the demographic questions at the end of the survey. Car drivers were also asked for the reasons of owning or not owning a car.

3. Vehicle specific questions [6 questions]

Participants were asked to provide information about the vehicle they usually drive. Apart from the type of the car, age, fuel and the time of possession were identified.

4. Attitude of the drivers [3 questions]

This category intended to identify how participants feel about driving and how much they enjoy driving. Additionally, they were asked to reevaluate their current situation in terms of car ownership (what would be the best in that situation? Car ownership, car rental, car sharing, etc.).

5. Will you own a car in the future (for respondents that do not own a car)? [3 questions]

To further understand respondents that do not own a car, three questions were asked to identify their general attitude regarding car ownership. People were asked if they think that they would own a car in the next 5 years or the next 10 years and if yes which kind of car that would be.

6. Future outlook of mobility [2 questions]

To assess participants' attitudes regarding future mobility concepts two questions were asked in this category. First participants should answer whether they could imagine to entirely relinquish car possession and only rely on car sharing services. Second, participants were asked to spontaneously respond (agree/disagree/don't know) to a range of statements regarding autonomous vehicles.

7. Demographics [13 questions]

A broad range of demographic questions was asked to distinguish between the participants. Among others, people were asked to state their age, gender, household size,

educational status, evaluate the quality of public transport and define if they live in an urban or rural environment.

As described above, the display of several questions depended on previous answers of the participants (e.g. people without driving license were not asked about their driving behavior).

In total, 321 responses were recorded with 292 participants who concluded the entire questionnaire. In the process of data clearing, everyone that did not own a driving license and respondents that reported to 'never' drive a car were filtered out, since the survey was designed to identify the factors associated with car ownership among car drivers. Testing the questionnaire before distribution, revealed that the fastest respondents finished the survey after precisely five minutes. Considering this value as a benchmark, all participants that took less than four minutes and thirty seconds to finish the questionnaire were excluded from the sample. It cannot be assumed that these respondents concluded the survey thoroughly. Eventually, 234 respondents belonged to the demographic target group of young Germans (20 – 27 years old) and therefore formed the sample for this work.

5 DATA ANALYSIS AND RESULTS

5.1 General findings and introduction of chosen model

Apart from descriptive statistics, logistic regression models were applied to analyze the factors influencing car ownership among young Germans using the software application SPSS. Due to the fact that data regarding the question of car ownership is collected in binary form (own a car/do not own a car) multiple linear regression models would not be suited to correctly analyze the data. Logistic regression analysis however, considers that the dependent variable is categorical (Hjorthol, 2016; Tranmer & Elliot, 2008).

The gender distribution of the analyzed sample proved to be nearly equal, with 50.4 percent of the respondents being female. While 58.5 percent of the sample state to be students (full time and part time) 41 percent are employed full time with only one respondent being employed part time. Further heterogeneity is found in the educational level where 10.7 percent of the participants state that their highest degree was the certification of an accomplished apprenticeship, 27.4 percent finished high school, 45.7 percent their undergraduate degree and 10.3 percent hold a master's degree. The remaining 5.9 percent of the respondents hold other degrees ranging from German middle school, to federal law degrees or PhDs. Also, the distribution of participants living in urban and rural areas proves to be rather equal. A small majority of 51.7 percent responded to live in a small town or rural area while the rest lives in an urban environment, either in a suburb of a big city (13.2 percent) or in a big city itself (35.0 percent)(Appendix 2).

Furthermore, some questions regarding the general attitudes in different situations in life were asked. Figure 2 shows that the respondents value their leisure time and work life balance most, which goes in line with the presented literature on Generation Y. With over 30 percent of the participants stating that driving a car is very unimportant or at least moderately unimportant to them, this is by far the attribute that is least important which also confirms prior suggestions.

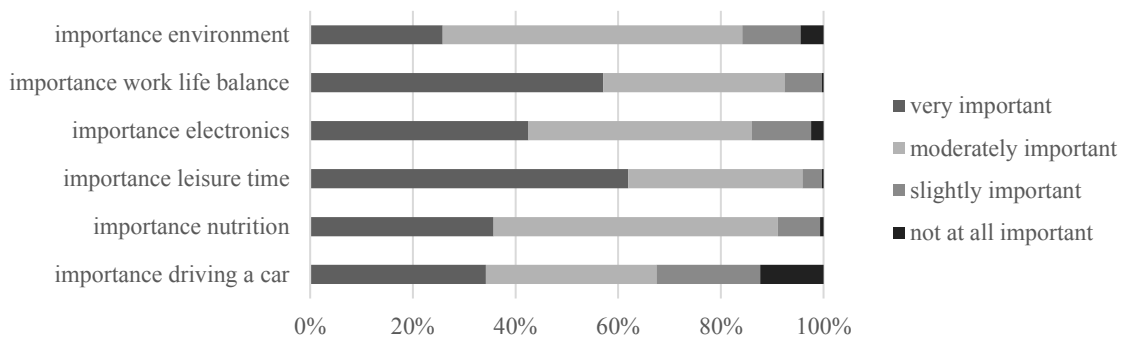


Figure 2 - General attitude of participants

Additionally, respondents were asked how much they liked driving inside a car, independently from being the driver or passenger. More than 70 percent of the participants claimed to moderately enjoy it or to enjoy it a lot.

Figure 3 displays to which extent participants agree to certain statements regarding the use and possession of a car. This graph only shows the answers of participants that claimed to own their own car or a company car. It is striking that the vast majority likes their car, feels that cars are a place you should feel comfortable in and states to need a car to organize their daily lives. 45 percent of the respondents sometimes think that they spend too much money on driving a car but only 35 percent consider using other means of transportation.

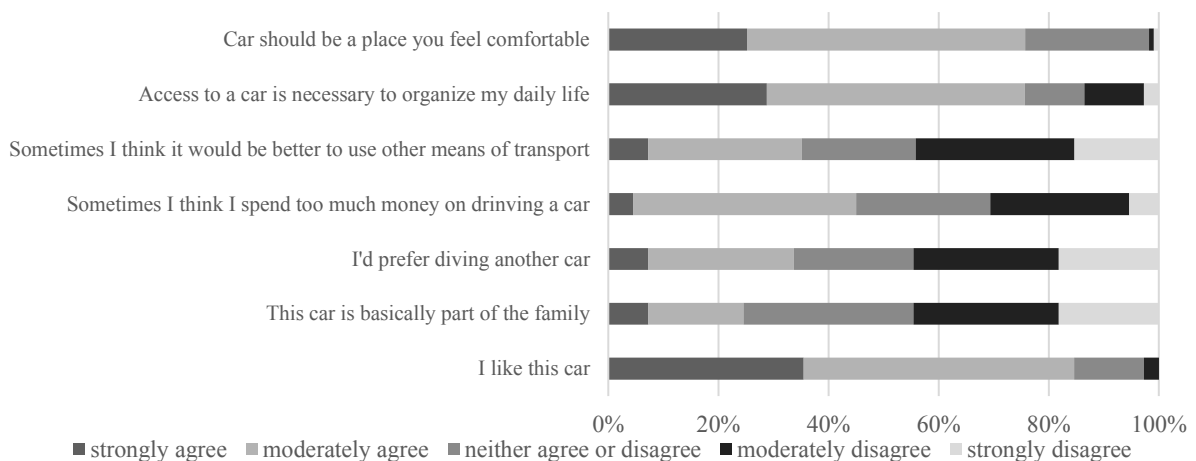


Figure 3 - Attitude regarding car driving

Additionally, the reasons why people do not own cars were analyzed. 87.7 percent of the respondents that do not own a car stated that they would not need one since they can use other means of transport instead and a slightly lower percentage said that it was significantly cheaper to live without a car. Only 30 percent see difficult parking situations as a reason not

to own a car. These findings get more diversified when differentiated between urban and rural population. While the relative number of participants that find car ownership too expensive proves to be rather equal, the differences within the categories parking constraints, other means of transport and the statement ‘I don’t need a car every day’ are noteworthy. Only 16 percent of the rural population without a car state the parking situation as a major reason. Within the urban population, this proportion rises to over a third of the respondents. Similar observations can be made for the use of public transport. 73 percent of the rural participants without a car state that the access to public transport played a major role in the decision not to own a car. Among the urban respondents this percentage goes up to nearly 95 percent.

In order to solidify this research, logistic regressions were carried out to identify the factors that influence car ownership. The chosen model is displayed in Figure 4. The analysis reveals that five out of seven determinants are not significant in explaining the probability of car ownership. Among the determinants that were analyzed gender, the age of respondents, environmental consciousness, the level of education and the individual financial situation proved not to be significant factors when analyzing car possession among young Germans. The employment factor is a categorical variable that is 0 for people that are not employed and 1 for employed respondents. This regression shows that that employment is a significant factor and suggests that employed people are 5.4 times as likely as unemployed people to own a car, holding all other factors constant.

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
gender	-,588	,323	3,319	1	,068	,555	,295	1,046
age	,058	,093	,392	1	,531	1,060	,883	1,272
empl_stat_dummy	1,689	,349	23,433	1	,000	5,415	2,732	10,729
env_dummy	,339	,370	,838	1	,360	1,404	,679	2,901
urban_rural_dummy	1,099	,327	11,271	1	,001	3,002	1,580	5,702
education	,088	,149	,351	1	,553	1,093	,815	1,464
fin_sit	-,134	,252	,284	1	,594	,874	,533	1,433
Constant	-2,019	2,504	,650	1	,420	,133		

Figure 4 - Logistic regression model

5.2 Impact of living in urban vs. rural environments on car ownership

In order to test for H1: *Living in rural areas is positively associated with car ownership*, first the two categorical variables `urban_rural_dummy` and `owncar_dummy` were analyzed. A crosstabulation reveals that people living in urban environments (suburbs of big cities or big cities itself) own significantly less cars than people living in rural areas. This goes in line with the assumption stated in H1 and is further confirmed by the logistic regression model presented above. Holding all other variables constant, a person living in a rural environment is three times more likely to own a car than someone living in an urban area. This observation is significant at a 1% level, thus supports H1.

5.3 Impact of the individual financial situation on car ownership

H2 hypothesized that the individual financial situation is positively associated with car ownership. Within the survey, participants were asked to rate their own financial situation from 1 = very bad, 2 = moderately bad, 3 = moderately good to 4 = very good. Participants that did not want to answer this question were given the choice not to provide any information. The logistic regressions however, carried out to test H2 did not provide any significant influence of the individual perceived financial situation on car ownership. Other attempts to transform the data on the financial situation into a categorical variable (good/bad) did not lead to different results. Therefore, H2 cannot be supported and is rejected.

5.4 Impact of environmental attitude on car ownership

In H3 it was stated that the individual environmental attitude is expected to be negatively associated with car ownership. Through logistic regressions no statistically relevant connection between environmental cautiousness and the possession could be identified. The data regarding environmental awareness presented above was then transformed into a new categorical variable dividing people that value environmental awareness as very important from the rest of the respondents. Further logistic regressions did not reveal any statistically significant relationship, thus H3 is rejected.

5.5 Future outlook on mobility

Two questions were asked regarding the future of mobility. Participants were asked a hypothetical question, if they could imagine to entirely rely on car sharing and refuse car ownership, provided that car sharing providers offer a good service in their region. The answer categories were 1 = certainly not, 2 = probably not, 3 = probably yes and 4 = certainly

yes. 49.5 percent of the respondents rejected this idea (1 and 2) and cannot imagine living without car possession. Figure 5 builds on the same data but cross tabulated with the categorical variable `urban_rural_dummy`. A clear distinction between urban and rural respondents is visible with urban people being more appealed by the thought of a future without car possession while people in rural areas tend to see car possession as more important. A similar observation can be made when analyzing the willingness to only rely on car sharing offers for students and employed people. While over 63 percent of the students can imagine to solely use car sharing, only 31 percent of employed people can imagine that (Appendix 3).

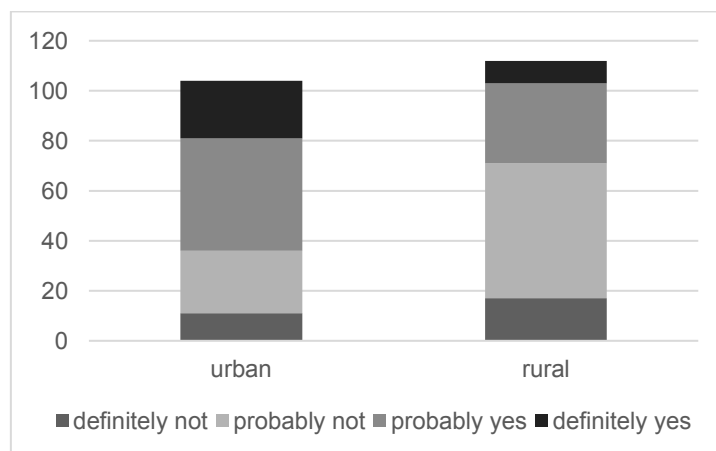


Figure 5 - Can people imagine life without owning a car? (number of respondents)

Furthermore, a logistic regression was carried out to identify the influencing factors if people are willing to relinquish car possession and use car sharing services. The results differ from the regression above and among the eight variables tested, only one proved to be significant on an acceptable level. People that state that environmental protection is very important to them, are 2.5 times as likely to favor the idea of only using car sharing offers (p-value 0.015) than people that state that saving the environment is very unimportant, moderately unimportant or moderately important (Appendix 4). Other variables that were highly significant for the question of car ownership proved not to have a noticeable influence on the likelihood of respondents to accept car sharing offers.

The second question regarding the future of the automotive industry focused on the new technology of autonomous vehicles. Participants were asked a variety of questions to which they could moderately agree, moderately disagree or state that they don't know. It is striking that for most of the questions, around 20 percent of the respondents did not see themselves capable of answering the question and opted for 'I don't know'. The majority of respondents

believes that autonomous vehicles can offer support in stressful or monotonous situations and that the technology can help to prevent heavy accidents. A little more than half of the respondents believe that autonomous vehicles will spoil the fun of driving a car. Nearly one third of the participants claim to be rather afraid of the idea of entering a car that drives driverless. Although only 25 percent say that they have waited for something like that, a large majority of 64.5 percent considers this technological advancement as a useful progress.

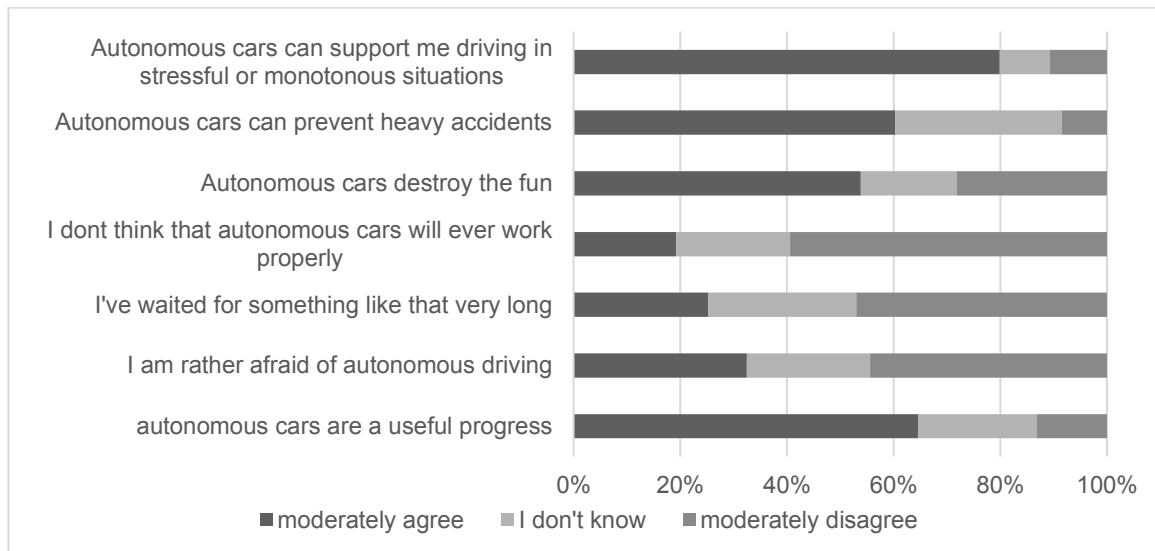


Figure 6 - Perception of autonomous vehicles

6 DISCUSSION AND IMPLICATIONS

This study aimed to answer the questions how the Generation Y sees the future of mobility and how these people challenge the status quo in the automotive industry specifically focussing on the German market. It was expected to find significant differences regarding car ownership rates depending in the geographic location, the individual financial situation and an environmental consciousness. The survey questionnaire was provided by the automotive supplier Continental AG that conducted the study in 2014 and published it as their mobility study 2015. Concluding and summarizing their research, it is stated that young people, indeed are interested in owning cars and that car driving is mainly a matter of money and not of location. In the following, the results of this work will be discussed.

6.1 Car ownership and the geographic location (urban vs. rural)

Analyzing car ownership rates among participants living in rural or urban environments revealed significant differences. Which could already be assumed by the raw distribution of cars among the participants was confirmed by the logistic regression. Combined with difficult parking situations and a generally high quality of public transport in urban areas, these findings provide a solid explanation for lower levels of car possession in urban environments. The results of this work can therefore confirm the conclusions of prior research (Metz, 2013; Hjorthol, 2016). Nevertheless, it is interesting to see that car sharing services do not seem to be used frequently among young people. Only one participant stated to make use of car sharing offers while 65 percent of them claim that they could imagine only relying on these services providers. This clearly displays a significant market potential for car sharing providers but also allows the assumption that something in their offers makes young people reluctant to sign up and use the service.

6.2 Car ownership and the individual financial situation

The above presented logistic regression did not show any significant influence of the perceived financial situation on the level of car ownership. Therefore, the hypotheses had to be formally rejected. Nevertheless, there are other factors that might explain the insignificance of this variable and still suggest an influence of the individual economic situation on car possession. First, the question to identify the financial power did not ask for an exact value of income or an income range, it only asked for a rather subjective assessment of the own financial power. Participants were asked to evaluate their financial situation on a

range from very bad to very good. This brings a variety of difficulties starting from the fact that the data collected is hardly measurable. A highly subjective evaluation for a sensitive topic like the financial situation does not provide enough reliable information to draw conclusions from it. It is rather natural that perceptions of the own economic power change according to the situation. Assuming that a student and someone employed had the same amount of money available every month, it is very possible that the student would state to be in a moderately good situation while the employed worker would feel underpaid and claim to be in a moderately bad situation. Furthermore, the personal economic situation is something very intimate and also connected to public appreciation. Therefore, it is likely that participants did not truthfully answer this question to avoid perceived public shaming.

However, the analyzed data suggests a strong and highly significant influence of employment on car ownership. Employed people are 5.4 times as likely to possess a vehicle than participants that are not employed. Naturally, employment has a strong effect on the objective financial situation, the money available to the person but employment can also change other factors in life such as the distance from home to the workplace. This makes it hard to separate the gains in financial power from other factors. Considering all this, it would seem unreasonable to reject H2 and state that there is no influence of financial circumstances on car ownership. It can only be said that a positive association can be assumed but it is impossible to draw exact conclusions from the data.

6.3 Car ownership and environmental consciousness

As a third hypothesis, it was assumed that environmental consciousness is negatively associated with car ownership. This hypothesis however, could not be confirmed by the analyzed data. No significant influence of an environmental attitude on car possession could be identified. There might be several explanations associated with these findings. First of all, the questionnaire tested the attitude of participants not their actions. It is therefore hard to evaluate the actual environmental consciousness. It is socially favorable to state environmental concerns in times of global warming and increasing appearance of natural disasters. But it is obvious that it is easier to raise these concerns than to actually live up to the consequences it would bring. The comfort cars bring to individual travel might outweigh environmental concerns for many people. On the other hand, people in rural areas are quite often highly dependent on the access to cars in order to organize their daily lives. Lacking

public transportation and longer distances from job to work might make cars vital for everyone living in small towns and villages.

Despite the fact that there is no significant relationship between environmental attitude and car ownership, there is a positive association between environmental consciousness and the willingness of young people to only rely on car sharing offers without owning cars. One possible explanation for this is that it shows that environmental attitude could indeed be a driver to refuse car possession but people simply do not see themselves capable of it and car sharing providers do not offer a viable alternative yet. Another, little less benevolent, explanation could be the fact that the question was asked hypothetically. It might be easier for people to say that they are willing to live without a car than to actually do it. It is possible that the romantic illusion of saving the environment through living without an own car does not come true because of the comfortability the own car brings in reality.

6.4 The future of mobility

While the analyzed hypotheses aimed to answer questions on the status quo among young Germans, two questions inside the questionnaire focused on hypothetical future scenarios. The findings that respondents in urban areas are more willing to opt for car sharing offers, provided that the offer is attractive and can meet the demand, go in line with the analysis of the current situation. As indicated before, many people in rural areas cannot imagine life without possessing a car due to the remote location and poor public transportation. This is also unlikely to change in the future even though nearly 40 percent of the rural participants could imagine living without a car. The lower density of population within rural areas makes it hard for car sharing providers to offer competitive and sustainable solutions. Car sharing solutions can only be successful when vehicle availability is nearly always guaranteed and a good public transport system serves as a reliable backup in case no car is available, but both these factors can hardly be met in rural environments.

The second question regarding the future of mobility focused on the perception of autonomous vehicles. Since the technology is still being developed and only prototype testing is happening on public roads, the perception of these vehicles is mainly influenced by media and press releases. Therefore, the information provided by the participants need to be evaluated with great caution but it can be seen as an indicator of the public opinion. This statement is supported by the fact that for most of the questions, around 20 percent of the participants did not know whether to agree or disagree and chose the option 'I don't know'.

This shows that there is still great uncertainty regarding these new technologies that are expected to change mobility in the coming years. The majority considers this development as a useful progress and a helpful technology for monotonous driving situations. This is likely to be influenced by the many assistance mechanisms that are already implemented in new cars today. People slowly get used to the technology and get to use it step by step. Nevertheless, many people think that autonomous vehicles will spoil the fun of driving a car manually, which is a fact that should not be neglected with more than 70 percent of the respondents enjoying being inside a car.

It can be expected that people will be more educated on the topic in a few years, but public discussions about the safety will keep the debate alive. The death of a pedestrian, hit by an autonomous vehicle by the tech company UBER in March 2018 caused a lot of controversy on the security of the technology (Wakabayashi, 2018). Within this study, more than 75 percent agreed to the statement of being a very good driver. Furthermore, nearly 40 percent of the respondents were not convinced that autonomous vehicles can prevent heavy accidents and therefore increase road safety. This shows that driving a car is more a question of emotion than a rational choice since it is a proven fact that more than 90 percent of road accidents stem from human failure (Fagnant & Kockelman, 2015). It will be the task of the automobile companies to convince these people that self-driving cars, in fact can increase the overall security.

6.5 Management implications

The results and findings discussed above are not only interesting from a scientific point of view, but also for corporations in the automotive and mobility industries. The young people of Generation Y that are currently entering the job market are a vital target group for these companies. However, within these young people it is necessary to differentiate in order to target them effectively. This study identified two main drivers that determine the likelihood of young people owning cars. First, the distinction between employed and unemployed people is crucial to determine the likelihood of car possession and second, the geographical location of living in rural or urban environments.

As described above, OEMs start shifting from pure manufacturing to providing mobility as a service. This will mainly benefit people living in dense areas where different modes of transport are easy to combine. This study revealed that many people in rural areas cannot imagine a life without car ownership since the own car is their only mean of mobility.

Therefore, it is advisable that OEMs focus on a differentiated strategy of providing mobility across different means of transportation in urban areas and act as traditional manufacturers in rural regions. It might be a successful approach to target young urban dwellers with mobility services since they do not need cars to organize their daily lives. But this situation is likely to change, as soon as these young people grow older, have families and move to calmer, cheaper and more remote areas where the quality of public transport is not as high as in the city centers. And in this moment, it should be the goal of the OEMs to convert these people to customers of their automobile products. This way, the car manufacturers will stay an important player for both young and old people.

The situation is slightly different for companies that only focus on providing mobility as a service but do not produce cars on their own. It is still recommendable to focus on urban dwellers as the main target group, but since car access is very popular among employed people, it might be successful to specifically target these young people that are employed and own cars to convince them of the benefits living with constant car access but without the burdens that come with possession. This target group has the buying power to pay for full mobility solutions and according to this study they are also willing to live without their own car as long as the service provider offers a comfortable and reliable solution to their mobility needs.

6.6 Further research opportunities

This work complements existing literature to identify the behaviors and needs of Generation Y regarding car ownership and mobility. For further research it would be interesting to collect data from a broader sample regarding age and nationality in order to draw cross generational and international conclusions. Furthermore, it could be very interesting to collect panel data over several years to see how behaviors and attitudes of the same persons change over the years.

This study did only cover the younger part of Generation Y, those between 20 and 27 in the year of data collection (2018). Therefore, this study's results and recommendations cannot be generalized for the entire population of Generation Y. Further research, especially among the older part of this generation will be required to draw generally valid conclusions.

7 CONCLUSIONS

This work joins the existing literature on Generation Y, sharing economy and the trends in the automotive industry by focusing specifically on young Germans. The industry is facing disruption and new competition with the appearance of autonomous vehicles. This study revealed that people are still skeptical, insecure and hesitant when it comes to these technological advancements and it seems to be vital for car manufacturers to promote it within society and politics.

But not only technological changes are challenging established players in the industry. New mobility concepts that combine different means of transport in order to get customers from A to B gain popularity among young people. This study aimed at identifying how Generation Y sees the future of mobility and especially car ownership. During the analysis of this study, two main determinants were identified that mainly impact car possession among these young people. Employment and geographic location play a dominant role and therefore it has to be distinguished between different sub groups of Generation Y. Although members of this generation might share similar values and beliefs, it is impossible to treat their attitude towards car ownership as if they were one homogenous group. Possessing a car is not necessarily a matter of choice, in many cases it appears as the only alternative to ensure individual mobility. It will be a big challenge for OEMs to successfully manage the compromise between attracting young people to purchase their vehicles and on the other hand providing comfortable and reliable mobility to those who can afford to live without their own a car. Therefore, both scholars and corporations in the automobile and mobility industries are well advised to differentiate within their youngest target group and not draw general conclusions on the behavior of a whole generation.

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APPENDIX

Appendix 1: Survey questionnaire

The original, validated survey was conducted in German language. For consistency purposes, the questionnaire was translated to English.

General attitude and identifications of car drivers

Q1: When you think about different areas of your life: How would you rate the importance of the following areas? [RANDOMIZE]

- a. Driving a car
- b. Your nutrition
- c. Leisure time activities
- d. Electronic devices such as smartphone, tablet, laptop
- e. Work-life balance
- f. Environmental protection

1: very important

2: moderately important

3: moderately unimportant

4: very unimportant

5: I don't know

Q2: How much do you like driving a car – independently from being driver or passenger?

- a. Not at all
- b. Dislike moderately
- c. Neither like or dislike
- d. Like moderately
- e. I like it a lot

Q3: Do you own a driving license?

- a. Yes
- b. No

Q4: Why don't you own a driving license?

- a. Driving a car is too expensive
- b. I can't afford an own car
- c. There are no parking opportunities where I live
- d. I don't want to own a car due to ecological reasons
- e. In my daily life, I don't need a car
- f. I cannot drive a car due to health reasons
- g. Other reason

Q5: Do you plan on getting a driving license in the next years?

- a. Definitely not
- b. Probably not
- c. Probably yes
- d. Definitely yes
- e. I don't know

General questions for car users: driving behavior and motivation

Q6: How often do you drive a car yourself?

- a. Every day or nearly every day
- b. At least once a week
- c. At least once a month
- d. Less than once a month
- e. Never

Q7: How many kilometers do you drive every year? (estimate is sufficient)

- a. Less than 5,000 km
- b. 5,000 to max. 10,000 km
- c. 10,000 to max. 15,000 km
- d. 15,000 to max. 30,000 km
- e. 30,000 to max. 50,000 km
- f. 50,000 to max. 100,000 km
- g. More than 100,000 km

Q8: Driving a car in everyday life is experienced differently. How do you experience driving a car? Would you say driving a car in your daily life is... [RANDOMIZE]

- a. Stressful
- b. Reasonable
- c. Fun
- d. Comfortable
- e. Expensive
- f. Practical
- g. Unproblematic

1: always

2: sometimes

3: never

Q9: The car that you usually use...

- a. Is your own car
- b. Is a car of your household, family or friend
- c. Is a rental car (e.g. Sixt, Avis)
- d. Is a car sharing service (e.g. DriveNow, Car2Go)
- e. Is a company car

Q10: Why do you use an own car? To which extent do the following statements apply to you? [RANDOMIZE]

- a. I need a car every day
- b. I prefer the freedom an own car offers
- c. It is financially cheaper
- d. I love my car and enjoy driving it

Q11: Why don't you own your own car? To which extent do the following statements apply to you? [RANDOMIZE]

- a. I do not need a car every day
- b. I always have access to a car – also without owning one

- c. It is financially cheaper
- d. I don't have available parking opportunities
- e. I can use other means of transport

- 1: Extremely inappropriate
- 2: Moderately inappropriate
- 3: Neither inappropriate or appropriate
- 4: Moderately appropriate
- 5: Extremely appropriate

Vehicle specific questions

Q12: What kind of car do you usually drive?

- a. A small car
- b. A middle-class car
- c. An upper-class car
- d. A pickup
- e. A van
- f. An SUV / crossover
- g. A sports car
- h. Another car

Q13: Would you say you are the main user of this car?

- a. Yes, I am the main user
- b. Yes, I am one of the main users
- c. No

Q14: Is this car...

- a. Younger than two years
- b. Between two and five years
- c. Older than five years
- d. Completely different

Q15: For how many years have you been driving this car?

- a. Less than a year
- b. Between one and three years
- c. Between three and six years
- d. More than six years

Q16: This car was bought as a

- a. New car
- b. Used car

Q17: Which kind of fuel does your car use?

- a. Petrol
- b. Diesel
- c. Electricity and petrol or diesel (hybrid)
- d. Only electricity
- e. With gas (LPG or CNG)
- f. Other

Attitude of the drivers

Q18: To which extent do you agree with the following statements? [RANDOMIZE, options a, b, c are only displayed to respondents that state to own their own car or a company car]

- a. I like this car
- b. This car is nearly a part of the family
- c. I would prefer to drive another car
- d. Sometimes, I think that I spend too much money on driving a car
- e. Sometimes, I think it would be more reasonable to use other means of transport
- f. Access to a car is necessary to organize my daily life
- g. The car should be a place where you feel comfortable

1: I do not agree at all

2: I moderately disagree

3: Neither agree or disagree

4: I moderately agree

5: I totally agree

Q19: When you critically question your current situation: Which scenario would you prefer according to your available budget and your everyday needs? [RANDOMIZE]

- a. Own my own car
- b. Lease a car
- c. Rent a car whenever I need one (e.g. Sixt, Avis)
- d. Use a car sharing service (e.g. DriveNow, Car2Go)
- e. No car at all
- f. I don't know

Q20: To which extent do you agree to the following statements about driving a car in general? [RANDOMIZE]

- a. I think that I am a very good car driver
- b. Driving a car is fun
- c. Driving a car on the increasingly full streets is becoming more stressful
- d. In my daily life, I drive a car as often as possible
- e. With the car I can always go wherever I want

1: I do not agree at all

2: I moderately disagree

3: Neither agree or disagree

4: I moderately agree

5: I totally agree

Will you own a car in the future (for respondents that do not own a car)?

Q21: Do you think you will own a car in the next 5 years?

- a. Yes
- b. No
- c. I don't know

Q22: And when you think about the next 10 years. Do you think you will own a car within that time?

- d. Yes
- e. No
- f. I don't know

Q23: And which kind of car would you like to own?

- i. A small car
- j. A middle-class car
- k. An upper-class car
- l. A pickup
- m. A van
- n. An SUV / crossover
- o. A sports car
- p. Another car

Future outlook of mobility

Q24: For the following two questions we take a look in the future. Assuming that car sharing companies manage to provide a service that sufficiently covers your region. Could you imagine to live without an own car and only use car sharing offers?

- f. Definitely not
- g. Probably not
- h. Probably yes
- i. Definitely yes
- j. I don't know

Q25: Buzzword autonomous cars: In a few years it is very likely that there will be cars that drive autonomously without you doing anything. Many people have different opinions on this topic. Please indicate if you moderately agree or disagree with the following statements.

[RANDOMIZE]

- a. Autonomous driving is a useful development
- b. Autonomous driving scares me

- c. I have waited for something like that a long time
- d. I don't think that this will ever work reliably
- e. Autonomous driving spoils the fun of driving a car
- f. Autonomous driving can help prevent heavy accidents
- g. Autonomous driving can assist me in monotonous and stressful driving situations

1: I moderately disagree

2: I moderately agree

3: I don't know

Demographics

Q26: Now we reached the end of the questionnaire. To come to an end, I will need some general data from you. When you were asked to describe your place of residence. Would you say...

- a. In a small town or rural environment
- b. In the suburb of a big city
- c. Inside a big city

Q27: How would you rate the offer of public transport in your place of residence?

- a. Very bad
- b. Moderately bad
- c. Moderately good
- d. Very good
- e. I don't know

Q28: How do you rate your current financial situation?

- a. Very bad
- b. Moderately bad
- c. Moderately good
- d. Very good
- e. I prefer not to answer

Q30: Counting yourself in, how many people live in your household? *Free text field*

Q31: How many cars do you have in your household? *Free text field*

Q32: How many people in your household hold a driving license? *Free text field*

Q33: How old are you? *Free text field*

Q34: Are you...

- a. Female
- b. Male

Q35: Where do you live at the moment?

- a. In Germany
- b. Outside Germany, where? *Free text field*

Q36: You are...

- a. Full time student
- b. Part time student
- c. Full time employed
- d. Part time employed
- e. Unemployed

Q37: What is your highest, already achieved level of education?

- a. PhD
- b. Master
- c. Undergraduate
- d. German A-level/High School
- e. Technician
- f. Accomplished apprenticeship
- g. German middle school
- h. German junior high school

Q38: Which field of study does your degree belong to?

- a. Agriculture science
- b. Social science
- c. Humanities
- d. Art, Design and Music
- e. Educational sciences
- f. Media and communication
- g. Medicine and Health science
- h. Natural sciences and Mathematics
- i. Legal, economic and business sciences
- j. Language and culture sciences
- k. Technology and Engineering sciences
- l. Other

Appendix 2: Descriptive statistics on gender, geographic location, own car, education and employment status

gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	female	118	50,4	50,4	50,4
	male	116	49,6	49,6	100,0
	Total	234	100,0	100,0	

urban/rural

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Small town or rural area	121	51,7	51,7	51,7
	Suburb of big city	31	13,2	13,2	65,0
	Big city	82	35,0	35,0	100,0
	Total	234	100,0	100,0	

own car?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	My own car	110	47,0	47,0	47,0
	Car of a friend / family	109	46,6	46,6	93,6
	Rental car (e.g. Sixt, Avis)	4	1,7	1,7	95,3
	Company car	10	4,3	4,3	99,6
	Car sharing service (e.g. DriveNow, Car2Go)	1	,4	,4	100,0
	Total	234	100,0	100,0	

education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	1	,4	,4	,4
	Master	24	10,3	10,4	10,9
	Bachelor	107	45,7	46,5	57,4
	High School	64	27,4	27,8	85,2
	Technician	4	1,7	1,7	87,0
	Apprenticeship	25	10,7	10,9	97,8
	Middle School	5	2,1	2,2	100,0

Total	230	98,3	100,0
Missing Other	4	1,7	
Total	234	100,0	

employment status

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Full-time student	129	55,1	55,1	55,1
Part-time student	8	3,4	3,4	58,5
Full-time employed	96	41,0	41,0	99,6
Part-time employed	1	,4	,4	100,0
Total	234	100,0	100,0	

Appendix 3: Crosstabulation employment and willingness to live without car and only rely on car sharing

employment dummy * only car sharing, no own car? Crosstabulation

		only car sharing, no own car?				Total
		certainly not	probably not	probably yes	certainly yes	
student	Count	11	36	54	28	129
	% within employment dummy	8,5%	27,9%	41,9%	21,7%	100,0%
employed	Count	17	43	23	4	87
	% within employment dummy	19,5%	49,4%	26,4%	4,6%	100,0%
Total	Count	28	79	77	32	216
	% within employment dummy	13,0%	36,6%	35,6%	14,8%	100,0%

Appendix 4: Logistic regression with the willingness to only rely on car sharing offers as dependent variable

Variables in the Equation								
	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
gender	-,076	,357	,046	1	,831	,927	,461	1,864
age	,178	,110	2,598	1	,107	1,195	,962	1,484
empl_stat_dummy	-,633	,427	2,196	1	,138	,531	,230	1,226
env_dummy	-,922	,379	5,937	1	,015	,398	,189	,835
urban_rural_dummy	-,721	,439	2,702	1	,100	,486	,206	1,149
education	,144	,176	,673	1	,412	1,155	,819	1,629
fin_sit	-,074	,281	,069	1	,793	,929	,536	1,610
pub_tr_dummy	-,053	,431	,015	1	,901	,948	,408	2,205
Constant	-4,555	2,939	2,402	1	,121	,011		

a. Variable(s) entered on step 1: gender, age, empl_stat_dummy, env_dummy, urban_rural_dummy, education, fin_sit, pub_tr_dummy.