Why the trend towards gas-guzzlers? A closer look at the complex effects of social norms on German car buyers

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Abstract: The transport sector is one of the major drivers of global climate change, with a large share related to the personal use of cars. Paradoxically, as efforts are undertaken to reduce this share, a trend to buy large, heavy cars with comparatively high fuel consumption is occurring nearly worldwide. In this article, we analyze the possible influence of social norms in car-buying decisions and in particular in the trend towards sport utility vehicles (SUVs). After giving a short introduction into the theoretical foundations underlying this research, we develop a model applying a multi-criteria decision analysis approach. By using data from surveys conducted by VuMA Touchpoints and ARAL, on German car buyers, preferences and characteristics of the different social groups in German society, as well as the ADAC on characteristics of different car types, we quantify the influence of social norms on car-buying decisions. Our results indicate that social norms play a significant role in driving the demand for heavyweight passenger cars across most social groups, while the desire for social esteem leads some groups in particular to purchase SUVs and off-road vehicles. By taking society's heterogeneity into account, we show that social norms are group-specific and not universal in society, though car choice is always to a certain extent influenced by social norms and ranges from between 24% and 42% in our model calculations. The novel approach taken in this research can be applied beyond the mobility sector to other environmentally significant consumer behaviors.

Keywords: Social norms; milieus; sport utility vehicles; multi-criteria decision analysis

1 Introduction

As do legal norms, social norms restrict and frame behavior patterns. Human behaviors, in which the influence of social norms was substantiated, are as varied as energy use [1], smoking [2], eating behavior [3], and gender roles [4]. Many studies focus on the effects of social norms on pro-environmental behavior (see [5] for an extensive review), trying to make pro-environmental norms salient and prompt norm-compliant behavior. These social norms are aiming to frame decisions on the use of resources or of technologies towards resource efficiency and energy conservation. Existing social norms frequently do not support sustainability transformations, and the transition of energy systems in particular; however, behavioral tipping might be elicited by targeted policy measures [6] if social norms and underlying structural drivers are known and understood. One such example seems to be mobility behavior, i.e. people's choices in mode of travel.

Societal trends regarding people's mobility in Western countries over the last century have been characterized by increasing private motorization and personalized everyday travel and commuting over ever-larger distances [7, 8, 9]. At the same time, the transport sector is one of the main drivers of global climate change, contributing around 25 % of the world's global carbon dioxide (CO_2) emissions in 2017 [10]. In Germany, its share lies at 18.1 % of national CO_2 emissions (without accounting for international air travel), 60 % of which are caused by the use of cars, with an overall increase in emissions observed in recent years [11]. Some technological trends in the car sector have led to reductions in emissions, like an increasing use of cars running on new, environmentally friendly technologies (i.e., electric and hybrid electric vehicles) [12]. However, a growing number of newly registered cars with internal combustion engines counters this development. In particular, sales of gas-guzzlers, i.e. heavier cars with comparatively high fuel consumption (e.g. sport utility vehicles (SUVs)), are booming [13]. The trend in consumer preferences towards such cars can be observed not just in Germany but constitutes a worldwide phenomenon [14]. Since these cars are linked with high demand for resources (needed for their construction) and emissions, it runs counterintuitive to demands of sustainability. In order to foster the transition of the mobility sector towards sustainability, changes in behavior patterns are needed[1]. Policy measures that successfully induce such changes towards more sustainable behaviors can only be created if developments such as the trend towards ever-larger cars and its underlying drivers, such as social norms, are properly understood. Thus, by using the example of car purchases by private households in Germany, while taking the heterogeneity of households into consideration, we assess the meaning of social norms for a transition of the mobility sector towards sustainability.

Based in various disciplines – first and foremost social psychology and economics, but also sociology (e.g. [15]), anthropology (e.g. [16, 17]), and neuroscience (e.g. [18]) – social norms literature can be clustered into two groups: Social norms are studied on a theoretical basis in both psychology (e.g. [19, 20, 21]) and economics (e.g. [22, 23, 24]), or empirical basis, which can be further divided into laboratory experiments (e.g. [25] in psychology, or [26, 27, 28] in economics) and field research where behaviors are observed and the underlying social norm motivation determined. Field studies in social norm research can be either purely observational [29, 30] or focus on social norm interventions, where nudges, i.e. changing the physical environment [31, 32], or information messaging (e.g. [33]) are utilized to make social norms salient in order to change behaviors or guide it in a certain direction.

[1] At present, SUVs show disadvantages with respect to fuel consumption as well as to demand for resources needed for their production. As SUVs become more environmentally friendly in terms of emissions as well as demand for metallic and non-metallic resources, less or even no behavior changes might be necessary. However, it is highly unlikely that heavyweight cars like SUVs become less detrimental to the environment compared to, e.g., a medium-sized car.

Reviewing the empirical literature shows, a broad range of behaviors is studied to determine social norms' influence on them. Many studies focus on the effects of social norms on pro-environmental behavior, but their study goes well beyond. Examples of research into social norms and their wide-ranging themes are: Recycling [34, 35, 36, 37, 38], energy use and conservation [1, 33, 39, 40, 41, 42], participation in community energy projects [43] and collective action in general [44], smart meter adoption [45, 46], eating behavior [3, 47, 48, 49, 50, 51], gender issues and inequality [4, 52, 53], smoking and drug use [2, 29, 54, 55], graffiti and littering [56, 57], reporting corruption [58], and the avoidance of certain stocks on the stock market [59].

In transport in particular, behaviors studied in relation to social norms are the adoption of electric vehicles [46, 60, 61, 62], bicycle use [63], use of public transport [64, 65, 66], air travel [30], decisions on mobility in general [67], buying fuel-efficient vehicles [68], driving behavior [69, 70], and car-use reduction [71].

The breadth of research into social norms is staggering; but whereas most studies try to determine the influence of social norms by attempting to elicit behavior changes via social norm interventions, few actual purchasing behaviors are analyzed in terms of effects social norms may have on them. No longer surprising then, that the quantification of social norm influence in an observed behavior is also seldom undertaken. Many of the articles named above bring attention to the importance of social norms; Cialdini and Griskevicius et al. [72, 73] even assert that the influence of social norms is underestimated. However, the underlying motivation for any behavior is always a mixture of factors, among which social norms can be frequently found, as for example [62] show. Ex-post analyses of motives for an exhibited behavior usually do not explicitly contain social norms, since stated motives have two major limitations [74]: First, they are conventional responses, since motivation for most actions is so complex – rooted in psychology, biology, and social factors – it is beyond the comprehension of actors [75]. Second, stated motives differ from the truth because of social desirability and similar phenomena [76]. Thus, to quantify the actual influence of social norms in an observed behavior on the basis of stated motives is fraught with difficulty. Our research, presented in this article, is a first concerted effort quantifying the influence of social norms in purchasing decisions on the bases of stated motives.

We explore the possibility that the social context consumers face is the main factor behind their propensity to prefer heavy cars (i.e. SUVs). For this, we assume the car-buying decision of a consumer to be embedded in a social context, so that she/he not only accounts for self-centered personal motives in her/his decision but also actions and reactions of other individuals around her/him [77]. Car-buyers show a large amount of heterogeneity with respect to motives and hence, rank characteristics of cars differently. Additionally, the social influence on purchasing decisions likely differs among car-buyers. In order to assess the influence of social norms on car-buying decisions and assess whether social norms jeopardize a transition towards sustainable mobility, we combined theoretical assumptions (i.e. the share of normative social influence in motives to buy a certain car type) with empirical secondary data (i.e. data on different social groups, i.e. social milieus, on milieus' preferences regarding car types, on ratings of exemplarily chosen car types, and on attitudes towards car characteristics) and created a model applying a multi-criteria decision analysis approach. Thus, Section 2 will elaborate on theoretical foundations and connections of social context, social norms, and milieus. Section 3 will analyze the importance of social norms underlying stated motives in car-buying decisions. Section 4 will attempt to quantify the influence of social norms in car-buying decisions applying a multi-criteria decision analysis, and in Section 5 conclusions will be drawn.

2 Social context, milieus, and social norms

In a study conducted by Bamberg, Hunecke, and Blöbaum [64] two cities – Dortmund and Frankfurt – where compared in terms of people's choice in mode of travel. Since both cities are of similar size and feature corresponding infrastructure, especially in regard to transport, no great differences in travel behavior were to be expected. Indeed, Dortmund's inhabitants exhibited a far greater propensity to use cars (58 %) in daily commutes, while in Frankfurt only 40 % did so by car, favoring public transport instead. Thus, in a society predominant behaviors are frequently not homogenous; they vary among smaller entities within society. Though some conditions such groups face may be similar, warranting the expectation of observing analogous behaviors (as was highlighted by the example above), a holistic scrutiny of all characteristics will reveal their differences. We define the entirety of those characteristics typifying a social group as its **social context** (see also [78, 79]). They influence the options for action of actors, who are pursuing certain goals, and thus weighing different alternative actions, while at the same time usually not being able to directly influence or shape them as single actors within civil society. These characteristics, i.e. boundary conditions, include descriptive and injunctive social norms, but also legal frameworks, market prices, (un)employment, subsidies, household structures, generally shared values, aesthetic preferences, and the social history of a social group.

Taking the research findings by Bamberg, Hunecke, and Blöbaum [64] and others (e.g. [80, 81]), which ascribe behavioral differences to dissimilarities of social contexts, into account, we go about evaluating the influence of social norms while integrating society's heterogeneity. A way to depict diversity in society is the **milieu** approach, which creates a manageable amount of sub-groups without being too differentiated and too complex [82]. Milieus are essentially the social groups of the social context definition above, and can be delineated as large groups of people that distinguish themselves through group-specific forms of existence (situational and subjective characteristics making up the social context) and increased internal communication [82]. There exist several milieu models of German society, most created in the 1970s and 1980s: the "Experience Society" by Schulze [83, 84], the "Lifestyle Groups" by Gluchowski [85], the "Sinus-Milieus" by the Sinus-Institute [86], and the concept by Vester et al. [87] based on the latter.

The Sinus-Milieu approach – the model among them that prevailed and is to this day broadly applied in science and politics (e.g. [88]), but mainly marketing – is also ideal for our purposes. It is continually updated, was verified by countless quantitative studies [89], and focuses on target groups and their distinct consumption behavior when applied in marketing [90] and environmental awareness studies [88, 91]. It has also been proven to be the best explanatory model for variations in mobility behavior in a sociological study focused on Austria [92, 93]. All this makes it well-suited to look at car-buying behavior as environmentally relevant consumption. Usually the Sinus-Milieu approach is criticized for its lack of transparency [94]: neither the questionnaire used for identification of the Sinus-Milieus nor the rules to generate the typology are publicly available [95]. Despite this limitation, Sinus-Milieus is a well-established approach used both in research and the business world. Because of that, it is being kept up to date continuously and lends itself well to secondary data research such as this. Hence, we use it as an example for clustering a country's population with respect to attitudes and for showing impacts of heterogeneity in society on socio-technical changes (for more details on Sinus-Milieus see section 3.2.1).

Being inherently implicit, **social norms** are the most ambiguous and elusive part of the social context. At times defined as shared behavioral rules in a social group in part sustained by its members' approval or disapproval [44, 96], they remain unwritten and as such become somewhat tangible only through exhibited behaviors. Thus, another strain of definitions focuses on the rules' impact: on prevalent behavioral patterns in social groups (e.g. [6, 97]). Important characteristics of social norms within the context of this article are (for an extended discussion see [5]): they are only conditionally followed, and

therefore depend on external enforcement like sanctions, observability, and normative expectations; descriptive (the majority's behavior within a social group) and injunctive social norms (behavior (dis)approved or believed to be (dis)approved) are the two main categories of social norms; and they are partially internalized via socialization within one's milieu.

As described above, the social context, and thus also social norms, shape individual choices and preferences. With their help a selection among alternatives is made – in our case among cars. People may choose what they prefer, but their preferences frequently conform to social norms prevalent among their peers. Through partial internalization social norms also become inseparable from individual motives of people because of the process of socialization (see also [98, 99]). During that process of socialization norms, values, and other subjective characteristics of a person's milieu are internalized as a result of interactions with significant others of the same milieu over long periods of time. Hence, social norms are shared within a milieu, but different milieus are under the influence of different norms.

In the remainder of this article, we will go into depth on normative social influence – a term coined by Deutsch and Gerard [100] meaning the "influence of norms on behavior that is the result of a person's desire to gain social approval or to avoid social sanctions" [101] – when people purchase a car.

3 Estimating the normative social influence in car-buying decisions

In our study, we proceed as follows (see Fig. 1): Firstly, we analyze the normative social influence in car-buying decisions for the entire German population by using data on stated motives. In a second step, we employ multi-criteria decision analysis to take a closer look at the differences between the different social milieus in German society when it comes to buying cars.

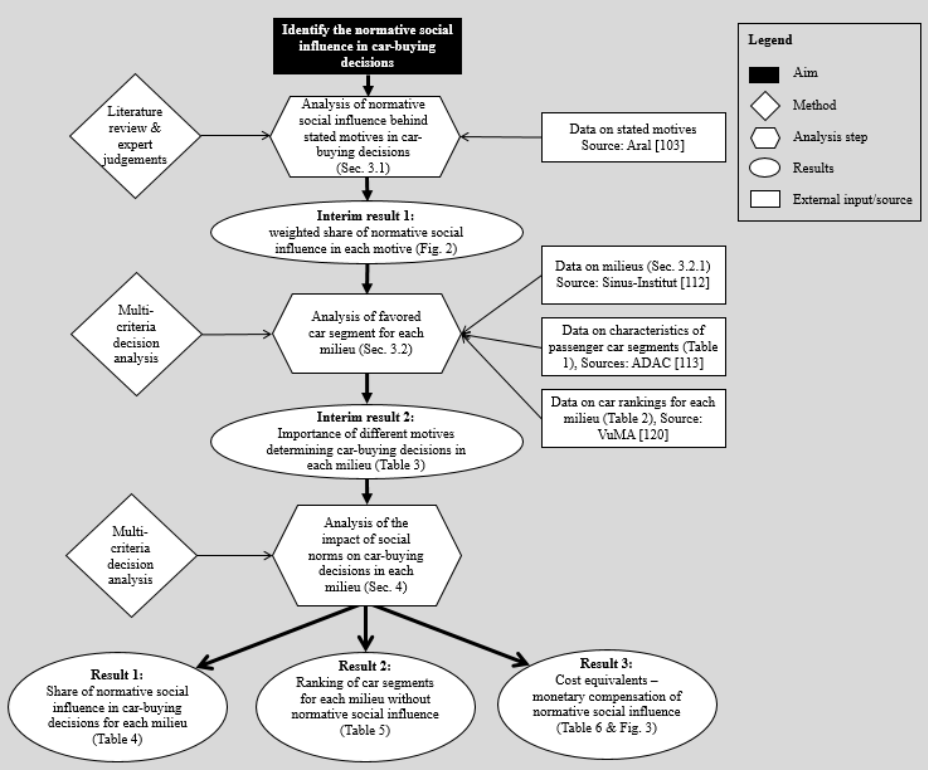


Fig. 1. Flow chart of this study's analysis steps, including the main methods, sources, and results.

Thirdly, we assess the share of normative social influence in car-buying decisions for each milieu, the ranking of car segments for each milieu without normative social influence, and draw conclusions on the monetary compensation of normative social influences. The main secondary data sources we used for these analyses are described in Box 1.

Box 1

Main data sources used in this study.

The General German Automobile Association (**ADAC**, *Allgemeiner Deutscher Automobil-Club e.V.* in German) regularly publishes ratings of all cars available on the German market. ADAC [102] assesses different criteria important in cars by taking more than 300 sub-criteria into consideration. The criteria are graded by using a scale from 1 to 5 (with additional markups and markdowns resulting in 0.6 (best) to 5.6 (worst)) and grouped into key characteristics. Safety, for example, is assessed by grading among others the availability and functionality of intelligent assistance systems, results of New Car Assessment Programme (NCAP) crash tests, child safety, and protection of pedestrians. The great number of criteria in combination with markups and markdowns restrict the transparency of the grading. However, since the ADAC is an independent association and collects data on individual cars autonomously (e.g. by testing each car) and by applying a standardized list of parameters it is a unique source for assessing cars.

Since the year 2003 **Aral**, a German company and subsidiary of BP selling automobile fuels and operating petrol stations, regularly conducts surveys on motives for buying cars and on attitudes towards car characteristics. The surveys are conducted as representative studies with more than 1,000 participants from all parts of Germany. Among the respondents are usually some 300 people with concrete plans to buy a new car. All participants are asked to answer 40 questions on attitudes and motives [103].

The Consumption and Media Analysis (**VuMA**, abbreviated from the German: Verbrauchs- und Medienanalyse), i.e. VuMA Touchpoints, is a market and media study conducted annually since 1995 in Germany by a consortium of three advertising agencies (ZDF Werbefernsehen, ARD-Werbung Sales & Services, and RMS Radio Marketing Service). VuMA Touchpoints 2019 [104] is based on 23,000 interviews, resulting from a rolling sample survey with four waves: Around 5,750 interviews were conducted in winter 2016, spring and winter of 2017 and winter 2018. Data collection is split into personal interviews and supplementary household books, respondents fill out themselves. In these household books respondents provide information on their consumption behavior. The survey focuses on general habits of buying, ownership, usage, or consumption of more than 1,000 different kinds of goods. Results of the survey are representative for the German-speaking population aged 14 years and older and thus can be extrapolated to approximately 70.60 million people in Germany. Clustering respondents into a large number of sub-groups can impact the representativity of behavior and investment decisions of a group; however, the large sample allows them to apply the Sinus-Milieu approach.

3.1 Stated car-buying motives

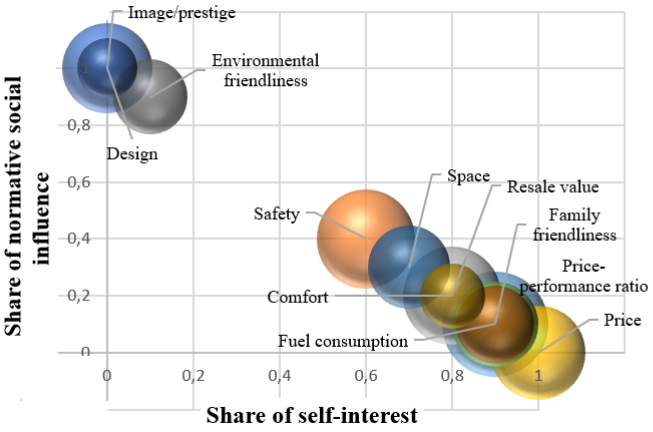
According to Aral [103], there is a broad range of motives that determines the purchasing decision concerning specific car categories, i.e., car segments. As essential criterion, the price-performance ratio

is listed, followed by comfort, safety, design, and price. Also, image/prestige and environmental friendliness are mentioned as criteria.

The valuation of each car segment's characteristics by people when buying a car, are in varying degrees influenced by these people's social context. Without extensive research with the help of surveys and discrete choice experiments, it is difficult to assess the amount of normative social influence in each stated motive. Here, we approached the issue in two stages: First, we looked at stated motives with no direct connection to physical characteristics of cars. Second, we took a closer look at all the other car-choice motives considering whether they contain normative social influence.

As motive with no direct link to physical car characteristics, we identify "image/prestige". "Image/prestige" describes the standing or reputation of something or someone. The two terms, while frequently used as synonyms and ascribed to certain disciplines – prestige is the main term in sociology, image is dominant in the marketing world [105] – are not identical in meaning. Prestige describes the social recognition or reputation given to a person because of their social position and role or because of individual achievements in that position [106]. This perception by others of someone is determined by the material or physical resources seen to be in that person's possession [107]. Thus, prestige can be gained through accomplishments, but also through the acquisition and presentation of status symbols [108], or conspicuous consumption as Veblen [109] coined it. More pertinent, image is the "emotionally charged picture a person or several people have of themselves, of other people, of groups, organizations, milieus or of certain objects or material and social conditions. (...) The image of a person, an object, an activity (...) is the subjectively evaluated picture of reality, determined and processed by social and cultural guiding principles and selective social perceptions" [110]. Those social and cultural guiding principles are non-other than social norms. A positive image describes what someone perceives the social group, to which she/he wants to belong to or belongs to, approves of. In contrast to "image/prestige", other motives cannot be connected to social norms as easily. Motives like "environmental friendliness", "comfort", and "safety" strongly depend on actor-specific assessments of cars' physical characteristics. They assess these factors subjectively and are partially influenced by social context and social norms in their assessment – to what extend is difficult to determine definitively.

Physical characteristics, which are linked to "environmental friendliness", are a car's specific emissions of carbon dioxide and particulate matter, but also consumption of resources or noise pollution. Whether a person considers these characteristics important, depends very much on values strongly influenced by social norms. In the case of "comfort" the car buyers assess physical factors like sitting comfort for the driver, temperature and acceleration. Here too, they assess these factors subjectively. The increasing demand for cars to be equipped with seat heating in Germany [111] can be traced back to demographic developments (increases in the population's average age) or changes in weather conditions in part, but it can also be explained by normative social influence. Regarding "safety" it can be observed that the list of safety features has increased. A great share of them have been pushed by regulations. However, features like lane departure warning systems, forward collision warning systems, and adaptive headlights are becoming trendy. The diffusion of such features, and hence part of the motive "safety" can be linked to social norms. The degree, to which motives like "environmental friendliness", "comfort", and "safety" are influenced by social norms, is down to high uncertainty. Thus, we decided to use ranges for the share of normative social influence in each stated motive as a first-guess approximation. Fig. 2 shows the weighted share of normative social influence in each stated motive, calculated on the basis of the median of the assumed ranges, and contrasted to the share of self-interest, i.e. a focus on personal needs with complete disregard for the social context and others' needs.



Stated motive	Share of self-interest	Share of normative social influence	Rating* of the motive's importance
Price-performance ratio	0,9	0,1	51
Safety	0,6	0,4	44
Comfort	0,8	0,2	43
Price	1	0	40
Design	0	1	37
Fuel consumption	0,9	0,1	33
Space	0,7	0,3	31
Family friendliness	0,9	0,1	27
Environmental friendliness	0,1	0,9	25
Resale value	0,8	0,2	19
Image/prestige	0	1	16

Fig. 2. Stated motives for buying a car of a particular car segment clustered according to their underlying share of self-interest and normative social influence.
Note: *As rating of a motive's importance we used the number of times a motive was mentioned in the survey by Aral [103].
Source: Authors' conception.

Assuming an uncertainty range of 25 %, i.e. undervaluing or overvaluing the share of pure self-interest, the share of social norms' influence in the overall rating of motives (calculated as sum of weighted shares of normative social influence) ranges between 22 % and 59 %.

3.2 Car buyers and their cars characterized

3.2.1 The heterogeneity of actors – The Sinus-Milieus

In the section above, we used clustering of motives as a first approximation to distinguish between those motives completely self-centered and those partially generating a benefit for the individual through the influence of her/his social context. However, the list of motives as well as the individual motives' importance varies from actor to actor. For example, some actors might pay more attention to ecological impacts, while others give the car's design top priority. Since social norms and their influence depends on the social group to which an actor belongs (see Section 2), we did not focus on actors' heterogeneity at the individual level but the group level.

The Sinus-Milieus – the approach mentioned above and introduced in 1978, aiming to provide information on values, lifestyles, and attitudes – identify ten milieus in German society [112]:

1. "Traditionals": This group of actors consists of individuals, which belong to the security- and order-loving older generation. Thriftiness and adaptation where necessary, along with a rising sense of being left behind, are critical characteristics of this group.
2. "Precarious": The Precarious are actors of the lower class in search of social inclusion, who exhibit a desire to keep up with consumer standards of the middle classes.
3. "Hedonists": Hedonists are individuals of the modern lower class/low-middle class, for whom fun and adventure are very important.
4. "Modern Mainstreamers": Modern Mainstreamers represent individuals of the middle class, for whom security is of utmost importance, and thus seek to become established at a professional and social level.
5. "Adaptive Navigators": Young individuals with a pragmatic outlook on life and sense of expedience. They are prepared to adapt, but also keen to belong and value social ties.
6. "Social Ecologicals": This group consists of socially engaged individuals with normative notions about ecology and society.

7. “Established”: Individuals that have a sense of status, show a success ethic, and seek exclusivity and leadership form the Established Conservative milieu.
8. “Liberal Intellectuals”: Individuals belonging to the “Liberal Intellectuals” have a postmaterial and liberal outlook and a strong desire for self-determination and personal development.
9. “Performers”: “Performers” consist of IT minded individuals with a global economic outlook.
10. “Cosmopolitan Avant-gardes”: These individuals are trendsetters beyond the borders of a single country by being mentally, culturally, and geographically mobile and by constantly seeking new frontiers and new solutions.

3.2.2 The heterogeneity of cars – Car segments and their characteristics

Not only actors but also cars differ widely (concerning, e.g., costs, comfort, design, safety). Hence, for an appropriate assessment of changes in car stock, it is crucial to consider the characteristics of cars. Table 1 shows the rating of characteristics of a car model chosen as an example for each car segment, by evaluating each car along the lines of the aforementioned motives for choosing a specific car. SUVs, for example, offer more space than small cars, while the latter are much lower in fuel consumption and price. Note, that we did not include design in Table 1 since it is difficult to assess a characteristic as subjective as car design. Furthermore, design is significantly influenced by car brand, not only car segment.

Table 1

Rating of characteristics for each car segment.

Sources: [113, 114, 115].

	Car segment								
	Mini cars	Small cars	Medium cars	Large cars	Executive cars	Luxury cars	SUVs	Off-road vehicles	Minivans
*Example selected for illustration**	Volks-wagen up!	Volks-wagen Polo	Volks-wagen Golf	Volks-wagen Passat	Volks-wagen Arteon	Audi A8	Volks-wagen T-ROC	Volks-wagen Tiguan	Volks-wagen Sharan
Share in car sales (04/2019)	6.8	12.9	20.5	10.4	3.4	0.9	19.5	9.4	3.5
Price-performance ratio	3.5	4.2	4.1	3.8	3.1	3.2	4	3.9	2.9
Comfort	3.4	3	3.9	4.3	4	4.7	3.5	3.8	3.2
Safety	3.8	4	4.1	4.6	4.5	3.9	4	4.3	4.7
*Price***	3.9 (14000 Euro)	3.6 (17200 Euro)	3.1 (24000 Euro)	2.2 (35000 Euro)	1 (52000 Euro)	1 (74500 Euro)	3.1 (24000 Euro)	2.5 (31000 Euro)	1.8 (39600 Euro)
*Fuel consumption****	3.7 (5.2 l/100 km)	3.5 (5.4 l/100 km)	3.1 (5.8 l/100 km)	2.8 (6.1 l/100 km)	2.7 (6.2 l/100 km)	1 (7.8 l/100 km)	2.4 (6.5 l/100 km)	1.8 (7.0 l/100 km)	1.6 (7.2 l/100 km)
*Space*****	2.4	2.9	3.2	3.8	3.2	3.4	3.1	3.6	4
*Resale value******	2.9	3.7	3.7	3.8	3.7	4.1	4.2	3.8	3.1
Image/prestige	2	2	3	3	4	5	4.5	4.5	2
*Environmental friendliness *******	3.6 (119 g CO_2/100 km)	3.4 (125 g CO_2/100 km)	3.1 (135 g CO_2/100 km)	2.8 (145 g CO_2/100 km)	2.2 (161 g CO_2/100 km)	1.1 (196 g CO_2/100 km)	2.1 (165 g CO_2/100 km)	1.7 (177 g CO_2/100 km)	1.6 (182 g CO_2/100 km)
Family friendliness	1.5	2.7	3.2	4.2	3.3	3.6	3.4	3.6	4.7

Note: The choice to use the most popular car model in each segment could not be made, because that would have included different brands making comparison difficult. Thus, the most popular Volkswagen model in each car segment was chosen as an example (except in the segment of luxury cars). Even within one model, there are different versions with significant variations in technical features. All models compared here are equipped with petrol engines. The specific models chosen are:

VW up! 1.0 white up!, VW Polo 1.0 TSI Comfortline, VW Golf 1.4 TSI ACT BMT Comfortline, VW Passat Variant 1.4 TSI BMT ACT Highline, VW Arteon 2.0 TDI SCR Elegance 4MOTION DSG, VW T-Roc 1.5 TSI ACT Sport, VW Tiguan 1.4 TSI ACT Comfortline, VW Sharan 2.0 TDI SCR BMT Comfortline DSG, Audi A8 3.0 TDI quattro tiptronic

ADAC assessed [113] the characteristics by using a rating scale ranging from 1 to 5 with 1 being best and 5 worst. Since we are looking for highest performance, we inverted the scale (1 as the worst value to 5 as the best value).

** Prices are converted into the rating scale by assuming 50.000 Euro as worst value;

*** Fuel consumption is converted by assuming 4 l/km as best and 7 l/km as worst value;

**** Space is assessed by using the information on different kinds of loading capacities as well as information on space for passengers;

***** The source for resale values is [115]

****** Environmental friendliness is converted into the applied rating scale by assuming 75 g CO_2/100 km as best and 200 g CO_2/100 km as the worst value.

3.3 Assessment of the favored car segment

As stated earlier, we expect that when purchasing a car, social norms play a crucial role in the choice of car model. Of course, the same can be argued for the choice between different car brands. However, since we seek to understand the reasons behind the particular decision to purchase large and heavy cars, e.g. an SUV, we hypothesized that SUVs would not be bought in such large quantities if social norms were disregarded during the purchasing decision. In the following section, we assess the decisions of private households to opt for a car of a specific segment by applying a multi-criteria approach or multi-criteria decision analysis (MCDA) (see e.g. [116, 117]). This approach is based on the assumption that a group of actors will opt for a particular car category if the category shows more advantages for the group of actors than any other category [118, 119].

In the databases we use for this study, information on the characteristics of car categories is measured independently of other car categories' assessment values. The same metrics are used for each characteristic. Thus, a normalization of the characteristics is not necessary.

Taking the weighting factors into consideration, the attitude of actor group *a* towards car category *k* can be assessed as follows:

$$P_k^a = \sum_{i=1}^{m} w_i^a * u_i^k \quad (1)$$

with

P_k^a: performance index of car category *k* assessed by actor group *a*
m: number of car characteristics under consideration
w_i^a: weighting of characteristic *i* by actor group *a*
u_i^k: value of characteristic *i* assigned to car category *k*

As mentioned above, each group will choose the car segment with the highest performance index.

3.4 Assessment of milieu-specific weightings of cars' characteristics

Information on the rating of characteristics in general is provided by [103]. Unfortunately, there is no data on the weightings of cars' characteristics by the different milieus available. Such data can be generated via surveys. But taking into consideration that surveys are time consuming and pre-studies can help to increase the possible success of a survey, we decided to test a new approach: Since for each milieu data on the ranking of the favored car categories is available, we identify which sets of weightings of the characteristics support this order. Using key characteristics of the Sinus-Milieus (e.g. age, income, attitudes towards green products, profession) as selection criteria we retrieved information from VuMA Touchpoints [120] on the car categories the corresponding groups want to buy if they have to replace their car. As a result, we get information on the share of each car category in the overall demand for new cars. Next, we rank the car categories based on these shares.

We apply a weighting range between 0 (characteristic is not relevant for the actor group) and 5 (characteristic is very important for the actor group), increase the weightings of the different groups of actors in steps of 0.25 points, and collect all weighting sets that result in the same order of performance indices for each car category compared to those empirically observed by [120]. Table 2 shows the order of most desirable car segments for each milieu that serves as basis for the search of the weightings.

In principle, a given ranking of car categories by a group of actors can be explained by different sets of weighting factors: An attitude towards "Medium cars" as an example, can be a result of importance placed on price performance in combination with less interest in image/prestige, or a lower ranking of price performance in combination with less interest in comfort. The number of possible combinations of weighting factors becomes smaller if the combination of weighting factors has to support the ranking of all car categories: For "Traditionals", for example, the weightings of the car characteristics must be such that "medium cars" are ranked higher than "small cars" and "small cars" are preferred to "large cars". By modifying the weighting factors, we look for sets of factors that support the rankings. Even if the assumed ranking restricts the solution space, the large number of characteristics, which have to be weighted, results in a great number of possible combinations of plausible weighting sets.

Table 2

The four most desirable car segments for each Sinus-Milieu ("Ranking 2019").

Source: [120].

Sinus-Milieu	Ranking			
	First place	Second place	Third place	Fourth place
Traditionals	Medium cars	Small cars	Large cars	Mini cars
Precarious	Small cars	Medium cars	Mini cars	Large cars
Hedonists	Small cars	Medium cars	Large cars	Mini cars
Modern Mainstreamers	Medium cars	Large cars	Small cars	SUVs
Adaptive Navigators	Medium cars	Large cars	SUVs	Small cars
Social Ecologicals	Medium cars	Large cars	Small cars	SUVs
Established	Medium cars	Small cars	Large cars	SUVs
Liberal Intellectuals	Large cars	Medium cars	SUVs	Off-road vehicles
Performers	Off-road vehicles	SUVs	Large cars	Medium cars
Cosmopolitan Avant-gardes	Medium cars	Small cars	Large cars	SUVs

The identified values reflecting the weightings of the characteristics by the milieus are presented in Table 3. The table shows the mean values for each characteristic, the standard deviation as well as the total number of sets of weightings fulfilling the requirements regarding the order of car categories. According to this table, the motives determining the car-buying decision of a particular car carry significantly differing weights among different milieus. For example, car-users of milieus with a high likelihood of children likely emphasize family friendliness, while Social Ecologicals are interested in environmental friendliness and fuel consumption.

Table 3

Importance of the different motives determining car-buying decisions in each milieu.

Source: Own calculation; milieu characteristics from [88].

		Lower / lower-middle classes			Middle classes			Upper classes			
		Traditionals	Precarious	Hedonists	Modern Mainstreamers	Adaptive Navigators	Social Ecologicals	Established	Liberal Intellectuals	Performers	Cosmopolitan Avant-gardes
Characteristics (typical)	*Share of population*	11%	9%	15%	13%	11%	7%	10%	7%	8%	9%
	Age - core group	>60	>50	<50	>40	<50	>30	>50	40-60	30-50	<30
	Type of household	women/ widowed	single/ widowed/ divorced	Single	married/ children	married/ children	women/ married and divorced	married	married/ children	single	single
	Profession	pensioners	blue-collar workers/ employees	blue-collar workers/ employees	mid-level workers/ employees	mid-level/ qualified workers/ employees	qualified employees/ freelancers	qualified employees/ freelancers/ clerks	qualified employees/ freelancers	qualified employees/ freelancers	qualified employees/ education
Price-performance ratio		3.3 (Std. 0.35)	2.0 (Std. 0.35)	2.0 (Std. 0.35)	2.1 (Std. 0.34)	3.5 (Std. 0.35)	3.5 (Std. 0.35)	3.0 (Std. 0.35)	1.3 (Std. 0.35)	2.9 (Std. 0.34)	2.0 (Std. 0.35)
Price		2.2 (Std. 0.34)	3.0 (Std. 0.34)	2.1 (Std. 0.32)	1.8 (Std. 0.31)	2.1 (Std. 0.31)	1.9 (Std. 0.33)	3.0 (Std. 0.34)	1.1 (Std. 0.34)	1.0 (Std. 0.31)	2.6 (Std. 0.33)
Resale value		1.3 (Std. 0.35)	2.0 (Std. 0.35)	2.2 (Std. 0.34)	1.3 (Std. 0.35)	1.3 (Std. 0.35)	1.3 (Std. 0.35)	2.0 (Std. 0.35)	0.7 (Std. 0.35)	0.9 (Std. 0.22)	2.5 (Std. 0.35)
Environmental friendliness		2.3 (Std. 0.35)	2.3 (Std. 0.34)	2.6 (Std. 0.34)	2.0 (Std. 0.34)	1.0 (Std. 0.34)	2.9 (Std. 0.34)	1.6 (Std. 0.34)	1.4 (Std. 0.32)	2.0 (Std. 0.29)	2.6 (Std. 0.34)
Fuel consumption		2.8 (Std. 0.35)	2.8 (Std. 0.35)	3.5 (Std. 0.34)	2.5 (Std. 0.35)	1.5 (Std. 0.34)	2.2 (Std. 0.34)	2.3 (Std. 0.35)	2.1 (Std. 0.32)	1.2 (Std. 0.23)	2.6 (Std. 0.34)
Image/Prestige		0.7 (Std. 0.33)	0.6 (Std. 0.29)	1.0 (Std. 0.25)	1.2 (Std. 0.26)	1.2 (Std. 0.25)	1.4 (Std. 0.31)	0.9 (Std. 0.29)	2.0 (Std. 0.28)	4.0 (Std. 0.29)	1.5 (Std. 0.25)
Family friendliness		0.8 (Std. 0.20)	0.7 (Std. 0.20)	1.1 (Std. 0.19)	0.7 (Std. 0.20)	1.0 (Std. 0.20)	1.0 (Std. 0.20)	1.0 (Std. 0.20)	1.0 (Std. 0.20)	1.0 (Std. 0.20)	0.5 (Std. 0.20)
Comfort		3.0 (Std. 0.34)	1.5 (Std. 0.34)	1.1 (Std. 0.33)	1.5 (Std. 0.34)	2.0 (Std. 0.34)	2.3 (Std. 0.34)	2.0 (Std. 0.33)	2.0 (Std. 0.35)	2.0 (Std. 0.34)	1.4 (Std. 0.33)
Space		0.8 (Std. 0.35)	1.0 (Std. 0.34)	1.1 (Std. 0.33)	1.4 (Std. 0.34)	1.2 (Std. 0.34)	1.1 (Std. 0.34)	1.2 (Std. 0.35)	2.0 (Std. 0.35)	3.0 (Std. 0.25)	2.5 (Std. 0.35)
Safety		0.5 (Std. 0.205)	0.5 (Std. 0.205)	0.5 (Std. 0.20)	2.0 (Std. 0.20)	1.7 (Std. 0.20)	1.8 (Std. 0.20)	1.7 (Std. 0.20)	2.0 (Std. 0.20)	1.8 (Std. 0.20)	1.0 (Std. 0.20)
Number of sets		1750936	1731720	669907	793690	655989	1601369	1356030	1424656	54967	996359

Note: Std.: standard deviation

The weightings listed in Table 3 serve as starting points for an assessment of the impact of social norms on car-buying decisions: In a first step, we set the weightings for "image/prestige" to zero and calculate new performance indices by employing Eq. 1. Based on these indices, we assess changes in the order of car categories. The results are forming the "Prestige does not matter" scenario. In a second scenario ("Without normative social influence"), we consider that not only "image/prestige" but also other motives are partially influenced by social norms. Taking information on the shares of "self-interest" and "normative social influence" in each motive into consideration (Fig. 2), we adjust the weightings by focusing on the share of self-interest and recalculate the performance indices.

4 Results

Table 4 shows the shares of "self-interest" and "normative social influence" across all motives for each Sinus-Milieu. The shares are calculated by adding up the weightings presented in Table 3 multiplied by the characteristic's specific shares from Fig. 2.

Table 4

Assessment of the shares of "self-interest" and "normative social influence" across all car-choice motives.

Source: Authors' calculations.

	Lower / lower-middle classes			**Middle classes**				**Upper classes**		
	Traditionals	Precarious	Hedonists	Modern Mainstreamers	Adaptive Navigators	Social Ecologicals	Established	Liberal Intellectuals	Performers	Cosmopolitan Avant-gardes
Share of "self-interest"	74 %	74 %	71 %	69 %	75 %	68 %	76 %	65 %	58 %	68 %
Share of "normative social influence"	26 %	26 %	29 %	31 %	25 %	32 %	24 %	35 %	42 %	32 %

According to this table, the shares of self-interest are higher for the Sinus-Milieus "Traditionals," "Precarious", "Adaptive Navigators", and "Established", whereas the upper class pays more attention to social norms. It also highlights that each milieu is to a certain extent prone to consider self-interest but always also social norms.

Results of the multi-criteria decision analysis excluding normative social influence are presented in Table 5. The row "Ranking 2019" vs. "Prestige does not matter" shows the impacts of changes in the weighting of "Prestige" on the overall preference for a particular car segment, the row "Ranking 2019" vs. "Without normative social influence" shows the same ranking when all normative social influence is not factored in.

Table 5

Ranking of car segments showing the most desirable car types for each Sinus-Milieu (with and without normative social influence).

Source: Authors' calculations.

	Traditionals			Precarious			Hedonists			Modern Main-streamers		
"Ranking 2019" vs. "Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"
	Medium cars	→	Medium cars	Small cars	→	Small cars	Small cars	→	Small cars	Medium cars	↗	Small cars
	Small cars	→	Small cars	Medium cars	→	Medium cars	Medium cars	→	Medium cars	Large cars	↗	Medium cars
	Large cars	→	Large cars	Mini cars	→	Mini cars	Large cars	↘	Mini cars	Small cars	→	Large cars
	Mini cars	→	Mini cars	Large cars	→	Large cars	Mini cars		Large cars	SUVs	↘	Mini cars
	...		..	...		..	...		..	...		..
"Ranking 2019" vs. "Without normative social influence"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"
	Medium cars	→	Medium cars	Small cars	→	Small cars	Small cars	→	Small cars	Medium cars	↘	Small cars
	Small cars	→	Small cars	Medium cars	→	Medium cars	Medium cars	→	Medium cars	Large cars	↘	Medium cars
	Large cars	→	Large cars	Mini cars	→	Mini cars	Large cars	→	Large cars	Small cars		Large cars
	Mini cars	→	Mini cars	Large cars	↘	SUVs	Mini cars	→	Mini cars	SUVs	→	SUVs
	...		..	...		..	...		..	...		..

	Adaptive Navigators			Social Ecologicals			Established			Liberal Intellectuals		
"Ranking 2019" vs. "Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"
	Medium cars	→	Medium cars	Medium cars	→	Medium cars	Medium cars	↘	Small cars	Large cars	→	Large cars
	Large cars	→	Large cars	Large cars	↘	Small cars	Small cars		Medium cars	Medium cars	→	Medium cars
	SUVs	↘	Small cars	Small cars		Large cars	Large cars	→	Large cars	SUVs	↘	Small cars
	Small cars		SUVs	SUVs	↘	Mini cars	SUVs	↘	Mini cars	Off-road vehicles	↘	Mini cars
	...		..	...		..	...		..	...		..
"Ranking 2019" vs. "Without Social aspects"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"
	Medium cars	→	Medium cars	Medium cars	→	Medium cars	Medium cars	↘	Small cars	Large cars	→	Large cars
	Large cars	↘	Small cars	Large cars	↘	Small cars	Small cars		Medium cars	Medium cars	→	Medium cars
	SUVs		Large cars	Small cars		Large cars	Large cars	→	Large cars	SUVs	→	Small cars
	Small cars	↘	SUVs	SUVs	→	SUVs	SUVs	→	SUVs	Off-road vehicles	↘	SUVs
	...		..	...		..	...		..	...		..

	Performers			Cosmopolitan Avantgardes		
"Ranking 2019" vs. "Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"	"Ranking 2019"		"Prestige does not matter"
	Off-road vehicles	↘	Large cars	Medium cars	↘	Small cars
	SUVs	↘	Medium cars	Small cars		Medium cars
	Large cars	↘	Small cars	Large cars	→	Large cars
	Medium cars	↘	Off-road vehicles	SUVs	↘	Mini cars
	...		..	...		..
"Ranking 2019" vs. "Without Social aspects"	"Ranking 2019"		"Without normative social influence"	"Ranking 2019"		"Without normative social influence"
	Off-road vehicles	↘	Large cars	Medium cars	↘	Small cars
	SUVs	↘	Medium cars	Small cars		Medium cars
	Large cars	↘	Off-road vehicles	Large cars	→	Large cars
	Medium cars	↘	Small cars	SUVs	→	SUVs
	...		..	...		..

The results of our calculations imply that normative social influence plays a significant role in the trend toward heavy cars such as SUVs. Without it, smaller cars rise in ranking becoming favorites in the middle- and upper-class milieus. Additionally, we find that social norms have different influences within each milieu, which points to the fact that in different milieus different social norms are prevalent. While in lower- and middle-class milieus the normative social influence seems to induce a preference for generally larger cars, the trend towards SUVs specifically seems to be a phenomenon of the upper-class milieus and the adaptive navigators, which are most receptive towards status effects through conspicuous consumption. Like Luxury cars and Off-road vehicles, SUVs seem to bear characteristics of a status good, as described by Veblen [121] that individuals mostly seem to buy to increase/solidify their social status since they perceive this behavior to be the social norm among their peers.

This is particularly problematic from the perspective of climate policy since these cars have worse scores for fuel-consumption and environmental friendliness, which most strongly manifests itself in SUVs by being cheaper and having a better price-performance ratio than the other status-affecting car types. The trend toward SUVs seems to coincide with the results of a theoretical model by Dasgupta et al. [77], where social approval by a status good leads to increased consumption of it, which is especially dubious

if the good causes negative externalities. As a result, consumption of the status good is much higher than what could be considered efficient, causing a high degree of negative externalities.

Since within the MCDA approach monetary and non-monetary factors are combined, it is possible to draw conclusions on how changes in non-monetary factors can be compensated by economic incentives. Using "Ranking 2019" vs. "Prestige does not matter" as example we can estimate the value of "image/prestige". In Figure 3 we present results of the MCDA indicating which setting of "prices" results in the ranking of SUVs as in the scenario "Prestige does not matter". According to the figure for milieus "Modern Mainstreamers" and "Social Ecologicals" the prices of SUVs have to increase by 40 % to fall to 5th place. Assuming 15 % higher prices (~3,500 Euro) than in the default situation the MCDA, calculations indicate that the "Adaptive Navigators" will rank SUVs in fourth place, as they did in the scenario where "image/prestige" is set to zero.

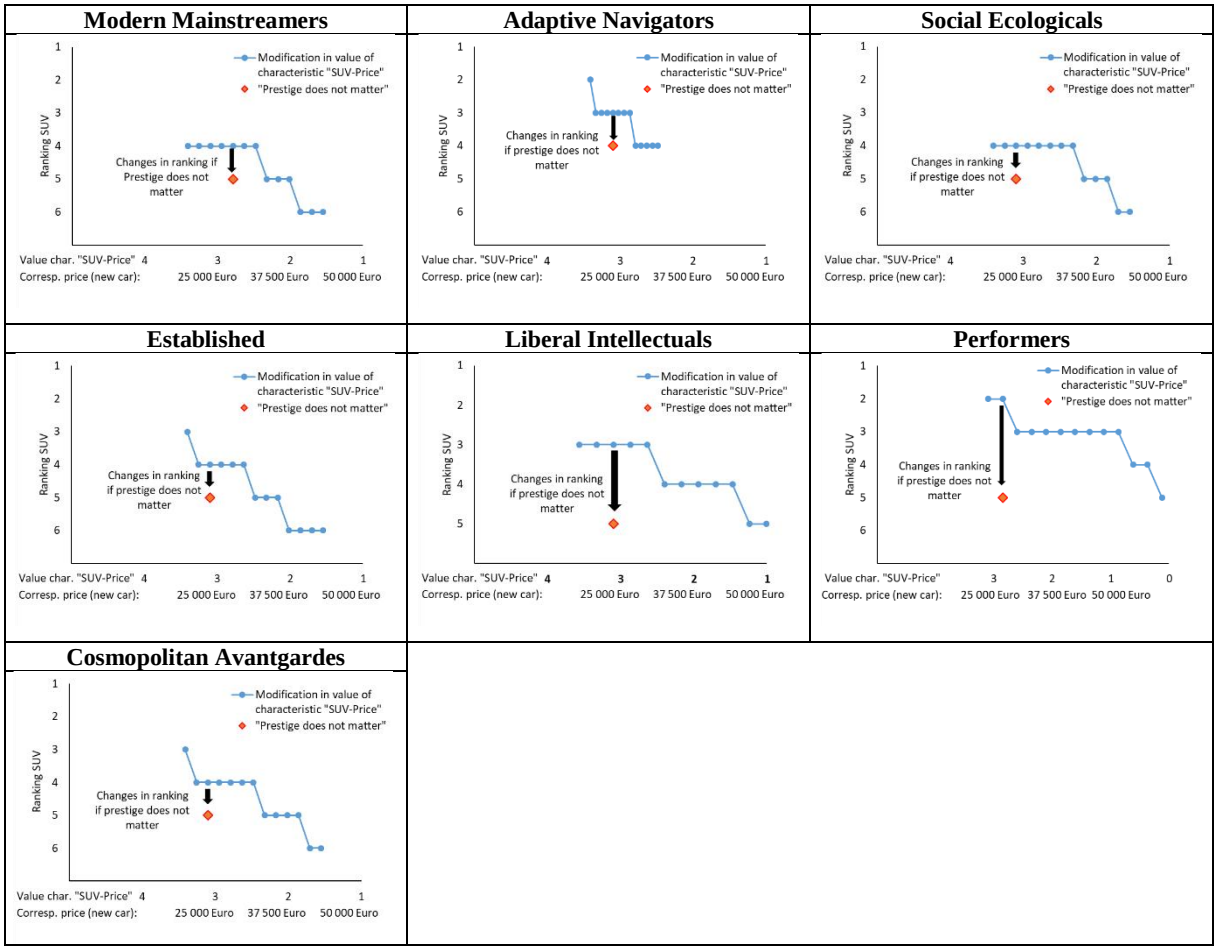


Fig. 3. Impacts of excluding "image/prestige" vs. changes in "prices" for SUVs.
Source: Authors.

Like in the case of "image/prestige", cost equivalents can be calculated to assess the normative social influence in other car-buying motives. A list of cost equivalents for normative social influence, identified by employing our MCDA, is presented in Table 6.

Positive numbers indicate that the part of the motives attributed to normative social influence supports a higher ranking of SUVs. Without this effect, members of the milieu under consideration have to be compensated to rank SUVs as high as they do in the default situation. A value of "0" means that corresponding social norms have no significant impact on the ranking of SUVs. Negative numbers indicate that without normative social influence, SUVs would be ranked higher. Hence, a price increase

for SUVs would be necessary if they should rank as they do today. As an example, "emissions" can serve: If the social part of environmental friendliness is ignored, SUVs gain interest by milieus. Thus, the price of SUVs has to increase to avoid that SUVs are ranked higher than before. Since the social norm to put great stock on environmental friendliness is highest among Social Ecologicals, the price has to rise the most for them, i.e. compensation must be the lowest and negative (-12,875.00 Euros). On the other hand, Performers would have to be significantly compensated, should "image/prestige" no longer play a role in order to rank SUVs as they did before; prices for SUVs would have to decrease by 35,950.00 Euros, or 2,568.00 Euros/year if calculated as annual costs for a car's average lifetime of 14 years. In a review conducted by the United States Environmental Protection Agency (EPA) [122] studies on consumer willingness to pay for vehicle attributes are compared and discussed. Regarding prestige they find a broad variety in the willingness to pay. As maximum value $ 22.226 was listed. Taking into consideration that our study focuses on different milieus in Germany, our results are more or less in line with the numbers presented by [122].

Table 6

Cost equivalents - Compensation of normative social influence by changes in "Prices" (calculated as additions in cost).

Source: Authors' calculations.

	Compensation for each motive (Euros)								
	Price-performance ratio	Resale value	Environmental friendliness	Fuel consumption	Image/ prestige	Family friendliness	Comfort	Space	Safety
Modern Mainstreamers	0	0	-10938	0	8438	0	0	0	0
Adaptive Navigators	0	0	0	0	2625	0	0	0	0
Social Ecologicals	0	0	-12875	0	10375	0	0	0	0
Established	0	0	-9000	0	6500	0	0	0	0
Liberal Intellectuals	0	0	-9000	0	22000	0	0	0	0
Performers	0	0	0	0	35950	0	-3187	-3187	-3187
Cosmopolitan Avant-gardes	0	0	-10938	0	8438	0	0	0	0

These numbers as well as ours show the significant role normative social influence plays in car-buying decisions. We particularly want to call for more social group and actor-oriented discussions of policies targeting larger, heavier, more fuel-intensive cars, since our numbers prove that the need for compensation strongly depends on preferences of different milieus. According to our assessment "Performers" pay more attention to prestige than to the price of a car. Hence, their attitudes make them resistant to price changes. Other milieus pay more attention to price levels, and their preferred car choice would, therefore be impacted to a greater extent. The results show that members of milieus will react differently to monetary incentives. Accordingly, monetary policy measures need to pay more attention to the heterogeneous preferences of social groups (see Section 5 for an in-depth discussion).

As mentioned above, regarding the share of normative social influence in motives like, e.g., "comfort", "space", and "environmental friendliness", there are uncertainties. Hence, we conducted sensitivity analyses by modifying the corresponding shares. The results do not show great changes for the rankings (see Appendix A). Changes can only be found in lower ranks, i.e. the top three car categories for every milieu do not change upon assuming a 25 % higher share of normative social influence on each of the car characteristics. Even though the results contain uncertainties, they provide information on the

relevance of social norms. Hence, they can serve as starting point for further research including the specification among milieus through choice experiments and surveys.

5 Concluding Remarks

Our article represents a first concentrated effort to determine the share of normative social influence in the development of environmentally significant consumer trends, tackling the increased preference for large cars such as SUVs in Germany, as a case study. After giving an overview of the literature on social norms, research approaches, and insights gained therein, we go into the theoretical foundations and their connections, in which this research is grounded. We conducted a multi-criteria decision analysis that was based on the estimated motives of actors belonging to one of ten different social milieus. Estimating preferences for members of each milieu when buying a car, and determining characteristics for different types of cars, we find that the trend toward buying SUVs occurs particularly in milieus where members have a high valuation for their social image, belonging to the upper class of society. Our analysis indicates that SUVs show characteristics of a status good in the sense of Veblen [121] but also that social norms are different in each milieu, leading to interesting compensatory effects in cases like the Social Ecologicals.

The ranking of car-categories results from comparing weighted characteristics of different cars. Hence, the attitude towards a car category depends on differences in the characteristic of cars as well as on the weighting by the corresponding actors. Hence, if a change in the ranking is desired (e.g. for environmental reasons), measures have to aim either at the characteristics of the cars or the preferences (taking shape in the weighting of each characteristic) of actors. In our study we particularly take a closer look at the ranking of SUVs as a car category growing in popularity. Currently, this category shows disadvantages with respect to fuel consumption as well as the demand for resources needed for their production [123, 124]. Furthermore, current regulations on emission performance standards for new passenger cars seem to be insufficient to weaken the trend towards SUVs [125].

According to our results, some social norms trigger the diffusion of this car category. However, social norms also influence the weighting of characteristics that support other kinds of cars. Our analysis shows that prestige/image dominate positive attitudes towards SUVs. Assuming that taking the heterogeneity of actor groups into account is a cumbersome task, in principle, the trend towards SUVs could be weakened by increasing their cost. One option would be the introduction of high CO_2 taxation of fuels. However, such a tax would impact all car users, even if they do not purchase heavyweight cars like SUVs. Another option would be to tax motor vehicles progressively based on their weight or based on specific amounts of CO_2 emitted per 100 kilometers. Taxes like these focus on environmentally harmful aspects of SUVs resulting from their weight and fuel consumption. However, a high weight-based motor vehicle tax might also impact the cost of hybrid and electric cars which are equipped with large batteries. Hence, there will be a need to implement a taxation system that differs between car categories. Since the ranking of car categories depends on differences in cars' characteristics, improvements in characteristics of categories like "small cars" and "medium cars" (e.g. via their image/prestige) could also result in lower interest in SUVs. As unlikely as this last scheme might seem, it has been proven to work before with the help of ingenious marketing: The 1950's most popular car in the United States of America (U.S.) were large sedans. The self-deprecating advertising of the Volkswagen Beetle highlighting its many characteristics desired by American car drivers at the time, made it a status symbol and the U.S.' most popular car of the 60s and 70s [126].

This article only represents the first step for continued efforts to quantify the influence of social norms in car-buying (or other environmentally significant consumption) decisions, since it is based on secondary data and theoretical assumptions, as mentioned in Section 1. Secondary data has some major

limitations, as it is prone to be incomplete or to contain errors [127]. While some of the data might be replicated in studies of one's own, which would afford greater control over details and scientific rigor, some of the sources drawn on are quite unique in depth and breadth of research (e.g. the Sinus-Milieus and ADAC) and would be very difficult to come close to.

In principle our results can be used as first guess for explaining developments in other countries with respect to the diffusion of SUVs and the trend towards ever larger cars. However, it has to be taken into consideration that characteristics of cars (e.g. fuel cost) as well as preferences of milieus and the milieus themselves might differ considerably. Therefore, specific results and policy recommendations should be extended to other countries with utmost caution. Of course, the methodological approach taken in this study can be used as a blueprint for similar studies focusing on other countries.

Increasing the precision of the analysis might require conducting specialized surveys among the different Sinus-Milieus for a better estimation of their preferences. Within these surveys, it might also help to determine the underlying reasons for the car segments' evaluation by consumers. Such an improved analysis could help to not only develop a deeper understanding of the interplay of social norms and consumption decisions, and connected societal trends, but also in the development and refinement of non-price-based policy mechanisms in environmentally significant consumption decisions.

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Appendix

A. Sensitivity Analyses: Impacts of modifications in the shares of normative social influence on the results of the scenario "Without normative social influence"

A.1 Impacts assuming a 25 % higher share of normative social influence in "comfort"

Traditionals			Precarious			Hedonists			Modern Main-streamers		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars		Small cars	Small cars		Small cars	Small cars		Small cars	Small cars		Small cars
Small cars		Medium cars	Medium cars		Medium cars	Medium cars		Medium cars	Medium cars		Medium cars
Large cars		Large cars	Mini cars		Mini cars	Large cars		Large cars	Large cars		Large cars
Mini cars		Mini cars	SUVs		SUVs	Mini cars		Mini cars	SUVs		SUVs
...		..	...		..	...		..	...		..

Adaptive Navigators			Social Ecologicals			Established			Liberal Intellectuals		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars		Small cars	Medium cars		Small cars	Small cars		Small cars	Large cars		Large cars
Small cars		Medium cars	Small cars		Medium cars	Medium cars		Medium cars	Medium cars		Medium cars
Large cars		Large cars	Large cars		Large cars	Large cars		Large cars	Small cars		Small cars
SUVs		SUVs	SUVs		SUVs	SUVs		SUVs	SUVs		SUVs
...		..	...		..	...		..	...		..

Performers			Cosmopolitan Avantgardes		
Default shares		Higher share	Default shares		Higher share
Large cars		Large cars	Small cars		Small cars
Medium cars		Medium cars	Medium cars		Medium cars
Off-road vehicl		Small cars	Large cars		Large cars
Small cars		Off-road vehicle	SUVs		SUVs
...		..	...		..

A.2 Impacts assuming a 25 % higher share of normative social influence in "space"

Traditionals			Precarious			Hedonists			Modern Main-streamers		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars		Medium cars	Small cars		Small cars	Small cars		Small cars	Small cars		Small cars
Small cars		Small cars	Medium cars		Medium cars	Medium cars		Medium cars	Medium cars		Medium cars
Large cars		Large cars	Mini cars		Mini cars	Large cars		Large cars	Large cars		Large cars
Mini cars		Mini cars	SUVs		SUVs	Mini cars		Mini cars	SUVs		Mini cars
...		..	...		..	...		..	...		..

Adaptive Navigators			Social Ecologicals			Established			Liberal Intellectuals		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars		Medium cars	Medium cars		Medium cars	Small cars		Small cars	Large cars		Large cars
Small cars		Small cars	Small cars		Small cars	Medium cars		Medium cars	Medium cars		Medium cars
Large cars		Large cars	Large cars		Large cars	Large cars		Large cars	Small cars		Small cars
SUVs		SUVs	SUVs		SUVs	SUVs		SUVs	SUVs		SUVs
...		..	...		..	...		..	...		..

Performers			Cosmopolitan Avantgardes		
Default shares		Higher share	Default shares		Higher share
Large cars		Large cars	Small cars		Small cars
Medium cars		Medium cars	Medium cars		Medium cars
Off-road vehicl		Small cars	Large cars		Large cars
Small cars		SUVs	SUVs		SUVs
...		..	...		..

A.3 Impacts assuming a 25 % higher share of normative social influence in “safety”

Traditionals			Precarious			Hedonists			Modern Main-streamers		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars	—	Medium cars	Small cars	—	Small cars	Small cars	—	Small cars	Small cars	—	Small cars
Small cars	—	Small cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars
Large cars	—	Large cars	Mini cars	—	Mini cars	Large cars	—	Large cars	Large cars	—	Large cars
Mini cars	—	Mini cars	SUVs	—	SUVs	Mini cars	—	Mini cars	SUVs	—	SUVs
…		..	…		..	…		..	…		..

Adaptive Navigators			Social Ecologicals			Established			Liberal Intellectuals		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars	—	Medium cars	Medium cars	—	Medium cars	Small cars	—	Small cars	Large cars	—	Large cars
Small cars	—	Small cars	Small cars	—	Small cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars
Large cars	—	Large cars	Large cars	—	Large cars	Large cars	—	Large cars	Small cars	—	Small cars
SUVs	—	SUVs	SUVs	—	SUVs	SUVs	—	SUVs	SUVs	—	SUVs
…		..	…		..	…		..	…		..

Performers			Cosmopolitan Avantgardes		
Default shares		Higher share	Default shares		Higher share
Large cars	—	Large cars	Small cars	—	Small cars
Medium cars	—	Medium cars	Medium cars	—	Medium cars
Off-road vehicl	✕	Small cars	Large cars	—	Large cars
Small cars	✕	Off-road vehicle	SUVs	—	SUVs
…		..	…		..

A.4 Impacts assuming a 25 % higher share of normative social influence in “fuel consumption”

Traditionals			Precarious			Hedonists			Modern Main-streamers		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars	—	Medium cars	Small cars	—	Small cars	Small cars	—	Small cars	Small cars	—	Medium cars
Small cars	—	Small cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars	Medium cars	—	Small cars
Large cars	—	Large cars	Mini cars	—	Mini cars	Large cars	—	Large cars	Large cars	—	Large cars
Mini cars	✕	SUVs	SUVs	—	SUVs	Mini cars	—	SUVs	SUVs	—	SUVs
…		..	…		..	…		..	…		..

Adaptive Navigators			Social Ecologicals			Established			Liberal Intellectuals		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars	—	Medium cars	Medium cars	—	Medium cars	Small cars	—	Small cars	Large cars	—	Large cars
Small cars	—	Small cars	Small cars	—	Large cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars
Large cars	—	Large cars	Large cars	—	Small cars	Large cars	—	Large cars	Small cars	—	Small cars
SUVs	—	SUVs	SUVs	—	SUVs	SUVs	—	SUVs	SUVs	—	SUVs
…		..	…		..	…		..	…		..

Performers			Cosmopolitan Avantgardes		
Default shares		Higher share	Default shares		Higher share
Large cars	—	Large cars	Small cars	—	Small cars
Medium cars	—	Medium cars	Medium cars	—	Medium cars
Off-road vehicl	—	Off-road vehicle	Large cars	—	Large cars
Small cars	✕	SUVs	SUVs	—	SUVs
…		..	…		..

A.5 Impacts assuming a 25 % higher share of normative social influence in “environmental friendliness”

Traditionals			Precarious			Hedonists			Modern Main-streamers		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars	—	Medium cars	Small cars	—	Small cars	Small cars	—	Small cars	Small cars	—	Small cars
Small cars	—	Small cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars
Large cars	—	Large cars	Mini cars	—	Mini cars	Large cars	—	Large cars	Large cars	—	Large cars
Mini cars		Mini cars	SUVs	—	SUVs	Mini cars	—	Mini cars	SUVs	—	SUVs
…		..	…		..	…		..	…		..

Adaptive Navigators			Social Ecologicals			Established			Liberal Intellectuals		
Default shares		Higher share	Default shares		Higher share	Default shares		Higher share	Default shares		Higher share
Medium cars	—	Medium cars	Medium cars	—	Medium cars	Small cars	—	Small cars	Large cars	—	Large cars
Small cars	—	Small cars	Small cars	—	Small cars	Medium cars	—	Medium cars	Medium cars	—	Medium cars
Large cars	—	Large cars	Large cars	—	Large cars	Large cars	—	Large cars	Small cars	—	Small cars
SUVs	—	SUVs	SUVs	—	SUVs	SUVs	—	SUVs	SUVs	—	SUVs
…		..	…		..	…		..	…		..

Performers			Cosmopolitan Avantgardes		
Default shares		Higher share	Default shares		Higher share
Large cars	—	Large cars	Small cars	—	Small cars
Medium cars	—	Medium cars	Medium cars	—	Medium cars
Off-road vehicl	—	Off-road vehicle	Large cars	—	Large cars
Small cars	—	Small cars	SUVs	—	SUVs
…		..	…		..