Business models and experienced entrepreneurs

A quantitative analysis on the performance of carsharing firms

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Abstract

While the overall carsharing industry is growing rapidly and some firms have proven to be quite successful, there are other firms that are less successful or even forced to exit the market. Little is known about the business side of carsharing and which factors influence the performance of carsharing firms. This research addresses this gap by explaining the differences in carsharing firm performance. It investigates the relationship between an entrepreneur's education, managerial, entrepreneurial and industry experience, and business models on the performance of carsharing firms. Business model factors include generic carsharing business model types and a firm's distance of their business model to other firms. The effects are quantitatively tested on different firm performance measures by developing a database of the German carsharing market. First, a cluster analysis is used to group firms based on business model characteristics and validate generic carsharing business models qualitatively found in earlier studies. Then, a regression analysis is used to test the effects of the entrepreneurial characteristics and business model factors on firm performance. The cluster analysis indeed validates the generic carsharing business models (round-trip, one-way, peer-to-peer), while also revealing a new cluster: round-trip cooperative firms. The results show effects of both the entrepreneurial characteristics and business models that varies for the different firm performance measures. Education is positively related to firm performance, while entrepreneurial and industry experience are partly related to firm performance. Managerial experience seems to have no effect at all on the performance of carsharing firms. The business model factors show that one-way firms tend to perform better than round-trip firms. Notably, the results showed that a firm's larger distance to other business models increases carsharing firm performance, whereas the opposite was expected. The results imply that researchers should be careful with explaining firm performance uniformly, and take into account multiple dimensions of firm performance and the specific industry context. Moreover, the results imply that business model innovation is important for firm performance.

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Contents

1. Introduction

The sharing economy is growing rapidly: firms and consumers increasingly see sharing as a sustainable and profitable alternative to ownership (Botsman & Rogers, 2010; Lamberton & Rose, 2012). Growth in sharing practices has been accelerated by the internet and the rise of its social media systems, as this facilitates the connection between peers to match wants with needs (Matzler et al., 2014). One of these sharing practices is shared-use mobility such as carsharing, bikesharing or ridesharing. Due to high urban population growth, many experts are concerned that urban travel patterns are likely to damage the viability of cities due to air pollution and traffic congestion (Shaheen et al., 2015). Also, factors such as economic uncertainty, rising energy and private vehicle ownership costs, and efforts to reduce greenhouse gas (GHG) emissions encourage drivers to seek for alternatives for vehicle ownership (Shaheen & Cohen, 2013). One solution to reduce these personal transportation expenses and mitigate the negative environmental impacts of vehicle use is carsharing, which can be defined as short-term vehicle access among a group of members sharing a vehicle fleet (Shaheen et al., 2015).

In the early 1990s carsharing firms were active in a couple of countries in Europe and since then the service has grown considerably in Europe, North America, Asia and Australia (Bert et al., 2016; Shaheen & Cohen, 2013; Shaheen et al., 2009). The rapid growth of carsharing and the associated benefits make it a particularly interesting topic for researchers. Indeed both scholars and private sector researchers have studied aspects of this growing phenomenon. Several studies on the impact of carsharing have been conducted. Different studies show that benefits associated with carsharing are lower GHG emissions, reduced vehicle ownership and vehicle kilometres travelled (Katzev, 2003; Litman, 2000; Martin & Shaheen, 2011; Martin et al., 2010). In addition carsharing provides the social benefit that a person can use a vehicle without having to bear the full costs of vehicle ownership (Ryden & Morrin, 2005; Shaheen et al., 2009). Furthermore, researchers have analysed user behaviour (Cervero et al., 2007; Costain et al., 2012; Kopp et al., 2015; Morency et al., 2012), carsharing planning issues and simulation models (Ciari et al., 2013, Correia & Antunes, 2012; Kek et al, 2009) or the diffusion of carsharing in certain areas (Coll et al., 2014; Nobis, 2006; Truffer, 2003). Some studies have analysed the market developments and trends of the carsharing industry (Shaheen & Cohen, 2013; Shaheen et al., 2009; Shaheen et al, 1998). While the overall carsharing industry is growing rapidly and many new entrants enter the market, there is also a high churn rate among the new entrants: firms are forced to exit the market (Le Vine et al., 2014). However, the causes for the differences in performance of carsharing firms have not yet been researched. This research gap is also pointed out by Vaskelainen (2014) who states that the business side of carsharing services has received little attention.

This research focusses on explaining the differences in performance of carsharing firms. But which factors affect firm performance? Zott et al. (2011) show that business models can play a central role in explaining firm performance. Business models are a reflection of the firms realized strategy and firms can compete through their business models (Casadesus-Masanell & Ricart, 2010; Markides & Charitou, 2004). The carsharing market is not homogenous. Three distinct generic business models can be identified (Cohen & Kietzman, 2014; Vaskelainen, 2014). In the traditional model carsharing firms acquire vehicles and require users to return vehicles to the same location where it was picked up (round-trip). Firms using the freeflowing model allow users to make point-to-point trips within the area of their operations (one-way). In the peer-to-peer model, carsharing firms work as market mediator to connect individual owners of vehicles with potential drivers. While these first explorative studies provided a qualitative explanation of the different business models existing in the carsharing industry,

these studies did not investigate how the business models affect the performance of carsharing firms. This research aims to fill this research gap by empirically explaining how the business models affect carsharing firm performance. It aims to do so by researching three undiscovered aspects: first, this research uses a cluster analysis to quantitatively test if firms can be grouped together according to the three generic business models which are qualitatively identified in existing research on carsharing. Second, this research tests how the three generic business models relate to firms performance by comparing these firm clusters. Third, firms within each group are compared by looking at their (dis)similarity and how the firms' distance to other business models relates to firm performance. This distance to other business models notion is inspired by two streams of literature: configuration theory on the one hand (Miller, 1986; Zott & Amit 2002), and categorization theory on the other hand (Navis & Glynn, 2010; Zuckerman, 1999).

Apart from that, the entrepreneurs behind the carsharing firms have been less studied. These entrepreneurs can play an important role in explaining carsharing firm performance. A large stream of literature is devoted to the personality traits of entrepreneurs and how they affect firm performance (Sarasvathy and Menon, 2013). However, many personality traits and motives of entrepreneurs have produced weak or indirect relationships with firm performance (Baum et al., 2001). On the other hand, entrepreneurial experiences are relevant and have direct effects on firm performance (Gilbert et al., 2006). Knowledge and skills embedded in entrepreneurs are shaped by past work experiences and education (Shane, 2000). This experience is of value in searching for new opportunities as well as making decisions in daily firm activities (Dahl & Reichstein, 2007). Entrepreneurial founder characteristics such as prior related industry experience, start-up experience, managerial experience and education have well-established direct effects on firm performance (Baum et al. 2001; Cooper et al., 1994; Dahl & Reichstein, 2007; Soriano & Castrogiovanni, 2012). Hence, this research includes these entrepreneurial characteristics next to the business model factors.

The evidence of the factors determining firm performance has been ambiguous and empirical studies have shown contradictory findings. An explanation could be that the factors influencing firm performance have often been studied in isolation (Baum et al, 2001). This research therefore also aims to fill the research gap in literature on firm performance by looking at the combination of these two factors and their possible interplay. I combine the entrepreneurial characteristics and business models factors in this research to provide a comprehensive approach in measuring carsharing firm performance. This leads to the following research question:

What is the effect of entrepreneurial characteristics and business models on the performance of carsharing firms?

The effect of these variables is quantitatively tested by developing a database of the carsharing firms in Germany. The country Germany is chosen as it is a significant player of carsharing and has the top spot in Europe based on the number of customers (Bert et al., 2016; Loose, 2010). This research contributes to existing carsharing literature by explaining the differences in performance of carsharing firms. Both positive and negative effects of the entrepreneurial characteristics and business model factors on firm performance are found. Moreover, the research contributes to existing carsharing literature by validating the three generic business models qualitatively explained in earlier studies. From a managerial perspective, this research can be used as guideline to increase the performance of carsharing firms. Managers of carsharing firms could for example increase their firm performance by

adapting their business model, which in turn stimulates the industry and provides in the need for people that seek alternatives for vehicle ownership (Shaheen & Cohen, 2013). Moreover, investors have traditionally attached a high importance to the experiences of entrepreneurs when evaluating firm potential (Unger et al., 2011). This research can provide insights in the specific entrepreneurial experiences that increase the performance of carsharing firms. The remainder of this thesis consists of a theoretical section, methodology, results and ends with a conclusion and discussion.

2. Theory

In this section, first an introduction is given to carsharing and firm performance. Then, I delve into the literature streams of entrepreneurs and business models. I discuss mechanisms that relate entrepreneurial characteristics and business models to carsharing firm performance and formulate hypotheses.

2.1 Carsharing background

Carsharing is in this research defined as short term vehicle access among a group of members sharing a vehicle fleet (Shaheen et al., 2015). Although carsharing is still relatively small compared to the car manufacturing industry, these new ventures are becoming an industry to be reckoned with (Vaskelainen, 2014). As seen in figure 1, the amount of carsharing users grew exponentially from 0.35 million users in 2006 to 5.29 million in 2014 worldwide (Frost & Sullivan, 2015). The amount of users grew to 5.8 million users in 2015, and is estimated to climb up to 35 million in 2021 (Bert et al., 2016). The country Germany which is studied in this research has gained the top spot in Europe, with most of the growth occurring since 2011: it controls about 50% of the total European fleet and has a customer base of more than a million (Bert et al., 2016). Before 2000, carsharing players were mainly small firms and cooperatives, operating on a regional or national level. In recent years firms have grown considerably. Zipcar has for example grown to an international firm operating in USA and Europe with a turnover of hundreds of millions (Vaskelainen, 2014). Also, large firms from different industries are increasingly entering the field, such as car manufacturers and car rental firms (Vaskelainen, 2014).

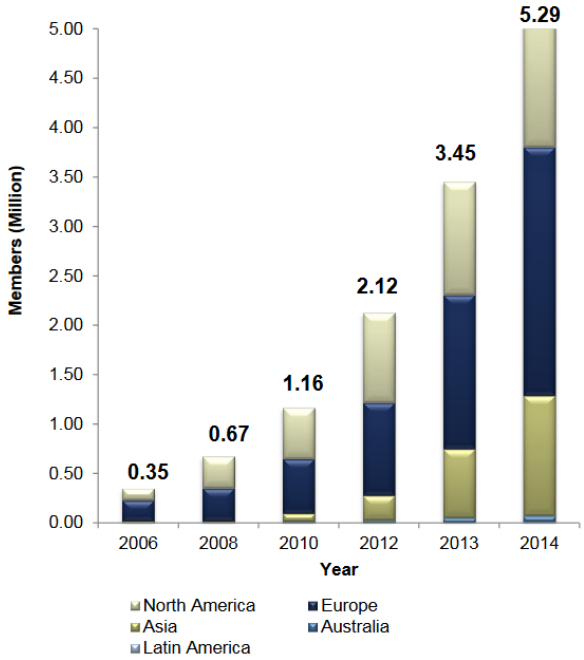

Figure 1: carsharing market, number of members 2006-2014 Source: Frost and Sullivan (2015)

Figure 2: example of a round-trip (Cambio), one-way (DriveNow) and P2P firm (Tamyca)

Three generic models are identified in the carsharing industry (Vaskelainen, 2014): the round-trip model, the one-way model and the P2P model. In the round-trip model carsharing firms acquire vehicles and require users to return the vehicle to the same location where it was picked up. The basic value proposition is based on hourly car rental with bookings that are done in advance, and the length

has to be decided during the booking. Many carsharing firms are private, but increasingly firms are being owned by larger more established transportation industry players. Car rental firms and public transit operators are especially active in this round-trip field. Cooperatives, which are not private firms but organisations in which members collectively contribute resources (Cohen & Kietzmann, 2014), are common among small firms. An example of a private round-trip firm in Germany is Cambio (see figure 2).

In the one-way model, firms allow users to make point-to-point trips within the area of their operations. Rental costs are calculated on minute instead of hourly basis, and the booking is open-ended. In this field, especially big car manufacturers are entering the market (Vaskelainen, 2014). Drive Now, a joint venture between BMW and Sixt, is an example (see figure 2).

The peer-to-peer (P2P) model is significantly different than the other two. Carsharing firms do not own any vehicles, but work as market mediator to connect individual owners of vehicles with potential drivers. This model is also characterized by round-trip usage. P2P firms are mainly private and in the start-up phase (Vaskelainen, 2014). Tamyca is an example of a P2P firm in Germany (see figure 2).

2.2 Firm performance

This research explores the determinants of the performance of these carsharing firms. Before doing this, it is important to define firm performance. There is a lack of consistency apparent in what constitutes firm performance (Daily et al., 2002). I argue to include different categories for firm performance as firm performance has a multidimensional nature and may reflect different aspects such as growth, profitability or operational effectiveness (Stam et al., 2014). Venkatraman and Ramanujam (1986) recommended researchers to distinguish between financial and nonfinancial performance categories: the financial performance indicates the achievement of economic goals of the firm, whereas nonfinancial performance captures the firm's broader operational effectiveness. To capture the multidimensional nature of firm performance, I include three firm performances measures to define carsharing firm performance, which will be elaborated upon in the method section.

A variety of determinants influencing firm performance have been studied in previous research, including individual and organizational variables. However, these variables have often been studied in isolation and the authors of more recent studies have proposed that these dimensions combined provide a more comprehensive prediction of firm performance than any of these in isolation (Baum et al., 2001). Therefore I aim to provide a comprehensive approach of measuring firm performance of carsharing firms by looking at both the entrepreneurs and business models factors. The next sections of the theory will delve deeper in these determinants of carsharing firm performance.

2.3 Entrepreneurs

I define entrepreneurship, in line with Shane & Venkatamaran (2000), as the recognition, evaluation and pursuit of entrepreneurial opportunities to create products or services. As the carsharing industry is a young and rapidly growing industry (Le Vine et al., 2014), there is a lot of entrepreneurial activity and opportunities. Therefore it is useful to study the individuals or the entrepreneurs who recognized, evaluated and exploited the opportunities in the carsharing industry. These entrepreneurs can be the founder of a new carsharing firm, or a manager/owner within an established firm that entered the carsharing industry.

A large stream of literature is devoted to the traits and characteristics of entrepreneurs and how they affect the firm performance (Sarasvathy and Menon, 2013). The belief that the firm is an extension of the entrepreneur led researchers to examine personality traits (Gilbert et al., 2006). Many personality traits and motives of entrepreneurs haven been identified, but these concepts have produced weak relationships with firm performance (Baum et al., 2001). On the other hand, entrepreneurial founder characteristics such as prior related industry experience, prior entrepreneurial or managerial experience and education have well-established direct effects on firm performance (Cooper et al., 1994; Baum et al. 2001; Dahl & Reichstein, 2007; Soriano & Castrogiovanni, 2012). Therefore this research analyses these entrepreneurial experiences instead of personality traits or motives.

It is argued that the survival and success of organisations is fundamentally shaped by the pre-entry experiences of the founders (Klepper, 2001; Klepper, 2002). This relationship has also been studied in management literature where the relationship between top managers and performance is studied (Hambrick et al., 1996; Michel and Hambrick, 1992). Both research fields draw on organizational ecology literature (Hannan & Freeman, 1977) that shows how founders of start-ups transfer routines and experiences from previous employments (Phillips, 2002). The cornerstone of the research in this field is the argument that a parent organisation's blueprints are carried over to new firms through the career experiences of their founders (Phillips, 2002).

Following these lines, Shane (2000) argues that knowledge and skills embedded in entrepreneurs are shaped by past work experiences and education. These experiences are of value in searching for new opportunities as well as making decisions in daily firm activities (Dahl & Reichstein, 2007). Education and past experiences are also important as they enable entrepreneurs where to obtain information relevant to the firm and how to use obtained resources (Gilbert et al., 2006). Entrepreneurs thus carry skills and routines which are very likely to influence future development and success (Dahl and Reichstein, 2007). The knowledge and experience of entrepreneurs is heterogeneous according to their different pasts (Argawal et al., 2004).

As Gilbert et al. (2006) argue, an entrepreneur with related experience is likely to make better decisions than entrepreneurs who lack similar experience. The knowledge and skills of an entrepreneur only lead to higher performance when it is applied and successfully transferred to the specific tasks that need to be performed (Unger et al., 2011). This process is easier when the knowledge and skills are related to the current tasks of the business owner (Unger et al., 2011). Therefore this research examines such task-related experience of the carsharing firm founder/owner: related industry experience, entrepreneurial experience and managerial experience. These related experiences, in combination with the entrepreneurs' education are thus likely to influence the performance of carsharing firms.

The following sections elaborate on how these entrepreneurial characteristics relate to firm performance and formulate hypotheses.

Hypothesis industry experience

I define industry experience as experience in the carsharing industry, or experience in related industries in terms of market or products. Related industries include other sharing industries, car rental, car leasing or car manufacturing industries and ICT. Car rental, leasing or manufacturing industries are included as these can give valuable experiences for car-related aspects such as controlling and maintaining a fleet of cars. The ICT industry is included as the carsharing industry is an e-commerce based industry which requires the development of mobile and web technologies for supporting reservations, payments and keyless entry of vehicles (Cohen & Kietzmann, 2014). ICT experiences can thus give valuable experiences for these internet based challenges a carsharing firm faces.

Experience in similar settings reduces uncertainty and the number of assumptions that an entrepreneur has to make (Chandler, 1996). The more similar prior knowledge is to newly acquired knowledge, the easier it is to absorb the new knowledge (Cohen & Levinthal, 1990). Those with expertise in a certain industry are likely to get relevant and more accurate data about their new business in the same area (Cassar, 2014). Also, industry experience can increase the awareness of industry trends such as developments in processes of production or service delivery and thereby reduce uncertainty (Delmar & Shane, 2006). Further, experience in similar settings allows entrepreneurs to better evaluate and comprehend the environment in which their new business will compete (Chandler, 1996). Concluding, related industry experience offers entrepreneurs knowledge to reduce uncertainty and better evaluate opportunities within the industry.

Furthermore, industry experience can also be important to build social capital: personal contacts from previous related work experiences can for example facilitate the establishment of valuable alliances with previous employers (Patzelt et al., 2008). Industry experienced entrepreneurs with more social capital have strategic options available and may draw superior strategic decisions compared to those without these options. Several empirical studies showed a positive relationship between related industry experience and firm performance (Politis, 2005). Hence, I hypothesize:

H1: Entrepreneur's industry experience increases carsharing firm performance

Hypothesis entrepreneurial experience

I define entrepreneurial experience as prior experience in a start-up. Previous start-up experience provides tacit knowledge that facilitates decision-making about entrepreneurial opportunities under uncertainty (Sarasvathy, 2001). Individuals with more start-up experience should see a given opportunity as more desirable than others, and are therefore more likely to exploit it (Shane, 2003). Experience from entrepreneurial activity allows the development of cognitive frameworks that improve the evaluation and selection of entrepreneurial opportunities and better judgement (Cassar, 2014).

Prior start-up experience is also considered to provide knowledge to overcome the liabilities of newness that new ventures meet (Shane & Khurana, 2003). Much of the necessary information about exploiting opportunities and coping with the liabilities of newness can only be learned by doing (Rae, 2000; Shane, 2003). This learning by doing argument is thus an important benefit of having start-up

experience. Several empirical studies showed that prior start-up experience had a significant and positive relation on firm performance (e.g. Cooper et al., 1989; Shrader & Siegel, 2007). Hence, I hypothesize:

H2: *Entrepreneur's entrepreneurial experience increases carsharing firm performance*

Hypothesis managerial experience

I define managerial experience as prior experience in a managerial position. General managerial experience provides individuals with information about relevant business aspects to recognize and act on entrepreneurial opportunities, such as finance, sales, technology, logistics, marketing and organization (Politis, 2005). Managerial experience also provides entrepreneurs training in skills needed for coping with the liability of newness, such as selling, negotiating, leading, planning, decision-making, problem solving, organizing and communicating (Shane, 2003).

Managerial experience is further associated with leadership experience and the ability to coordinate internal resources and make complex operational and strategic decisions (Ganotakis, 2012). Managerial experiences increases an individual's understanding of the market and ability to respond to its changes (Newbert et al., 2007). Several studies found positive relationships between management experience and firm performance (e.g. Haber & Reichel, 2007; Shephard et al., 2000). Hence, I hypothesize:

H3: *Entrepreneur's managerial experience increases carsharing firm performance*

Hypothesis education

I define education as the general education level of the entrepreneur which can differ according to the amount and the type of education (i.e. university degree or not). Education has long been used as a measure of future career success with the assumption that there is a direct relationship between academic achievement and vocational success (Segal, 2010). Education is related to knowledge, skills, problem-solving ability which enables the entrepreneur to cope with problems and be thereby more successful (Cooper et al., 1994). Individuals with advanced educational backgrounds develop more intellectual capability and knowledge that can help them in making strategic choices which can lead to higher firm performance (Hitt et al., 2001). Several empirical studies found a positive relationship between education and firm performance. Sapienza and Grimm (1997) found for example founders' general educational level positively related to firm performance. Similarly, Mengistae (2006) found founder's years of schooling related to small firm survival and growth. Hence, I hypothesize:

H4: Entrepreneur's education level increases carsharing firm performance

2.4 Business models

Next to the entrepreneurial characteristics, business models can play a significant role in explaining firm performance. The business model concept became prevalent with the arrival of the Internet in the mid-1990s and since then ideas around the concepts started evolving by scholars and business practitioners. They have received interest because of the fundamental change in which firms make money (Vaskelainen, 2014): in the industrial era value creation was based on manufacturing a product and selling it to the customer. But due to the destructive power of the Internet and increasing knowledge of consumers many industries need to reconsider the ways to create value (Vaskelainen, 2014). The digital economy provided firms with novel forms of value creation mechanisms, which are networked as value is created by firms with many partners, for multiple users (Zott et al., 2011). Innovative business models can create value and the choice of the business model is an important ingredient for organisational success (Patzelt et al., 2008). The carsharing industry is such an emerging industry which is e-commerce based and proposes innovative business models to provide services aimed to replace a private car. Therefore business models are well suited to describe the organisational differences and explain the success of carsharing firms.

Business models have been mainly used to explain three phenomena: e-business, innovation/technology management and strategic issues (Zott et al., 2011). While in the e-business and technology management field firm performance is not discussed extensively, the business model has received increasing attention in the strategy field from scholars and business strategists interested in explaining firms' value creation, performance, and competitive advantage. Scholars increasingly are highlighting that firms can compete through their business models (Casadesus-Masanell & Ricart, 2010). The business model can then represent a potential source of competitive advantage (Markides & Charitou, 2004). The novelty of new effective business models can result in superior value creation (Morris et al., 2005). This can replace the traditional ways of doing things to become the standard for the next generation entrepreneurs to beat (Magretta, 2002). Business models can thus play a central role in explaining firm performance (Zott et al., 2011). As Afuah and Tucci (2001) explain, business models are a unifying construct for explaining competitive advantage and firm performance, as business models are the method by which a firm builds and uses its resources to offer its customer better value and earn money.

The business model is often studied without an explicit definition of the concept (Zott et al., 2011). It is important to be explicit about how to define the business model to avoid confusion. A business model defines how the firm creates and delivers value to customers, and then converts received payments into profits (Teece, 2010). The following four elements of a business model are distinguished in this research, in line with Vaskelainen (2014):

1. *Value proposition*: what value is embedded in the service offered by the firm;
2. *Key assets*: how the supply chain is organized (e.g. fleet owner, fleet variety);
3. *Value network*: primary stakeholders other than the customer;
4. *Value capture*; the mechanisms how the carsharing firm makes money.

As explained earlier in section 2.1, three models are identified in the carsharing industry. These generic business models are based on the four proposed elements of a business model (Cohen & Kietzman, 2014; Vaskelainen, 2014): in the round-trip model carsharing firms acquire vehicles and require users to return vehicles to the same location where it was picked up. The basic value proposition is based on

hourly car rental with bookings that are done in advance. In the one-way model, firms allow users to make point-to-point trips within the area of their operations. Rental costs are calculated on minute instead of hourly basis. The peer-to-peer (P2P) business model is significantly different than the other two. Carsharing firms do not own any vehicles, but work as market mediator to connect individual owners of vehicles with potential drivers (Vaskelainen, 2014). A more detailed description of the relevant carsharing variables that each business model element consists of can be found in table 2.

Hypothesis business models distance

Configuration theory provides a useful basis to examine the impact of the business model configuration on firm performance (Zott & Amit, 2002). Configuration theory takes into account holistic configurations, also called archetypes or generic types of firms (Miller, 1986). Configurations are the constellation of different elements that commonly occur together because there interdependence makes them fall into patterns (Meyer et al., 1993; Zott & Amit, 2002). The idea of coherence is central: subcomponents are related to each other in a coherent ensemble (Greenwood & Hinings, 1993). This has been referred to as the archetype (Greenwood & Hinings, 1993). The deviation from the archetypes can then relate to firm performance (Zott & Amit, 2002). Three archetypes are identified in the carsharing industry which are the round-trip, one way and P2P model.

These three carsharing archetypes can also be seen as market categories. A market category is defined as a meaningful conceptual system that is shared among producer organisations and interested audiences (Rosa et al., 1999). A market category exists when two or more products or services are perceived to be of the same type in satisfying market demand. The organisations producing these products or services are grouped together as members of the same market category (Navis & Glynn, 2010). The identity of a market category is collectively shared among its members and encodes a prototype of salient features of its members by which audiences assess legitimacy (Zuckerman, 1999; Navis & Glynn, 2010). The features of a prototype are weighted in terms of salience to their category and the frequency with they occur in the members of the category. These mechanisms create typicality effects: firms that have only a few typical features will be recognized as less typical (Durand & Paolella, 2013). Audiences respond better to purer category members: for example, when firms differentiate their activities too much, their products/services lack clarity and attractiveness and are reviewed less often and positively by market analysist than more focused firms (Durand & Paolella, 2013). When an organisational member is perceived as isomorphic to the prototype, it is judged as more attractive and legitimate (Zuckerman, 1999). The achievement of legitimacy can enable firms to acquire resources and create wealth (Rosa et al., 1999). In addition, this achievement of legitimacy can be especially important for new ventures operating in new market categories (Navis & Glynn, 2010), which is the case in the carsharing industry. These new ventures namely often lack clear or coherent identities and are deficient in resources (Navis & Glynn, 2010). The current market categories in the carsharing market can thus be identified as the round-trip, one-way and P2P model. Based on both the notion of archetypes and market categories, I expect firms which have a more similar business model to each other within the same archetype/market category to perform better compared to firms that have a more distant business model. These firms with a smaller distance share more features and thus gain more legitimacy compared to firms with a more distant business model, and are therefore expected to have a higher carsharing firm performance. This leads to the following hypothesis:

H5: The closer the business model to other firms within the same market category, the better the carsharing firm performance

Hypothesis generic business models

From the three generic business models identified, the round-trip model is the oldest and most established business model. Customers must return the car to the same place as it was accessed and pay for the entire time between accessing the car and returning at the end of the reservation (Le Vine et al., 2014). The value proposition of the one-way business model can be considered as superior because there are no monthly fees, customers only need to pay for the time that the car is actually used and one way trips are possible (Vaskelainen, 2014). As one-way trips are possible, the one-way business model is better suited to personal needs and allows more trips to be captured (Jorge & Correia, 2013). This is underlined by Firnkorn & Müller (2011), who show that the market penetration of the German one-way firm Car2go is 25 times higher than the market penetration of round-trip firms in Germany. Another empirical study by Le Vine et al. (2014b) shows that the potential market of Greater London is 430,000 subscribers for the round-trip model, and for the one-way model several times larger at around 1,570,000 subscribers. While the round-trip model and the one-way model are reaching maturity, the P2P does not seem to have reached its maturity and it is not clear if the model works for short term rentals at all (Vaskelainen, 2014). As the one-way business model seems to have a larger market potential than the round-trip model and the effects of the younger P2P model are unclear, I hypothesize:

H6: Firms with a one-way business model have a higher carsharing firm performance than firms with a round-trip business model

Hypothesis business models and related industry experience

As defined before, related industry experience include experience in other sharing industries, car rental, car leasing or car manufacturing industries and ICT. These type of experience could also have different effects on firm performance, depending on the business model. The P2P model deviates significantly from the other two business models as the carsharing firm does not own any vehicles at all (Vaskelainen, 2014). For this business model, experience in car rental, car leasing or car manufacturing industries could be of less influence than for the other two models. In the round-trip and one-way business model, the carsharing firms namely own and control a fleet of vehicles. Hence I hypothesize:

H7: The relationship between carsharing firm performance and car industry related experience is more positive for the round-trip and one-way business model than for the P2P business model

3. Method

3.1 Data & sample

The hypotheses formulated in the theory section are tested using a quantitative cross-sectional approach (Bryman, 2008). The dependent variable of this research is carsharing firm performance, the unit of analysis is the carsharing firm. As sample a database of carsharing firms in Germany is developed. A single industry is studied as universal organizational patterns and processes will be most apparent in single industry studies (Baum et al., 2001). The country Germany is chosen as this is a significant player of carsharing and has the top spot in Europe based on number of customers (Loose, 2010). German carsharing firms control a carsharing fleet which is about 50% of the total European fleet, and the customer base has grown from a handful of adopters in 2001 to more than a million (Bert et al., 2016). To obtain the data needed for the database a list of current carsharing firms in Germany is obtained by contacting the Bundesverband Carsharing (bcs). In addition, an internet search using carsharing related key words is used to identify firms not included in the database from the bcs, as for example P2P firms are not mentioned in this list. The sample only includes firms that have a company website as this is the main source for obtaining the data about business models. Also, firms with websites containing insufficient information about the business model variables are excluded. This results in a list of 87 firms (see appendix A). Data on firm performance is collected via company websites and Google statistics. To obtain the data about the entrepreneurs, company websites are used, as well as a web search by looking at work-related profiles such as LinkedIn or Xing (German equivalent) profiles of the entrepreneurs. Data on the control variables firm age and GDP growth in founding year, which are explained in detail in section 3.2, is also collected. Data on the year of entry is collected via company websites or news articles, while the German GDP growth rates are collected from the Federal Statistical Office. In the case of missing information, additional internet searches are used and after this e-mails have been send to firms to obtain this missing information. Table 1 summarizes the data collection. The data is collected in the period February-June 2016. To ensure stable measurement of the indicators, the data collection was repeated at different times in this period for a sample of firms. No differences were found, leading to consistent and stable indicators.

In addition, an expert interview with Gunnar Nerhke from the Bundesverband Carsharing is held to gain additional insights in the underlying mechanisms of the factors influencing carsharing firm performance in the German market. A short report of this interview can be found in appendix F. These insights are used when relevant to interpret the quantitative results and give possible indicative explanations for the empirical results seen in this study.

Table 1: Overview data collection

Data	Sources
Firm performance variables	Company websites, Google statistics, e-mail
Business model variables	Company websites
Entrepreneurial characteristics	LinkedIn, Xing, company websites, e-mail
Year of entry	Company websites, news articles, e-mail
German GDP growth rates	Federal Statistical office Germany

3.2 Operationalization

This section provides the operationalization of all dependent and independent variables used in this research. Table 2 shows a summary of the operationalization.

Firm performance

Firm performance has a multidimensional nature and may reflect different aspects such as growth, profitability or operational effectiveness (Stam et al., 2014). Firm performance measures might be insignificantly correlated or negatively correlated to each other. It is quite possible that a given independent variable is positively related to one performance measure and negatively related to another. Therefore, researchers should include multiple performance measures and be explicit about the type of performance included (Murphy et al., 1996). Because of its multidimensional nature this research measures firm performance in three ways. Venkatraman and Ramanujam (1986) argue that the financial performance indicates the achievement of economic goals of the firm, whereas nonfinancial performance captures the firm's broader operational effectiveness. In line with this, number of cars shared will be used as indicator to capture the operational effectiveness. In new emerging industries with many small firms it is difficult to acquire data on financial performance such as profit or sales. Therefore an alternative measure is used to still capture the multidimensional nature of firm performance: Google results. Choi & Varian (2012) show that search data of Google can forecast near-term values of economic indicators such as sales. The amount of Google results for a given firm is found by searching for the following term: '' [firm name]'' + carsharing. The brackets and the additional term of carsharing is used to exclude results that are not related to the firm at all. Furthermore, the results are set on a limited time period (last year) to capture only the recent results and thus the recent performance of a firm.

In Germany the carsharing market is very heterogeneous and decentralized with a large group of small independent providers (Loose, 2010). These small firms can also be cooperatives (co-op), in which members collectively contribute resources and manage the firm without the expectation of financial gain (Cohen & Kietzmann, 2014). These firms do not necessarily aim to make profit and grow, and they might not seek to maximize their firm performance in terms of number of cars or Google results. Therefore, a third performance indicator is included to capture a different aspect of firm performance: Google results (time period: all)/ number of cars. By measuring the Google results per car, this indicator aims to account for the fact that these small cooperatives have a different goal than the for-profit carsharing firms in the industry. While the first two firm performance indicators measure firm performance and are used to test the hypotheses, this third performance indicator is designed to give indicative results and additional insights on the small cooperatives and how these perform in this relative measure that accounts for the fact that these firms have a different goal than for-profit firms.

Entrepreneurial characteristics

The characteristics of the entrepreneur will be measured by four dimensions: industry experience, entrepreneurial experience, managerial experience and education. Industry experience is measured as a binary variable and is counted 1 when the entrepreneur has experience in the carsharing industry or experience in related industries (including other sharing industries, car rental, car leasing or car manufacturing industries and ICT) and 0 if there is not any (related) industry experience. Entrepreneurial experience is a binary variable that is counted as 1 when the entrepreneur has prior start-up experience and 0 when the entrepreneur has no prior start-up experience. Managerial experience is a binary variable that is counted as 1 when the entrepreneur has prior managerial experience and 0 when the entrepreneur has no prior managerial experience. Education is measured as a categorical variable in line with Dahl & Reichstein (2007), namely three levels of education: high level education is equal to a 5-year university education or higher. This includes thus all masters and doctoral programs. Medium level is education equivalent to all university bachelor level programs or

similar level. Low level is short education, equivalent to a high school degree, tradesman/craftsman or similar education up to 3 years' duration after primary school level.

Business models

Each business model of a firm will be measured along the four dimensions mentioned in the theory, based on Vaskelainen (2014). The attributes for each dimension and the calculation of the scores are presented in table 2.

These business model variables provide the basis for a cluster analysis. A cluster analysis is widely used in business policy and strategy literature to group firms into homogenous categories based on a similarity measure between profiles of variable scores (characteristics) (Arthur, 1992; Hollenstein, 2003). The cluster analysis can show if the archetypes qualitatively discussed in theory (P2P, round-trip and one-way) also exist when doing a cluster analysis. Furthermore, it could reveal possible new insights of the archetypes and shows which firms can be grouped together having a similar business model. The method of the cluster analysis is discussed in detail in chapter 3.3. Data analysis. When the firms are grouped in certain clusters, the distance to other business models can be calculated.

To determine this distance of the business model to those of other firms, a distance measure is used. In the case of discrete variables the Hamming distance between a pair of business models can be used. This distance measure is the number of discrete characteristics in which two business models differ, and is analogous to the number of genes in which two organisms differ (Frenken et al., 2002). A Hamming distance matrix is computed for all of the firms' business models and an example of the Hamming distance calculation be found in appendix B. Then, the distance of a certain business model to the others in the same cluster is operationalized by adding up the distances to each firm in the particular cluster and dividing it by the amount of firms in this cluster – 1. In this way firms that are closer to other firms in the cluster have a lower distance score than firms that deviate more from the other business models in a cluster. In order to compare the clusters adequately and control for the effect that distances can be larger on average in a certain cluster, normalized distances are used. This means that each distance is divided by the average distance of the particular cluster. This results in the following equation for firm x of cluster y:

$$Distance\ firm\ x\ (cluster\ y) = \frac{\frac{(distance\ x,n1 + distance\ x,n2 + \cdots + distance\ x,nz)}{(z-1)}}{a}$$

Distance x,n1= Hamming distance from firm x to firm n1
z= amount of firms in cluster y
a= average distance cluster y

Control variables

The first control variable founding year includes the growth rate of the German economy in this year to adjust for general economic business cycles in the founding year (Dahl & Reichstein, 2007). The second control variable firm age is included as it is widely used in studies dealing with influences on firm performance (Murphy et al., 1996; Song et al., 2008). It controls for the age of the firm because older firms have on average higher sales and generate higher levels of business volumes than younger firms (Chandler & Hanks, 1994).

Table 2: Operationalization table

Concepts	Indicator	Calculation of scores	Measurement
Dependent variables			
Firm performance (1)	Cars shared	Amount of cars shared	Continuous
Firm performance (2)	Google results	Amount of Google results (last year)	Continuous
Firm performance (3)	Google results/ cars shared	Amount of Google results/ amount of cars shared	Continuous
Independent variables			
Industry experience	Prior (related) industry experience	1: (Related) industry experience 0: Experience is lacking	Binary
Entrepreneurial experience	Prior start-up experience	1: Start-up experience 0: Experience is lacking	Binary
Managerial experience	Prior managerial experience	1: Managerial experience 0: Experience is lacking	Binary
Education	Type of education	1: Low education 2: Medium education 3: High education	Categorical
Business model			
Value proposition	Trip type	1: Round-trip 2: One-way 3: Hybrid	Categorical
	Customer segments	1: Private 2: Private+ Business	Categorical
	Booking mechanism	1: In advance 2: Spontaneous 3: Both	Categorical
	Rental period	1: Minimal one minute 2: Minimal one hour 3: Minimal 12 hours	Categorical
	Span of membership	1: One city/ small region 2: More cities 3: Global	Categorical
Key assets	Fleet owner	1: Carsharing firm 2: Individuals	Categorical
	Fleet variety	1: One size fits all 2: Model based 3: Size based 4: Only insurance constraints	Categorical
	Electric cars	1: Electric cars in fleet 0: No electric cars in fleet	Binary
Value Network	Partners	Public transit operator (1:yes 0: no) Other carsharing firm Rental company Building association Airport/airline Municipality University	Binary Binary Binary Binary Binary Binary Binary
	Firm owner	1: Carsharing start-up 2: Co-op owner 3: Car rental firm 4: Car manufacturer 5: Public transit operator 6: Car dealer	Categorical
Value Capture	Pricing	Registration fee (1:yes 0: no) Annual/monthly fee Minute fee Hourly fee Daily fee Kilometer fee Gas included	Binary Binary Binary Binary Binary Binary Binary
Distance to other business models	Distance firm to other business models in the same cluster	Normalized Hamming distance score	Continuous
Control variables			
Founding year	GDP growth in founding year	GDP growth rate (in %)	Continuous
Firm age	Age of the firm	Age (in years)	Continuous

3.3 Data analysis

First, the method of the cluster analysis is described, followed by the regression analysis.

Cluster analysis

As earlier explained, the business model variables provide the basis for a cluster analysis to group firms into homogenous categories. A hierarchical cluster analysis (using SPSS) is used in this research which can identify these relatively homogenous groups based on selected characteristics (IBM, 2016), which are in this case the business model variables described above. Another basic decision of the cluster analysis is the selection for a grouping procedure (Arthur, 1992). A common grouping procedure is the Ward's method. This method is less suitable because it is prone to outliers and creates small clusters, while the aim in this research is to create larger clusters and include outliers in the formation of groups of firms. In this research the between-group linkage is used wherein the distance between clusters is the average distance between all pairs of the two clusters' members (Sarstedt & Mooi, 2014). This is used as this works with both dense and long chains of clusters (Statistics Solutions, 2016). Finally a distance measure has to be chosen. In SPSS distance measures are available for interval, counts (categorical) and binary data. As all the business model variables are nominal (either categorical or binary) data, the chi-squared measure is selected.

One result of the hierarchical clustering procedure is a dendogram (or upside-down tree diagram), which shows the order in which observations are combined and the increase in fusion coefficient with each combination (Arthur, 1992). To determine how many clusters exist in the dataset, a jump in fusion coefficient associated with a combination of clusters can be used by cutting the tree at this point. As this is only a general rule and there is no clear objective basis for determining the basis, researchers must also rely partly in informed judgements. The aim is to pick a cluster solution that enlightens, is in correspondence with what would be expected theoretically, but also gains new insights (Arthur, 1992). Therefore the number of clusters in this research is determined by a combination of identifying a jump in the fusion coefficient and an informed judgement based on theory.

Regression analysis

Multiple regression is commonly used to analyse the relation between a continuous dependent variable and more than two independent variables. As this is the case for the dependent variable Google results/number of cars, an Ordinary Least Squares (OLS) regression is used to analyse the relationship between this performance indicator and the independent variables.

However, when the dependent variable is a count variable, standard ordinary least squares regressions may pose problems and produce biased results (Coxe et al., 2009). Count data refer to observations that only have nonnegative integer values from zero to a greater value, such as units or events (Hilbe, 2014). In this case count model distribution functions are more appropriate.

These count model distribution functions adhere to the basic structure of a linear regression, but have two major modifications. First, instead of a linear relationship between the predicted values and the observed outcomes, the linear relationship is between the natural log of the predicted values and the observed outcomes. Second, a normal linear regression assumes a conditional normal error structure while the count models allow for a variety of other error structures (Coxe et al., 2009; Hilbe, 2014).

Two common types of count models are the Poisson and the Negative Binomial model. The Poisson distribution has a single parameter to be estimated and its unique feature is that the mean and

variance are the same. When modelling real data, this equidispersion is rarely satisfied and therefore analysts need to account for overdispersion in the data. The Negative Binomial regression model has an extra parameter to deal with the overdispersion (Hilbe, 2014).

As two dependent variables in this research, number of cars and Google results, are both counts which only have nonnegative integer values, a count model is used to analyse the relation between these two carsharing firm performance measures and the independent variables. Seven models are estimated for both firm performance measures. The first model includes only the control variables. The second model adds the business model variables, while the third until the sixth model add the entrepreneurial characteristics one by one. Model 7 tests the interaction effect of hypothesis 7 between car industry related experience and the three generic business models. In addition, model 8 tests the third firm performance measure Google results/number of cars. Pearson correlations and VIF values are checked to assess whether multicollinearity assumptions are not violated. Model fit is evaluated by assessing the difference between the predicted values of the model and the observed values, and the presence of non-random patterns in the plotted standardized deviance residuals (Hilbe, 2014). In addition, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are used to compare the model fit of the different models. When a regression model has substantially lower AIC and BIC scores than other models, it can be regarded as a better fitted model (Hilbe, 2014).

4. Results

4.1. Cluster analysis

This section presents the results of the cluster analysis. Two cluster solutions are proposed which are relevant and used in the following regression analysis. Figure 3 shows the dendogram as a result of the cluster analysis that shows the order in which observations are combined.

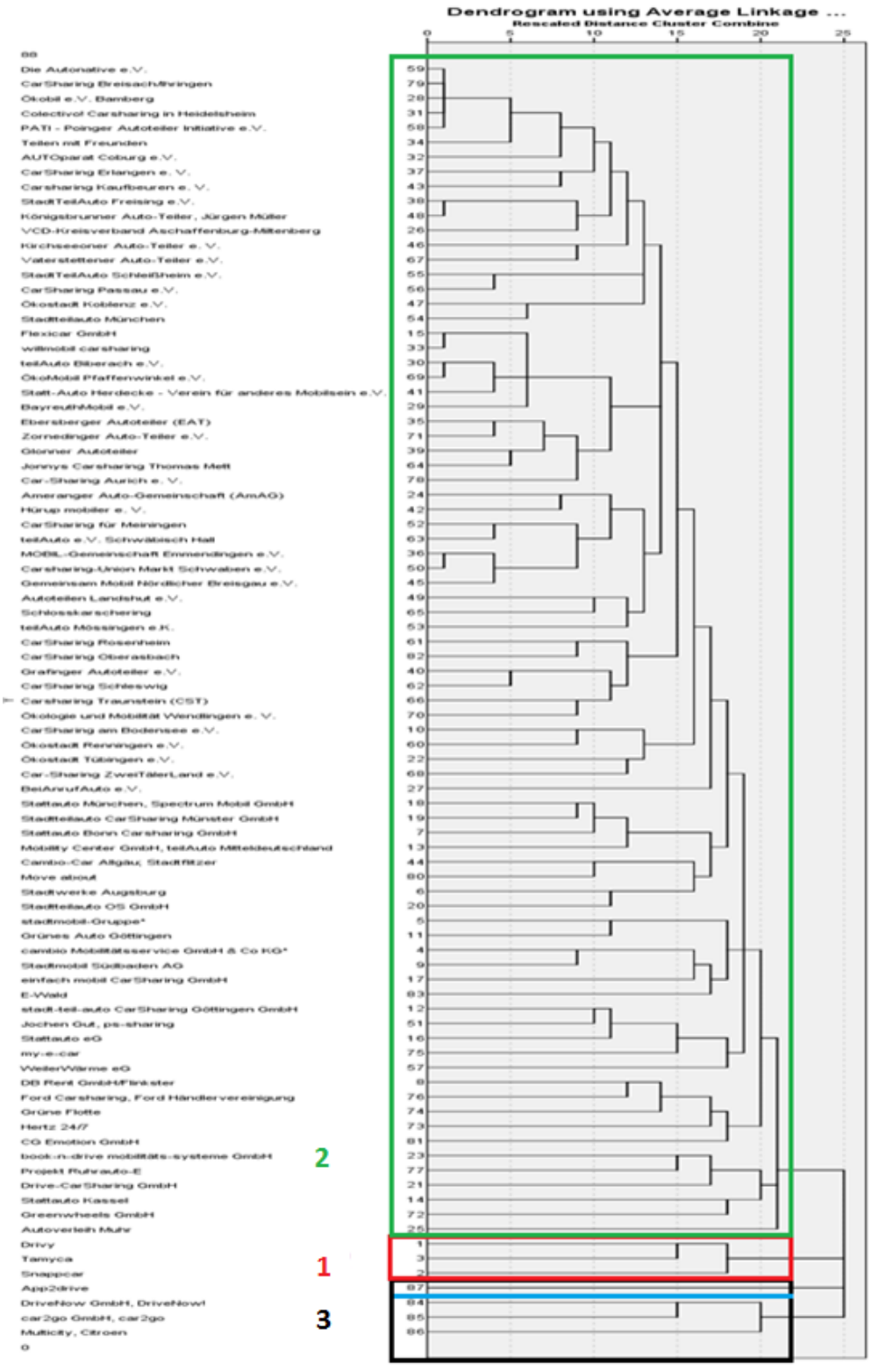

Figure 3: Dendogram cluster analysis

Results cluster analysis: cluster solution 1

A hierarchical cluster analysis with the business model characteristics of each firm is computed to see if certain firms can be grouped together having a similar business model. Highly correlated variables should not be included in the analysis (> 0,9) (Sarsstedt & Mooi, 2014). When assessing the correlation matrix (see appendix C), the variable 'gas included' was highly correlated with fleet owner (0,861). In addition, the expert interview (see appendix F) confirmed the importance of all individual variables, except for the variable 'gas included' which was not deemed as important. Therefore, the variable 'gas included' was excluded from the cluster analysis.

The dendogram above (figure 3) shows the order in which observations are combined and the increase in the fusion coefficient associated with each combination. A general rule to determine the number of clusters is to look for a jump in the fusion coefficient and cut the tree at this point (Arthur, 1992). When following this, three large clusters can be identified, and also a cluster with a single firm (APP2drive).

If we take a closer look at these clusters and the characteristics of the firms in it, these three large clusters can be categorized as follows (see dendogram and appendix A):[1]

1: P2P cluster (N=3)
2: Round-trip cluster (N=80)
3: One-way cluster (N=3)

These findings correspond with the three generic business models qualitatively identified by Cohen & Kietzman (2014) and Vaskelainen (2014). When assessing the individual data of each firm, all firms are indeed grouped together in correspondence with these three generic business models. When combining all dimensions and 22 individual variables of a business model, the cluster analysis therefore quantitatively validates the initial ideas of literature on carsharing business models.

The firm APP2drive does not fit in a cluster with other firms but is considered separate cluster according the cluster analysis. APP2drive is closest to the one-way cluster. The reason that this firm is considered as a separate cluster could be because APP2drive has a station-based one-way business model, while the other firms in the one-way cluster have a free-floating one-way business model. In both business models one way trips are possible. The difference is that in the free-floating business model users can park the car at any place within a specified geographic zone, while with APP2drive users need to return the car at one of their stations. Another difference is the possibility to book in advance, while in the free-floating one-way business model it is only possible to book spontaneously. As one of the aims of this research is to compare whether firms which have a more similar business model to other firms perform better or not, it is important to include all firms in the analysis. Firms which are more distant to others are of particular interest to include, enabling an accurate and comprehensive comparison. As APP2drive has a one-way business model which is most close to the one-way cluster, the firm is included in this cluster. The inclusion of all firms, including more distant firms, is especially useful for testing H6 and the notion of legitimacy: As APP2drive only has a few typical features it will be recognized as less typical for the one-way category, and on basis of theory

[1] The blue line in the dendogram indicates the separate firm APP2Drive which is a single cluster according the cluster analysis. App2drive is manually included in the one-way cluster (cluster 3) by the researcher and this is justified by the reasons stated in the section 'results cluster analysis: cluster solution 1'.

thus expected to gain less legitimacy (Durand & Paolella, 2013; Zuckerman, 1999). The inclusion of APP2drive in the one-way cluster results in the following cluster solution:

Table 3: three cluster solution

Cluster number (N= number of firms)	
Cluster 1 (N=3)	P2P
Cluster 2 (N=80)	Round-trip
Cluster 3 (N=4)	One-way

Results cluster analysis: cluster solution 2

As there is no clear objective basis for determining the correct number of clusters, researchers must rely partly on informed judgements. It is argued that the aim is to pick a cluster solution that enlightens, is in correspondence with what would be expected theoretically, but also gains new insights and reveals relations not taken for granted (Arthur, 1992). When taking a closer look at the round-trip cluster, an apparent difference is visible in this group based on the owner differences. Cooperatives (co-op) had often similar characteristics: these are often small firms with a low amount of cars, operating in one particular region and with less options possible (e.g. renting an EV car). On the other hand firms with another type of firm owner were often more driven towards growth, operating in more regions and with higher amounts of cars. A summary of this can be found in the next table, which shows the descriptive statistics of the mentioned variables per group.

Table 4: descriptive statistics of selected business model variables per cluster

Cluster	Variables	N	Minimum	Maximum	Mean
P2P	Number of cars	3	17	10000	5005.67
	Span of membership	3	2	3	2.67
	EV in fleet	3	1	1	1.00
	Owner	3	1	1	1.00
Round-trip: other owner	Number of cars	35	2	4000	328.09
	Span of membership	35	1	3	1.49
	EV in fleet	35	0	1	.46
	Owner	35	1	6	1.66
Round-trip: co-op owner	Number of cars	45	1	134	12.29
	Span of membership	45	1	1	1.00
	EV in fleet	45	0	1	.20
	Owner	45	2	2	2.00
One-way	Number of cars	4	192	3750	1710.50
	Span of membership	4	1	3	2.25
	EV in fleet	4	0	1	.75
	Owner	4	3	4	3.75

Legend:
Span of membership: 1= one city/small region, 2= more cities, 3= global
EVs in fleet: 1= Electric cars in fleet, 0= no electric cars in fleet
Owner: 1= carsharing start-up 1, 2= co-op owner, 3= car rental firm, 4= car manufacturer, 5 =public transit operator, 6= car dealer

This distinct difference between firms in the round-trip cluster is also visible in the dendogram where most of the co-op firms (In Germany often recognizable due to the abbreviation e.V. behind the firm name[2]) are clustered together (from firm number 59-27). Two round-trip clusters can thus be distinguished, based on the owner differences. Therefore an additional cluster solution is proposed. In this cluster solution, the clusters have each unique characteristics and are consistent with the generic business models described in literature, but also reveal new relations with the additional round-trip co-op cluster. This results in the following cluster solution (see appendix A for list of firms and their corresponding cluster number):

Table 5: four cluster solution

Cluster number (N= number of firms)	
Cluster 1 (N=3)	P2P
Cluster 2 (N=35)	Round-trip: other owner
Cluster 3 (N=45)	Round-trip: co-op owner
Cluster 4 (N=4)	One-way

Both proposed cluster solutions have each its advantages. The first three cluster solution confirms the theory section in this research. This enables adequate answering of hypotheses that are based on these three generic business models. The second cluster solution can reveal interesting new insights regarding the specific characteristics of the German carsharing market. In Germany the carsharing market is very heterogeneous and decentralized with a large group of small independent providers (Loose, 2010). This cluster solution can give more insight in how these small firms perform, by adding the fourth cluster with the small round-trip co-op firms. Therefore both cluster solutions will be taken into account in the regression analyses in the next section.

[2] The abbreviation e.V. stands for Eingetragener Verein, which is a legal status for a registered association.

4.2 Regression analysis

First, a descriptive overview of the German carsharing market is provided. Then, the data is used to construct models that explain the relationship between the different firm performance indicators and the independent variables. The three cluster models with the firm performance indicators Google results and number of cars are presented to answer the hypotheses. The four cluster solutions and the third firm performance indicator Google results/number of cars follow to provide additional insights in the German carsharing market and how the round-trip co-op firms relate to firm performance.

Descriptive statistics

Figure 4 shows the distribution of cases over the Google results and number of cars. As can be seen, the frequency of observations decreases when the Google results and number of cars increases. The data does not follow a normal distribution but shows a distribution that is commonly seen for count data (Hilbe, 2014). Table 6 presents the N, minimum, maximum and the mean of the variables used in the regression analyses, as well as sorted per cluster. From the 87 identified firms, two firms have an unknown firm age. This results in 85 firms analysed in the control models and models including business model variables. However, due to the unavailability of data regarding the entrepreneurial variables only 59 cases have data for all variables. Due to this limited sample size, the entrepreneurial variables are tested in separate models one by one instead of a model including all variables at once.

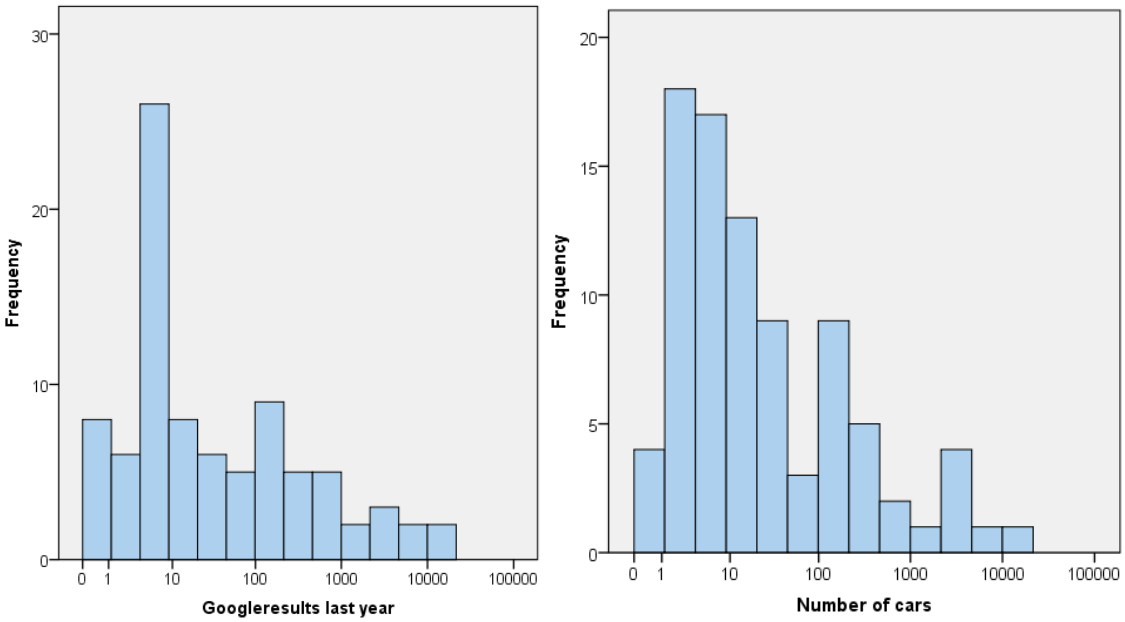

Figure 4: Distribution of Google results (left) and Number of cars (right)

From the descriptive statistics, a difference can be noted between the number of cars when comparing each cluster. P2P firms have the highest number of shared cars on average. However, it is important to note that these firms do not own the cars, in contrast to the other clusters. From the other clusters, one-way firms have the most cars on average, followed by the 'other owner' round-trip firms. The cooperative round-trip firms have the lowest number of cars on average. A reason for this could be that these firms only operate in one city or small region and do not have the aim to grow as these firms have a co-op ownership structure. When looking at the google results, one-way firms are the most popular on average, while the P2P firms are on the second place. The co-op round trip firms have also in this indicator the lowest average. The descriptive statistics of the Google results/ number of cars shows that in this indicator, co-op firms have the highest maximum and the second highest average,

while one-way firms have the lowest average. Furthermore, it is noticeable that P2P firms and one-way firms are relatively young on average, indicating that these are relatively new business models. The cooperative round trip firms are the oldest, followed the round-trip firms with another owner.

Table 6: Descriptive statistics

	Variables	N	Minimum	Maximum	Mean
Total	Number of cars	87	1	10000	389.60
	Google results	87	0	21400	790.95
	Google results/ number of cars	87	1	812	76.5468
	Firm age	85	1	25	12.85
	GDP growth in founding year	85	-.056	.041	.01245
	Distance to other business models (3 cluster solution)	87	.471	1.701	0.99721
	Distance to other business models (4 cluster solution)	87	.265	1.661	1.01153
	Industry experience	66	0	1	.50
	Entrepreneurial experience	63	0	1	.32
	Managerial experience	63	0	1	.67
	Education experience	62	1	3	2.60
P2P	Number of cars	3	17	10000	5005.67
	Google results	3	817	1790	1342.33
	Google results/ number of cars	3	2.12	437.65	149.1390
	Firm age	3	5	6	5.67
	GDP growth in founding year	3	.037	.041	.03967
	Distance to other business models	3	.938	1.031	1.00000
	Industry experience	3	0	1	.67
	Entrepreneurial experience	3	0	1	.33
	Managerial experience	3	0	1	.67
	Education experience	3	3	3	3.00
Round-trip: other owner	Number of cars	35	2	4000	328.09
	Google results	35	1	7060	701.06
	Google results/ number of cars	35	4.59	202.50	41.5652
	Firm age	34	1	25	12.00
	GDP growth in founding year	34	-.056	.041	.01268
	Distance to other business models	35	.733	1.661	1.03978
	Industry experience	24	0	1	.67
	Entrepreneurial experience	22	0	1	.41
	Managerial experience	22	0	1	.59
	Education experience	21	1	3	2.43
Round-trip: co-op owner	Number of cars	45	1	134	12.29
	Google results	45	0	163	25.38
	Google results/ number of cars	45	1	812.00	102.5549
	Firm age	44	2	25	14.70
	GDP growth in founding year	44	-.056	.041	.00925
	Distance to other business models	45	.265	1.567	.99135
	Industry experience	35	0	1	.31
	Entrepreneurial experience	34	0	1	.26
	Managerial experience	34	0	1	.68
	Education experience	35	1	3	2.63
One-way	Number of cars	4	192	3750	1710.50
	Google results last year	4	437	21400	9776.75
	Google results/ number of cars	4	12.23	53.46	35.6008
	Firm age	4	2	8	5.00
	GDP growth in founding year	4	.011	.037	.02525
	Distance to other business models	4	.820	1.279	1.00000
	Industry experience	4	1	1	1.00
	Entrepreneurial experience	4	0	1	.25
	Managerial experience	4	1	1	1.00
	Education experience	3	3	3	3.00

Correlations and multicollinearity

The correlation with the dependent variables Google results, number of cars and Google results/number of cars was assessed for each independent variable to give a first indication of potential effects (see the correlation matrix in Appendix D). To account for the nature of count data when assessing the correlations, the natural log of the dependent variables Google results and number of cars was taken.

Significant Pearson correlations are seen between the dependent variable number of cars (log) and the independent variables 'GDP growth in founding year', 'Distance to other business models (3 cluster solution)', 'P2P', 'Round-trip (all)', 'Round-trip (other)', 'Round-trip (co-op)' and 'Industry experience'.[3] Although this can be only seen as a first indicative result, most significant correlations and its directions are in line with what is expected based on theory except for one. The 'Distance to other business models' variable is positively correlated which would suggest that when a firm has a larger distance to the other business models in the cluster, it would share more cars. This is contradictory to the theory which suggest that firms which are closer to other business models would perform better.

Significant correlations are also seen between the dependent variable Google results (log) and the independent variables 'P2P', 'Round-trip (all)', 'Round-trip (co-op)', 'Distance to other business models (3 cluster solution)' and 'Industry experience'. Also in this case, most correlations are in line with theory, except for the 'Distance to other business models' variable.

When assessing the dependent variable Google results/ number of cars, significant correlations are seen with the independent variables 'Firm age', 'Round-trip (other)' and 'Round-trip (co-op)'. In this case, the correlations have the opposite direction compared to the other two firm performance measures. A noticeable correlation is that the round-trip co-op firms are positively related to this performance measure, while negatively related to the other two firm performance measures.

The collinearity statistics were evaluated to control for multicollinearity between independent variables. If the variance inflation factor (VIF) is above 5, this can indicate potential multicollinearity problems (Rogerson, 2001). Industry experience has the highest VIF value (VIF=1.780), which is below the threshold of 5 and therefore no signs of multicollinearity between the independent variables exists.

Model fit

As explained earlier in the method section, the dependent variables Google results and number of cars are count data and therefore a count model is used for these firm performance measures.

Two common types of count model distributions are the "Poisson" and the "Negative Binomial" probability distribution functions. For a Poisson distribution the variance has the same value as the mean (Hilbe, 2014). However, the variance is not equal to the mean for both the dependent variables: the data is overdispersed. Therefore the Negative Binomial model is used to deal with this overdispersion. Based on the model configurations with the highest N and the highest number of variables possible (model 2), the model fit is assessed for both firm performance measures. The difference between the predicted values of the model and the observed values, and the presence of

[3] The P2P, Round-trip (all), Round-trip (other) and Round-trip (co-op) clusters are dummy variables with the One-way cluster as reference category to show the correlations of each group separately. The round-trip (all) group represents the three cluster solution, while the Round-trip (other) and Round-trip (co-op) groups represent the four cluster solution.

non-random patterns in the plotted standardized deviance residuals can be used to evaluate the model fit (Hilbe, 2014). In Appendix E plots of the observed values versus the predicted value of the models and plots of the standardized deviance residuals versus the observed values can be found. When looking at the standardized deviance residuals with Google results as dependent variable, four observations have standardized deviance residual of more than three and these outliers could have effect on the model fit. These are Cambio, Autoverleih Muhr, CG Emotion and APP2drive. The Cook's distance, which is a measure for the influence of a single observation on the overall model (McDonald, 2002), is therefore assessed. For datasets with more than 3 predictors, points can be considered as influential when > 0.85. The highest Cook distance is 0.447 (Cambio), which is below 0.85 and this means even the farthest outlier has no strong effect on the model. Therefore the outliers do not have to be excluded. When doing the same exercise for the number of cars as dependent variable, two cases have a standardized deviance residual of more than three. These are Snappcar and Stadtmobil Südbaden. The highest Cook-distance is 0.206 (Stadtmobil Südbaden), which is below the threshold of 0.85. Based on these observations, no data points have to be excluded. In both cases the majority of observations lie close to the fit line of predicted values, which indicates the model is able to predict the observations sufficiently.

To compare the model fit of different negative binomial regression models, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) are used. When a negative binomial regression model has substantially lower AIC and BIC scores than other models (compared on the same number of cases), it can be regarded as a better fitted model (Hilbe, 2014). Tables 7-11 show that the models with the number of cars as dependent variable have a slightly better model fit than models with Google results as dependent variable. However, both models are used in the analysis to test the hypotheses as both variables capture different aspects of firm performance. Furthermore, the models with the four cluster solution show slightly lower AIC and BIC scores than the three cluster solution models but the difference is not substantial. The three cluster solution models are used to test the hypotheses, while the four cluster models give insight in how round-trip cooperatives perform.

When assessing the model fit of the models with Google results/ number of cars as dependent variable, the model with the four cluster solution slightly adds to the explanatory power of the model compared to the three cluster model. The three cluster model has an adjusted R^2 of 0.105, while the four cluster model has an adjusted R^2 of 0.161 (see table 12).

Model results

Table 7 and 8 present the results of the regression models with the three cluster solution, used to test the hypotheses H1-H6. Model 2 tests the hypotheses on business models, while model 3-6 test the hypotheses of the entrepreneur's experiences.

Industry experience shows a significant positive effect on the number of cars. In the Google results model, industry experience shows a positive relation to Google results but insignificant. Therefore H1 is partially confirmed.

Entrepreneurial experience is positively related to both firm performance measures. Entrepreneurial experience shows a significant positive effect on the Google results. However, entrepreneurial experience is not significantly related to the number of cars. Hence, H2 is partially confirmed.

Managerial experience does not show any significant effects on either of the firm performance measures. Managerial experience appears not to influence the carsharing firm performance and thus H3 cannot be confirmed.

Educational experience shows significant relations to both Google results and number of cars. A high education level significantly increases firm performance compared to entrepreneurs with a low education level. Medium education level is also positively related to both firm performance measures, but the effect is not significant. As the positive effect is only significant for the high education level, H4 is partially confirmed.

The distance to other business models variable shows a significant relationship to both Google results and number of cars, which is consistent over the different models. The relationship is positive, meaning that if a firm has a business model with a larger distance to others in the cluster, this increases firm performance. This effect is thus the opposite of what is expected, as H5 expected firms with a smaller distance to firms in the same cluster to perform better. Therefore H5 is not confirmed. Rather, the opposite effect is significantly confirmed.

The cluster variable shows significant results on both firm performance measures. P2P firms perform significantly worse compared to one-way firms in the Google results model. When number of cars is the dependent variable, P2P firms show no significant results. Round-trip firms perform significantly worse than one-way firms for both firm performance measures, which is consistent over all models. The results are thus in line with H6 which expected that one-way firms perform better than round-trip firms. Hence, H6 is confirmed.

Table 7: Regression models results with Google results as dependent variable (3 cluster solution)

Model	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
AIC	1032.527	975.802	792.180	753.701	756.701	728.968
BIC	1042.297	992.900	809.575	770.718	773.718	747.965
Pearson chi²/df	2.311	1.760	1.948	1.366	1.455	1.502
N	85	85	65	62	62	61
	B					
Firm age	-.100***	.022	.036	.015	.043*	.041
GDP growth	48.771***	14.656*	22.747**	18.449*	12.247	15.106
Clusters						
P2P		-3.066**	-2.921**	-3.160***	-3.166***	-3.354***
Round-trip		-5.368 ***	-4.934***	-5.434***	-5.554***	-5.418***
One-way		0	0	0	0	0
Distance to other business models		6.516***	5.871***	5.839***	6.189***	6.594***
Industry experience (no)			0			
(yes)			.376			
Entrepreneurial exp. (no)				0		
(yes)				.913**		
Managerial exp. (no)					0	
(yes)					-.484	
Educational exp. (low)						0
(medium)						.600
(high)						1.718***

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

Table 8: Regression models results with Number of cars as dependent variable (3 cluster solution)

Model	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
AIC	962.763	871.064	706.318	677.743	676.271	652.848
BIC	972.533	888.162	723.713	694.760	693.288	671.846
Pearson chi²/df	2.204	1.507	1.357	1.220	1.050	1.182
N	85	85	65	62	62	61
	B					
Firm age	-.015	.085***	.094***	.077***	.087***	.082***
GDP growth	51.792***	4.374	10.652	6.690	8.713	7.852
Clusters						
P2P		.330	.810	.303	-1.06	-.047
Round-trip		-5.225***	-4.661***	-5.406***	-5.173***	-5.140***
One-way		0	0	0	0	0
Distance to other business models		6.663**	6.086***	6.411***	6.394***	6.803***
Industry experience (no)			0			
(yes)			.652*			
Entrepreneurial exp. (no)				0		
(yes)				.342		
Managerial exp. (no)					0	
(yes)					-.528	
Educational exp. (low)						0
(medium)						.894
(high)						1.204**

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

Models with the interaction effect of car-related industry experience included, are used to test H7 for both Google results and number of cars as firm performance measure (see table 9). For P2P firms, car industry related experience has no relationship with firm performance as none of the firms possess this experience. Car industry related experience has a positive relationship with firm performance for the round-trip firms in both models which is in line with H7. However, the effect is not significant. All one-way firms possess car industry related experience and therefore it is not possible to see if the relationship is more positive for the one-way business model compared to P2P. Due to this and because the interaction effect between car industry related experience and round-trip firms is insignificant, H7 is not confirmed.

Table 9: Regression models results to test car-related industry experience

Model	***Model 7***	
AIC	786.155	700.960
BIC	803.426	718.231
Pearson chi^{2}/df	1.733	1.308
N	64	64
Dependent variable	*Google Results*	*Number of cars*
	B	
Firm age	.036	.095***
GDP growth	19.720**	6.667
Clusters		
P2P	0	0
Round-trip	-2.143**	-5.529***
One-way	3.079**	-.303
Distance to other business models	6.018***	6.566***
Clusters*car-industry experience		
Car-industry experience (0)*P2P	0	0
Car-industry experience (0) *Roundtrip	0	0
Car-industry experience (1) *Roundtrip	.180	.477
Car-industry experience (1) *One-way	0	0

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

Control variables

GDP growth in founding year has a positive significant effect on both Google results and the number of cars of carsharing firms in the control model. When adding the business model variables and entrepreneurial variables, the effect disappears with number of cars as firm performance measure. For Google results, the effect remains positively significant when adding the business model variables and industry experience. The effect disappears when adding the other three entrepreneurial experiences. Firm age has a small negative effect on firm performance in the control model for both number of cars and Google results, but only significant for Google results. For Google results, the effect is positive but insignificant when the business model variables are added. Firm age has a small significant positive effect on the number of cars when the business model variables and/or the entrepreneurial experiences are added. The reason that firm age is negative in the control model and positive in the models where the business model variables are added could be because the round-trip firms that perform worse tend to be old. So, when including the business model variables, that effect is captured by the cluster variable and therefore the effect of firm age changes.

Model results additional models

The following sections present the four cluster models and the models with the third firm performance indicator Google results/number of cars to provide additional insights in the German carsharing market and how the round-trip co-op firms relate to firm performance.

Model results four clusters

Table 10 and 11 present the results of the four cluster solution. As can be seen, round-trip co-op firms perform significantly worse than one-way firms on both firm performance measures. These firms also have the strongest negative effect compared to P2P firms and round-trip firms with another owner. Another apparent result is that also in these models P2P firms seem to perform significantly worse than one-way firms with Google results as dependent variable, while having a positive insignificant relationship to the number of cars. A reason for this could be that P2P firms can have easily many cars on their platform as in this business model firms don't have their own fleet but only work as market mediator (Vaskelainen, 2014). The other firm performance indicator Google results controls for this and in this case P2P firms perform less than one way firms. The distance to other business models variable has also in the four cluster solution a positive significant effect on both firm performance measures. [4]

Table 10: Regression models results with Google results as dependent variable (4 cluster solution)

Model	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
AIC	1032.527	971.488	776.575	736.479	737.377	713.033
BIC	1042.297	991.123	796.144	755.623	756.521	734.142
Pearson chi²/df	2.311	1.266	1.238	0.944	1.047	1.164
N	85	85	65	62	62	61
	B					
Firm age	-0.100***	0.052**	.075***	.087**	.093***	.086***
GDP growth	48.771***	17.553*	28.237***	12.418	13.507	13.520
Clusters						
P2P		-2.459**	-2.276**	-2.416**	-2.311**	-2.654**
Round-trip		-3.263 ***	-2.799***	-3.426***	-3.206***	-3.381***
Round-trip (co-op)		-6.370***	-5.857***	-6.995***	-6.874***	-6.961***
One-way		0	0	0	0	0
Distance to other business models		1.843**	1.113	1.756**	1.746**	1.828**
Industry experience (no)			0			
(yes)			.569			
Entrepreneurial exp. (no)				0		
(yes)				.381		
Managerial exp. (no)					0	
(yes)					.125	
Educational exp. (low)						0
(medium)						.862
(high)						1.123**

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

[4] In addition, as in the models with number of cars as dependent variable the different business models are not fully comparable, models have been run with only including round-trip firms. This gave exactly the same results in terms of significance and direction of the different control, business model and entrepreneurial variables. Controlling for this shows that the model results are not skewed due to the fact that the P2P business model does not require to own a fleet of vehicles.

Table 11: Regression models results with Number of cars as dependent variable (4 cluster solution)

Model	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
AIC	962.763	849.621	680.521	648.537	648.212	624.890
BIC	972.533	869.163	700.091	667.681	667.356	645.998
Pearson chi^{2}/df	2.204	1.140	1.082	0.957	0.970	1.138
N	85	85	65	62	62	61
	B					
Firm age	-.015	.105***	.113***	0.112***	0.111***	0.112***
GDP growth	51.792***	7.805	12.949*	6.944	6.927	6.266
Clusters						
P2P		.738	1.019	0.744	0.971	0.536
Round-trip		-3.039***	-2.646***	-2.721***	-2.644***	-2.991***
Round-trip (co-op)		-6.396***	-5.982***	-6.485***	-6.449***	-6.612***
One-way		0	0	0	0	0
Distance to other business models		2.433***	2.221***	2.286***	2.197***	2.219***
Industry experience (no)			0			
(yes)			.471			
Entrepreneurial exp. (no)				0		
(yes)				-.149		
Managerial exp. (no)					0	
(yes)					.249	
Educational exp. (low)						0
(medium)						1.358**
(high)						.830**

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

Model results third performance indicator

Finally, the third performance indicator Google results/number of cars is tested. A three cluster and a four cluster model is computed, including both the control variables and the business model variables. The results (see table 12) show that the small round-trip co-op firms perform significantly better than one-way firms when looking at the Google results per car they own. As explained in the method section, this performance measure is designed as an atypical performance measure that accounts for the fact these co-op firms do not have the standard profit and growth oriented firm goal. This results indicates that when a testing a different aspect of performance, co-op firms can actually perform well. Another interesting notion from the results is that the distance to other business model variable has a significant negative effect on the Google results/number of cars in the three cluster model. This indicates that in this performance measure, a firm that has a more similar business model to the others in the cluster performs better, which is contrary to the other model results. The fact that in this model the co-op round-trip firms are the largest part of the cluster and these firms perform better than other business models when Google results/number is the dependent variable, could account for these opposite results. The discussion section elaborates further on this explanation and delves deeper in the theoretical implications of the results concerning the distance to other business models variable.

Table 12: regression models results with Google results/ car as dependent variable

Model	***Model 8: 3 clusters***	***Model 8: 4 clusters***
R	0.324	0.401
R Square	0.105	0.161
N	85	85
	B	
Firm age	-4.259**	-4.321**
GDP growth	-97.511	-58.344
Clusters		
P2P	117.783	117.260
Round-trip	74.072	32.789
Round-trip (co-op)		108.512*
One-way	0	0
Distance to other business models	-92.807*	-2.406

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

5. Conclusion & Discussion

The aim of this research was to study the effect of entrepreneurial characteristics and business models on carsharing firm performance, by answering the following research question:

What is the effect of entrepreneurial characteristics and business models on the performance of carsharing firms?

By combining human capital theory with research on business models from strategy literature, configuration theory and categorization theory, a rich set of hypotheses regarding carsharing firm performance are investigated. Entrepreneurial experiences and business model factors are considered and empirically tested which is not yet covered in existing research on carsharing. Furthermore, a cluster analysis validated the three expected generic business models based on theory and identified a new cluster: the round-trip co-op firms. The results, based on a sample of the German carsharing market, confirm the effect of both entrepreneurial characteristics and business model factors on the performance of carsharing firms. The influence of the entrepreneurial characteristics varies for the different performance measures, while managerial experience seems to have no effect at all on carsharing firm performance. Entrepreneurial experience is positively related to Google results as firm performance measure, while industry experience has a positive effect on the number of cars. A high education level has a positive effect on both Google results and number of cars. This study shows, contrary to theory, that a larger distance to other firms' business models increases carsharing firm performance. One-way firms perform better than round-trip firms on both firm performance measures, in line with theory. The four cluster model shows that the one-way firms also tend to perform better than the round-trip co-op firms on both firm performance measures. P2P firms tend to perform worse than one-way firms, only when Google results is the firm performance measure. The interaction effect of car industry related experience and the different business models is not confirmed as it showed no significant results. Entrepreneurial experiences and business model factors can thus explain carsharing firm performance, but only partially confirm the hypotheses.

5.1. Theoretical implications

This research empirically shows the effect of entrepreneurial characteristics and business model factors on carsharing firm performance. The evidence of factors determining firm performance has been ambiguous and empirical studies have shown contradictory findings (Baum et al., 2001). This research shows that contradictory findings can be avoided to an extent by using different firm performance measures to capture its multidimensional nature and being explicit about which measures are used. The results underline the notion that different firm performance measures can capture different aspects of performance (Murphy et al., 1996): entrepreneurial experience shows a significant effect on the Google results, while related industry experience shows a significant effect on the number of cars. Industry experience seems thus of particular influence for the number of cars as firm performance measure. This could be explained by the suggestion that related industry experience in for example car rental, leasing or manufacturing industries gives valuable experiences for controlling and maintaining a large fleet of vehicles. High educational experience shows a positive significant effect to both firm performance measures. These results support the theoretical propositions that industry experience, entrepreneurial experience and education positively influence firm performance (e.g. Baum et al. 2001; Cooper et al., 1994; Dahl & Reichstein, 2007; Soriano & Castrogiovanni, 2012).

However, managerial experience seems to have no effect on carsharing firm performance. Although the majority of studies supports the existence of a positive relationship between managerial experience and firm performance, some studies have found no effects (Ganotakis, 2012). A reason for this could be that managerial experience is especially important for high-tech firms, because managerial experience enables one to handle difficult and complex tasks in management and production (Choi & Shepherd, 2004; Ganotakis, 2012). As carsharing firms operate a service and do not produce high-tech products, this could be an explanation for the result that managerial experience seems to have no effect on firm performance in this study.

The results also show the importance of business model factors on carsharing firm performance. Firms with a one-way business model tend to perform better than round-trip firms on both number of cars and Google results as firm performance measure. If the one-way business model only would perform better on number of cars, one could argue that this is the case because one-way firm need a certain density of cars to perform and round-trip firms can work in smaller communities (Vaskelainen, 2014). However, the one-way firms also perform better on the Google results indicator, which shows that one-way firms perform better on different aspects of firm performance. These results are in line with the studies by Firnkorn & Muller (2011) and Le Vine et al. (2014b) who show that the market penetration and potential market of the one-way business model is larger than for the round-trip business model. When looking at the model with four clusters, both the round-trip co-op firms and the round-trip firms with another owner perform significantly worse than the one-way firm on both Google results and number of cars as firm performance measure. The results show empirically that the newer one-way business model seems to already outperform the traditional older round-trip model. This finding could suggest that business model innovation is important for firm performance. This view is supported by an increasing number of scholars that see business model innovation as key to firm performance (Zott et al., 2011). P2P firms perform significantly worse than one-way firms when Google results is the firm performance measure. When the number of cars is the firm performance measure, no significant results are found. However, while the round-trip and one-way business model are reaching maturity, the P2P model does not seem to have reached maturity (Vaskelainen, 2014). This research gives an indication that P2P firms could be underperforming compared to one-way firms, but as this business model is still in development at this point, conclusions should be made at a later stage.

The results of this study show that when the distance of a firms' business model to other firms increases, the firm performance increases. This is contrary to what is expected and can have possible theoretical implications. The results could indicate that in the German carsharing market, a dominant design or prototype of the three generic business models is not yet established. Therefore, the mechanism that firms which are more isomorphic to this prototype are judged as more attractive and legitimate (Zuckerman, 1999), would not be applicable when following this argument. On the other hand, the round-trip business model is already existing for a substantial period (more than 20 years), and the results for only the round-trip firms show the same findings. The nature of the German carsharing market could account for this effect. As explained earlier, the carsharing market in Germany is very heterogeneous and decentralized with a large group of small independent providers (Loose, 2010). In the interview with Nerkhe from the Bundesverband Carsharing, it came apparent that some business owners have their roots in the ecological movements of the 1980s and they do not look at firm performance in the same way as other business owners do. They do not want to grow faster than others, but want to be profitable only. These small co-op firms, in which members collectively contribute resources and manage the firm without the expectation of financial gain (Cohen &

Kietzmann, 2014), do not have many cars or a high amount of Google results. When assessing the descriptive statistics, these firms have the smallest minimum distances of all the firms in the dataset. As these co-op firms are a large part of the round-trip cluster, this could account for the effect that when a firm has a more distant business model to others in the cluster, it performs better. In the four cluster model, that takes into account these co-op firms as a separate cluster, it can be observed that the effect of the distance to other business model variable is already a lot smaller. The results of the third dependent variable Google results/ number of cars, underline this view. In this model, the co-op round-trip firms do perform better than the one-way firms. The distance to other business model variable has in this case a significantly negative effect on the performance measure in the three cluster model, which means that firms that have a closer business model to others in the cluster perform better. The fact that in these models the co-op round trip firms are the best performing, could account for the effect that the distance to other business model variable is negative in this case. The findings of this study could implicate that the mechanism of business model distance between firms differ dependent on the industry specific context.

However, the co-op firms cannot alone explain the results. In the four cluster models, that takes into account these co-op firms as a separate cluster, the effect of the distance to other business models variable is a lot smaller, but it is still positive. A possible explanation for this could be the identity challenge that firms of a certain cluster face. Navis & Glynn (2010) explain that members of a category can vary in the extent to which they claim conformity from the prototype by a distinctive identity and the alignment with the audiences' expectations on the prototypicality and perceived grade of membership. Firms need to navigate between shared sameness with firms in the same cluster and their individual distinctiveness from other firms. An individual firm can claim an optimal level: distinctive enough from other firms to individuate it, but not so distinctive that the firm is unrecognizable as a rightful member of the cluster (Glynn & Abzug, 2002). The small positive effect found in the four cluster models of this study could therefore imply an optimal level of distance, not too much, but also not too little. The squared term of the distance to other business models variable is used to test for this inverted U-shape relationship with firm performance. When testing a U-shaped relationship, researchers should also include the first order of the independent variable in the regression analysis as leaving it out is equal to assuming a turning point of 0 (Haans et al., 2015). Therefore the squared term is added to model 2, which includes the control variables and business model variables. The squared term is tested for the three and four cluster model, and for both Google results and number of cars as firm performance measure. The results show a negative effect of the squared distance to other business models variable for both Google results and number of cars, which could indeed indicate an inverted u-shape relation to firm performance. However, the effect is not significant. The results do therefore not significantly prove an optimal level of business model distance, but show the right direction. Future research could delve deeper into this notion and test the possible inverted u-shape relationship using other datasets.

In terms of methodology, the application of a cluster analysis in this research enabled to validate the generic business models that were found in earlier qualitative studies (e.g. Cohen & Kietzmann, 2014; Vaskelainen, 2014). It also revealed new insights on the business models in the German carsharing market as a fourth cluster, the co-op round-trip firms, could be identified. In the regression analysis that followed, the effect of these business models on firm performance could then be assessed. The combination of a cluster analysis and a regression analysis gave valuable insights in the business models of the carsharing market and how this relates to firm performance. The advantages of this

combined cluster analysis and regression analysis method over solely performing a regression analysis, are both the validation of generic business models in emerging markets, as the revelation of generic business models that are less visible at first, which can then in turn be used in the regression analysis to test how these business models relate to firm performance. This makes it a valuable method for future studies on business models in emerging markets.

5.2. Societal implications

Some useful implications for entrepreneurs, managers and investors can be derived from the results. First, related industry experience seems to be important in the case of number of cars. Entrepreneurial experience has a significant positive effect in the case of Google results as firm performance measure and a high educational level increases both firm performance aspects. This study suggest that multiple entrepreneurial characteristics affect firm performance. It is therefore recommendable that entrepreneurs that aim to enter the carsharing market acquire these experiences, by for example hiring or partnering and in this way acquire the experiences they lack. Investors or venture capitalist could, based on these findings, look for new firms in which entrepreneurial characteristics such as related industry experience, entrepreneurial experience and education are present that can enhance the firm performance.

For both managers of current carsharing firms, as well as entrepreneurs, it is recommendable to look at the one-way business model, as this business model performs significantly better on both Google results and number of cars as firm performance measure. In several countries, operators of round-trip firms have taken notice of the rapid growth of competing one-way services by experimenting with one-way services to complement their existing service (Le Vine et al., 2014). Combining the two business models can be a way for managers of round-trip firms to gain a competitive advantage.

The results of this research showed that if the business model of a firm is more dissimilar to other firms with the same generic business model, the firm tends to perform better. According to these findings, managers of current firms or entrepreneurs should aim to differentiate their business model as this seems to increase carsharing firm performance. However, this also depends on the aim of the entrepreneur. If social entrepreneurs have for example not a profit or growth oriented aim, but rather a more community oriented goal in which members can actively participate, these social entrepreneurs can better stay more close to the round-trip co-op business model explained in this research.

5.3. Limitations

This research has a couple of limitations. First, it should be emphasized there are more aspects of firm performance than the firm performance measures used in this research. Financial indicators such as profit/sales or growth can be an interesting alternative as firm performance measure, but due to data limitations, Google results is chosen in this research. Choi & Varian (2012) show that search data of Google can forecast near-term values of economic indicators such as sales and Google results can therefore be seen as an appropriate alternative. Furthermore, it is important to note that the amount of shared P2P cars is not fully comparable to the amount of cars from round-trip or one-way firms, as P2P firms do not own the cars and therefore it can be easier to get a high amount of cars since no

investment costs are necessary. To account for this, no conclusions are made for the P2P firms based on solely this firm performance indicator. The other firm performance indicator Google results is therefore especially useful to see the effect of P2P firms.

Second, this research has limitations regarding generalizability. Only German carsharing firms are included in this research and the cases are therefore specific for the German context. As the German carsharing market controls around 50% of the whole European fleet with more than a million customers (Bert et al., 2016), Germany can be seen as the leading country for carsharing developments. Researchers should however still take care in generalizing findings to regions with other contexts.

Also, due to data limitations the number of observations was low for the entrepreneurial variables. To account for this and maintain the stability of the regression analyses, the entrepreneurial variables are tested in separate models. The stability of the measurement of the entrepreneurial variables could however be further increased with a higher number of observations in future research.

A final limitation is the fact that the business model variables in the cluster analysis are not weighted. This research identified four dimensions (value proposition, key assets, value network and value capture) that each are measured by different variables. Certain individual variables of a business model dimension could then possibly be of larger importance than other aspects of that dimension. However, as it is hard to weight each individual variable on objective grounds, this research aimed to only include the important business model variables specifically relevant for carsharing firms. In addition, the expert interview (see appendix F) with the Bundesverband Carsharing confirmed the importance of all individual variables, except for the variable 'gas included'. As explained earlier, this variable was also highly correlated and excluded from the cluster analysis. Furthermore, each business model dimension has a substantive amount of variables so that each dimension has a significant share in the cluster analysis. The results of the cluster analysis confirm this as it grouped the firms in a meaningful way and validated the generic business models qualitatively discussed in theory.

5.4. Future research

Although this research aimed to provide a comprehensive analysis of carsharing firm performance, some suggestions for future research exist. Future research could further explore the different determinants of firm performance. This research has already captured two dimensions, but by testing for example for firm survival as a firm performance measure, another aspect of firm performance can be captured. In this way a longitudinal research design can be used and this could reveal new insights in why certain carsharing firms fail and others are successful. Taking into account changes over time could also reveal insights in the further development and growth of carsharing firms.

Furthermore, future research could delve deeper into interaction effects, between the entrepreneurial characteristics and the business models, but also interaction effects with environmental conditions. Entrepreneurial characteristics could for example work differently dependent on the firm size, which would support the notion from organizational sociology that large organisations become political entities with outcomes divergent from the plans of the manager (Brüderl et al., 1992). When looking at the interplay between business models and environmental conditions, future empirical research can

underline the expectation of Vaskelainen (2014) that certain business models could work better in one specific area dependent on the population density.

Future research could test if the results of this study can be extrapolated to different countries. In this way, these future studies could identify if the results concerning the entrepreneurial characteristics and business models are global carsharing industry patterns. In turn, the results of these future studies could then benefit the development of newer carsharing markets, such as countries in Latin America or the Middle East (Shaheen & Cohen, 2013).

Another direction of future research could go into more detail in the underlying reasons why certain carsharing firms fail or have success by doing qualitative in depth case studies of high performing or failing outliers.

Last, this research emphasizes that instead of finding general explanations of the determinants of firm performance, the future challenge is to fine-tune determinants for specific firm performance aspects and take into account the specific industry context.

6. References

Afuah, A., & Tucci, C. L. (2001*). Internet business models and strategies: Text and cases.* New York: McGraw-Hill.

Arthur, J. B. (1992). The link between business strategy and industrial relations systems in American steel minimills*. Industrial & Labor Relations Review, 45*(3), 488-506.

Baum, J. R., Locke, E. A., & Smith, K. G. (2001). A multidimensional model of venture growth. *Academy of management journal*, *44*(2), 292-303.

Bert, J. Collie, B. Gerrits, M. Xu, G. (2016). What's Ahead for Car Sharing? The new mobility and its impact on vehicle sales. Boston Consulting Group. Retrieved from: <https://www.bcgperspectives.com/content/articles/automotive-whats-ahead-car-sharing-new-mobility-its-impact-vehicle-sales/#chapter1>

Botsman, R., & Rogers, R. (2010). *What's Mine Is Yours: The Rise of Collaborative Consumption.* New York: HarperBusiness.

Brüderl, J., Preisendörfer, P., & Ziegler, R. (1992). Survival chances of newly founded business organizations. *American sociological review*, 227-242.

Bryman, A. (2008). *Social research methods*. Oxford: Oxford university press.

Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and onto tactics. *Long range planning*, *43*(2), 195-215.

Cassar, G. (2014). Industry and startup experience on entrepreneur forecast performance in new firms. *Journal of Business Venturing*, *29*(1), 137–151

Cervero, R., Golub, A., & Nee, B. (2007). City CarShare: longer-term travel demand and car ownership impacts. *Transportation Research Record: Journal of the Transportation Research Board*, (1992), 70-80.

Chandler, G. N. (1996). Business similarity as a moderator of the relationship between pre-ownership experience and venture performance. *Entrepreneurship: Theory and Practice*, *20*(3), 51-66.

Chandler, G. N., & Hanks, S. H. (1994). Market attractiveness, resource-based capabilities, venture strategies, and venture performance. *Journal of Business Venturing, 9*, 331-349.

Choi, Y. R., & Shepherd, D. A. (2004). Entrepreneurs' decisions to exploit opportunities. *Journal of management, 30(3)*, 377-395.

Choi, H., & Varian, H. (2012). Predicting the present with google trends. *Economic Record*, *88*(s1), 2-9.

Ciari, F., Schuessler, N., & Axhausen, K. W. (2013). Estimation of carsharing demand using an activity-based microsimulation approach: model discussion and some results. *International Journal of Sustainable Transportation*, *7*(1), 70-84.

Cohen, B., & Kietzmann, J. (2014). Ride On! Mobility Business Models for the Sharing Economy. *Organization & Environment*, *27*(3), 279-296.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative science quarterly*, 128-152.

Coll, M. H., Vandersmissen, M. H., & Thériault, M. (2014). Modeling spatio-temporal diffusion of carsharing membership in Québec City. *Journal of Transport Geography*, *38*, 22-37.

Cooper, A. C., Gimeno-Gascon, F. J., & Woo, C. Y. (1994). Initial human and financial capital as predictors of new venture performance. *Journal of business venturing*, *9*(5), 371-395.

Cooper, A. C., Woo, C. Y., & Dunkelberg, W. C. (1989). Entrepreneurship and the initial size of firms. *Journal of Business Venturing*, *4*(5), 317-332.

Correia, G. H., & Antunes, A. P. (2012). Optimization approach to depot location and trip selection in one-way carsharing systems. *Transportation Research Part E: Logistics and Transportation Review*, *48*(1), 233-247.

Coxe, S., West, S. G., & Aiken, L. S. (2009). The analysis of count data: A gentle introduction to Poisson regression and its alternatives. *Journal of personality assessment*, *91*(2), 121-136.

Dahl, M. S., & Reichstein, T. (2007). Are You Experienced? Prior Experience and the Survival of New Organizations. *Industry & Innovation*, *14*(5), 497–511.

Daily, C. M., Mcdougall, P. P., Covin, J. G., & Dalton, D. R. (2002). Governance and Strategic Leadership in Entrepreneurial Firms. *Journal of Management*, *28*(3), 387–412.

Delmar, F., & Shane, S. (2006). Does experience matter? The effect of founding team experience on the survival and sales of newly founded ventures. *Strategic Organization*, *4*(3), 215-247.

Durand, R., & Paolella, L. (2013). Category stretching: Reorienting research on categories in strategy, entrepreneurship, and organization theory. *Journal of Management Studies*, *50*(6), 1100-1123.

Costain, C., Ardron, C., & Habib, K. N. (2012). Synopsis of users' behaviour of a carsharing program: a case study in Toronto. *Transportation Research Part A: Policy and Practice*, *46*(3), 421-434.

Firnkorn, J. and Müller, M. (2011). What will be the environmental effects of new free-floating carsharing systems? The case of car2go in Ulm. *Ecological Economics, 70(8)*, 1519-1528.

Frenken, K., Saviotti, P. P., & Trommetter, M. (2002). Variety and economic development: conceptual issues and measurement problems•. In *Economic Evolution, Learning, and Complexity* (pp. 209-244). Physica-Verlag HD.

Frost and Sullivan. (2015). Future of Mobility. Future and visions of collaborative mobility. Retrieved from: < http://www.wocomoco.org/assets/docs/Infomaterialien-Kongress-2015/Praesentationen/BriggsWocomoco_FrostSullivan_26062015.pdf>

Ganotakis, P. (2012). Founders' human capital and the performance of UK new technology based firms. *Small Business Economics*, *39*(2), 495–515.

Gilbert, B. a., McDougall, P. P., & Audretsch, D. B. (2006). New Venture Growth: A Review and Extension. *Journal of Management*, *32*(6), 926–950.

Glynn, M. A., & Abzug, R. (2002). Institutionalizing identity: Symbolic isomorphism and organizational names. *Academy of Management journal*, *45*(1), 267-280.

Greenwood, R., & Hinings, C. R. (1993). Understanding strategic change: The contribution of archetypes. *Academy of Management journal*, *36*(5), 1052-1081.

Haans, R. F., Pieters, C., & He, Z. L. (2015). Thinking about U: theorizing and testing U-and inverted U-shaped relationships in strategy research. *Strategic Management Journal, 37,* 1177-1195.

Haber, S., & Reichel, A. (2007). The cumulative nature of the entrepreneurial process: The contribution of human capital, planning and environment resources to small venture performance. *Journal of Business Venturing*, *22*(1), 119-145.

Hambrick, D. C., Cho, T. S., & Chen, M. J. (1996). The influence of top management team heterogeneity on firms' competitive moves. *Administrative science quarterly*, 659-684.

Hannan, M. T., & Freeman, J. (1977). The population ecology of organizations. *American journal of sociology*, 929-964.

Hilbe, J. M. (2014). *Modeling count data*. Cambridge: Cambridge University Press. Retrieved from: < http://dx.doi.org/10.1017/CBO9781139236065>

Hitt, M. A., Biermant, L., Shimizu, K., & Kochhar, R. (2001). Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management journal*, *44*(1), 13-28.

Hollenstein, H. (2003). Innovation modes in the Swiss service sector: a cluster analysis based on firm-level data. *Research Policy*, *32*(5), 845-863.

IBM. (2016). Hierarchical Cluster Analysis. Retrieved from: <http://www.ibm.com/support/knowledgecenter/SSLVMB_21.0.0/com.ibm.spss.statistics.help/idh_clus.htm>

Jorge, D., & Correia, G. (2013). Carsharing systems demand estimation and defined operations: a literature review. *European Journal of Transport and Infrastructure Research*, *13*(3), 201-220.

Katzev, R. (2003). Car sharing: A new approach to urban transportation problems. *Analyses of Social Issues and Public Policy*, *3*(1), 65-86.

Kek, A. G., Cheu, R. L., Meng, Q., & Fung, C. H. (2009). A decision support system for vehicle relocation operations in carsharing systems. *Transportation Research Part E: Logistics and Transportation Review*, *45*(1), 149-158.

Klepper, S. (2001). Employee startups in high-tech industries. *Industrial and Corporate Change*, *10*(3), 639-674.

Klepper, S. (2002). The capabilities of new firms and the evolution of the US automobile industry. *Industrial and corporate change*, *11*(4), 645-666.

Kopp, J., Gerike, R., & Axhausen, K. W. (2015). Do sharing people behave differently? An empirical evaluation of the distinctive mobility patterns of free-floating car-sharing members. *Transportation*, *42*(3), 449-469.

Lamberton, C. P., & Rose, R. L. (2012). When is ours better than mine? A framework for understanding and altering participation in commercial sharing systems. *Journal of Marketing*, *76*(4), 109-125.

Le Vine, S., Zolfaghari, A., & Polak, J. (2014). Carsharing: Evolution, Challenges and Opportunities. *Brussels, 22nd European Automobile Manufacturers Association (ACEA) Scientific Advisory Group Report*.

Le Vine, S., Lee-Gosselin, M., Sivakumar, A., & Polak, J. (2014)**b**. A new approach to predict the market and impacts of round-trip and point-to-point carsharing systems: case study of London. *Transportation Research Part D: Transport and Environment, 32*, 218-229.

Litman, T. (2000). Evaluating carsharing benefits. *Transportation Research Record: Journal of the Transportation Research Board*, (1702), 31-35.

Loose, W. (2010). The state of European car-sharing. *Project Momo Final Report D*, *2*. European Commission Grant Agreement.

Magretta, J. (2002). Why business models matter*. Harvard Business Review, 80*(5), 86-92.

Markides, C., & Charitou, C. D. (2004). Competing with dual business models: A contingency approach. *Academy of Management Executive, 18*, 22-36.

Martin, E. W., & Shaheen, S. (2011). Greenhouse gas emission impacts of carsharing in North America. *Intelligent Transportation Systems, IEEE Transactions on*, *12*(4), 1074-1086.

Martin, E., Shaheen, S., & Lidicker, J. (2010). Impact of carsharing on household vehicle holdings: Results from North American shared-use vehicle survey. *Transportation Research Record: Journal of the Transportation Research Board*, (2143), 150-158.

Matzler, K., Veider, V., & Kathan, W. (2014). Adapting to the Sharing Economy. *MITSloan Management review, 56(2).*

McDonald, B. (2002). A teaching note on Cook's distance - a guideline. Massey University. Retrieved from: <http://mro.massey.ac.nz/xmlui/bitstream/handle/10179/4352/A_Teaching_Note_on_Cooks_Distance-A_Guideline.pdf?sequence=1&isAllowed=y>

Mengistae, T. (2006). Competition and entrepreneurs' human capital in small business longevity and growth. *Journal of Development Studies*, *42*(5), 812-836.

Meyer, A. D., Tsui, A. S., & Hinings, C. R. (1993). Configurational approaches to organizational analysis. *Academy of Management journal, 36*(6), 1175-1195.

Michel, J. G., & Hambrick, D. C. (1992). Diversification posture and top management team characteristics. *Academy of Management Journal*, *35*(1), 9-37.

Miller, D. (1986). Configurations of strategy and structure: Towards a synthesis. *Strategic management journal*, *7*(3), 233-249.

Morency, C., Habib, K. M. N., Grasset, V., & Islam, M. T. (2012). Understanding members' carsharing (activity) persistency by using econometric model. *Journal of advanced Transportation*, *46*(1), 26-38.

Morris, M., Schindehutte, M., & Allen, J. (2005). The entrepreneur's business model: toward a unified perspective. *Journal of business research*, *58*(6), 726-735.

Murphy, G. B., Trailer, J. W., & Hill, R. C. (1996). Measuring performance in entrepreneurship research. *Journal of Business Research, 36*(1), 15–23.

Navis, C., & Glynn, M. A. (2010). How new market categories emerge: Temporal dynamics of legitimacy, identity, and entrepreneurship in satellite radio, 1990–2005. *Administrative Science Quarterly*, *55*(3), 439-471.

Newbert, S. L., Kirchhoff, B. A., & Walsh, S. T. (2007). Defining the Relationship among Founding Resources, Strategies, and Performance in Technology-Intensive New Ventures: Evidence from the Semiconductor Silicon Industry*. *Journal of Small Business Management*, *45*(4), 438-466.

Nobis, C. (2006). Carsharing as key contribution to multimodal and sustainable mobility behavior: Carsharing in Germany. *Transportation Research Record: Journal of the Transportation Research Board*, (1986), 89-97.

Patzelt, H., Zu Knyphausen-Aufseß, D., & Nikol, P. (2008). Top management teams, business models, and performance of biotechnology ventures: An upper echelon perspective. *British Journal of Management*, *19*(3), 205–221

Phillips, D. J. (2002). A genealogical approach to organizational life chances: The parent-progeny transfer among Silicon Valley law firms, 1946–1996. *Administrative Science Quarterly*, *47*(3), 474-506.

Politis, D. (2005). The process of entrepreneurial learning: A conceptual framework. *Entrepreneurship theory and practice*, *29*(4), 399-424.

Rae, D. (2000). Understanding entrepreneurial learning: a question of how?. *International Journal of Entrepreneurial Behavior & Research, 6*(3), 145-159.

Rogerson, P. (2001). *Statistical methods for geography*. London: Sage.

Rosa, J. A., Porac, J. F., Runser-Spanjol, J., & Saxon, M. S. (1999). Sociocognitive dynamics in a product market. *The Journal of Marketing*, 64-77.

Ryden, C., & Morin, E. (2005). Mobility services for urban sustainability: Environmental assessment. *Moses Report WP6, Trivector Traffic AB, Stockholm, Sweden*.

Sapienza, H. J., & Grimm, C. M. (1997). Founder characteristics, start-up process, and strategy/structure variables as predictors of shortline railroad performance. *Entrepreneurship: Theory and Practice*, *22*(1), 5-25.

Sarasvathy, S. D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of management Review*, *26*(2), 243-263.

Sarasvathy, S. D., Menon, A. R., & Kuechle, G. (2013). Failing firms and successful entrepreneurs: Serial entrepreneurship as a temporal portfolio. *Small business economics*, *40*(2), 417-434.

Sarstedt & Mooi, 2014. A Concise Guide to Market Research (second edition). Heidelberg: Springer. Retrieved from: <http://www.springer.com/978-3-642-53964-0>

Shaheen, S. A., Chan, N. D., & Micheaux, H. (2015). One-way carsharing's evolution and operator perspectives from the Americas. *Transportation*, *42*(3), 519-536.

Shaheen, S. and Cohen, A. (2013). Carsharing and Personal Vehicle Services: Worldwide Market Developments and Emerging Trends. *International Journal of Sustainable Transportation, 7*(1), p.5-34.

Shaheen, S., Cohen, A., & Chung, M. (2009). North American carsharing: 10-year retrospective. *Transportation Research Record: Journal of the Transportation Research Board*, (2110), 35-44.

Shaheen, S., Sperling, D., & Wagner, C. (1998). Carsharing in Europe and North American: past, present, and future. *Transportation Quarterly, 52 (3), 35–52.*

Shane, S. (2003). *A general theory of entrepreneurship. The individual—opportunity nexus.* Cheltenham, U.K.: Edward Elgar.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization science*, *11*(4), 448-469.

Shane, S., & Khurana, R. (2003). Bringing individuals back in: the effects of career experience on new firm founding. *Industrial and Corporate Change, 12*(3), 519-543.

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of management review*, *25*(1), 217-226.

Shrader, R., & Siegel, D. S. (2007). Assessing the relationship between human capital and firm performance: evidence from technology-based new ventures. *Entrepreneurship Theory and Practice*, *31*(6), 893-908.

Song, M., Podoynitsyna, K., Van Der Bij, H., & Halman, J. I. (2008). Success factors in new ventures: A meta-analysis. *Journal of product innovation management*, *25*(1), 7-27.

Soriano, D. R., & Castrogiovanni, G. J. (2012). The impact of education, experience and inner circle advisors on SME performance: insights from a study of public development centers. *Small Business Economics*, *38*(3), 333-349.

Stam, W., Arzlanian, S., & Elfring, T. (2014). Social capital of entrepreneurs and small firm performance: A meta-analysis of contextual and methodological moderators. *Journal of Business Venturing*, *29*(1), 152-173.

Statistics Solutions. (2016). Statistical analysis. A manual on dissertation and thesis statistics in SPSS. Retrieved from: < http://www.statisticssolutions.com/spss-manual/>

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, *43*(2-3), 172–194.

Truffer, B. (2003). User-led innovation processes: the development of professional car sharing by environmentally concerned citizens. *Innovation: The European Journal of Social Science Research, 16(2), 139-154.*

Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing*, *26*(3), 341–358.

Vaskelainen, T. (2014). Sustainable Business Models - The Case of Car Sharing. *In Resilence - The New Research Frontier: Proceedings of the 20th Annual International Sustainable Development Research Conference (pp. 615-627).* Norwegian University of Science and Technology; International Sustainable Development Research Society.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of management review*, *11*(4), 801-814.

Zott, C., & Amit, R. (2002). *Measuring the performance implications of business model design: evidence from emerging growth public firms*. Fontainebleau: Insead.

Zott, C., Amit, R., & Massa, L. (2011). The Business Model: Recent Developments and Future Research. *Journal of Management*, *37*(4), 1019–1042.

Zuckerman, E. W. (1999). The categorical imperative: Securities analysts and the illegitimacy discount. *American Journal of Sociology, 104(*5), 1398-1438.

Appendix

Appendix A: List of firms and cluster number

Firm name	Cluster number (3 clusters)	Cluster number (4 clusters)
1:Drivy	1	1
2:Snappcar	1	1
3:Tamyca	1	1
4:cambio Mobilitätsservice GmbH & Co KG*	2	2
5:stadtmobil-Gruppe*	2	2
6:Stadtwerke Augsburg	2	2
7:Stattauto Bonn Carsharing GmbH	2	2
8:DB Rent GmbH/Flinkster	2	2
9:Stadtmobil Südbaden AG	2	2
10:CarSharing am Bodensee e.V.	2	3
11:Grünes Auto Göttingen	2	2
12:stadt-teil-auto CarSharing Göttingen GmbH	2	2
13:Mobility Center GmbH, teilAuto Mitteldeutschland	2	2
14:Stattauto Kassel	2	2
15:Flexicar GmbH	2	2
16:Stattauto eG	2	3
17:einfach mobil CarSharing GmbH	2	2
18:Stattauto München, Spectrum Mobil GmbH	2	2
19:Stadtteilauto CarSharing Münster GmbH	2	2
20:Stadtteilauto OS GmbH	2	2
21:Drive-CarSharing GmbH	2	2
22:Ökostadt Tübingen e.V.	2	3
23:book-n-drive mobilitäts-systeme GmbH	2	2
24:Ameranger Auto-Gemeinschaft (AmAG)	2	3
25:Autoverleih Muhr	2	2
26:VCD-Kreisverband Aschaffenburg-Miltenberg	2	3
27:BeiAnrufAuto e.V.	2	3
28:Ökobil e.V. Bamberg	2	3
29:BayreuthMobil e.V.	2	3
30:teilAuto Biberach e.V.	2	3
31:Colectivo! Carsharing in Heidelsheim	2	3
32:AUTOparat Coburg e.V.	2	3
33:willmobil carsharing	2	2
34:Teilen mit Freunden	2	2
35:Ebersberger Autoteiler (EAT)	2	3
36:MOBIL-Gemeinschaft Emmendingen e.V.	2	3
37:CarSharing Erlangen e. V.	2	3
38:StadtTeilAuto Freising e.V.	2	3
39:Glonner Autoteiler	2	3
40:Grafinger Autoteiler e.V.	2	3
41:Statt-Auto Herdecke e.V.	2	3
42:Hürup mobiler e. V.	2	3
43:Carsharing Kaufbeuren e. V.	2	3
44:Cambo-Car Allgäu; Stadtflitzer	2	2
45:Gemeinsam Mobil Nördlicher Breisgau e.V.	2	3
46:Kirchseeoner Auto-Teiler e. V.	2	3
47:Ökostadt Koblenz e.V.	2	3

48:Königsbrunner Auto-Teiler, Jürgen Müller	2	3
49:Autoteilen Landshut e.V.	2	3
50:Carsharing-Union Markt Schwaben e.V.	2	3
51:Jochen Gut, ps-sharing	2	2
52:CarSharing für Meiningen	2	3
53:teilAuto Mössingen e.K.	2	2
54:Stadtteilauto München	2	2
55:StadtTeilAuto Schleißheim e.V.	2	3
56:CarSharing Passau e.V.	2	3
57:WeilerWärme eG	2	3
58:PATI - Poinger Autoteiler Initiative e.V.	2	3
59:Die Autonative e.V.	2	3
60:Ökostadt Renningen e.V.	2	3
61:CarSharing Rosenheim	2	3
62:CarSharing Schleswig	2	2
63:teilAuto e.V. Schwäbisch Hall	2	3
64:Jonnys Carsharing Thomas Mett	2	2
65:Schlosskarschering	2	3
66:Carsharing Traunstein (CST)	2	3
67:Vaterstettener Auto-Teiler e.V.	2	3
68:Car-Sharing ZweiTälerLand e.V.	2	3
69:ÖkoMobil Pfaffenwinkel e.V.	2	3
70:Ökologie und Mobilität Wendlingen e. V.	2	3
71:Zornedinger Auto-Teiler e.V.	2	3
72:Greenwheels GmbH	2	2
73:Hertz 24/7	2	2
74:Grüne Flotte	2	2
75:my-e-car	2	2
76:Ford Carsharing, Ford Händlervereinigung	2	2
77:Projekt Ruhrauto-E	2	2
78:Car-Sharing Aurich e. V.	2	3
79:CarSharing Breisach/Ihringen	2	3
80:Move about	2	2
81:CG Emotion GmbH	2	2
82:CarSharing Oberasbach	2	3
83:E-Wald	2	2
84:DriveNow GmbH, DriveNow!	3	4
85:car2go GmbH, car2go	3	4
86:Multicity, Citroen	3	4
87:App2drive	3	4

3 clusters

- 1: P2P
- 2: Round-trip
- 3: One-way

4 clusters

- 1: P2P
- 2: Round-trip other owner
- 3: Round-trip co-op owner
- 4: One-way

Appendix B: Hamming distance example

An example is given of the Hamming distance between Stadtteilauto München and Cambio based on the value proposition variables. Note that the actual Hamming distances include all business model dimensions, but this example is purely for illustrative purposes. Consider the following observations on five value proposition variables:

Table 13: Data example of business model variables

	Trip type	Customer segments	Booking mechanism	Rental period	Span of membership
Stadtteilauto München	Round-trip	private	In advance+ spontaneous	Minimal hour	One city
Cambio	Round-trip	private+ business	In advance + spontaneous	Minimal hour	International

The Hamming distance is the number of discrete characteristics in which the two differ (Frenken et al., 2002). The distance from Stadtteilauto München to Cambio then equals 2, as the firms differ on the variables 'customer segments' and 'span of membership'.

Appendix C: Correlation matrix business model variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1: Trip type	1																						
2:Customer segment	,285	1																					
3: Booking mechanism	,031	,209	1																				
4: Rental period	-,335	-,275	-,020	1																			
5: Span of membership	,177	,294	-,239	-,132	1																		
6: Fleet owner	-,053	-,130	-,484	,272	,419	1																	
7: Fleet variety	-,056	,052	,042	,340	,032	,357	1																
8: EV in fleet	,200	,258	-,052	-,165	,328	,254	,258	1															
9: Owner	,052	,014	-,070	-,332	,046	-,168	-,220	,020	1														
10: Public transit partner	,298	,416	,072	-,309	,284	-,107	-,018	,197	-,054	1													
11: Other carsharing firm partner	,016	-,256	,079	,045	,010	-,052	,201	,115	-,005	,059	1												
12: Rental company partner	,180	,170	-,141	-,299	,506	,350	,078	,141	,104	,161	-,169	1											
13: Building association partner	-,100	,137	-,066	,017	-,006	-,068	,142	-,042	-,144	,302	-,051	,114	1										
14: Airport partner	,329	,223	-,051	-,313	,298	-,029	-,169	,046	,238	,093	-,145	,452	-,055	1									
15: Municipality partner	,046	,150	,062	,026	,080	,046	,216	,164	-,004	,139	,086	,084	,146	,098	1								
16: University partner	-,003	,089	,139	-,141	,136	-,064	,134	,299	-,043	,249	-,018	,256	,469	-,052	-,006	1							
17: Registration fee	,143	,137	,134	-,237	-,185	-,260	-,034	,035	,077	,127	,297	-,151	,110	-,050	,166	,008	1						
18: Annual/monthly fee	-,225	,053	,156	,172	-,334	-,274	,022	-,258	-,206	-,129	,059	-,170	,094	-,058	-,033	-,008	,173	1					
19: Minute fee	,583	,395	-,023	-,555	,307	-,051	-,164	,271	,246	,270	-,166	,354	-,098	,564	,067	,056	,007	-,201	1				
20: Hourly fee	-,170	-,041	,266	-,218	-,278	-,495	-,098	-,126	-,070	,024	,035	-,240	,089	-,292	-,100	,084	,236	,147	-,323	1			
21: Daily fee	,239	,543	,131	-,138	,284	-,092	,077	,203	,059	,322	-,119	,140	,310	,132	,138	,140	,159	,054	,142	-,113	1		
22: Km fee	-,170	-,041	,119	,194	-,197	-,224	-,024	-,229	-,070	,024	,035	-,240	,089	-,292	-,217	-,078	,133	,253	-,323	,576	-,113	1	
23: Gas included	,061	,034	,399	-,240	-,427	-,861	-,333	-,295	,195	-,004	-,013	-,286	,079	,034	-,141	,075	,187	,201	,060	,417	,033	,182	1

Appendix D: Correlation matrix regression model variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1: Google results (log)	1														
2: Number of cars (log)	,830***	1													
3: Google results/ number of cars	-0,79	-,381***	1												
4: Firm age	-,135	,050	-,227**	1											
5: GDP growth	,179	,212*	-,017	-,070	1										
6: P2P	,283***	,320***	,116	-,169	,269**	1									
7: Round-trip (all)	-,523***	-,494***	-0,19	,278**	-,294***	-,639***	1								
8: Round-trip (other)	,188	,348***	-,242**	-,085	,010	-,155	,243**	1							
9: Round-trip (co-op)	-,469***	-,611***	,227**	,236**	-,171	-,196*	,306***	-,849***	1						
10: Distance to others (4c)	,132	,142	0,027	-,252**	-,011	-,009	,014	,098	-,088	1					
11: Distance to others (3c)	,356***	,441***	-,121	-,243**	,107	,002	-,003	,572***	-,563***	,755***	1				
12: Industry exp.	,431***	,347***	,147	-,286**	,007	,073	-,246**	,252**	-,395***	,154	-,174	1			
13:Entrepreneurial exp.	,136	,080	,068	,025	,055	,008	,024	,144	-,123	,053	-,049	,241*	1		
14: Managerial exp.	,141	,101	-,073	-,058	-,057	,000	-,143	-,118	,023	,171	,087	,337***	,121	1	
15: Education exp.	,203	,116	,146	-,053	,018	,121	-,176	-,160	,048	,009	,063	,273**	-,051	,104	1

*significant at p <0.1 level ** significant at p < 0.05 level *** significant at the p < 0.01 level

Appendix E: Model fit figures

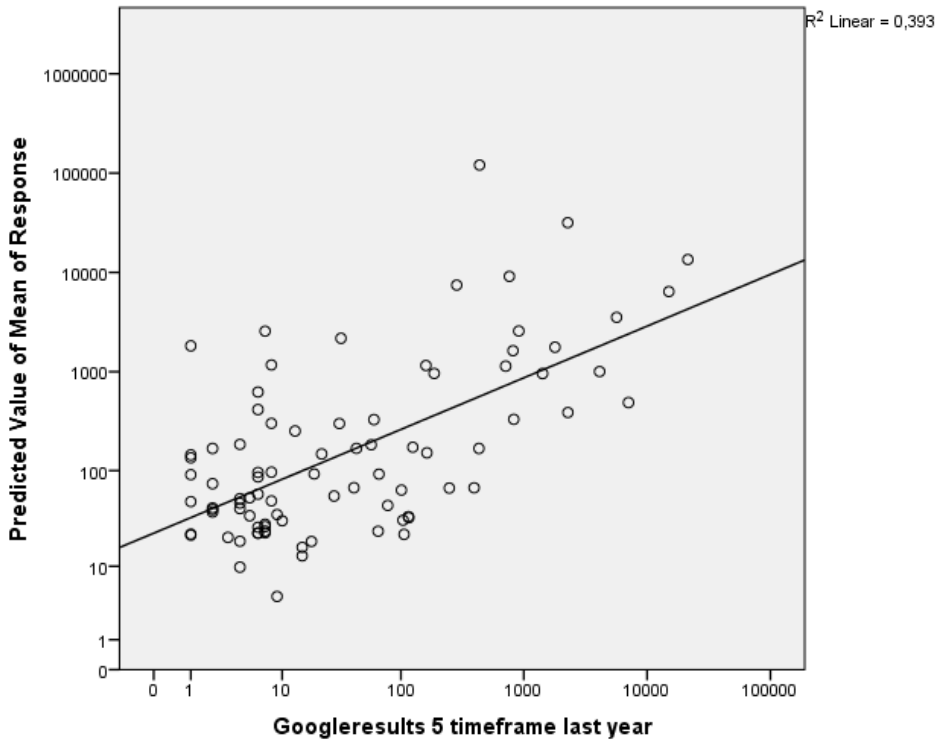

Figure 5: Observed number of Google results versus Predicted Google results (model 2 three cluster solution)

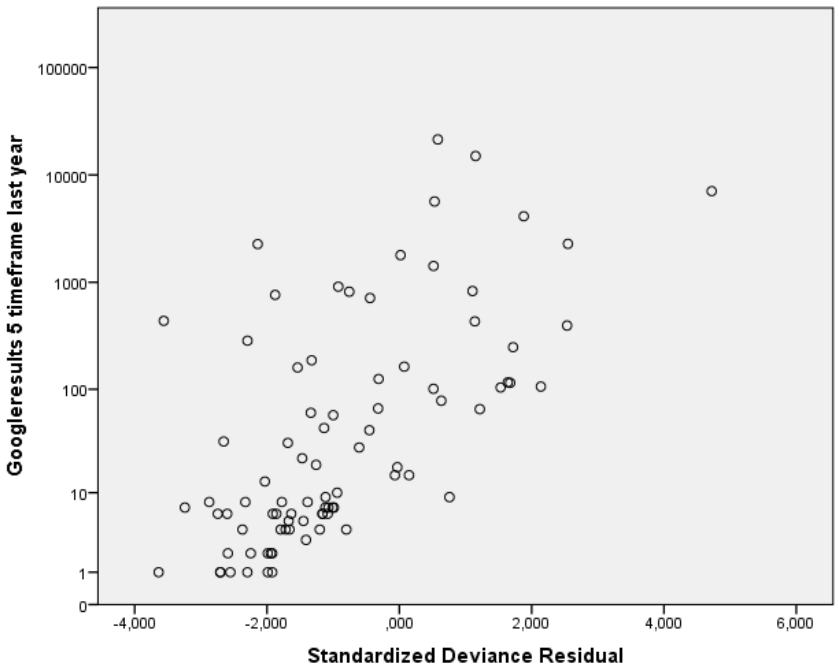

Figure 6: Standardized deviance residuals (model 2 three cluster solution)

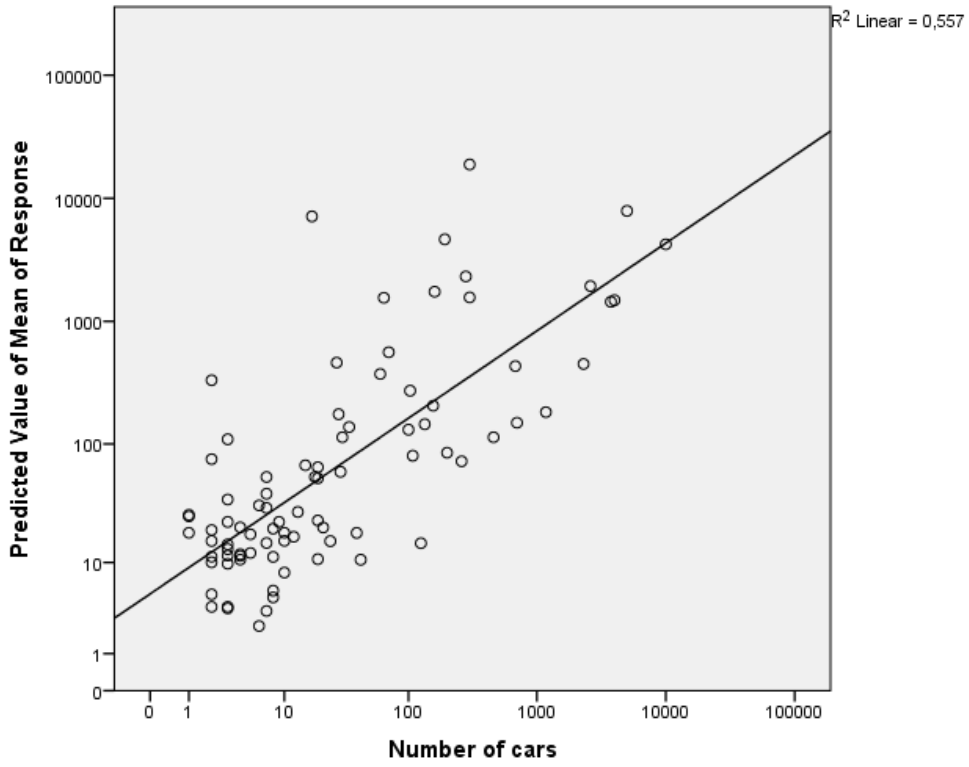

Figure 7: Observed number of number of cars versus Predicted number of cars (model 2 three cluster solution)

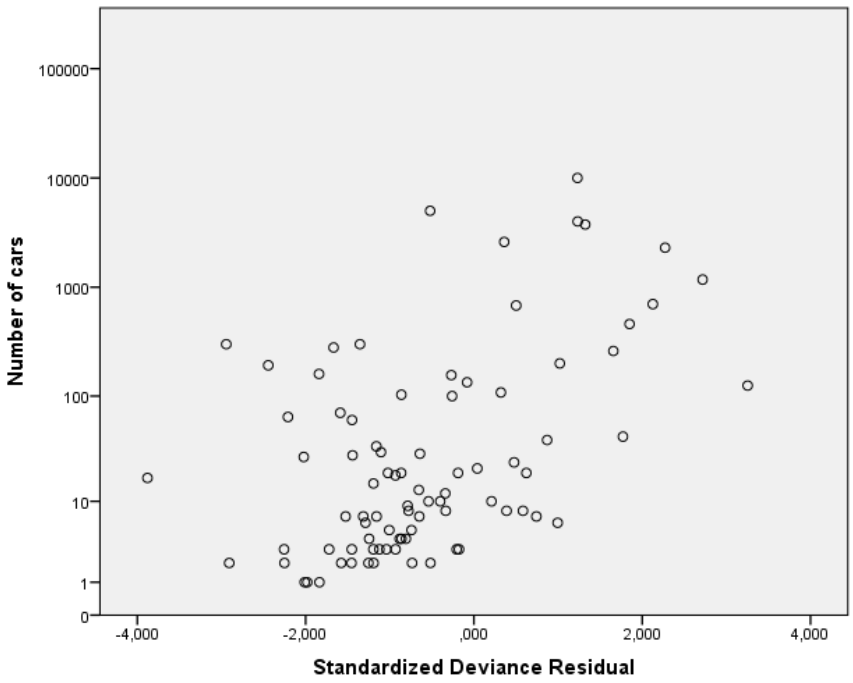

Figure 8: Standardized deviance residuals (model 2 three cluster solution)

Appendix F: Interview report

An expert interview was held with Gunnar Nerhke from the Bundesverband CarSharing (bcs), located in Berlin. The interview questions are designed to obtain additional knowledge of the underlying factors that determine carsharing firm success, and to gain inside knowledge in the German carsharing industry and its context. This report gives a short overview of the main outcomes of the interview.

1. *What are the main goals of the bsc?*

The bcs is the national organization of carsharing firms in Germany. Three goals are mentioned. First, a goal is to promote legislation for carsharing (e.g. parking spaces on public streets). Second, it aims to support and develop initiatives to promote and think about new carsharing products for developing the industry. Third, it aims to communicate to the general public of the benefits of carsharing.

2. *What are the barriers for firms to start a carsharing firm?*

There are no real barriers to start a carsharing firm, if you have the money to buy the cars you can do that. There is a problem with parking spaces. Mostly cars are parked in private car spaces, this is a problem because then the cars are not visible to people and don't know there is a carsharing service. One-way freeflowing cars have a marketing effect, the visibility of cars promotes the service very well. This is not the case with station-based round-trip firms, as 80% of the station based cars are parked on private ground (e.g. parking lots, underground garages). The parking spaces belong to public, but the bsc is trying to change regulation so that cities can give parking spaces to carsharing firms. Other barriers are built in the service itself. It is not easy to run a profitable carsharing service. You need lots of experience to run a profitable service. In the one-way service you need lots of money to bring all the cars on the road. If you don't have many cars the service will not function, because then the cars are not available if people want to book them. You need a certain density of cars in a certain area and this is very expensive. Car2go for example started in 2009 and is still not profitable. Starting a round-trip station based firm is easier because you can do that with 1 car and 20 customers who share it for example. But in this case it is hard to determine where the station should be so that it is attractive to households that will be your customer. For example, Citycar in Berlin started in 2012 and went bankrupt in the beginning of this year. Because they spread so many cars around many cities in Germany, they didn't have the management capacity to look at the single car, and define: is this is a profitable station for that car. Concluding, station based services grow very slowly, and it needs lots of experience to determine how and where you should go.

3. *What are in your opinion the key drivers for a firm to be successful in the German carsharing market (and how would you define success)?*

You can define success as 1) how to run a profitable business, and 2) how to grow faster than others. Not every carsharing firm in Germany wants to do the second. Carsharing exist for 26 years now in Germany. Some business owners have their roots in the ecological movements of the 80s and some of them do not look at growth the same way as business people would do that. They do not want to grow fast, but they want be profitable only. For most of the industry it is still the question how can you grow faster than others and how can you get more profitable customers than others. You can discuss growth by the number of cars or by the number of people who join the service. If you look at the one-way system, it grows very fast in number of people joining the service. But it does not grow very fast if you look at number of cars. To grow in regard of customers can mean that you attract lots of people who

never use your product. To run a profitable business, a key driver is to attract customers that use the service more often and to find the profitable customers. There are hints that the biggest station based systems, attract more profitable customers. Now these station based round-trip firms have 45 people (national average) that share one car. One-way firms have 126 users that share one car in national average. Three issues are related to profitability. First, what is your profitable target group? Second, the purchase costs of the cars as 90% of the cost are from the cars you need to purchase as a carsharing firm. Third, profitability is related to accident management. This has a great impact of how profitable your service will be. Some firms are profitable one year because they had almost no accidents, and the other year on the edge of being profitable because of many accidents. The question on how to grow faster than others has to with if you know your target groups and if you can find new ones.

3. *Do you see differences in how many times one-way cars or round-trip cars are used?*

On average a one-way car is rented for 30 or 40 minutes and it 8-14 km, whereas a station based round-trip car is rented on average 5-8 hours and the average distance is 50-60 km. So the usage of the car is different, which is mostly triggered by the prices. A station-based car has the same price for 5-6 hours than a one-way car for 30 minutes - 1 hour. Car2go (one-way firm) needs 7 different bookings per day per car, while the station based cars have an average of being booked once or below 1 per car per day.

4. *What are the relevant dimensions of the business model of a carsharing firm that determine success (when looking at the proposed variables?*

The interviewee explained that each of the proposed variables was important, except for the fuelling variable. If gas is included in the price was not deemed as important.

5. *What are differences in the main goals of the firms?*

The one-way services want to grow fast, be profitable and expand their service. In the round-trip group, the ecological impact and private car replacement is discussed more. If you have a really small firm in a rural area, some people need to work without getting paid. So you really want to have carsharing there as an owner, mostly for ecological reasons. Because if you ask the question if this is a real business and if is this really profitable, the answer would be no.

6. *What do you think are the key experiences a carsharing owner needs to have?*

Fleet management, accident management and knowledge of customer target groups.

7. *Do you see differences between start-ups and big firms like BMW that step in?*

We have to see if it is possible for a start-up to step into one-way, as you need a lot of money. BMW and Daimler have this money for example. It is possible to step into round-trip station based as start-up. However you have to ask as an entrepreneur why you would want to do this if you want to be profitable and grow fast, because then there a lot of industries where it is easier to do so.

8. *What are new developments you see happening or expect in the carsharing market?*

There will be new products, such as the combined one-way and round-trip services. There will also be new products to reduce cost. For example when customers lease or buy a car from a carsharing firm, and share it with a small community such as friends or family. This is very attractive for the provider

because then the firm is more an internet platform and they diminish the risk of owning the car. Also, within 10-15 years we have self-driving cars. This technology will completely disrupt the carsharing industry as we know it today and there will be also no taxi services as we know them today. There will be a whole different kind of on-demand mobility. Carsharing services can in the future own these self-driving cars.