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Identifying Social Values of Ecosystem Services: Theoretical and Empirical Investigations

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Abstract

The thesis at hand theoretically and empirically investigates social values in economic environmental valuation. In the current debate on social values of ecosystem services (ES), economic environmental valuation has been heavily criticised for falling short with regard to conceptual, ethical and methodological issues. Against this background, the thesis' overall objective is to make economic contributions to the discussion on social values visible and to reconcile economic valuation and social values.

A review of the current debate on social values of ES illustrates that *social value* is an ambiguous term with various meanings and conceptions. Accordingly, a consistent conceptual framework is missing in the current literature so far. Further, it is found that criticism against economic valuation is mostly limited to the realm of conventional neoclassical economics, ignoring the long-tradition of social values in the history of economic thought. While novel valuation approaches have been developed, theoretical foundations are rather weak and it is unclear how elicited values relate to conventional economic measures of welfare. In addition, only a small amount of empirical studies on social values of ES exists and their results are highly ambiguous.

Hence, from an economic perspective it is necessary to answer three fundamental questions: 1) what are unnoticed contributions of economics to the theory of social value; 2) what is the nature of social value – how can social values of ES be incorporated into an economic framework, and 3) how to elicit and identify social values in valuation studies?

The first half of this thesis is dedicated to the theoretical analysis of social values (question 1 and 2). To strengthen the theoretical basis, so far neglected economic theories that implicitly or explicitly discuss social values are identified and linked to the current debate. The insights obtained are incorporated into a novel conceptual framework. This framework is firmly based in economic theory – a preference-based utility framework – but incorporates insights from psychology and ethics in order to account for social values as boundary object. Based on a holistic view of society and individuals, the role of institutions, the social environment, cultural values and transcendental values is emphasized. To synthesise the diverging concepts of value and to account for the multidimensionality of social values, the framework consists of three spheres: social, natural and contextual.

The novel framework demonstrates that social values and economic environmental valuation are reconcilable. However, implications for economic environmental valuation are rather severe. A novel extension of the “traditional” Total Economic Value concept shows that TEV can account for social values of ES, yet, social preferences are not necessarily in line with the welfarist and utilitarian approach of mainstream neoclassical economics. In this context, it is demonstrated that neither *the* social value nor *the* assigned value exist. Instead, value expressions may diverge even within identical valuation settings. This introduces complex normative considerations with regards to corrective interventions and the act of choosing a valuation method based on a specific paradigm. Cases in which preference correction can be justified are discussed.

On this basis, the second part of the thesis focuses on the empirical analysis of social values (question 3). A case study, taking wolf management in Germany as example, is presented. The aim of the empirical section is twofold. Firstly, the consistency of the novel conceptual framework will be assessed. Secondly, three different monetary valuation methods (*Contingent Valuation*, *Preference Economisation* and *Preference Moralisation*) will be compared in order to evaluate if in terms of expression and elicitation of social values significant differences between the methods exist.

The results of the case study illustrate the consistency of the theoretical framework and show that social values can be identified based on *intention* (type of preferences expressed), *process* (changes in WTP due to preference construction caused by deliberation or rather social learning process), and *scale* (values beyond the individual, e.g. with reference to society).

The results with respect to the method comparison are ambiguous. On the one hand, the *between-group design* shows that the absolute magnitude of WTP is insensitive towards the method applied. On the other hand, in the *within-group design* significant changes in WTP are found for the Preference Moralisation treatment suggesting that preferences were constructed. Further, social values are identified based on scale and intention irrespective of the method.

The thesis at hand contributes to the current literature on social values of ES by i) improving the understanding of social values from an economic perspective by identification and incorporation of economic theories beyond neoclassical economics; ii) development of a novel conceptual framework which integrates social values into economic environmental valuation; and by iii) showing pathways how to empirically explore and reveal social values.

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Chapter 1 Introduction

1.1 Motivation and research gap

The on-going socially undesirable overexploitation of natural resources, degradation of ecosystems and loss of biodiversity are a threat to the supply of goods and services provided by nature for both present and future generations. Therefore, the conservation of ecosystems represents an important societal goal in order to sustainably govern the use of ecosystems and guarantee the preservation of benefits as well as their general existence (Millennium Ecosystem Assessment, 2005). To this end, demonstrating that conservation is not only beneficial for nature but also for human well-being remains a scientific challenge (Hansjürgens et al., 2017).

Even though biological knowledge is of importance, the success or failure of conservation policies is often determined by social factors (Mascia et al., 2003). TEEB (2010) emphasised that not only more precise information and data but also institutional structures are of importance for a sustainable management of natural resources and ES governance. To build a bridge between ecological science and social science, particularly economics, *ecosystem services* (ES) were introduced as interdisciplinary concept. Generally speaking, ES link ecological functions and processes with human well-being in order to “uncover” ecosystems’ benefits to humans. The underlying idea is to ecologically assess ES, which can then be economically valued for informing land-use decisions (see e.g. Nahlik et al., 2012).

From the economic perspective, overexploitation and unsustainable use is understood in terms of market failure meaning that social welfare is not maximised. So far, ES are often undervalued or even neglected because their benefits are not adequately reflected by market-prices (Daily et al., 2009; TEEB, 2010). Thus, by making material and immaterial benefits explicit, economic valuation of ES may provide arguments in favour of conservation efforts. Therefore, sensitive decision making regarding natural resources and ecosystems relies also on the provision of robust economic valuation studies. However, combining two anthropocentric concepts, ES and economic valuation, and conceptualising nature in terms of environmental goods and services is contentious (see Hansjürgens et al., 2017). Despite its potentials, economic environmental valuation is confronted with two fundamental problems (Hanley et al., 2007, p. 322): i) how to conceptualise the various non-marketed values of ecosystems from a theoretical perspective and ii) how to measure these values empirically?

Since the introduction of the ES concept major discussions within environmental and ecological economics revolved around the values of nature. In general, economic valuation has proven itself as useful tool to evaluate changes in ES and biodiversity. Yet, economic valuation is heavily criticised, more moderately questioning the robustness of obtained results but also fundamentally due to its individualistic and instrumental approach. It is noteworthy, that in most cases the critique has been limited to the realm of neoclassical economics which is the theoretical basis of conventional economic valuation of the environment.

It has been argued that valuation of ES has reached the limits of mainstream welfare economics, circumscribed by the utilitarian framework. Complexity and plurality of values towards nature as well as human-nature relationships have been emphasised, especially, with regards to non-use or rather immaterial values (Chan et al., 2016; Chan et al., 2012b; Kenter et al., 2019). Still, the identification of plural values is an intricate matter. In response, in recent years additional value categories such as relational values (Chan et al., 2016) and social values (Kenter et al., 2015) have gained interest within the scientific debate about values and valuation of public goods. Often, it is argued that conventional valuation methods due to their reliance on preferences of “socially isolated” individuals are unable to capture the social values of ES.¹ Hence, identification of social values of ES is perceived as an important challenge in environmental valuation (Parks & Gowdy, 2013).

Yet, despite recent developments, further research is needed to incorporate plural values into valuation approaches and decision-making (Chan et al., 2018) and with respect to the economic valuation of social values of ES many questions about the ontology, elicitation and aggregation of social values remain (Kenter et al., 2016a; Kenter et al., 2019). Currently, the discussion about economic valuation of social values of ES centres mainly around limits and drawbacks of neoclassical economic theory and associated conventional valuation methods. At the same time, constructive contributions regarding the economic discipline are seldom and economic theories which remained outside of mainstream neoclassical economics receive little attention. Hence, from an economic perspective three fundamental research questions still have to be answered: i) what are unnoticed contributions of economics to the theory of social value; ii)

¹ Note that this thesis focuses on ecosystem services and biodiversity. However, it may also contribute to the broader context of sustainability and other fields in which social values of public goods are discussed e.g. the health sector. However, this can only be assumed to hold if the good under valuation shares characteristics with ecosystem services.

how can social values of ES be incorporated into an economic framework – what is the nature of social value, and iii) how to elicit and identify social values in economic valuation studies?

Regarding the first research gap, social value is an ambiguous term which may have different meanings depending on the context. In the current scientific debate regarding social values of ES it is often criticised that economics conceptualises social value only in term of aggregated individual values. However, looking beyond mainstream neoclassical economics, a variety of complex understandings of social values exist in the economic literature. Hence, it is necessary to identify relevant but so far neglected economic theories and to link them to the current debate.

Concerning the second research gap, identification and elicitation of social values is empirically challenging and therefore, a solid theoretical foundation is needed to allow the empirical analysis of social values of ES. However, the existing literature does not provide a coherent conceptual framework for the identification of social values (Bunse et al., 2015; Kenter et al., 2015; Parks & Gowdy, 2013). It remains unclear if social values are complementary to individual values, and if so to what extent, or if individual values and social are mutually exclusive (Howarth & Wilson, 2006; Kenter et al., 2015). This implies that it is still ambiguous how social values can be conceptualised in economic theory and if such a concept is reconcilable with economic environmental valuation.

Regarding the third research gap, it has been argued that integration of deliberative approaches into the valuation process may help to overcome some of the drawbacks of conventional valuation approaches (Lienhoop et al., 2015; Vatn, 2009). The latter typically assumes that people have ex-ante given preferences which can be articulated on demand e.g. in a survey. In contrast, deliberative methods assume that preferences are formed through interaction and mutual understanding. Hence, the combination of economic valuation with deliberative approaches seems promising from a methodological perspective (see Lienhoop et al., 2015; Orchard-Webb et al., 2016; Spash, 2007, 2008). Yet, these theories are partly contradictory which makes a consistent combination challenging. Further, it is debated whether existing methods should be complemented or substituted by deliberative approaches (Bebbington et al., 2007; Gowdy & Parks, 2014; Kenyon et al., 2001; Parks & Gowdy, 2013; Wegner & Pascual, 2011). So far, little empirical evidence exists and results from studies based on different paradigms are difficult to compare with one another. Therefore, it is ambiguous how deliberation affects preferences and to which extent deliberated preferences differ from aggregated individual preferences (Irvine et al., 2016; Kenter et al., 2016b; Kenter et al., 2019).

Consequently, an improved understanding about the impacts of deliberation is needed (Kenter et al., 2016a) which requires the theoretical foundation to be strengthened (Bartkowski & Lienhoop, 2018; Massenber, 2019).

In summary, in a first step it has to be elaborated which relevance economic theory has for the discussion about social values and how social values have been conceptualised so far. Based on these insights, social values need to be consistently integrated into an economic conceptual framework to close the second above-identified research gap. Drawing upon a strong theoretical basis, the third research gap can be addressed: Empirical evidence is needed to assess the relevance of social values of ES in economic valuation studies and the role of conventional and deliberative valuation methods for eliciting social values needs to be analysed.

1.2 Objectives

The thesis at hand provides an economic perspective on social values of ES and biodiversity by addressing the three above-mentioned fundamental research gaps. The three overarching questions are: How can social values of ES be conceptualised in theoretical terms, what role can play economic theory in this context, and how can social values be identified empirically? The overall aim is to contribute to the understanding of social values from a theoretical perspective by strengthening the theoretical foundations of social values of ES as well as to empirically explore social values on the basis of a case study. This will be done, firstly, by identifying meanings of social value in economic literature; secondly, the development of a conceptual framework integrating social values in economic environmental valuation; and thirdly, conducting a case study in order to test the conceptual framework's validity empirically, to analyse determinants and motives behind stated preferences, and to compare different valuation methods with respect to elicitation of social values.

In order to achieve these overarching aims, the following specific objectives will be addressed:

1. Identify concepts, meanings, definitions or attributes associated with social values in the current debate about social values of ES.
2. Broaden the view towards so far neglected contributions of economics which implicitly or explicitly discuss social values and identify relevant theories. This will clarify the role social values have played in economics so far, illustrate the relevance of economic theory for the analysis of social values of ES and thereby, enrich the theoretical

foundations of social values of ES. Hence, this is an essential prerequisite for the economic contribution provided by the thesis at hand.

3. Building on the review on social values, it shall be clarified if and how social values can be integrated into economic environmental valuation in a meaningful way. This will be addressed by developing a conceptual framework incorporating relevant insights from present and past debates.
4. Put the conceptual framework in the general context of environmental economic theory and discuss implications for economic environmental valuation. Further, implications for policy making shall shortly be discussed.
5. Explore if and to what degree social values are empirically identifiable. This will be done by testing the conceptual framework's validity by means of a valuation study regarding preferences for wolf conservation in Germany.
6. Assess if different valuation methods lead to varying results. The method comparison is of importance because in context of methodological pluralism and a lack of a common theoretical basis or principles to prefer one approach over another, the act of choosing one methodology becomes subjective (see Dow, 2012).

1.3 Methods

In order to meet the above-described objectives, consecutive steps are necessary. First, the relevant body of literature has to be identified and reviewed. The general literature refers to the concept of ES and economic environmental valuation in terms of the *total economic value* (TEV) concept and valuation methods. Further, the underlying neoclassical economic theory is of relevance. This rather general overview will provide the theoretical background for the specific topic of *social value*.

At a first glance, the discussion about social values seems to be a newly discovered topic in environmental economics and/or ecological economics with respect to ES. On the contrary, the discussion has a long tradition in economic theory, although, it never made it into mainstream literature. This may be the case due to two reasons: Firstly, social values are an interdisciplinary topic incorporating a variety of terms with same or similar meaning. Hence, social values are not necessarily discussed explicitly and insights of one discipline may not be accounted for in another discipline despite their relevance. The relevant disciplines comprise environmental and ecological economics, environmental ethics, discursive ethics and political science. Secondly, within economics social values are associated with rather heterodox theories, e.g. old

institutional economics, that were shaking some of the very foundations of mainstream neoclassical economics. Hence, reviewing an extensive body of literature in order to identify meanings of social value, recurrent attributes associated with social values and arguments for their relevance with respect to economic environmental valuation is necessary component of the thesis at hand. The literature review will first summarise the current debate. Following upon this, economic theories outside of mainstream neoclassical economics which may contribute to understanding and conceptualisation of social values of ES will be identified. As discussed above, the debate on social values of ES does not only involve conceptual questions but also methodological issues. Hence, also relevant valuation approaches will be discussed.

As mentioned above, the current literature lacks a consistent framework to incorporate social values into economic environmental valuation. Therefore, on the basis of the literature review, a novel framework which integrates social values in a preference-based utility framework will be developed. Thereby, it can be elaborated upon the meaning and role of social values in context of ES and how they relate to commonly elicited individual values.

In order to test the validity of the conceptual framework a case study will be performed taking as an example the return of the wolf to Germany. The goal of the case study is to derive conclusions about the appropriateness of different valuation methods based on diverging paradigms. Therefore, the case study will compare three different valuation approaches with respect to elicitation of individual and/or social values. The methods are one conventional stated preferences approach and two approaches combining stated preferences with deliberation. Also, the two deliberative approaches build upon different paradigms. The analysis bases on different methods and techniques. Regression analysis is essential for estimating willingness to pay (WTP) and to compare the stated preferences between the three methods. Additional methods will be used in order to investigate and interpret motivations underlying WTP. Thereby, individual and social values can be distinguished. Although, not generally applied in economic valuation studies, qualitative methods have been shown to be of relevance. For example, the quantitative analysis of responses to a discrete choice experiment conducted by Ryan et al. (2009) suggested irrational behaviour, whereas the behaviour was assessed to be rational after analysing associated qualitative statements. Hence, incorporation of qualitative methods besides quantitative methods may be important to explain counterintuitive results (Coast, 1999).

1.4 Thesis outline

The thesis is divided into seven chapters. The first half of the thesis (Chapter 2 to Chapter 4) investigates social values of ES theoretically, whereas the second half (Chapter 5 and Chapter 6) is dedicated to the empirical analysis of social values of ES.

After the introduction, Chapter 1, the following Chapter 2 (*Ecosystem Services and Economic Valuation: Theoretical Background*) provides a brief overview about ecological and economic theory relevant for ecosystem service economics and biodiversity economics. Firstly, the conceptual core and the theoretical foundations of neoclassical economic value theory will be presented. This is indispensable because the current debate about social values of ES is to a certain degree motivated by scholars' criticism against neoclassical economic theory and the neoclassical economic concept of (social) value. Making the conceptual core and fundamental assumptions explicit serves three goals: i) explain the neoclassical economic concept of social value, ii) laying foundations to later on illustrate conceptual differences to economic theories and/or schools of thought beyond neoclassical economics, iii) and thereby, address the commonly voiced critique against economic environmental valuation and associated limitations. Further, social value of ES is a topic of interdisciplinary interest and the non-economic readership may be unaware of central assumptions of neoclassical economic theory. Hence, it is necessary to make them explicit.

Based upon the understanding of neoclassical economics, the linkage of ecological and economic theories can be illustrated by means of the concept of ES and *service cascades*. This lays ground for understanding the relation between ES and human welfare which is the underlying incentive for conducting economic environmental valuation. As mentioned above, economic environmental valuation centres around the two fundamental topics of conceptualisation and measurement of value. The TEV concept will be presented in order to illustrate how ecosystems' benefits are conventionally translated into value. Additionally, a short overview about conventional economic valuation methods as well as economic critique against stated preferences will be given in order to introduce to the topic of value measurement. This overview will help to emphasize theoretical and methodological differences to novel valuation approaches discussed in subsequent chapters.

Chapter 3 (*Identifying Social Values of Ecosystem Services*) reviews the relevant body of literature regarding social values of ES in order to identify meanings, recurrent attributes and concepts of social values. The chapter begins with a summary of the fundamental critique

against economic environmental valuation as this critique often motivates the current debate about social values of ES and illustrates the relevance of social values for ES valuation. Thereafter, deliberative monetary valuation will be discussed as a methodological response to the fundamental critique. Building upon the understanding of theoretical issues as well as methodological advances, the ambiguous concept of social values of ES in light of the current debate can be reviewed.

On this basis, the first of the three above-identified research gaps – unnoticed contributions of economics to the theory of social values – is addressed. The literature review is extended towards a retrospective view on the contributions of economics to the scientific discussion about social values in order to account for the long but so far neglected tradition of social values in economic theory. First, the historical context will be presented because the economic discussion about social values originated more than hundred years ago. This is of relevance because the economic concept of value and the role of nature in economic theories changed throughout time. Based on the historic background, the early discussion on social values mainly involving value-in-use, value-in-exchange and social components of value will be reviewed. After extending the scope beyond market prices by discussing the introduction of social goods and externalities into economic theory, the review will turn towards the conceptualisation of social value in old institutional economics. Thereafter, theories implicitly dealing with social values – with reference towards preferences beyond self-interest and values on a social scale – will be identified and discussed.

Building on the insights derived from Chapter 3, in Chapter 4 (*Making Sense of Social Values in Economic Environmental Valuation*) the second research gap – lack of a consistent economic conceptual framework – is addressed. A novel framework integrating social values into a preference-based utility framework is developed in consecutive steps. The framework demonstrates that social values of ES and economic theory are reconcilable, based on consideration of economic theories beyond neoclassical economics and incorporation of interdisciplinary aspects associated with society, nature and culture. Integrating these dimensions into economic environmental valuation is a challenging task impeded by disciplines' diverging concepts of value. Against this background, the conceptual framework incorporates three spheres: a natural, social and contextual sphere.

Following this logic, firstly, the underlying value concept will be discussed. Subsequently, the social and natural sphere will be explained emphasising the assumption of human

embeddedness in nature and society. This has to be understood in context with human-nature relationships and (sense of) connectedness to nature and society which are argued to be relevant for social values of ES and their valuation. Following hereon, the contextual sphere will be illustrated, stressing the role of economic valuation methods as *value articulating institutions*. Once the framework is developed, implications for economic environmental valuation as well as for policy-making will be discussed.

Chapter 5 and Chapter 6 (*Exploring Social Values of Biodiversity*) present the case study exploring social values and motivations behind WTP for wolf conservation in Germany in order to contribute to the closure of the third research gap – identification and elicitation of social values of ES. The case study has two overarching aims: Firstly, to validate the conceptual framework developed in Chapter 4 based on the analysis of WTP and identification of social values. Secondly, to analyse if significant differences between valuation methods based on different paradigms exist by comparison of *Contingent Valuation*, *Preference Economisation* and *Preference Moralisation*.

Chapter 5 provides a short overview about the valuation background and the return of wolves to Germany. Thereafter, challenges associated with “the wolf” as valuation object will be discussed. Hypotheses are developed on the basis of the conceptual framework in order to test its validity. On this basis, the methodology will be discussed at length.

Chapter 6 presents the study’s results. The latter covers the descriptive analysis, the regression analysis, the analysis of motives behind WTP and general items regarding the study design concerning information (provision), complexity (of tasks) and preference formation. This is followed by a discussion of the results, especially concerned with implications for economic environmental valuation, and concluding remarks.

Chapter 7 summarises the overall results of the thesis at hand, sheds light on limitations of the study and on further research possibilities, and then concludes the thesis with final thoughts about social values and economic environmental valuation.

Chapter 2 Ecosystem services and economic valuation: Theoretical Background

This chapter provides a brief overview about the theoretical background of ecosystem services and economic environmental valuation in order to lay a foundation for the analysis of social values in subsequent chapters. The aims of the chapter are: i) summarise the conceptual core and fundamental assumptions of neoclassical economic value theory, ii) describe the concept of ES as commonly used valuation object in economic environmental valuation, iii) depict the incentive to undertake economic environmental valuation by illustrating the link between ecosystems and human well-being, and iv) present how values are conventionally assessed by economic environmental valuation approaches.

2.1 Theoretical foundations of neoclassical economic value theory

Economic theory comprises differing concepts of value dependent on the school of thought. Economic environmental valuation is commonly grounded in environmental and resource economics. The latter was established as a sub-discipline of (mainstream) economics and therefore, incorporates the neoclassical economic framework (Spash, 1999). Yet, neoclassical economics is an unprecise term and to date an agreed upon definition is absent (see e.g. Colander et al., 2004; Hodgson, 1999; Lawson, 2013). Therefore, in the following the theoretical foundation and assumptions of neoclassical economics that are relevant for the discussion revolving around values and valuation of nature shall be shortly illustrated (see also Table 2-1 for a glossary of terms).

The ethical framework of mainstream neoclassical economics is grounded in *utilitarianism*, *anthropocentrism* and *instrumentalism* (see e.g. Randall, 1988). These three conceptual pillars shall be explained briefly as they are fundamental for the understanding and conception of economic environmental valuation but not always made explicit (see also Schröter et al., 2020 for a discussion of the role of transparency about assumptions in an interdisciplinary context).

Table 2-1 Glossary of terms for interested non-economic readership

Term	Definition / brief explanation
Marginal utility	Additional utility or rather satisfaction gained by a marginal increase in consumption of a good or service. (See also <i>utility</i>)
Meta-ranking	Ranking of preference rankings. Meta-rankings are preferences over preferences which indicate what a person would like her preference to be while making other choices under certain constraints (Sen, 1977b). For example, a person prefers cake over nothing but does not take the last piece of cake because someone else might want it. Yet, under other conditions (more cake left) the person would eat another piece of cake. Thus, the choice seems to contradict the person's preferences because the person may follow a social norm (e.g. good manners) or may consider motivations different from self-interest.
Public goods	A good or service without restricted access and that can be consumed without reducing the benefits of others e.g. clean air (Samuelson, 1954).
Social costs and benefits	All costs and benefits which occur to society as a whole. The costs consider negative consequences and damages which are borne by society members or the public in general who are not necessarily involved in the costs' generation (see Kapp, 1950/1975).
Utility	A measure of a person's satisfaction (Samuelson, 1980, p. 48). (See also <i>marginal utility</i>)
Value-in-use	Value of a good owing to its capacity to satisfy wants and needs. Also referred to as <i>use value</i> . (see also <i>value-in-exchange</i>)
Value-in-exchange	Value or rather utility of a good or service due to its capacity to be exchanged on markets, usually expressed as relative prices in terms of other goods. Also referred to as <i>exchange value</i> . (see also <i>value-in-use</i>)

Source: Own illustration adapted from Massenber (2019, p. 1234)

Utilitarianism is a *consequentialist* ethical theory, in its classical form associated with Bentham (1789) and Mill (1863). Generally, consequentialism suggests that the rightness of an action depends only on its consequences, and utilitarianism is based on the principle that an action is morally right if it promotes happiness. The best action is the one that creates the greatest happiness to the greatest amount of people. Happiness is defined in terms of gaining pleasure and avoiding pain. Utilitarianism is often seen in context of self-interest, yet, in its classical form the focus was not on a single individual but on the outcome for all individuals (Mill, 1863; Sagoff, 1986). In fact, because utilitarianism focuses on aggregated (or average) utility to compare social states, it is considered to be a special form of *welfarism* (Hausman & McPherson, 1993).

Welfarism is a consequentialist ethical theory following the premise that for the assessment of the “goodness” of a state of affairs only (consequences for) individual well-being matters. Welfarism considers two social states as equivalent if the distribution of individual well-being is identical (see Sen, 1977a; Sen, 1979). The divergence between welfarism and utilitarianism can be illustrated formally by the social welfare functions (Ng, 1990, p. 171):

$$W = W(W^1, W^2, \dots, W^n) \quad (1)$$

Equation (1) shows the general form of a welfarist welfare function that maximises social welfare only as a function of individual welfare of n individuals society is comprised of.

$$W = \sum_{i=1}^n U^i \text{ or } W = \frac{1}{n} \sum_{i=1}^n U^i \quad (2)$$

Equation (2) illustrates a utilitarian social welfare function where w is the social welfare, u^i is the utility of individual i and n the number of individuals. The first function represents total utility in society whereas the second function is the average utility. While in classical utilitarianism happiness was defined through pleasure and pain, utility has been introduced in the utilitarian social welfare function as a substituting measure. Thus, the question arises what drives a person’s utility?

In fact, based on the concept of *consumer sovereignty* it is assumed that the individual is the best judge of her well-being. Hence, the maximisation of subjective utility is considered to be central in neoclassical economics, implying that human well-being is assessed in terms of the satisfaction of personal preferences which represent the *social good* (Niemeyer & Spash, 2001). Due to the divergence from the classical utilitarianism’s happiness, this type of utilitarianism is referred to as *preference utilitarianism*. A further implication of this conceptualisation is that the value of a good is only related to its ability to satisfy the subjective wants or desires of an individual. It is therefore anthropocentric (Vatn, 2005, p. 146) and instrumental as objects and state of affairs are regarded as instruments for preference satisfaction.

Besides, mainstream neoclassical economics is based on *methodological individualism*. The latter assumes that within a society, or any other collective entity, all economic phenomena are the collective outcomes of all economic agents’ individual decisions and eventually, the sum of individual behaviour (see Elster, 1982; Rosenberg, 2001, p. 180; Schumpeter, 1909).

Further, individual behaviour is assumed to be *rational*. Again, individual rational behaviour can be conceptualised in various ways (Sen, 1995). The formal concept of rationality defines mainly the consistency of choice. In order to be rational, preferences must be (see Hausman, 1992; Samuelson, 1938)

- i) *complete* (for all x and $y \in X$: $x \geq y$ or $y \geq x$), meaning that for any good preferences can be expressed;
- ii) *transitive* (for all x , y and $z \in X$ if $x \geq y$ and $y \geq z$ then $x \geq z$ holds), implying that if good x is preferred over good y and good y is preferred over good z , also good x must be preferred over good z ; and
- iii) *continuous* (options can be ranked even if the difference in their utility is marginal).

In addition, a concept of rationality within neoclassical economics defines rationality as self-interested utility maximisation (see Becker, 1996), this concept is referred to as *homo economicus*. The maximisation is related to the (ex-ante known) individual preferences and subject to budget constraints as well as prices of the goods (Vatn, 2005, p. 114).

In summary the relevant conceptual core can be identified as i) consequentialism in form of ii) welfarism which defines iii) social welfare in from of aggregated individual utility; hence, iv) individualism is underlying; while individuals are assumed to act v) rational; and ultimately value is vi) instrumental. For the discussion about social values this implies that neoclassical economics conceptualises social values as aggregated preferences of self-interested rational individuals. The conceptual core and associated assumptions of neoclassical economics will serve as benchmark in order to emphasise theoretical and methodological issues concerned with this narrow concept of social values as well as to highlight conceptual differences with respect to other economic schools of thought.

2.2 Human welfare and the value of ecosystem services

After having clarified the neoclassical economic concept of value, it will now be briefly examined why ecosystems, their services and economic valuation of the latter are important. To understand the connection between ecosystems, associated ES and human welfare, the concept of ES and the ES cascade model will be shortly presented in the following (Section 2.2.1). Further, to build the bridge to values of ES and their economic valuation, the concept of TEV as well as conventional economic valuation methods will be illustrated (Sections 2.2.2 and 2.2.3). Delineating the complexity of ES accentuates the ambition of economic valuation

to extend consideration of values beyond individual benefits and costs and hence, provides arguments for examining social values of ES (Hansjürgens et al., 2017).

2.2.1 Ecosystem services and service cascades

ES is a concept aiming to link ecosystems and human well-being in order to incorporate the values human place on ecosystems and the effects of management changes on human well-being into decision making (see e.g. Chee, 2004; de Groot et al., 2002; Farber et al., 2002; Turner & Daily, 2008). The scientific discourse about ES did not emerge before the late 1970s (Gomez-Baggethun et al., 2010). Still, awareness about services provided by ecosystems or rather negative impacts due to degradation of ecosystems dates back to the ancient world when, for example, Plato wrote about negative impacts of deforestation of the hills of Attica (Mooney & Ehrlich, 1997). The concept gained popularity since the 1980s (Ehrlich & Ehrlich, 1981) and since the Millennium Ecosystem Assessment (2003) the scientific interest in ES and their valuation has risen substantially (Fisher et al., 2009; Kull et al., 2015).

A unique definition of ES does not exist (see Table 2-2 for an overview of definitions). In the context of economic environmental valuation, ES are usually defined in terms of ecosystems' benefits to humans (Millennium Ecosystem Assessment, 2005) or ecosystems' contribution to human well-being (TEEB, 2010).

Table 2-2 Different definitions of ecosystem services

Definition of ecosystem services	Source
The conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfil human life	Daily (1997)
Benefits human populations derive, directly or indirectly, from ecosystem functions	Costanza et al. (1997)
Benefits people obtain from ecosystems	Millennium Ecosystem Assessment (2005)
Final ecosystem services are components of nature directly enjoyed, consumed or used to yield human well-being	Boyd and Banzhaf (2007)
The aspects of ecosystems utilized (actively or passively) to produce human well-being	Fisher et al. (2009)
Ecosystems contribution to human well-being	TEEB (2012)
Contributions of ecosystem structure and function – in combination with other inputs – to human well-being	Burkhard et al. (2012)

Source: Own illustration adapted from Häyhä and Franzese (2014, p. 125)

As for definitions of ES also not a single classification of ES exists (see Table 2-3 for an overview of competing classifications).

Table 2-3 Different classifications of ecosystem services

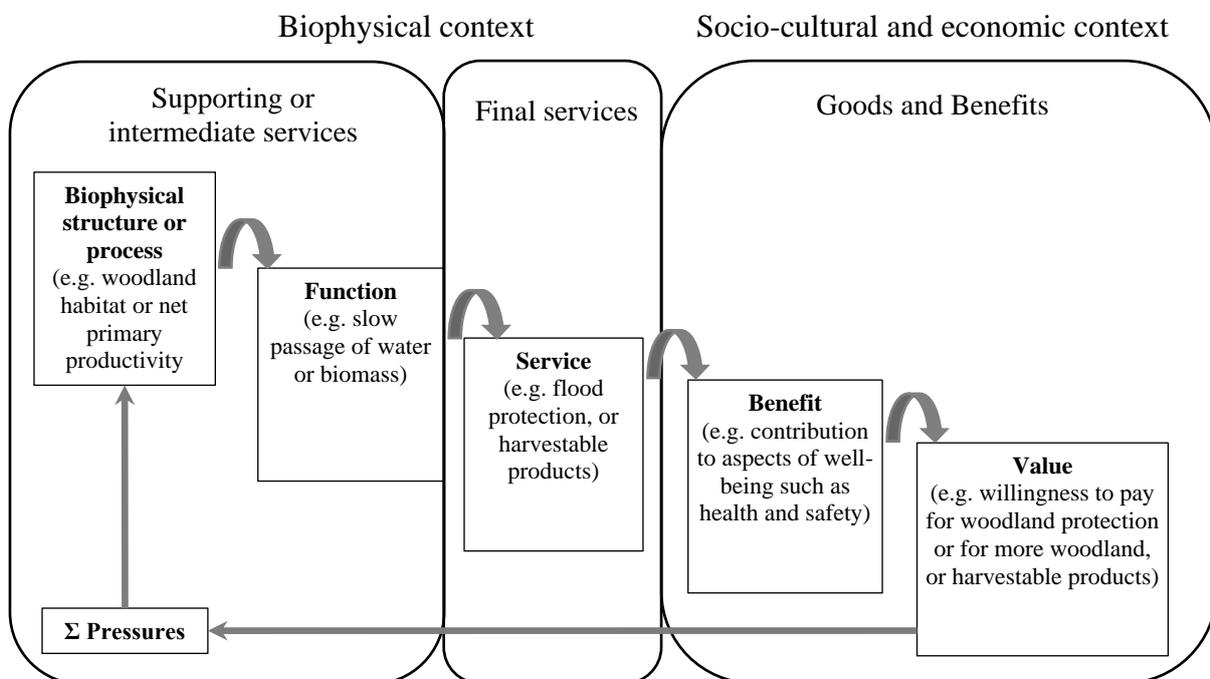
Commonly used classifications of ecosystem services	Reference
Provisioning (e.g. food, timber)	Millennium Ecosystem Assessment (2005)
Regulating (e.g. climate regulation, flow regulation)	
Cultural (e.g. recreation, aesthetic experiences)	
Supporting (e.g. photosynthesis, soil formation)	
Provisioning (e.g. food, timber)	de Groot et al. (2010)
Regulating (e.g. climate regulation, flow regulation)	
Cultural (e.g. recreation, aesthetic experiences)	
Habitat (e.g. nursery habitat, gene pool protection)	
Provisioning (e.g. biomass, water)	Haines-Young and Potschin (2013)
Regulation and maintenance (e.g. mediation by ecosystems, pest and disease control)	
Cultural (e.g. physical, intellectual and spiritual interaction with ecosystems)	
Alternative classifications of ecosystem services	
Adequate resources (e.g. food, water, energy)	Wallace (2007)
Protection from predators, disease, parasites	
Benign physical and chemical environment (e.g. temperature, moisture, light)	
Socio-cultural fulfilment (spiritual contentment, benign social group)	Costanza (2008); Fisher et al. (2009)
Rival and excludable (marketed ecosystem goods; e.g. timber)	
Rival and non-excludable (open access sources; e.g. berries)	
Non-rival and excludable (club goods; e.g. some recreational services)	
Non-rival and non-excludable (public services, climate regulation, aesthetic experience)	Costanza (2008)
Global non-proximal (does not depend on proximity; e.g. carbon sequestration)	
Local proximal (depends on proximity; e.g. disturbance regulation, pollination)	
Directional flow related: flow from point of production to point of use (e.g. water supply)	
In situ (point of use; e.g. soil formation, food, raw materials)	Costanza (2008)
User movement related: flow of people to unique natural features (e.g. genetic resources, cultural services)	

Source: Own illustration adapted from Häyhä and Franzese (2014, p. 126)

The Millennium Ecosystem Assessment (2005) differentiates ES into four major categories: provisioning services (e.g. food, timber), regulating services (e.g. climate regulation, flow regulation), cultural services (e.g. recreation, aesthetic experiences) and supporting services (e.g. photosynthesis, soil formation). This classification was used as a starting point for the *Common International Classification of Ecosystem Services* (CICES) which is commonly applied. The distinguishing feature is that supporting services were integrated into the category of regulating services as the former do not directly influence human well-being but other services may build upon them. This integrated category is referred to as *regulation and maintenance services* (Haines-Young & Potschin, 2013).

Haines-Young and Potschin (2010) developed the so-called cascade model (Figure 2-1) to illustrate the connection between the biophysical context incorporating the underlying functions and processes, ES (which represent the final services) and associated benefits and values. The cascade model depicts a linear relationship between the biophysical context, so all processes and structures created by living organisms and their capacities to provide ES, and the socio-cultural and economic context associated with all benefits to humans, and accordingly value to humans.

Figure 2-1 The ecosystem service cascade model

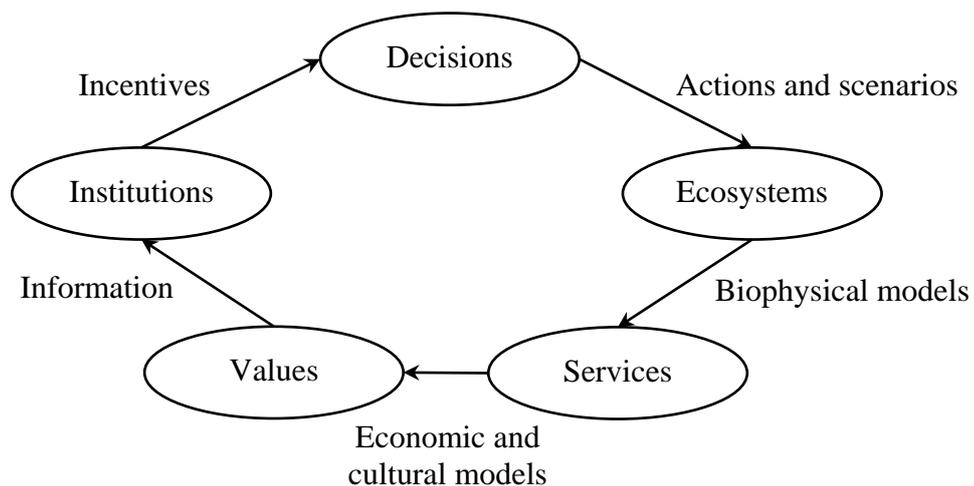


Source: Own illustration adopted from Potschin-Young et al. (2018); see also Haines-Young and Potschin (2010, p. 116)

This simplified depiction does not account for the general complexity of ecological structures but aims at illustrating the ‘production chain’ in context of ES (Haines-Young & Potschin, 2010, p. 115). ES build the bridge between ecosystem functions and benefits and values. This is important to note as it emphasises the difference between an ecosystem’s capability to provide services and the actual services which cannot exist isolated of human needs (Haines-Young & Potschin, 2010, p. 115). Furthermore, the production chain suggests a unidirectional flow. However, decision-making based on value may influence the biophysical structure through pressures, e.g. overexploitation of natural resources. Hence, the concept suggests a feedback from the socio-cultural and economic context to the biophysical context as indicated by bold arrows leading from value over pressures back to the biophysical structure.

Daily et al. (2009) illustrated how ES can be incorporated into decision-making (see Figure 2-2). The framework reflects a continuous loop. Starting at the “decisions” oval the natural sciences and biophysical models are essential to understand how decisions affect ecosystems through actions and scenarios, and how ecosystems functions and processes translate into services. Combining these insights with economic and cultural models is central to assess the multidimensional value of ES. Information about the value of ES can then be used to design institutions which are guiding decisions (Daily et al., 2009).

Figure 2-2 Framework integrating ecosystem services into decision-making



Source: Own illustration adopted from Daily et al. (2009, p. 23)

Recently the *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (IPBES) introduced the concept of *nature’s contribution to people* (NCP) out of criticism against the ES concept and with the aim to substitute it (Díaz et al., 2018). There is an

ongoing debate if or to what extent this new conceptual framework reflects the paradigm shift suggested by Díaz et al. (2018) (see e.g. Braat, 2018; Kenter, 2018; Peterson et al., 2018).

NCP has contributed to the discussion about links between nature and human well-being or rather quality of life by highlighting the importance of cultural context and recognising culture as mediator between NCP and peoples' good quality of life. Further, NCP calls for a broader acknowledgement of indigenous and local knowledge in the assessments (Díaz et al., 2018; Peterson et al., 2018). However, it has been questioned if replacing the term *service* with *contributions* is sufficient to overcome the criticised instrumental view of human-nature relationship and it has been argued that NCP do not succeed ES but that the latter are complementary to the former (Kenter, 2018). Furthermore, it has to be emphasized that attempts to integrate value pluralism are also increasing in the ES literature (see e.g. Arias-Arévalo et al., 2018; Bartkowski & Lienhoop, 2018; Chan et al., 2012b; Hansjürgens et al., 2017; Kenter, 2016a; Kenter et al., 2019; Spangenberg & Settele, 2016). Therefore, in the following the term *ecosystem services* will be used in an attempt to integrate value pluralism under this umbrella framework.²

This section has illustrated the supply or flow of direct and indirect benefits ecosystems provide to humans which is the underlying incentive to conduct economic environmental valuation. In the following, it shall be shortly discussed how the resulting value is conventionally conceptualised in economics and which conventional economic valuation methods are available to estimate these values empirically.

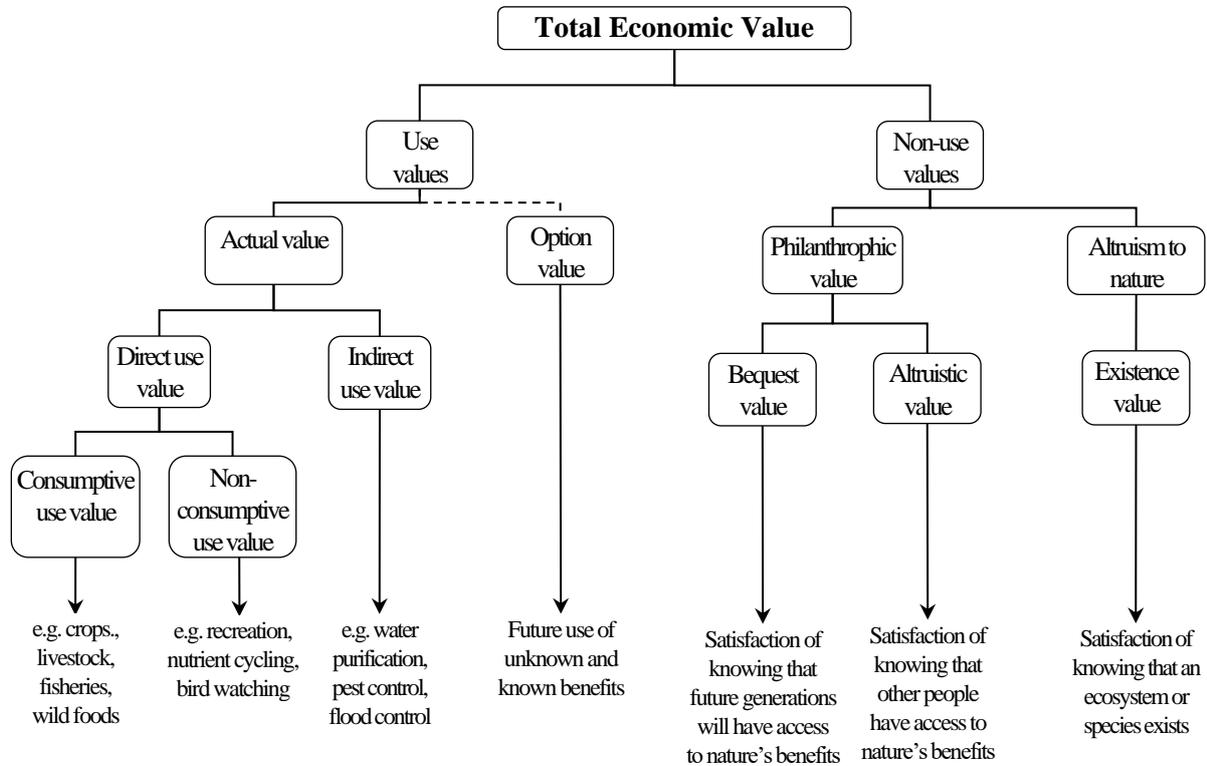
2.2.2 Total Economic Value

In order to support sustainable development implying 'economic and ecological system sustainability' (Faucheux & O'Connor, 1998, p. 4), economic valuation of ES was developed. The aim is twofold, firstly, to incorporate natural capital into decision-making and economic development (Munda, 2000) and secondly, to illustrate dependence of human well-being on ES (TEEB, 2010). To assess the aggregated value of benefits associated with ES, the TEV framework was developed. TEV is an anthropocentric utilitarian framework. "Total" refers to the aggregate of values, which incorporates also *non-use values*, while ES are valued in terms of marginal changes in their provision (TEEB, 2010, p. 192). The framework, as it is usually depicted (see e.g. Pearce & Turner, 1990), consists of various individual values which are

² See Schröter et al. (2014) for a review of critique against the ES concept and counter-arguments i.a. related to environmental ethics and human-nature relationships.

comprised by two overarching value categories: *use value* and *non-use value* (see Figure 2-3). This distinction is based on the early work of Krutilla (1967).

Figure 2-3 The total economic value framework



Source: Own illustration adapted from TEEB (2010, p. 195)

Boxes represent value typologies and arrows mark examples of ES or associated values.

As the name suggests use value relates to the use of natural resources and ES which includes tangible and intangible ES. It comprises all *actual value* which involves *direct use value* and *indirect use value*. The former is associated with consumptive use that reduces availability for others (e.g. extraction of natural resources such as timber) and non-consumptive use (e.g. recreation). Indirect use value refers to regulating ES, such as water purification, which increase human well-being without being actually used. Hence, use value often relates to exchange value on a market whereas indirect use values are not part of market transactions.

More complex is the notion of non-use value. The latter represent values of ES which are not related any kind of use but still affecting human well-being. The associated value categories are altruism towards other humans (*philanthropic value*) and towards nature (*existence value*). According to the framework philanthropic value or rather altruism may either be directed towards future generations (*bequest value*) or other people of current generations (*altruistic value*). Existence value is associated with the knowledge that an ecosystem or species persists. Although, bequest, altruistic and existence value are associated with other humans or non-

human entities, they are understood strictly in terms of individual utility. In other words, they are associated with an individual obtaining “satisfaction of knowing” that e.g. other have access to ES. This assumption eliminates the risk of double-counting when aggregating individual preferences because the valuing agent is the one gaining utility.

Placed somewhere in between use and non-use value is the so-called *option value* which describes the potential value of future use of ES. This potential may either be already known or unknown. For example, flora biodiversity may be protected in order to preserve the option to use the plants for medical purposes.

2.2.3 (Conventional) economic valuation methods

After having clarified how value is commonly conceptualised, conventional methods to assess this value will be briefly presented in the following. A variety of economic valuation methods exist to estimate TEV. Each method has certain strengths and weaknesses, e.g. some are particularly useful to assess use values but less suitable in case of non-use values. Further, valuation methods can be based on diverging paradigms and theories. Economic environmental valuation is predominantly conducted within the theory of environmental economics whose analytical foundations are based on neoclassical economics. Illustrating conventional methods serves two purpose: firstly, to provide a general overview to the non-economic readership and secondly, the conventional valuation approaches will serve as baseline for discussion of novel valuation approaches in subsequent chapters.

As already mentioned above, the motivation to undertake economic valuation is the assessment of ecosystems’ contributions to human well-being. Of particular interest is the estimation of alternative actions’ impact on human well-being (or welfare) in order to be accounted for in decision-making. On the basis of the TEV framework, values are derived from information about individual behaviour. This individual measure of value is premised on individual utility, as a measure of a person’s satisfaction. As utility is not directly measurable, often preferences are elicited and a monetary indicator is applied in order to approximate marginal utility changes on a common scale.

Changes in welfare can be evaluated in *Marshallian* or *Hicksian* terms (Freeman et al., 1993/2014). The concept of ordinary *consumer surplus* was first developed by Dupuit (1844/1969) and disseminated into the field of economics by Marshall (1890/2013). This is why it is also referred to as *Marshallian surplus*. The latter conceptualises the surplus of satisfaction that is obtained from a purchase as the difference between maximum WTP and

market price. Building upon the work of Marshall, Hicks (1943) developed two additional welfare change measures in order to account for gains and losses, *compensating variation* and *equivalent variation*. As mentioned above, the common monetary value indicator that is applied to measure marginal changes in welfare or rather utility is individual maximum WTP for an increase in quantity or quality of an environmental good. Alternatively, *willingness to accept* (WTA) compensation can be used in case of a decrease in utility. If the individual would be worse off than before, the minimum compensation necessary to keep the initial level of utility is defined as compensating variation. The same applies for the case of an increase in utility and associated maximum WTP for the change to happen. Instead, the maximum WTP to evade a marginal change decreasing utility or minimum WTA to not have an increase in utility is referred to as equivalent variation. The difference is that compensating variation uses the initial utility level as reference while equivalent variation focuses on the utility level after the marginal change (Hicks, 1941, 1943).

Individual behaviour may be directly observable on markets but if this is not the case a good's value may be derived indirectly through behaviour on related markets. If neither direct nor indirect price information is available, in case of so-called non-marketed goods, hypothetical markets must be constructed to obtain information. Based on these three possibilities economic valuation methods are commonly categorized as *market-based* valuation (directly observable), *revealed preferences* and *stated preferences*. A brief description of the methods will be given in the following.³

2.2.3.1 Direct market valuation

Direct market valuation approaches are based on market prices (*market price-based method*), costs (*cost-based method*) or production functions (*production function-based method*).

Market price-based methods are dominantly used for provisioning services which are exchanged on markets, e.g. timber. The underlying assumption is that on a perfect market, exchange value or rather the market price reflects the marginal cost of production.

The *cost-based method* assesses the costs that would occur if ES benefits must be substituted by some technological solution. Costs are estimated by assessing the effect if ES were absent (*avoided cost method*); the cost of an artificial, technical solution (*replacement cost method*);

³ Note that also other methods i.a. Benefit Transfer and Multi-Criteria-Analysis exist. However, they are not as commonly applied as the conventional methods presented here. The same applies to deliberative valuation methods which will be discussed later on.

or costs of mitigation of ES degradation or restoration of ES (*mitigation cost method* and *restoration cost method*).

The *production function-based method* estimates the contribution of an ES to the production of another good or service which is sold on a market. Hence, it is limited to the case where ES are used as inputs for production and thus, contribute to productivity.

2.2.3.2 Revealed preferences

In case of *revealed preferences* inference on a good or ES is based on parallel market transactions – actual behaviour revealed on markets is linked to the ES of interest. The two associated methods are *hedonic pricing* and the *travel cost method*.

Hedonic pricing assesses the value of ES through prices of marketed goods with certain environmental characteristics. The underlying assumption is that the demand for these characteristics is implicitly contained in the market price (Rosen, 1974). For example, by looking at similar houses in an area, from the analysis of house prices and houses' characteristics it can be inferred how much people are willing to pay for an environmental attribute, e.g. living closer to a forest or less polluted air.

The travel cost method is a similar approach. Instead of linking implicit demand with prices, it assesses peoples' *willingness to travel* to consume an environmental good, e.g. how far people are willing to travel for recreation in nature (see Bateman et al., 2002; Bockstael et al., 1987).

2.2.3.3 Stated preferences

In case of goods with pure public good characteristics – non-marketed goods – non-use values, e.g. existence or bequest value, cannot be reflected by market prices and hence, cannot be elicited via market-based approaches. In contrast, *stated preferences* are able to not only elicit use-values but also non-use values through the creation of a hypothetical market (see Mitchell & Carson, 1989, p. 2 f.). Another advantage is that it is comparatively simple to ask people about their WTP for the preservation of the status quo or rather an environmental improvement or their WTA a compensation payment for an environmental degradation (Spash et al., 2005). Put another way, values are obtained by stated preferences of survey responses with regard to a marginal change in an environmental good's supply. Usually, preferences are elicited in terms of their individual WTP. Then, individual preferences are aggregated in order to reflect the total value of the relevant natural good or ES. Soma (2006) refers to this understanding of the environment within the economic analysis as *Natura economica*.

Various *stated preference* techniques exist. The earliest techniques developed is ascribed to the work of Ciriacy-Wantrup (1947) and Davis (1963) and referred to as *contingent valuation* (CV) method because responses are contingent upon the described hypothetical market. Survey participants are usually asked for the maximum WTP. Therefore, this format is also known as *open-ended CV* implying that responses and associated amounts are not restricted (Freeman et al., 1993/2014, p. 24ff.). Various payment formats were developed. For example, Bishop and Heberlein (1979) suggested a discrete choice format instead of open-ended survey questions. In practice, participants are told WTP bids which can either be accepted or rejected, so referendum data is obtained which reflect only point observations. Hence, the results are relatively imprecise (McConnell, 1990). Another technique to elicit WTP within CV are *payment cards*, originally suggested by Mitchell and Carson (1981). Payment cards comprise an array of amounts and participants are asked for each amount if they are willing to pay them.

Choice experiments, originally developed by Louviere and Woodworth (1983), are commonly used as stated preferences method in addition to CV. In choice experiments the environmental good of investigation is described to participants in form of various characteristics. Alternative scenarios are generated by various combinations of these characteristics. Participants are then asked to choose the best alternative to the status quo or in a more experimental setting, they are asked to choose numerous preferred scenarios out of sets of combinations, referred to as *choice cards* (Hanley et al., 1998).

No matter which of the techniques is applied, measures of uncertainty can be incorporated by simply asking participants how certain they are on being willing to pay the stated amount, e.g. on a scale ranging from 0%-100% or verbally framed (see e.g. MacMillan et al., 2002).

2.2.3.4 Economic critique against stated preferences

Although stated preferences are in principle very suitable in context of valuing non-use value of ES (Pearce et al., 1989), conceptual and methodological concerns are often voiced from “within” the field of economics. This critique is primarily directed towards validity of valuation results (Spash et al., 2005).⁴

One of the issues regarding stated preferences relates to the definition of the boundaries of environmental goods and the fact that they are often non-marketed (Vatn, 2000). The issue at

⁴ Note that a second, more fundamental, strand of critique exists which is directly linked to the discussion on social values of ES and biodiversity. The fundamental critique will be discussed in the following chapter.

stake is that the nature of the good is complex (Clark et al., 2000). Usually people are not confronted with market situations regarding complex goods such as ES. Therefore, they lack the ability to price these goods which may lower the robustness of the responses (Burney, 2000; Rolston, 1985). In line Kahneman and Knetsch (1992) showed that the WTP for a public good may be insensitive to scope, implying that WTP is identical for the overall public good as for a fraction of the public good, the so-called *embedding effect*. The latter is argued to arise due to lack of individual preferences for the public good or due to the hypothetical nature of the survey which may cause respondents to struggle to consider the effects of their budget constraints (Diamond & Hausman, 1994). Due to the above-mentioned complexity, preferences for environmental goods may not be fully defined (Svedsäter, 2003). It is debated whether stated preferences generally suffer from embedding effects or if they are artifacts of study design (Blamey et al., 1995). Another concern is the *hypothetical market bias* implying that due to the hypothetical nature of the survey, participants might overestimate their true WTP (see e.g. Bohm, 1972).

Already Ciriacy-Wantrup (1947) emphasized the importance of the design of the surveys and questionnaires because *framing effects* may bias the valuation of ES as stated preferences may be influenced by the problem statement (Common et al., 1993; Sagoff, 1988; Stagl, 2004). In some cases, researchers might even remove important aspects from the analysis and ultimately, participants struggle to weigh costs and benefits (Bennis et al., 2010).

Further, an issue is the divergence between WTP and WTA (Hanemann, 1991), also referred to as *willingness to pay–willingness to accept gap* (Plott & Zeiler, 2005). Based on the theory, WTP for and WTA should be identical at the margin (Willig, 1976). Yet, it can be observed that WTA often exceeds WTP (see e.g. Horowitz & McConnell, 2002; Plott & Zeiler, 2005). Several explanations of the phenomenon exist i.a. it is argued that the gap arises due to loss aversion (Tversky & Kahneman, 1991), availability of substitutes (Hanemann, 1991), lack of experience in a market setting (Coursey et al., 1987) and/or intrinsic values (Boyce et al., 1992).

2.3 Concluding remarks

The aim of this chapter was fourfold: i) to provide an overview about the conceptual core and associated assumptions of neoclassical economics, ii) to introduce the concept of ES representing the valuation object, iii) to illustrate the link between ES and human well-being, which is the underlying incentive for economic environmental valuation, and iv) to elucidate how values of ES can be accessed via conventional economic environmental valuation approaches.

This chapter is rather brief, as most of the content can be found in introductory textbooks of environmental economics. Nevertheless, it is of importance because it creates a common initial position for the economic and non-economic readership. Especially, with respect to the issue that within research fundamental assumptions regarding one's own discipline are not necessarily made explicit but presumed to be known (see Schröter et al., 2020). The topic is of interdisciplinary interest and deeper knowledge of economic theory cannot be expected from non-economists. Furthermore, the discussion on social values of ES centres largely around drawbacks of conventional economic valuation approaches and underlying neoclassical economic theory. In particular, the utilitarian framework of welfare economics is criticised. At the same time, the critique is mostly limited to neoclassical economics, ignoring a long-standing research of heterodox economics, e.g. old institutional economics. The conceptual core and associated assumptions will serve as a baseline for the discussion about social values of ES. On this basis, the critique against conventional approaches can be set in context and differences to various schools of economic thought can be highlighted. Hence, also for the interested economic readership the brief summary is of relevance as short review of the most important aspects of neoclassical economics.

After laying the foundation by clarifying the concepts of neoclassical economic value, ES and economic environmental valuation, which serve as background for the analysis of social values, we now approach the core of the thesis at hand, the economic analysis of social values and their valuation. In a next step social values of ES are identified from an economic perspective. This will be done by reviewing the current literature about social values of ES mainly focussing on the economic perspective. Thereafter, the review will be extended by identifying so far neglected economic theories which are explicitly or implicitly concerned with social values.

Chapter 3 Identifying social values of ecosystem services: The current state

This chapter provides an overview about the literature on social values. The overall aim is to identify meanings, recurrent attributes and concepts of social value in the existing literature in order to illustrate the research gaps associated with i) neglect of relevant economic theories and ii) conceptual ambiguity and lack of a consistent conceptual framework.

First, the current debate on social values of ES and their embeddedness in economic theories will be reviewed (Section 3.1), illustrating the need for conceptual clarification. On this basis, the review is extended towards so far neglected economic theories that explicitly or implicitly deal with social values (Section 3.2). Hence, the second part of the chapter will contribute to the closure of the first identified research gap – unnoticed contributions of economics to the theory of social value – and lay foundations for the closure of the second research gap – clarification of the nature of social value and development of a consistent economic conceptual framework.

3.1 The current debate on social values and their embeddedness in economic theories

As illustrated above, neoclassical economic theory comprising economic environmental valuation usually recognizes nature or rather the environment as a bundle of commodities which can be expressed in monetary values by means of shadow prices. Monetary values enable an ordering for alternative uses of the relevant good and can be obtained through the elicitation of preferences, either revealed or stated (Lawson, 2013). The criticism of mainstream welfare economics – including environmental economics and economic valuation methods – is manifold. On the one hand, stands a moderate critique, mostly from “within” neoclassical economics, mainly questioning the validity of specific numbers obtained (Spash et al., 2005). On the other hand, a more fundamental criticism of the theoretical foundation of economic values exists. The current debate on social values of ES originated from the fundamentally critical literature. Therefore, in the following first the main points of criticism will be examined (Section 3.1.1), before discussing *Deliberative Monetary Valuation* (DMV) and social values of ES as methodological and theoretical responses to the critique against economic environmental valuation (Sections 3.1.2 and 3.1.3).

3.1.1 Fundamental critique against economic environmental valuation

Commonly economic valuation of ES is criticised for commodifying nature implying the adaptation of market transactions for beforehand non-marketed goods (see e.g. Gomez-Baggethun & Ruiz-Perez, 2011; Neuteleers & Engelen, 2015). Especially, biologist commonly reject the idea of valuing nature and biodiversity (see e.g. Ehrenfeld, 1988). In fact, economics in context of natural resources and ES is interested in property rights (regimes), representing a certain type of institution. However, this does not infer that ES are privatised as property rights regimes may be common (see e.g. Ciriacy-Wantrup & Bishop, 1975; Costanza et al., 2017; Ostrom & Hess, 2010). Further, the overarching intention is not to “put a price on nature” but valuation of ES generally aims to internalize external costs in order to reduce market and policy failure (Marggraf, 2005, p. 3 f.). Thereby, not only private but also social costs are supposed to be considered in decision-making (Gatzweiler, 2008). Therefore, in theory the intentions of economic environmental valuation to protect ecosystems through informed decision making and to illustrate that ES are not only valuable in terms of intrinsic but also instrumental value is in accordance with the ontological position of the ES concept (see Gomez-Baggethun & de Groot, 2010). However, even when adapting this rather pragmatic perspective, two arguments can be opposed. Firstly, while valuation studies aim to provide a scientific basis for an improved decision-making, little evidence of sufficiently more sensitive decision-making and changes in environmental behavior exists (Jordan & Russel, 2014). It is broadly acknowledged that the decision-making does not account for the total value of ES (Kenter et al., 2016c) which has been a substantial factor regarding the continuous degradation and loss of ecosystems and biodiversity (Millennium Ecosystem Assessment, 2005). Secondly, it is debatable to which degree economic valuation methods can be considered to be a neutral tool and to which extent it is dependent on the institutional and socio-political context. Then again, the question is who to blame – should the tool be blamed for an inadequate institutional setting (see Gomez-Baggethun & de Groot, 2010)? Rather, economic valuation should be understood as a pragmatic and imperfect information tool which should be considered in the decision-making process (Bartkowski & Lienhoop, 2018; Gomez-Baggethun & de Groot, 2010).

As discussed above, the complexity of environmental goods poses challenges for economic environmental valuation in terms of estimates’ reliability. Furthermore, complexity plays a decisive role in the more fundamental critique. It is argued that complex ecosystem functions do not comply with the market analogy of measurable units of a good and that therefore, conventional economic valuation approaches are not suitable for environmental goods with

public good characteristics and/or for goods where individuals lack experience (Norton & Noonan, 2007). According to Vatn (2005, p. 421) some value dimensions of ES may not comply with a unidimensional approach which reduces all value to a single scale (see also Gatzweiler, 2008; Norton & Noonan, 2007). Due to this reductionist thinking towards exchange value as single source of value, the neoclassical economic framework is associated with *value monism* (see O'Neill et al., 2008, p. 70 f.) and *monetary reductionism* (Söderbaum, 1987). These are central assumptions as they allow for the reduction of value to a single value indicator and thereby, enables the comparison of goods – this is referred to as *commensurability* (see e.g. Aldred, 2006; Gowdy & Erickson, 2005). However, it is opposed that due to ethical and cultural factors survey participants may obstruct weighing costs and benefits. Hence, although a market context can be hypothetically constructed, people may refuse trade-offs at the margin (Vatn, 2000). This type of preference is referred to as *lexicographic* (Gowdy & Erickson, 2005) or in the non-economic literature known as *protected values* (Baron & Spranca, 1997) or *sacred values* (Tetlock, 2003; Tetlock et al., 2000). Lexicographic preferences violate the assumption of continuously defined preferences. Hence, instead of consequentialism they may involve moral obligations which are considered universal and beyond personal preferences (Baron & Spranca, 1997; Bennis et al., 2010). The implication is that certain value dimensions are not reducible to a single metric, this is referred to as *incommensurability*. It is worth noting that incommensurability does not necessarily suggest that goods are incomparable (based on an ordinal scale) (cf. Raz, 1986, p. 328f.) but that values cannot be consistently measured in terms of a single metric along a cardinal scale, mostly monetary in economic valuation (Aldred, 2002; Griffin, 1986; Martinez-Alier et al., 1998). If nevertheless single, simple metrics such as monetary value indicators are applied and individual utilities are aggregated, information is lost in the process (Burney, 2000; Vatn, 2005, p. 421; Vatn & Bromley, 1994). Thus, aspects such as procedural justice, non-utilitarian ethics and social norms' influence on individual choice are neglected (Jorgensen et al., 2001; Spash et al., 2009), which may ultimately limit the quality of the assessment (Burney, 2000). Nevertheless, lexicographic preferences are often treated as “protest responses” and therefore, eliminated from the analysis. Incommensurability and lexicographic preferences raise the question which role the context with respect to the valuation method and the valuation setting play for the elicitation of preferences for complex environmental goods.

Regarding the critique of value monism, it is commonly opposed that ES aims to be a holistic framework that e.g. also incorporates cultural ES (see Fish et al., 2016). In line, also the TEV

concept tries to account for a variety of value categories and it has been emphasized that TEV is a heuristic in order to cover different value dimensions (Hansjürgens et al., 2017). As emphasized in the theoretical introduction (Chapter 2), ES and conventional economic valuation are anthropocentric instrumental concepts. In the discussion about environmental values the distinction of values is two-fold: instrumental values and intrinsic values. The former is concerned with the satisfaction of preferences or a specific purpose and hence, it is a mean to an end. In contrast, intrinsic values lie in the object itself and therefore, represent an end in itself (Bengston, 1994; Sagoff, 1991). Thus, TEV is not designed to capture intrinsic value of nature (see Pearce et al., 1994, p. 22). Accordingly, the narrow concept of value in the neoclassical theory restricts valuation of ecosystems and their services to the measurement of a ‘subjective, instrumental, utilitarian exchange value’, and is criticised for ignoring the uniqueness and inherent value of nature (Spangenberg & Settele, 2016, p. 103). In line, Chan et al. (2012b, p. 12) argue that TEV captures only a ‘metaphorical shadow’ of biocentric values. This poses the question whether the current concept of TEV is sufficient to capture social values of ES. These philosophical concerns often go hand in hand with technical ones. For example, if other-regarding values and moral norms affect individual preferences (see Keat, 1997; Peacock, 1997), a narrow TEV concept ignoring the multidimensionality of value would result in undervaluation of the environmental good (Ravenscroft, 2010).

Moreover, Sagoff (1986) questions the theoretical foundation of preference utilitarianism that builds the basis of economic valuation and TEV. He states that preference satisfaction does not necessarily represent a desirable end because preferences must not be intrinsically good themselves. For example, preferences driven by sadism, racism, injustice or non-autonomous preferences such as drug addiction are not considered to be intrinsically good (see also Harsanyi, 1977). So, if preference satisfaction cannot be considered to be an end in itself but is an instrumental mean to an end, preference satisfaction should just be one of many means to generate the greatest happiness. However, as noted by Sagoff (1986), the theory then returns to the moral principle of classical utilitarianism. Consequentially, Sagoff (1988) questions also the aggregation of individual preferences regarding environmental concerns, especially in case of poor information of respondents. According to Sagoff (1986) public policy should only be based on individual preferences until basic needs are met, after the threshold of basic needs is met public values should be considered. Hence, it is emphasised that value can also be related to a good society and moral principles which are beyond the individual. The resulting questions

are if the individual is the appropriate unit of analysis and if consumer sovereignty is an adequate norm in case of public goods.

The concept of human behaviour adapted in conventional economic valuation assumes utilitarian preference satisfaction. Therefore, it is often criticised for being too narrow and restrictive (Gowdy, 2007). It is argued that potential biases arise due to missing incentives for the individual to express precise responses and more critical that respondents often violate the assumption of rational choice (Blamey et al., 1995). Hence, it is argued that the *homo economicus* concept fails to account for complex motivation behind the individuals' choices (Spash, 1998). As an early critic of the rationality assumptions, Herbert Simon (1955) argued that human behaviour described by optimization within models of rational choice does not reflect real human behaviour well enough due to a lack of time, lack of information and limited *computational capacity*, simply put cognitive abilities. Generally, it is assumed that participants have a limited amount of information about complex goods. Due to the lack of information people may undervalue ES which is closely linked to the theory of merit goods that suggests that people do not value ES as much as they “should” (Burney, 2000). Also Sagoff (1988) argues in favour of an *ethical rationality* which requires deliberation in order to elicit highly informed preferences.

Further, the assumption of the utility maximising individual is a concern. As Hausman (1992) noted, the assumption of individual utility maximisation does not state anything about the nature of the preferences and simply links choices and preferences. The findings of Kahneman and Knetsch (1992) imply that the WTP for public goods elicited in CV studies is not only reflecting the economic value of the good but reveals also a WTP for *moral satisfaction*. Further, Vatn (2005, p. 114) argues that utility maximising conception of rationality suggest that preferences are independent of the context. Firstly, because rankings of good x and good y are independent of the existence of a third good z and secondly, because preferences are independent of the institutional setting such as the social context. This implies that based on neoclassical economic theory preferences for example for drinks are independent of the specific social event (e.g. funeral or birthday party). Hence, institutional constraints on choice are not considered in the model of human behaviour (Swaney & Olson, 1992).

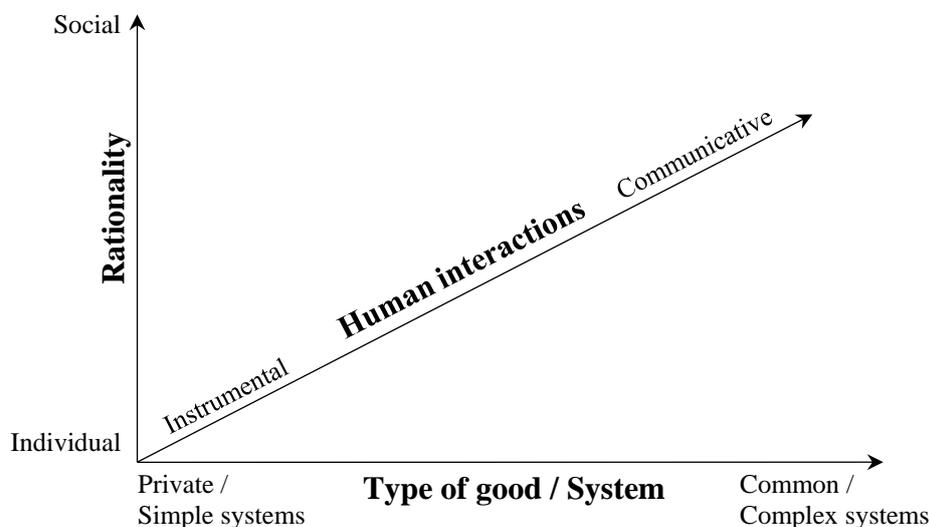
Another concern with respect to the standard valuation approach and neoclassical economic theory is the assumption of stable preferences. Empirical evidence has shown that individuals change preferences during the decision process (Norton & Steinemann, 2001). Being exposed

to new information, participants may construct preferences in a process of deliberation (Jacobs, 1997). Studies have shown that preferences are constructed on demand instead of being pre-existent (Gregory et al., 1993) which may lead to preference reversals (Tversky et al., 1990).

The necessity of informing participants, potential effects of deliberation in form of preference construction and relevance of social context challenge the adequacy of ex-ante given individual preferences with respect to complex environmental goods. Continuing in the same vein, these issues link to the question of social values' relevance for ES and biodiversity. Further, this issue is not purely theoretical but has also to be seen in context with methodology. Conventional valuation methods are designed in order to elicit ex-ante given individual preferences which are assumed to be stable. Thus, the theoretical and the methodological dimensions are interlinked which emphasises the need to test theoretical concepts empirically.

Often it is argued that self-interested behaviour only partially applies and that consequently a more complex concept of human behaviour should be considered. Complex human behaviour refers to i.a. moral values (Hodgson, 1997; Vatn, 2009), information (sharing) and deliberation (Jacobs, 1997), dependency of individual preferences on the social sphere (Etzioni, 1988/2010) and emotions (Ariansen, 1998). In line, Soma (2006) argues that if the underlying concepts of economic valuation regarding the environment, natural goods and human behaviour differ significantly from real world observations, also relevance of policy recommendations for environmental decision-making is low (see also Gatzweiler, 2008). Hence, applied valuation methods should meet the complexity of relevant dimensions as illustrated in Figure 3-1.

Figure 3-1 Relevant dimensions for choosing the valuation method



Source: Own illustration adopted from Vatn (2005, p. 419)

For “simple” decision-making situations defined by individual rationality, private goods and instrumental human behaviour, the use of unidimensional valuation methods is adequate. However, the further we move along the axes towards social rationality, common goods, and communicative human interactions, the more complex the decision-making situation gets. It is questioned that conventional valuation methods based on the theoretical foundation of neoclassical economics and associated axioms are able to account for the multidimensionality of values. In response towards the criticism against economic environmental valuation, it has been argued that a theoretical and methodological plurality is needed (Bebbington et al., 2007; Parks & Gowdy, 2013). The former centres around questions of value and the latter is especially associated with incorporating deliberative and participative approaches into economic valuation. Soma (2006) framed four questions (yes / no) in order to elaborate whether the simplified decision-making is suitable or whether participative and deliberative methods should be applied. In case that the concepts of *natura economica* and *homo economicus* hold, conventional valuation approaches are sufficient. Participative and deliberative methods should be applied in case that one of the questions is answered with “yes”: i) the analysis has more than one goal; ii) the environment cannot be treated as a bundle of commodities; iii) values are not commensurable; and/or iv) individual preference aggregation is not feasible.

Table 3-1 summarises the conceptual core of neoclassical economics and specific assumptions of economic environmental valuation criticised in the literature. In response to this critique, a variety of alternative valuation methods have been developed which either extend current approaches or aim to replace them. Multi Criteria Evaluation (MCE) (Martinez-Alier et al., 1998) and other ordinal rankings of non-monetized environmental values were suggested as alternatives (see Kant & Lee, 2004) out of scepticism towards monetization and market orientation of stated preferences. Further, these methods relax the assumption of commensurability implying avoidance of reducing all values to a cardinal scale. According to Söderbaum (1987) non-monetary approaches tend to be more multidimensional and holistic. Further, he argues that non-monetary impacts should be described as such and not tried to be expressed in a monetary equivalent. In line, alternative measures of welfare such as life satisfaction have been suggested (Ambrey & Fleming, 2014; Fujiwara & Campbell, 2011; Welsch & Kühling, 2009). Furthermore, interpretive and interpretive-deliberated approaches such as story-telling (Orchard-Webb et al., 2016), arts-led dialogue (Edwards et al., 2016) and a film-based approach (Ranger et al., 2016) were recently applied in an attempt to improve the assessment of cultural values of ES.

Table 3-1 Conceptual core and specific assumptions of economic environmental valuation

Conceptual core / framework	Specific assumptions of economic environmental valuation
Welfarism	Premise of self-interested utility maximisation.
Social Welfare	Social welfare defined as aggregation of individual preferences.
Individualism	Individuals considered to be atomistic beings. Individual welfare as relevant measure.
Consequentialism	Focus on the outcome.
Instrumentalism	ES as instruments for satisfaction of individual preferences.
Commensurability	Different types of value can be reduced to a single metric (e.g. monetary scale) in order to be comparable.
Preference formation	Ex-ante given preferences.

Source: Own illustration adapted from Massenber (2019, p. 1234)

With regards to the recent economic valuation literature, participatory and deliberative methods gained increasing attention in order to account for the multidimensionality of value (Kenter et al., 2015). Therefore, the next section will shortly introduce DMV and its theoretical foundations. The focus is laid upon deliberative valuation methods as they are closely linked to social values. At the same time DMV provides answers and solutions for some of the criticism against economic valuation approaches. Hence, if novel valuation approaches such as DMV can successfully address (some of) the fundamental criticism, it provides good reason to not abolish economic environmental valuation completely as suggested by some scholars.

3.1.2 Deliberative monetary valuation: a response to the criticism

In order to overcome some of the above-described limitations of conventional economic valuation methods regarding endogenous preferences, value monism and disregard of morality, approaches that combine economic with deliberative processes were developed (Orchard-Webb et al., 2016; Spash, 2007, 2008). The deliberative approach is based on the theory of deliberative democracy associated with John Dewey (1923) and Jürgen Habermas (1984, 1993). The underlying idea is that deliberation, in form of ingroup discussions, leads to mutual understanding which causes converging opinions or rather preferences and, ultimately, consensus can be reached. The prerequisite is an ideal speech situation characterised by ‘freedom of access, equal rights to participate, truthfulness on the part of participants, absence

of coercion in adopting positions, and so on' (Habermas, 1993, p. 31). In such a rational discourse the best argument is assumed to hold (Habermas, 2003, p. 251; 269). The resulting consensus is considered to be a rational agreement because it is based on a reflexive process and not on individuals' initial (potentially distorted) subjective views (Dewey, 1923; Habermas, 1987/1990, p. 315). Thereby, communicative rationality can serve as an alternative model of human behaviour which does not link rationality to instrumentality but to mutual understanding between individuals (Zografos & Howarth, 2010). The market sphere is extended by deliberative institutions, e.g. focus groups, citizens' jury or consensus conference, in order to create an adequate setting which allows for communicative rationality (see Hansjürgens et al., 2017). Thus, participants are given the possibility to share information, learn about relevant ES, and to discuss and to reflect upon their values and the values of other participants (Christie et al., 2006; Kenter et al., 2016c). Thus, deliberative approaches emphasise the need for discussion in the public sphere when dealing with common goods, instead of relying on purely individual assessments (see Dietz et al., 2009).

DMV extends stated preferences by ingroup discussions before eliciting WTP. DMV approaches can be categorised into *preference economisation* and *preference moralisation* based on their differing paradigms (Lo & Spash, 2013). In economic valuation studies the focus of deliberation is often on *preference economisation* in order to (better) inform participants about complex, unfamiliar goods (Aanesen et al., 2015; Lienhoop et al., 2015; Spash, 2008). In this case, deliberation in combination with time to reflect upon the topic is supposed to allow survey participants to share information which improves the general information level (see Ward, 1999), to reassess their WTP (Lienhoop & MacMillan, 2007b) and to allow for preference formation in case that the assumption of exogenous preferences is violated (Álvarez-Farizo & Hanley, 2006; Jacobs, 1997; Spash, 2002). Besides improved information and preference construction, it is also argued that deliberation reduces protest responses (Szabó, 2011) likely because of increased process' legitimacy (see Ward, 1999). Furthermore, some authors claim that deliberation results in "better" WTP estimates (Gomez-Baggethun & Ruiz-Perez, 2011; Kenter et al., 2016a; Lienhoop & MacMillan, 2007a). Yet, there is little empirical evidence supporting this assumption (Schaafsma et al., 2018). Despite the incorporation of deliberation, *preference economisation* is criticised for its preference utilitarian framework which is thought to diminish value pluralism (Lo & Spash, 2013) and to disregard empirical evidence that not all stated preferences are related to utilitarianism (Spash, 2000a, 2006, 2008).

Preference moralisation involves discussion about broader values that transcend the context, e.g. desired end-states, which gives participants the possibility to discuss for example ethical concerns in a group setting and include value categories which are not taken into account by conventional stated preferences (Kenter et al., 2016b; Spash, 2007; Ward, 1999). Additionally, deliberation helps to raise awareness about the perspectives of other individuals (Vatn, 2005, p. 350) which in case of social learning may result in a common understanding (Schusler et al., 2003). Further, some values must be experienced in order to be valued. Narration can play an important part for the articulation and elicitation of non-utilitarian values and may be incorporated in the valuation process (Satterfield, 2001). In addition, scholars suggest to use deliberative methods in order to elicit social wants (social goods) based on social rationality instead of individual rationality (Niemeyer, 2004; Sagoff, 1998; Sagoff, 2004). The argument is that valuation of public goods is inherently ethical and is therefore beyond the sole consideration of costs and benefits, and individual utility. Instead, desirability from a societal perspective and aspects of inter- and intragenerational fairness are identified as relevant concerns (Jacobs, 1997; Sagoff, 1998; Ward, 1999; Wilson & Howarth, 2002). While certainly it can be argued that collective decisions are more in line with the unanimity rule (Álvarez-Farizo et al., 2007), others question that unanimity must be the outcome of deliberation (see eg. Bartkowski & Lienhoop, 2018; Dryzek, 2013; Wilson & Howarth, 2002).

Five relevant aims of deliberation in the context of economic environmental valuation can be identified:

- i) Provision and sharing of information
- ii) Preference construction
- iii) Social learning process
- iv) Revelation of implicit values
- v) Coverage of multidimensionality of value

However, a combination of two different theories, e.g. individual and communicative rationality, is problematic (Vatn, 2009) and the theoretical basis of DMV remains vague (Bartkowski & Lienhoop, 2018; Bunse et al., 2015), especially regarding value formation within deliberative processes (Kenter et al., 2016c). Nevertheless, deliberative (monetary) valuation approaches form a crucial link between conventional economic valuation and fundamental criticism and contribute to the enhancement and improvement of economic

environmental valuation. We now turn our attention to social values which are the core theme of the thesis at hand.

3.1.3 Social values: An ambiguous concept

In the following, the various understandings, definitions and concepts of social values within the current debate on social values of ES will be identified. On the one hand, this review illustrates the relevance of social values for economic environmental valuation, on the other hand, it will depict the inconsistent use of the term “social value”, the neglect of relevant economic theories (first research gap), lack of a consistent framework (second research gap) and small amount of studies empirically investigating social values (third research gap).

As discussed above, neoclassical economics based on its utilitarian framework expresses value to society as social welfare which is defined as aggregated preferences of self-interested rational individuals. Yet, it is argued that the neoclassical utilitarian approach is only consistent in case of individual goods (e.g. provisioning services) relating to individual benefits in absence of externalities. In certain cases these two criteria also hold for public goods e.g. recreation values, yet, this is rather an exception than the rule (Farber et al., 2002). Following Arrow’s *Impossibility Theorem*⁵ (Arrow, 1950), it has been argued that in context of valuation a social ranking of alternatives or rather a ranking of policy alternatives based on individual preferences is unfeasible (Parks & Gowdy, 2013). Moreover, Parks and Gowdy (2013) argue that the aggregation of individual preferences cannot reflect more than the sum of them implying that monetary economic valuation of the environment is unable to fully reflect environmental values (Brouwer et al., 1999) and to capture the total value to society (Irvine et al., 2016). More sceptically, it has been argued that the valuation of ES has reached the limits of mainstream welfare economics, circumscribed by the utilitarian framework (Bowles & Gintis, 2000; Gowdy, 2004; Parks & Gowdy, 2013). Besides utilitarian values also the ‘sociocultural perspective’ associated with worldviews, identity, religion, culture and ethics which ‘transcends utilitarian preference satisfaction’ has been attributed central importance (Millennium Ecosystem Assessment, 2003, p. 128f.).

⁵ Arrow (1950) illustrated that aggregation of individual preferences to a social welfare function is subject to imperfection. Considering minimal conditions that must be met for the aggregation procedure (universality, consistency, non-dictatorship, monotonicity and independence), due to individual patterns no social welfare function complies with all conditions (Arrow, 1950).

Building upon the critique against economic environmental valuation, in recent years the concept of social values gained interest in the discussion about values of ecosystems (Fish et al., 2011; Kenter et al., 2014). Repeatedly, these values are generalised and synthesized as *cultural values* (Kenter et al., 2014), disregarding the broader social and cultural context most ES are associated with (Scholte et al., 2015). The existing literature does not provide a sufficient conceptual framework for the valuation of shared and social values (Bunse et al., 2015; Kenter et al., 2015; Parks & Gowdy, 2013; Raymond et al., 2014), and a consensus about the definition of social values does not exist in the literature (see e.g. Irvine et al., 2016; Kenter et al., 2014; Norton & Steinemann, 2001; Scorse & Kildow, 2015). The term *social value* has been used in reference to a variety of topics such as public interests, public goods, altruism, welfare measurements, aggregation of individual WTP, group WTP or deliberated values (Kenter et al., 2015). Further, the terminology is unclear e.g. *social values*, *shared values*, *citizen values* and *plural values* are interchangeably used (Irvine et al., 2016; Kenter et al., 2014) and generally, a confusion about the understanding and assessment of social values is present (Kenter et al., 2019; Norton & Steinemann, 2001). In line, no consensus exists whether social values should complement the existing theory and methods (see e.g. Bebbington et al., 2007; Sagoff, 1998) or replace them (see e.g. Farber et al., 2002; Parks & Gowdy, 2013). This is also caused by the interdisciplinarity of the topic in which not only ES but also social values represent boundary objects. Hence, diverse approaches towards social values exist resulting in conflicting disciplinary perspectives which may in some cases even be mutually exclusive (see Kenter et al., 2019).

In the following it will be reviewed from an economic perspective how social values are understood in the current discussion. This initial characterisation of social values aims at demonstrating the interdisciplinarity of the topic, shedding light on the role of economics in the debate or rather the little attendance given to economic theories beyond mainstream neoclassical economics, as well as illustrating the inconsistent use of the term, diverging assumptions about the nature of social values as well as lack of a consistent framework.

In context of ES, the incorporation of non-marketed benefits and non-use values besides consumptive goods, such as timber, stimulated the discussion about the nature of value regarding ecosystems and initiated the discussion about social values of ES. Halstead (1984) generalised social values as all non-marketed benefits of agricultural land. Thus, social values were assumed to reflect all non-marketed services of agricultural land that do not generate any income to the farmer, such as wildlife habitats or landscape aesthetics, which are nowadays

accounted for in the TEV. Yet, shifting the view from direct to indirect and non-use values extended the conventional economic concept that conceptualizes social value as the consumptive values of a natural resource (Koch & Kennedy, 1991) to a more complex understanding of nature of value which links the ecological with the social and cultural contexts (see also Norton & Steinemann, 2001). On this basis, the discussion about *normative values* often arises (Farley, 2012; Kenter et al., 2015; Lo et al., 2012; Soma, 2006). Yet another ambiguous term which is rarely set in context. Etzioni (1988/2010, p. 105) defines values as normative when they ‘prescribe behavior’. They may be internalized or act as constraints while a clear distinction from moral values is challenging (see also Etzioni, 1988). Further, he argues that ‘normative values are at the core of the deontological paradigm’ and suggests equality, freedom and justice as examples, although he also refers to them as *social values* (Etzioni, 1988/2010, p. 106). Generally, these normative values are considered to be shared by more than one person which may refer to a group, community, society or culture. These types of values are often regarded to transcend specific situations (Dietz et al., 2005; Schwartz & Bilsky, 1987) and hence, in the current discussion referred to as *transcendental values* (Kenter et al., 2015). In contrast to transcendental values, *contextual values* are associated with an object of value and hence, are context-specific (see e.g. Kenter et al., 2019).

Considering normative and (culturally) shared values, it has been argued that environmental degradation and undervaluation of ecosystems can be understood in terms of a tension between diverging rationalities. The underlying assumption is that individuals have in addition to self-interested preferences also intersubjective preferences towards the common good (Keat, 1994; Sagoff, 1988). These preferences are characterised by impersonality, independence of the personal state (Dworkin, 1981), suggesting that rationality is also shaped by social context or rather institutions (Niemeyer & Spash, 2001; Vatn, 2005, p. 121). Sagoff (1986, 1998) defines these shared values as intersubjective intentions, meaning that the individual ascribes intentions or goals to the group or community, and refers to them as *public values*. This understanding of rationality extends the unit of analysis from a purely individual scale towards a collective level (see also Bratman, 1999; Bratman, 1993). Thus, the traditional neoclassical perspective of social preferences as aggregated individual preferences is not able to grasp these values.

Sagoff (1986) describes a dualistic rationality in which individual self-interested preferences (consumer preferences) are contrasted with intersubjective preferences towards the common good (citizen preferences) also known as *consumer-citizen dichotomy* (see also Keat, 1994). Thus, individuals may have different roles with contradicting rationalities. The *consumer* as

utility maximiser may choose the cheapest good and thereby reveal also a preference for the associated negative attributes, e.g. ecosystem degradation. In contrast, in the role of the *citizen* a good may be chosen due to ethical concerns. Spash (1998) criticised the consumer-citizen dichotomy for this specific separation of ethical and economic concerns arguing that these are inseparable. Further, the dichotomy has been criticised for being unrealistic, arguing that individuals' behaviour has a continuous dimension instead of mutually exclusive dichotomous roles (Brouwer et al., 1999).

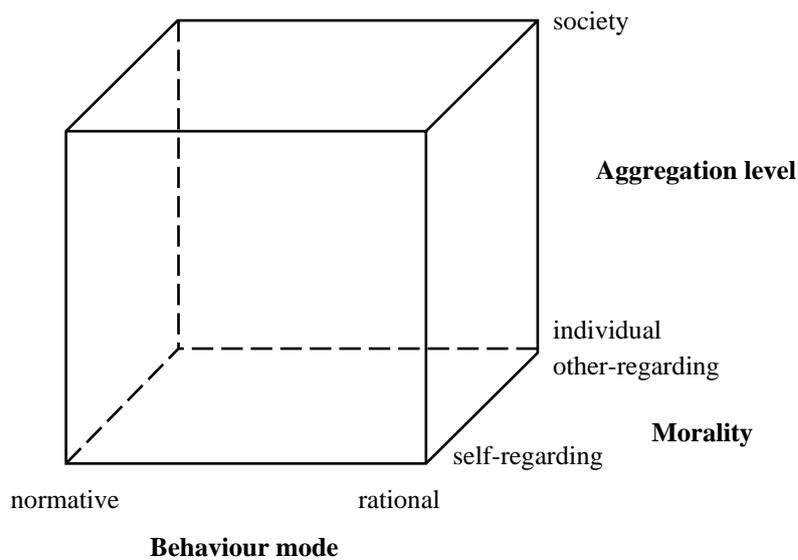
Vatn (2009) argues that individual choices with respect to ES are ethical due to ecosystem's physical interconnections implying that individual decisions influence others. Therefore, he considers elicitation of individual preferences to be inappropriate in a social context (Vatn, 2009). Also Vatn (2005, 2009) identifies two rationalities: a self-interested rationality (*I-rationality*) and a social or other-regarding rationality (*We-rationality*). However, the assumption of a strict dichotomy is relaxed, and instead Vatn (2005, p. 127) identified five different institutional systems which influence preferences: the market, the firm, the family, the community (civil society) and the political arena (the state). Along with the increase in institutional settings also the roles become more complex. The individual may for example have preferences as consumer (market), employer (firm), parent (family), neighbour (civil society) or politician (state). In the same vein, it has been argued that in context of political action individuals internalize not only self-interests but also moral principles that follow a higher ideal. For instance, people engage in elections, although it is not rational for the individual to vote. This suggests that individuals do not only have self-interested desires which they want to satisfy but that they further have ideals or principles (Goodin, 1989).

Vatn (2005, p. 126) elaborated that rationality is defined by institutional structures. Institutions may affect preferences directly and indirectly by 'activating' preferences (Vatn, 2005, p. 301). According to Sagoff (1986) shared values should be incorporated into the decision-making process through a democratic process. The latter provides the possibility for individuals to discuss issues as citizens and to dismiss their individual preferences (Sagoff, 1986). Also, Spash (1998) reasons in favour of a democratic model in which individual citizens are informed by scientific experts. Yet, in contrast to Sagoff (1986) and Vatn (2005), he considers the institutional design of the preference expression of less importance. According to Spash (1998) the preference expression does not necessarily have to be a political process but can also be market based as long as the individual is informed. However, empirical evidence has shown that the methodology used might critically alter stated and/or revealed preferences (see e.g.

Bateman et al., 2006; Herath & Kennedy, 2004). Although, generally stated preference surveys assume that elicited preferences reflect consumer preferences, empirical evidence exists that citizen preferences were elicited, e.g. in case of environmental preservation (Blamey et al., 1995) and wildlife preservation (Stevens et al., 1991; Stevens et al., 1993).

Tacconi (1997), without explicitly referring to the term *social values*, outlined such a complex behaviour space comprising *morality* (in terms of citizen preferences / other-regarding behaviour), the *behaviour mode* regarding the underlying process of choice and normative values influencing choice, and the *aggregation level* extending the unit of analysis beyond the individual (see Figure 3-2). He argued that this complex behaviour space should be incorporated into economic theory when analysing human behaviour related to the environment.

Figure 3-2 Complex human behaviour space



Source: Own illustration adapted from Tacconi (1997, p. 1999)

In a similar manner, Kenter et al. (2015) identified five relevant different dimensions (*value concept, value provider, elicitation process, intention and scale*) which results in differentiating seven types of shared and social values: *transcendental values, cultural and societal values, communal values, group values, deliberated values, other-regarding values and value to society*. The *value concept* differentiates between transcendental values (guiding principles) and contextual values (with reference to an *object of value*). *Value provider* refers to distinguishing between individuals, groups, communities or societies, as outlined by Tacconi's (1997) aggregation level. For example, group values may refer to collective value expressions elicited

through focus groups; communal values are considered with reference to i.a. faith groups, local communities or groups that undertake activities together on a regular basis; and on a societal scale values may refer to shared virtues. The *elicitation process* distinguishes between preferences and values that were deliberated or non-deliberated upon. As discussed above, *intention* may be self-regarding or other-regarding. In terms of *scale*, value may refer to an individual scale or regard value to society (see also Kenter, 2014). In line, the framework developed by Hansjürgens et al. (2017) identified *scale* (referred to as *object of value*), *intention* (referred to as *value type*) and *provider* as relevant non-mutually exclusive dimensions of value.

Kenter et al. (2019) extended the five dimensions of value concept, value provider, elicitation process, intention and scale by *value frame* and *value justification*. These two dimensions are linked to overarching categories of value. Dependent on how people perceive the natural world, e.g. with regard to human-nature relationships, values may be justified based on *instrumental values*, *relational values* or *intrinsic values*. Already Kennedy et al. (1995) emphasised the role of human-nature relationships, although, rather radically arguing that social values only originate from human-nature interaction either in form of utilitarian value (consumptive use) or biocentric value.

Widening the scope beyond economic theory, the term *social values* has also been used in a variety of research fields. Within the latter, non-monetary value indicators are perceived to be more suitable to elicit plural values compared to economic valuation (Kenter et al., 2015). The valuation through participatory mapping and *Geographical Information Systems* (GIS) was established as an alternative valuation approach to economic valuation of ES. Many of these studies aim to spatially identify, rate and rank social values (see e.g. Raymond et al., 2009; Sherrouse et al., 2011; Sherrouse et al., 2014). Hence, this type of non-economic valuation also adopts an instrumental paradigm (Raymond et al., 2014). Studies within the field often refer to pre-held place-based values as *social values for ES* (see e.g. Bryan et al., 2010; Klain & Chan, 2012; Sherrouse et al., 2011; van Riper et al., 2012) and social values are broadly defined as all use and non-use values that provide benefits to human well-being (Bryan et al., 2011; van Riper et al., 2012).

However, Brown (2013) notes that with respect to participatory mapping of place-based value the terminology instead of the typology of values changed. The other terms used in the literature for the same or similar concepts of *social values for ES* were *forest values* (Brown & Reed, 2000), *environmental values* (Brown et al., 2002), *ecosystem values* (Reed & Brown, 2003),

wilderness values (Brown & Alessa, 2005), *community values* (Raymond et al., 2009) and *landscape values* (Zhu et al., 2010). In general, the valuation method of participatory mapping defines social values as (non-monetary) landscape values instead of economic values. Even though, the value typology incorporates economic value, they are defined in a quite narrow sense reflecting only direct use value. Also, in an urban context social values were investigated. Tyrvaainen et al. (2007) defined social values as experienced values such as aesthetics, feelings of nature or towards nature, recreation and history and culture, and mapped these in context of urban woodlands. In contrast to the other studies, Bryan et al. (2010) conceptualized social values as assigned values. Hence, the values are not only place-dependent but also context specific implying that social values reflect values people attach to things such as places, goods, services or activities (Lockwood, 1999). While it is not always clear how these methods relate to economic valuation approaches, Brown (2013) considers the social valuation approach and the economic valuation of ES as complementary instead of mutually exclusive.

Social values are also considered in health management with respect to value judgements in terms of health priority-setting. Hence, moral and ethical values play a significant role. While moral values are considered to be universal (e.g. justice), social values are considered to be affected by culture, institutions and other social features of a society in a given time. In the discussion about health priority-setting a strong emphasis is placed on participation of various stakeholders due to decisions' effect on the public (Biron et al., 2012; Clark & Weale, 2012).

Also, in the discussion regarding social values of ES deliberation and participatory methods have gained increased attention, although economic valuation of ES is still dominated by survey-based methods (Kenter et al., 2014). In this context values are often referred to as *shared social values*. As already mentioned, the terms *shared values* and *social values* are interchangeably used. However, in the current debate *shared values* relate to values which are held in common, cultural value or civic virtue, whereas *social values* often centre around intention, scale and process (Kenter et al., 2015; Kenter et al., 2019). Therefore, also the category of *shared social values* can exist, e.g. deliberated preferences with reference to the societal scale or other-regarding preferences of individuals.

As discussed above, deliberation is a multifaceted approach which may have different aims. In context of social values, the reasons articulated in favour of deliberation are manifold. As discussed above DMV is mainly concerned with *preference economisation*, meaning that through deliberation complexity shall be reduced and information provided. On the basis of

these informed preferences, individual WTP can be elicited. Niemeyer (2004) opposes that deliberation should not produce simplified outputs in form of aggregated preferences and that it is an *epistemic populism* to believe that for complex goods simple outputs such as definitive preference outcomes exist. In his view, a deliberative process cannot be final because an increase in knowledge raises even more questions than answers – a *Socratic dilemma*. Further, he argues that emphasis on conclusions is contradictory to the social learning process and that it may provoke *symbolic politics* (Niemeyer, 2004).

In addition, it is claimed that deliberation is needed in order to account for the multidimensionality of value (Kenter et al., 2015). In contrast to DMV the so called *Deliberative Democratic Monetary Valuation* (DDMV) also allows for the *moralisation* of preferences. Shared and social values are assumed to be implicit and that deliberation and interaction among a group is required in order for them to be formed (see Gowdy & Parks, 2014; Kenter et al., 2015; Klamer, 2003; Pike et al., 2011; Pike et al., 2010). Hence, deliberation in terms of preference moralisation aims at introducing transcendental values alongside logical arguments into the valuation process (Kenter et al., 2015; Raymond & Kenter, 2016). In DDMV shared values are understood in terms of shared principles and intersubjective contextual values which are deliberated upon by the group. The inter-subjective deliberation aims to broaden participants' view from individual value towards other-regarding values (Orchard-Webb et al., 2016). Besides preference moralisation also storytelling may be used in the deliberative process to reveal implicit values and transcendental values. The narratives and expressed relational values of other persons offer space for making these values explicit (Chan et al., 2016; Kenter et al., 2016b). As already discussed, deliberative methods assume communicative rationality for which the best argument is essential (Vatn, 2005, p. 125). Hence, deliberative approaches shift the focus from the outcome to the process (Irvine et al., 2016; Stagl, 2004) and the democratic perspective recognises the importance of participation regarding the decision-making process (O'Connor, 2000). Further, the focus of DDMV is less on the individual, and instead of eliciting individual WTP other value indicators measuring social WTP, e.g. fair prices, may be used (Kenter et al., 2016b; Orchard-Webb et al., 2016).

Additionally, the notion of *shared social values* is often associated with a process of social learning. Generally, social learning processes enable the individual to learn from others and/or the environment and to understand the interdependencies between own interests and the interests of the society they live in. Therefore, it is argued that through social learning processes

individual action can be turned into collective action in order to enhance the consideration of collective needs and strengthen the understanding within the society (Webler et al., 1995).

The amount of empirical literature regarding deliberative valuation of ES is fairly low. Brouwer et al. (1999) combined quantitative methods (contingent valuation method) and qualitative methods (focus groups) to elicit individual WTP for a flood alleviation scheme. The validity of the WTP statements was tested based on qualitative data. Although most of the respondents stated that their WTP satisfactory reflected their values, participation and deliberation was still perceived as important by the respondents. Based on these results, the authors recommend to combine individual WTP approaches and participatory deliberative approaches.

Clark et al. (2000) investigated the robustness of stated preferences for nature conservation policy in the UK elicited through a contingent valuation survey. Robustness was assessed by analyzing qualitative data obtained after the completion of the CV questionnaire. Many respondents didn't consider their stated WTP to be valid after in-depth discussions. Thus, the findings were contradictory to Brouwer et al. (1999). Furthermore, the respondents perceived the group deliberation as necessary for the identification of values.

The contradicting findings of the two studies are likely to arise due to two reasons: Firstly, the design of the study (focus groups versus in-depth discussions) and secondly, the significant difference between the goods. A flood alleviation scheme is mostly connected to use values while nature conservation covers also highly complex cultural values. Therefore, people may find it more difficult to monetize values and struggle to state a valid WTP if cultural values are involved (Clark et al., 2000).

With regard to forests in the UK, it has been shown that peoples' perception, expectation and associated values differ dependent on the type of ownership of the forest (private or public). More people were able to list values for publicly owned forests than for privately owned forests. However, the respondents did not necessarily know the type of ownership of the visited woodlands (Carter et al., 2009). In the public debate about the selling of these Private Forest Estates in addition to individual contextual values also other-regarding values were expressed. The latter were articulated on a communal scale, especially in areas with an historical and cultural connection and on a societal scale regarding transcendental values, e.g. justice and ethical concerns about access rights to the woodlands. The findings suggest that the public debate lead to the articulation of transcendental values which were implicit before (Irvine et al.,

2016; Kenter et al., 2015). This empirical finding supports the hypothesis that the neoclassical axiom of pre-held preferences does not hold for complex goods because most people are not familiar with such complex ES (Kenter et al., 2016c). Instead, preferences for these kinds of goods may be incomplete and ought to be formed through deliberation (Kenter, 2014; MacMillan et al., 2002; Parks & Gowdy, 2013; Völker & Lienhoop, 2016).

Further insights were obtained by the UK NEA follow-on study on Marine Protected Areas in the UK (Kenter et al., 2016b). The study elicits cultural, plural and shared values of ES by combining DMV with qualitative and interpretive methods such as storytelling, subjective well-being and psychometric approaches (Kenter et al., 2016b). Participants in the study preferred group deliberation and were more certain about group deliberated values compared to individual values (see also Lienhoop & Völker, 2016). The authors found significant differences between values deliberated in a group, deliberated individual values and non-deliberated individual values. The deliberated individual values were in-between the deliberated group values and the non-deliberated individual values. Another study by Kenter (2016b) found similar results for a choice experiment with participatory elements and a psychometric analysis for a coastal area in Scotland.

Norton and Steinemann (2001) discuss social and shared social values related to an adaptive management in order to identify and measure the plurality of environmental values. In the study social values are not defined in particular, they just refer to a societal context and are broadly classified as public fears and hopes. The valuation approach is based on a *Multi Criteria Evaluation* (MCE) incorporating an iterative process. The latter allows for changes in the individuals' preferences due to changes in the information base and environmental conditions. Also Stagl (2004) discusses shared social values in the context of MCE with participatory elements or rather deliberation. She challenges the dominant theory of exogenous and predetermined values in the context of utility based static frameworks. Accordingly, values have to be developed through social interaction which in her view should be open dialogue. Raymond et al. (2014) identified two essential paradigms regarding non-monetary social values: the instrumental paradigm and the deliberative paradigm. The former is mainly concerned with the spatial identification, rating and ranking of social values (e.g. Raymond et al., 2009; Sherrouse et al., 2011; Sherrouse et al., 2014) and only contextual values are identified (Raymond et al., 2014). In contrast, the deliberative paradigm has the focus on the process of decision making with regards to informed preferences, participation, discussion and mutual understanding. The advantage of the deliberative paradigm is that it recognises not only

contextual but also transcendental values (Raymond et al., 2014). Ranger et al. (2016) developed an interpretative-deliberative ecosystem valuation approach in a marine context in order to elicit shared values of the coastal community. Adopting the definition of Kenter et al. (2015) in the study shared social values are defined both in terms of transcendental values and contextual values as outcome of a group-deliberation. The contextual values may be influenced by the transcendental values (Kenter et al., 2016c). The methodology combined ‘a structured, film-based interpretive methodology’, the so-called *Community Voice Method*, with a *deliberative multi-criteria approach* allowing for the reflection on deeper-held values and shared values, knowledge exchange and social-learning processes (Ranger et al., 2016).

In summary, the concept of social values is ambiguous and fundamental questions about the ontology, elicitation and aggregation of social values remain to be answered (Kenter et al., 2016a; Kenter et al., 2019). Key questions relate both to theoretical and methodological issues. From a theoretical perspective, the fundamental questions relate to the nature of social value and to which degree social values are consistent with economic theory. More specifically, the question arises whether in economic theory social values are a value category complementary to individual values or if they are mutually exclusive (Howarth & Wilson, 2006; Kenter et al., 2015). Regarding human behaviour, it has to be examined whether these values are predefined or formed, e.g. through social learning processes, and which role multiple sets of values play.

Addressing this research gap of conceptual ambiguity found relatively little attention in the current debate on ES so far, whereas the focus was rather on the development of novel valuation approaches. Yet, identification and elicitation of social values requires a solid theoretical framework. Additionally, insufficient attention has been given to economic theories beyond mainstream neoclassical economics – does the economic literature not have much more to contribute to the discussion on social values of ES? This will be elaborated in a next step by identifying relevant economic theories which have been neglect up until now. Thus, the review will be extended in order to close the first identified research gap – unnoticed contributions of economics to the theory of social value. Further, the review has illustrated that a consistent economic conceptual framework does not exist in the current literature which remains as second research gap to be closed in subsequent chapters of the thesis at hand.

Finally, the review emphasised that from a theoretical perspective many arguments in favour of deliberation exist. Yet, it remains ambiguous how deliberation affects peoples’ preferences and how deliberated values differ from aggregated individual values (Irvine et al., 2016; Kenter

et al., 2016b; Kenter et al., 2019). As a result, scholars disagree whether deliberative valuation should complement or replace existing methods (Bebbington et al., 2007; Gowdy & Parks, 2014; Kenyon et al., 2001; Parks & Gowdy, 2013; Wegner & Pascual, 2011). Hence, additional empirical analysis investigating the impact of deliberation is needed (Kenter et al., 2016a) on the basis of a strengthened theoretical foundation of deliberative valuation (Bartkowski & Lienhoop, 2018; Massenberg, 2019). This lack of empirical evidence and associated lack of understanding of the role of deliberation – the third identified research gap – will also be addressed in subsequent chapters by conducting a case study.

However, as discussed above consecutive steps are necessary. The first research gap must be addressed in order to strengthen the theoretical foundation of social values and DMV. Building upon this improved understanding, in the next step a consistent conceptual framework must be developed in order to systematically investigate social values empirically. Hence, in the following section the various unnoticed contributions of economics to the theory of social values will be identified.

3.2 A retrospective view on the contribution of economics

In the current discussion about social values, economic environmental valuation has been heavily criticised for falling short with regard to conceptual, ethical and methodological issues. In most cases the critique has been limited to the realm of neoclassical economics. In particular, concerns have been voiced that economic valuation, following its individualistic and instrumental perspective, is unable to capture social values of sustainability. The discussion about social values in the context of the ES concept and/or sustainability appears to be a relatively newly discovered topic within environmental and ecological economics. However, there are roots in economic theory that explicitly or implicitly address social values which can be traced back more than a century. In the following section, the aim is to illustrate that numerous approaches towards social values already exist in the economic literature when broadening the view beyond mainstream neoclassical economics. Thereby, it will be demonstrated that economic value theory is not as narrow as often considered.

The current critique against economics regarding (neglect of) social values is usually limited to the neoclassical economic conception of value and human behaviour. Likewise, current frameworks fail to account for economic theories which remained outside of the neoclassical realm (Hansjürgens et al., 2017). Consequently, traditions of research on social values in economics have been hardly given appropriate attention in the present literature discussing

social values of ES. Also the current critique against economic theory does not account for the long traditions in economic theory dealing with social values. Therefore, in the following this gap should be closed and contributions of economic theory to the literature on social values will be reviewed. The aim is to shed light on theories outside of neoclassical mainstream economics and to identify recurrent themes in these theories. The identified theories (among others: Kapp's theory of social cost; Harsanyi's utilitarianism; Sen's theories of meta-preferences, commitment and sympathy; Buchanan's constitutional economics; and Musgrave's theory of merit goods) emphasise the existence of value categories that transcend individual values and narrow self-interest.

The aim of the section is to review economic traditions outside the scope of mainstream (neoclassical) economics with reference to social values.⁶ These economic traditions may advance understanding the notion of social values. They may also contribute to the establishment of a theoretical foundation for the assessment of social values which will be focused on in Chapter 4. Furthermore, the review aims to identify recurrent questions and attributes associated with social values in these economic theories.

The remainder of this section is organised as follows: Section 3.2.1 introduces the historical development of economic value theory, especially concerning the role of nature. The historical context is important for two reasons: Firstly, it illustrates the diversity of schools of economic thought and illustrates the path taken within the theory of value towards what some critics refer to as *value monism* as opposed to accounting for a plurality of values (see e.g. Gowdy & Erickson, 2005). Secondly, the general discourse in economics on the origin of value affected also the discussion on social values. Section 3.2.2 describes early discussions of social values in economics which mainly centred on value-in-use and value-in-exchange. Section 3.2.3 briefly depicts the theories of externalities and social goods which contributed largely to the development of environmental economics while remaining within the realm of neoclassical economics. Sections 3.2.4 and 3.2.5 present economic theories outside the realm of mainstream (neoclassical) economics that may enhance the theoretical foundations of social values. Section 3.3 presents conclusions derived from the review.

⁶ This section is a slightly modified version of Massenbergh (2019).

3.2.1 Historical context: Development of economic value concept and the role of nature

The current discussion related to social values of ES is inseparable from the historical development of economic value theory and the role of nature. Therefore, this relationship will be illustrated shortly.

Historically *Physiocracy* is considered the first scientific school of economics (i.a. Bell, 1953, p. 121; Ware, 1931). The school of thought was developed in the 18th century in France in response to the predominant mercantilism (Beer, 1939, p. 13). The Physiocrats recognised nature as unique form of wealth while the cultivator was regarded as cooperator that was needed in order to produce wealth (Bell, 1953, p. 131; Quesnay, 1962/2003, p. 232).

Shortly after *Physiocracy* and with the dawn of the industrialization began the development of the *classical* economic theory (Hubacek & van den Bergh, 2006). Although ES did not literally appear in classical economic literature, some of its scholars referred to them as *natural agents* (Gomez-Baggethun et al., 2010; Say, 1821/2008, p. 74). Natural agents were considered to be free of charge and therefore only their *vale-in-use* was appreciated (Ricardo, 1821/2001, p. 207f.). In his work, *Capital*, Karl Marx (1867/1967) considered labour as the only source of exchange value which is in line with Ricardo's *value theory of labour* and implies that the value of an object can be measured by the hours needed to produce it (Hubacek & van den Bergh, 2006). He likewise assumed natural agents as costless and 'spontaneously provided by nature' (Marx, 1867/1967, p. 178). Generally, the rapid industrial and technological development and capital accumulation during the 19th century caused a change in the economic rationale resulting in a limited appreciation of nature in economic analysis (Gomez-Baggethun et al., 2010).

In line with this trend and likely shaped by the long-term persistence of the industrial revolution arose the *marginalist revolution* (Hubacek & van den Bergh, 2006). It initiated an essential alteration of the economic methodology by incorporating mathematical maximisation which originated in physics. While production dynamics were at the core of the classical economic analysis, neoclassical economic theory emphasises the static analysis of *exchange* (value) (Christensen, 1989; Mirowski, 1991, p. 195ff.). This affected the theory of (economic) value in two ways: Firstly, economic value and commodity prices were derived from subjective preferences of rational individuals which do not represent future generations. Preferences are assumed to be exogenously given implying that the formation of preferences and process of choice is irrelevant for economic analysis (Bruni & Sugden, 2007; Christensen, 1989). Hence,

psychology was banished from economic analysis by deducing rationality from (internal) consistency of choices (Bruni & Sugden, 2007; Samuelson, 1938). Secondly, regarding the role of nature, the marginal revolution restricted economic analysis to exchange value. Thus, the focus shifted towards marketed goods (Parks & Gowdy, 2013).

3.2.2 Early economic discussion on social values: Value-in-use, value-in-exchange, and social components of value

The general discussion about the economic theory of value intensified again with the rise of the marginal utility theory around the late 1880s (Kurz, 1995/2003, p. 71). The debate was not limited to the source of value; instead also the role of society as value provider and possible methodological implications were examined.

The discussion was partly influenced by socialist scholars' reaction to marginal utility theory as in the case of Rodbertus. He adopted Ricardo's (labour) theory of value (see Rodbertus, 1842) and primarily investigated the role of production cost and amount of labour regarding a good's value. Rodbertus argued that value-in-use is the only value type, suggesting that value-in-exchange (or exchange value) is social value-in-use (see Wagner, 1878, p. 223ff.). According to Rodbertus value-in-use can be either individual or social. Individual value-in-use relates to individual wants while social value-in-use considers the value-in-use of a social organism ('sociale Organismus'). Although this social organism is composed of many individuals it has own wants which are beyond the aggregation of individual wants. According to Rodbertus, a social organism's wants (e.g. a nation's wants) dominate individual wants and not vice versa (see Wagner, 1878, p. 222f.).

Yet, also non-socialist economists contributed to the discussion by debating society's influence or rather role regarding values, e.g. Gärtner (1887) disagreed with Rodbertus' definition of social value-in-use. Gärtner (1887) kept the general distinction between value-in-use and value-in-exchange and argued that the latter is not independent of value-in-use. Value-in-use is seen as importance a good is given regarding its ability to satisfy wants. Whereas value-in-exchange represents the importance of a good regarding its value-in-use, the good's availability and need for the good ('Bedarf') (Gärtner, 1887, p. 422). He also disagreed with Rodbertus about value-in-use being purely social. Instead, Gärtner distinguished between individual and social exchange value and individual and social value-in-use. He highlighted that individual value-in-use may also arise if the individual can use a good in order to satisfy exchange wants ('Tauschbedürfnisse'). Whereas social value is importance ascribed to a good regarding the

satisfaction of societal wants or rather of societies' average person ('Durchschnittspersönlichkeit') and can be either social value-in-use or exchange value (Gärtner, 1887, p. 423f.).

Some scholars argued that economic activities such as production, exchange and distribution are social processes (Schumpeter, 1909) and that values are socially constructed (see e.g. Anderson, 1911; Clark, 1886/1894; Seligman, 1901). Thereby, prices and values can be considered to be social phenomena (Clark, 1899/1914, p. 40ff.). John Bates Clark (1886/1894, p. 83) supported the idea that society and not the individual determines value. Additionally, he was in favour of the assumption that value is an absolute magnitude which is quantifiable by measuring marginal utility (Clark, 1886/1894, p. 74; 1899/1914, p. 237) and thereby, emphasised the importance of exchange value. He argued that 'final utilities to society' determine prices (Clark, 1899/1914, p. 243) and that society would estimate the utility 'which constitutes a social or market valuation' (Clark, 1886/1894, p. 83). This implies that market value is the utility of society as organic being. Thus, goods with equivalent market value imply that society estimates identical utilities for these goods. In contrast, the individual measurement of utility represents only value-in-use. Hence, a good which society considers cheap may be beyond price for an individual (Clark, 1886/1894, p. 81f.).

Seligman (1901) disagreed with earlier scholars such as Rodbertus and partly with Clark about the general definition of value, in particular about the definition of (social) value-in-use. Seligman (1901) denied that the distinction between exchange and use value is correct because he argued that only (social) marginal utility expresses value. Furthermore, he claimed that his concept of social marginal utility would make the exchange-use-value distinction redundant. He argued that the 'foundation of value is independent of exchange' because also an individual that cannot interact with others – like a castaway isolated from society – values goods due to satisfaction of individual wants and consequentially the weighing-off of desires (Seligman, 1901, p. 327). Hence, in an individual setting only two goods are required for the existence of value. Yet, he considered this setting as artificial and 'actual life' is about living in a society in which goods are exchanged and humans are 'social beings' (Seligman, 1901, p. 323ff.). Therefore, he argued that society and not the individual sets value on goods. He reasoned that the aggregate wants of all society members determine the value of the good in 'actual life'. The subjective wants of the individual (marginal consumer) can only (marginally) affect the aggregate wants of society (Seligman, 1901, p. 323). Therefore, according to Seligman value is not individual but social and value in society is expressed by social marginal utility.

Further, Seligman (1901, p. 323) argued that individuals consider not only individual wants but also other society members' wants. Thus, even a good that has no direct utility to the owner may still have value if the good has a 'social purpose' (Seligman, 1901, p. 324). A good that is useful for another society member has indirect marginal utility for the owner as it has direct marginal utility to society, implying that individual marginal utility is 'a reflection of social marginal utility' and that value is the result 'of a socialization of wants' (Seligman, 1901, p. 325). Additionally, Seligman reasoned that in a social setting only exchange value is relevant because 'value is a social conception' which compares different commodities by trading them between individuals (Seligman, 1901, p. 326). He concluded that economics as a social science should account for the social conception of value instead of relying on 'individualistic' theories (Seligman, 1901, p. 347).

In his analysis 'On the Concept of Social Value' also Joseph A. Schumpeter (1909) discussed the question if social values are a value category that (partly) substitutes individual values. Schumpeter (1909, p. 213ff.) emphasised that the concept of marginal utility applies only to individuals who value things based on the quantity they have and not based on the quantity that is available to the whole society. Therefore, he supported the principle of methodological individualism because marginal utility can only apply to individuals and not to society as a whole. Schumpeter agreed with Seligman that exchange value can only arise due to interaction between multiple individuals and that for an isolated individual the marginal utilities depend only on the individual herself. Yet, if the individual is part of a society the possibility of trade arises and therefore, value assigned to a good by the individual is also affected by the wants of other society's members. This signifies that the individual utility curves are directly affected by social influence. Thus, social influence may form individual demand curves and affect marginal utilities. Still, Schumpeter stressed that the interaction between the individuals is driven by self-interest. Further, Schumpeter opposed Rodbertus' and Seligman's idea of society determining values. If value is considered as exchange value, Schumpeter argued that the conception of social value only describes social interaction and influences of 'mutual interaction and interdependence'. According to him, this social influence on the individual does not oppose individualistic methods (Schumpeter, 1909, p. 217f.). He argued that individual valuations determine value and prices because society is not a conscious being 'having no brain or nerves in a physical sense, cannot feel wants and has not, therefore, utility curves' (Schumpeter, 1909, p. 215).

In contrast to other scholars Anderson (1911, p. 9ff.) rejected the idea of social (marginal) utility to investigate the nature of social value and to quantitatively measure it. He discussed that individual motives alone cannot explain economic value because motivation relates to ‘something superindividual’ – what he refers to as social values – so ‘ends, aims, purposes, desires’ are all affected by the interaction of society’s members (Anderson, 1911, p. 199). Also J.B. Clark (1886/1894, p. 36) questioned the assumption that human behaviour is only motivated by self-interest and highlighted moral principles and unselfishness as further motives. According to Schumpeter, who was more concerned with methodological issues, the only wants which are ‘strictly social’ are expressed by a community which consists of individuals that act collectively and consciously as such (Schumpeter, 1909, p. 216). Although recognising the existence of altruistic or social wants Schumpeter (1909) reasoned that they can only be accounted for by individuals. Consequently, he argued that the individuals’ motivation for demand is irrelevant for the analysis. Therefore, he concluded that the value theory of marginal utility should be based on an individualistic methodology.

3.2.3 Externalities and social goods: Beyond market prices

The focus of the above illustrated economic value theory was primarily on exchange value, value-in-use and market prices. Thereafter Arthur C. Pigou (1920) initiated a discussion about uncovered (social) costs which are not reflected by market prices especially regarding environmental goods. The central argument of Pigou’s analysis of social costs is that for an economic activity the ‘marginal private net product’ and the ‘marginal social net product’ may diverge, e.g. due to uncompensated costs of people not directly involved in the economic activity (Pigou, 1920, p. 114ff.). Put another way, a person’s activity, e.g. consumption or production, has a negative or positive impact on a third person that is not directly involved in the activity. The person taking the action does not consider the costs or benefits imposed on the other person. This uncompensated damage (or “spill-over” benefit) is usually referred to as *externalities*. Pigou (1920, p. 168) suggested that these externalities can be internalized by state intervention, e.g. in form of taxes or subsidies.

Howard Bowen (1943, p. 27) contributed to this discussion by distinguishing between private goods and ‘social goods’, commonly referred to as public goods. He defined public goods as indivisible and non-excludable as they are part of the environment individuals live in (Bowen, 1948, p. 173). He stated, without further explanation, that the marginal utility theory of individual goods is transferable to social goods. Hence, the aggregation of the individual

marginal rates of substitutions reflects societies' 'curve of total marginal substitution' which closely corresponds to the total demand curve (Bowen, 1943, p. 30). In other words, individual preferences for the provision of a public good can be illustrated in form of a curve showing how much money the individual is willing to give up for the good's provision. The aggregation of all society members' preferences then expresses how much society as a whole is willing to spend. Bowen emphasised the difficulty in finding a reasonable unit to quantify social goods that are often complex. He considered voting as best procedure to reveal and aggregate individual preferences which are not observable by consumer choice in order to optimally allocate public goods. Yet, he stressed that voting on marginal changes in a good's quality does not necessarily determine the optimum output.

These theories developed by Pigou, Bowen and others extended existing neoclassical theories by important aspects and contributed significantly to the development of environmental economics. Yet, they remained within the realm of neoclassical economics. In contrast, the following two sections will present selected economic theories that challenged the neoclassical paradigm. These theories intended to i) link individual behaviour, preferences and values with embeddedness in institutional social and cultural contexts, ii) account for complex human behaviour, morality, social influence and culture, and iii) thus go beyond the neoclassic rational choice theory and concepts of utility.

3.2.4 Social values in (old) institutional economics: Clark's and Kapp's holistic approach

Social values have also been discussed in the realm of institutional economics⁷ challenging the narrow assumptions of neoclassical economics. One of the pioneers was Veblen (1898) criticising the assumptions of homo economicus and utility maximisation. Generally, institutional economists were especially concerned with developing a more holistic theory of human behaviour and social value compared to the above presented concepts based on marginalism.

In contrast to neoclassical value theory, John Maurice Clark (1936, p. 54) called for a concept of (social) value which does not depend on market valuations. He considered social value to be 'value to society'. The assessment of the latter requires a 'truly organic social valuation' which

⁷ Due to the differentiation of "old" and "new" institutional economics it has to be highlighted that here *institutional economics* does not refer to the school of *new institutional economics* but to *old institutional economic* theory which emerged out of criticism against assumptions of neoclassical economic theory (Hodgson, 1989).

is not just the aggregation of individual utilities (Clark, 1936, p. 49). He argued that market value does not measure social value and that market value is only social because the context is ‘an organic social situation’ (Clark, 1936, p. 50). He reasoned that net products may diverge from market value due to interdependent utilities (Clark, 1936, pp. 45,56) and due to ‘intangible utilities’ (Clark, 1936, p. 45). Hence, social value is seen as ‘anti-marginal’ because exchange cannot be considered to be independent of complex social states and relationships within a society. Therefore, marginal utility cannot determine the price because the price relates to the ‘value of the whole’ (Clark, 1936, p. 59). Yet, Clark noted that social value will never be comparable to the quantifiable approach of exchange value in form of market prices. Nevertheless, he argued, a theory of social value may still deliver important insights (Clark, 1936, pp. 44, 60). Especially, when value is linked to motives and desires which may be achieved by incorporating insights obtained by psychology, ethics and sociology (Clark, 1936, p. 60f.).

Another milestone in the theory of social values was developed by Karl William Kapp. Kapp’s (1950/1975) theory of social values or rather social cost broke with the work of early neoclassicists such as J. B. Clarks, Anderson and Seligman which argued – as illustrated above – that society determines the value of a commodity. Kapp disagreed with these authors who identified market prices as social value indicating the value of a good to (all individuals of a) society (Kapp, 1950/1975, p. 256). Analysing the neoclassical theory of externalities, especially referring to Pigou, Kapp (1950/1975, pp. 37ff., 256f.) criticized that subjective value theory recognizes only individual preferences and that a social valuation must incorporate social benefits (exchange value on the market) and social cost (negative impact on society which is not accounted for by the market exchange) which jointly represent the social value to society.

Although Pigou’s definition of externalities and Kapp’s definition of social cost seem similar, their concepts differ. Kapp’s concept extended the scope of social costs beyond the market sphere. Kapp (1970, p. 841) argued that the analysis of externalities abstracts economic activity into an ‘autonomous “economic” sphere’. Thereby, the (neoclassical) economic analysis of externalities neglects power relations which cause non-autonomous behaviour, and it does not account for the severe environmental and societal effects caused by production and distribution (Kapp, 1970, p. 841f.). Kapp (1969) questioned markets as efficient institutions for coordinating behaviour because costs can be shifted towards other individuals and the environment due to asymmetric power relations. Additionally, profit maximising behaviour would induce cost-shifting as rational behaviour (Kapp, 1970; 1950/1975, p. xiii).

Concerning the translation of individual preferences scales into collective preference scales, Kapp (1950/1975, p. 257) questioned earlier theoretical analysis of social evaluation. He acknowledged Bowen's (1943) analysis that formally the individual marginal rates of substitutions can be combined to a collective marginal rate of substitution in order to express the collective WTP for a marginal social benefit. However, he argued that formal marginal analysis and analysis of externalities might fail to account for social preferences due to the impossibility to measure or calculate marginal costs and rates of substitutions. Therefore, he reasoned that also social cost cannot be measured in practice (Kapp, 1950/1975, p. 259f.).

According to Kapp (1978, p. 288ff.) social values must be based on collective decision-making instead of individual rationality, and democratic and participative processes are indispensable because of conflicting objectives and interests (Kapp, 1978, p. 317). Furthermore, social well-being cannot only be based on maximisation of aggregated individual utilities because in democratic societies these individual utilities are socially evaluated in order to judge social well-being. These judgments may also consider desired social ends (Kapp, 1950/1975, p. 260).

Kapp supported the idea that economic activity is tightly linked to the natural and social system (Kapp, 1970; 1985, p. 150ff.). He emphasised that humans can be seen either as isolated individuals or as social beings embedded in society ('Gesellschaftswesen') (Kapp, 1936, p. 43). Dependent on the perspective the satisfaction of individual needs or societal needs will be relevant. He further argued that this distinction is not about constructing two opposing views but to recognize the needs of society as needs of all individuals. Yet, if a human considers herself to be isolated, the subjective preferences will be individual. This behaviour is evoked by the market which sets the focus on exchange value and thereby, reveals preferences of isolated individuals while neglecting societal interests (Kapp, 1936, pp. 42-44). Therefore, Kapp (1950/1975, p. 260f.) called for the development of methods to discover individual preferences regarding social ends. Thus, Kapp (1950/1975, p. 260) held the view that for theoretical and practical reasons a justification of social preferences has to extend the utilitarian concept which defines total welfare as the aggregate of individual utilities. Kapp (1977, p. 538) reckoned that because of environmental problems it is necessary to consider the utilitarian premise of pleasure maximisation as secondary objective while the primary objective is the 'social and moral imperative of minimizing human suffering'. The principle to minimise suffering is referred to as *negative utilitarianism* (Popper, 1962, p. 284f.; Smart, 1958). Hence, the 'individualistic moral principle' is subordinated to a social one that is in line with social and ecological sustainability. In order to achieve this Kapp (1977, p. 538) suggested to appropriately

design institutions and policies. Yet, he notes the difficulty to agree on certain minimum standards and recommends political process to achieve consensus.

As illustrated above, (old) institutional economists emphasised human embeddedness in natural and social context implying that individuals may have interests that transcend individual values, e.g. towards social ends. Yet, the presented theories remain vague how these aspects could be included in the economic analysis. Therefore, the following section presents theories that elaborated more detailed contributions.

3.2.5 Complex human behaviour, multiple preference orderings and interdependent preferences: Beyond self-interest and individual values

The criticism of the concept of homo economicus has a long tradition in economic theory (see e.g. Veblen, 1898). One of the arguments brought forward by critics is preferences' interdependency (see e.g. Veblen, 1899/1918). It implies that preferences may be affected by social environment and culture. Yet, these arguments did not find their way into mainstream economics. According to Duesenberry (1949, p. 17ff.), marginal utility theory ignores the nature of preferences. If preferences are interdependent, it is essential to understand their nature and how they change. Therefore, he called for the analysis of motivation and incorporation of psychological assumptions in order to account for the influence of social factors and culture on preferences (Duesenberry, 1949, p. 20). The theories of Harsanyi (Section 3.2.5.1), Sen (Section 3.2.5.2), Buchanan (Section 3.2.5.3) and Musgrave (Section 3.2.5.4) presented hereafter transcend individual values and self-interest, and/or do not assume that individual choice and individual welfare are necessarily linked.

3.2.5.1 John Harsanyi's utilitarianism

The early work of John Harsanyi (1955, p. 315) distinguished between an individual's 'subjective preferences' and 'ethical preferences'. The former reflects what the individual actually prefers and affect only the personal utility function. In contrast, ethical preferences regard what is preferable from the societal perspective. These preferences are only expressed when the individual 'forces a special impartial and impersonal attitude upon himself' (Harsanyi, 1955, p. 315). The individual adopts social considerations by interpersonal comparison. In other words, the individual puts herself in the position of all other society members and assumes to have an equal chance to be in any of their positions. This concept is similar to Rawls' (1971/2009) 'veil of ignorance' regarding the concept of fairness. However, the outcome of Harsanyi's preference adoption and equal probability assumption differs to the outcome

obtained by the uncertainties of the ‘original position’ defined by Rawls. The latter hinders the individual to know her position in society, and therefore the individual does not know her individual utility function. In contrast, the idea behind Harsanyi’s utilitarianism is that the (expected) social welfare is the weighted aggregation of the (expected) individual functions. Hence, it has to be highlighted that in Harsanyi’s theory the individual still acts as a rational utility-maximiser, however, he/she acts just under uncertainty.

3.2.5.2 Amartya Sen’s theories of meta-rankings, commitment and sympathy

Amartya Sen (1977b) opposed the idea that utility maximisation or rather the idea that an extended utility function can fully explain human behaviour. Instead, Sen (1977b) distinguishes between different types of altruistic behaviour: commitment and sympathy. The notion of sympathy is similar to neoclassical conceptions of altruism (see e.g. Becker, 1974) in which case the increase of another person’s welfare increases the individual’s own well-being directly. In contrast, actions based on commitment are motivated by a sense of duty, are non-egoistic and may even affect personal welfare negatively. Hence, behaviour arising due to commitment is not in line with the assumptions of self-interest and individual utility maximisation. Commitment is not relevant for private goods characterised by perfect excludability and rivalry but is relevant for public goods (Sen, 1977b).

If the individual has “multiple selves”, the question is again, as in the case of Harsanyi’s subjective and ethical preferences, which preferences the individual considers. While Harsanyi assumed that social preferences must be enforced by the individual, Sen (1977b, 1982) held the view that preferences are hierarchical: he referred to the concept of *meta-rankings*. Meta-rankings rank preference rankings and imply that individuals do not only maximise their own utility but also incorporate moral judgments. Therefore, not only preferences under certain constraints can be ranked in order to maximise utility, but the individual can also reason what to maximise and may include for example non-utilitarian aspects. Sen (1977b) considered Harsanyi’s dual structure of preferences unsatisfactory. While sympathy may be captured by subjective preferences, it remains unclear to him how commitment relates to them. In contrast, meta-rankings allow transcending the context and constraints existent for the actual choice and provide insights about the individual’s morality.

3.2.5.3 James Buchanan's constitutional economics

Inspired by the work of the Swedish economist Knut Wicksell (1896), James Buchanan largely contributed to the theory of constitutional economics. In contrast to neoclassical economics which investigates human choice within constraints, constitutional economics focuses on the choice of constraints. To put it another way, constitutional economics aims to explore choices which are made in alternative hypothetical social frameworks. The latter are characterised by constitutional, legal and institutional rules (Buchanan, 1990; 2008, p. 1f.).

Buchanan's concept of social choice remained on the basis of individual rationality and he emphasised the divergence between the philosophical foundations of individualism and the organic concept of society. Both are considered to be useful for certain problems but social rationality can only be discussed referring to a social organism which itself has values or ends – and not in the case of individuals obtaining value orderings (Buchanan, 1954b).

Beginning with the focus on individual decisions, Buchanan (1954a) argued that individuals behave differently in different contexts such as the market and the political arena because distinct preference scales influence behaviour. In the market-context individuals act as atomistic beings which do not incorporate interdependencies. In contrast, in a political context the individual is aware of the decision-making-process' social character and her participation in this process as well as her vote's influence. Hence, individuals may consider a 'more inclusive value scale' and may consciously choose for the group, e.g. by accounting for interdependencies – internalising their actions' externalities (Buchanan, 1962, p. 24). Yet, Buchanan argued that a dichotomy of behaviour is unrealistic and supports methodological consistency regarding human behaviour. In his opinion behaviour may be based on 'moral or ethical principles' which leads to other-regarding behaviour and may 'inhibit individual utility maximising behaviour' (Buchanan, 1961, p. 340). However, Buchanan opposed the idea that individuals act socially or based on self-interest due to a duality of selves; instead, he argued that behaviour is dependent on the context which defines guiding principles (Buchanan, 1954a, 1962).

Buchanan argued that these decisions constrained by rules are made on the post-constitutional level, i.e. the level of daily decision-making (see e.g. Buchanan, 1959). Yet, collective decision-making has a second layer, the constitutional level, on which the "rules of the game" are chosen. According to Buchanan, the normative criterion for selection of "good" rules is not based on the efficiency criterion, instead he introduced the 'unanimity rule' implying that collective decision-making cannot be justified if an individual is worse off. Unanimous consent may be

achieved throughout the process of decision-making if everyone expects to benefit (Buchanan, 1954b; Buchanan & Tullock, 1999, p. 85ff.). In order to define “good” or fair rules of collective decision-making, Buchanan and Tullock (1999, p. 78ff.) – similar to Rawls (1971/2009) – argued in favour of a *veil of uncertainty* meaning that the individual does not know her position/role in society when agreeing on rules. Therefore, the individual cannot have any particular interests besides collective or social ones. Yet, also the role of deliberation as a method to reveal preferences is highlighted. Firstly, directly by stressing that preferences may not be ex-ante given and may be formed through discussion and social interaction (Buchanan, 1954b). Secondly, indirectly as the unanimity criterion is grounded on similar arguments to those of deliberation within theories of consensus (Hansjürgens et al., 2017).

3.2.5.4 Richard Musgrave’s theory of merit goods

As described above, economic theory distinguishes usually between private goods and public goods, often with a particular focus on externalities. Richard Musgrave (1957, 1959) introduced with his concept of *merit goods* an additional category. While a clear definition of this concept does not exist (Andel, 1984; Musgrave, 2008), merit goods often refer to a good’s evaluation which involves norms different from consumer sovereignty (Musgrave, 2008). Common examples are healthcare and education that could be provided by the market but would be under-consumed. Accordingly, restriction of drugs is an example for a demerit good.

Musgrave (1959, p. 8f.), in his concept of merit wants, differentiated between ‘social wants’ and ‘merit wants’. Social wants refer to public goods which are characterised – following the definition of Samuelson (1954) – by non-excludability and non-rivalry. As people will not voluntarily pay for these goods, the market cannot satisfy these wants. Any intervention of the state regarding social wants aims to supply the optimum amount of a good and to satisfy consumer preferences (Musgrave, 1959, p. 10f.). Thus, the public good intervention has consumer sovereignty as underlying norm.

In contrast, merit wants refer to situations in which interventions aim to correct consumer preferences. Resources are allocated in order to satisfy wants which could be provided by the market but individuals choose differently (Musgrave, 1959, pp. 8-14). Hence, the concept of merit goods implies that for certain goods the market demand does not correspond to the optimum demand and that such goods involve value judgments different than consumer sovereignty (Ver Eecke, 1998). Musgrave (2008) identified five settings in which either consumer sovereignty is difficult to implement (but still preferred) or the evaluation of the good

is based on different norms and therefore, violate the norm of consumer sovereignty. Firstly, ‘pathological cases’ in which the individual does not choose what is best for her, e.g. due to time discounting. Secondly, situations in which individual preferences are conditioned by society. Musgrave referred to this as ‘rule of fashion’. These two cases do not dismiss consumer sovereignty as preferred norm but rather aim to correct individual preferences. A third case are “community preferences”. Private preferences and community preferences may diverge if the individual considers herself as member of the community. An example would be payments for preservation of historical monuments (Musgrave, 2008; Musgrave & Musgrave, 1989, p. 57f.). Referring to Colm (1965), Musgrave (2008) argued that the formation of common preferences can be explained without the existence of a social organism. In a society ‘common concerns’ are developed due to social bonds and culture which may lead to the development of ‘common wants’ and therefore, consumption of private goods or support of public goods may diverge from individual preferences (Musgrave, 2008; Musgrave & Musgrave, 1989, pp. 55-58). A fourth argument is “paternalism in distribution”: society may be concerned with redistribution of income in order to cover society members’ basic needs but does so by providing the actual goods instead of the monetary equivalent. Fifth, as discussed above, value judgments may also refer to some “higher values” or multiple preference orderings as for the theories of Sen or Harsanyi. In this context, merit goods are chosen due to ethical preferences or rather commitment, and the assumption of consumer sovereignty remains.

Musgrave (2008) considered the case of diverging community values and individual preferences as most relevant application of the concept. While Musgrave’s or rather Samuelson’s concept of social wants is individualistic, merit goods may transcend the assumptions of an individualistic conception. Hence, Musgrave broadened the perspective towards a societal focus by emphasising that humans are social beings, suggesting that preferences and actions cannot be separated from the social environment. He assumed that individuals are able to evaluate private and social wants. He supported this view by noting that otherwise democratic processes such as voting could not function (Musgrave, 1959, p. 10f.).

3.3 Concluding remarks

This chapter summarised the current debate about social values of ES and identified relevant economic theories that were so far neglected. It has been shown that social value is a complex and ambiguous term. Many questions from a theoretical as well as methodological perspective remain to be answered and a consistent framework is missing. Further, it has been illustrated that the current debate is driven by the development of a value concept being distinct from the currently dominating concept of neoclassical economic value theory. The critique of the latter served as a starting point to develop new methodological approaches, e.g. DMV, in order to overcome some of the drawbacks of conventional economic environmental valuation.

Several strands in economic theory that touch upon social values were identified (among others): Kapp's theory of social cost; Harsanyi's utilitarianism; Sen's theories of meta-preferences, commitment and sympathy; Buchanan's constitutional economics; and Musgrave's theory of merit goods. It was found that the discussion is far beyond the scope of neoclassical economic theory and that economic theory is not as narrow as some critics claim. Still, the current literature on social values does not account for insights that can be derived from the past while the literature should take account of the long discourse about social values in economics and reflect on the progress already achieved. Furthermore, the review illustrated that identical or similar topics reoccur, resulting in the identification of recurrent attributes associated with social values: i) complex human behaviour and multiple preferences; ii) relevance of human embeddedness in nature, social relations and culture; iii) value pluralism and hierarchies; iv) public participation and social learning; v) preference aggregation; vi) interdependence of preferences and utility; vii) issues of distribution, power and justice.

The review illustrated potential contributions of these theories to the theoretical foundation of social values and that they may strengthen the theory of DMV in order to address commonly voiced concerns regarding economic valuation of the environment. Since the primary intention of this chapter was to identify relevant theories and illustrate their potential contributions, there is still a need to integrate these theoretical insights into a conceptual framework.

Therefore, in the following chapter a novel conceptual framework integrating social values into preference-based utility framework will be developed. The framework will aim at synthesizing insights from the current discussion as well as past debates.

Chapter 4 Making sense of social values in economic environmental valuation

This chapter aims at filling in the second major research gap – lack of a consistent conceptual framework. By development of a novel conceptual framework it will be emphasised that complex notions of social values of ES and economic theory are reconcilable when taking insights from economic theories beyond neoclassical economics and various factors associated with society, nature and culture into account. Integrating these diverse factors as well as diverging value concepts into a conceptual framework while maintaining operationalizability is a challenging task and requires consecutive steps which will be described in the following.

4.1 Integrating social values in a preference-based utility framework

As mentioned above, many questions about the ontology, elicitation and aggregation of social values remain (Kenter et al., 2016a; Kenter et al., 2019) and a consensus about the understanding of shared and social values does not exist (see e.g. Irvine et al., 2016). This chapter will contribute to the literature about social values and understanding of social values in four ways: Firstly, by building a bridge between the “old” literature associated with social values and the current debate on social values of ES in order to strengthen the theoretical basis (Section 4.1.1). Secondly, by developing a novel conceptual framework (Section 4.1.2) to integrate social values into a preference-based utility approach based on the theoretical insights delivered by the extensive review. Thirdly, implications for economic environmental valuation will be discussed at length with specific regards to an extension of the TEV concept and the relation of social values to conventional economic welfare measures (Section 4.1.3). Lastly, it will shortly be reasoned about implications for policy-making (Section 4.1.4).

4.1.1 Social values in economics: bridging the gap between past and current debates

The “current debate” contributed to the general discussion about social values especially by the development of new techniques in order to elicit shared and social values (see e.g. Kenter et al., 2016c; Orchard-Webb et al., 2016; Raymond et al., 2014). Recent contributions to the economic environmental valuation literature have illustrated the potential of combining different theories and how some of the above-described critiques against conventionally applied economic approaches and underlying theory can be addressed (see Table 4-1 for a summary of critique against the conceptual core of neoclassical economics with regards to specific assumptions in economic environmental valuation and links to the social values). Especially with reference to

the critique against stated-preference methods, DMV and DDMV were developed. These approaches combine economic with deliberative processes (Orchard-Webb et al., 2016; Spash, 2007) in order to inform preferences and to account for value plurality (Lo & Spash, 2013). Deliberation is a promising approach to form and express shared values (Kenter et al., 2016a).

However, the theoretical basis of DMV remains vague (Bartkowski & Lienhoop, 2018; Bunse et al., 2015) and as Irvine et al. (2016, p. 1) emphasised the ‘fundamental questions’ are equally important. One of these questions is in how far economic approaches are able to deal with complex issues such as social values of ES.

Table 4-1 Conceptual core and specific assumptions of economic environmental valuation and links to the current discussion about social values

Conceptual core / framework	Specific assumptions of economic environmental valuation	Link to social values discussion
Welfarism	Premise of self-interested utility maximisation.	Relevance of plural motivations.
Social Welfare	Social welfare defined as aggregation of individual preferences.	Consideration of different approaches to make social welfare judgements e.g. consensus-based deliberative approaches.
Individualism	Individuals are considered to be atomistic beings.	Question of individuals’ embeddedness in social and natural context.
	Individual welfare as relevant measure.	Relevant unit of analysis. Who is the value provider?
Consequentialism	Focus on the outcome.	Relevance of process. Aspects of justice and power in the context of the process.
Instrumentalism	ES as instruments for satisfaction of individual preferences.	Plural values involving non-instrumental components.
Commensurability	Different types of value can be reduced to a single metric (e.g. monetary scale) in order to be comparable.	Incommensurable aspects of ES would require more than a single metric.
Preference formation	Ex-ante given preferences.	Possibility of preference formation.

Source: Own illustration adapted from Massenber (2019, p. 1234)

According to Dasgupta (1985) economic theory can be circumscribed by epochs which emerge due to changing circumstances. Each epoch poses new questions regarding different problems and hence, old theories cannot be dismissed but are relevant dependent on the context

(Dasgupta, 1985, p. 143). While Dasgupta's analysis may well hold regarding the most influential schools of thought in Britain, it does not account for the heterogeneity of economic theory within these epochs as illustrated above for the case of social values. This does not weaken his argument regarding the relevance of old theories but questions the idea of "homogenous" epochs. The review of "old" literature and theories either explicitly or implicitly discussing social values has illustrated the heterodoxy within epochs. Certainly, the historic context cannot be completely dismissed as discussed with regards to changes in the economic concept of value and the role of nature in economic analysis. Yet, the review has also shown that criticism towards neoclassical economic assumptions, identified problems and questions posed were identical or largely overlapping over various epochs. Hence, topics, issues and discussions may be "rediscovered" and are not unique in terms of being bound to a single epoch. This also highlights the need to not disregard past insights but to integrate them into the current discussion when relevant.

Although most of the theories presented in the retrospective view on the contribution of economics (Section 3.2) did not discuss social values explicitly, they touch upon topics which often serve as starting point for the current discourse about social values of ES. Table 4-2 highlights the contribution of the identified theories to the discussion about social values with respect to theoretical and methodological issues in context of neoclassical economic assumptions. The topics are manifold and range from the conception of the individual over rationality assumption to the basis for normative evaluation. Incorporating the identified theories into the discussion of social values provides opportunities for a more solid theoretical foundation, may contribute to the understanding of the ontology of shared and social values and may further strengthen the theoretical basis of DMV.

Hence, in the following these insights will be integrated into a preference-based utility framework to allow incorporating social values into economic environmental valuation in a consistent manner (Section 4.1.2). Once the framework is developed implications for economic environmental valuation and policy-making will be examined (Section 4.1.3 and Section 4.1.4).

Table 4-2 Contributions of the identified theories to the theoretical foundation of social values in response to common criticism against the neoclassical economic concept

Theoretical and methodological issues	Neoclassical economic assumptions / framework	Contribution of the identified theories
View of individual	Atomistic individuals	Embedded in society & nature e.g. as members of society or community Individuals are able to evaluate social wants
View of society	Sum of self-interested individuals	Holistic - Emphasis on social environment, institutions, interdependencies and culture Existence of <i>common wants</i>
Preferences	Ex-ante given and complete Self-interested individual preferences	Ex-ante given and/or constructed Motivational plurality emphasised Meta-rankings and hierarchical preference relationship Individual preferences towards social ends Impartial and impersonal preferences Interdependent preferences Individual and social/community preferences Emphasis on need to understand the nature of preferences.
Rationality	Instrumental	Instrumental and/or communicative Choice within context Multiple selves & meta-rankings
Value concept	Contextual	Contextual and transcendental
Value scale	Individual	Individual and social
Preference aggregation	Rule-based aggregation of individual preferences.	Welfare judgements that incorporate individual and social preferences Unanimity criterion and consensus
Valuation process	Focus of valuation process is on elicitation in order to aggregate individual preferences.	Role of valuation process is highlighted.
Basis for normative evaluation	Value judgements based on consumer sovereignty.	Emphasis on different norms/criteria besides consumer sovereignty.

Source: Own illustration adapted from Massenber (2019, p. 1242)

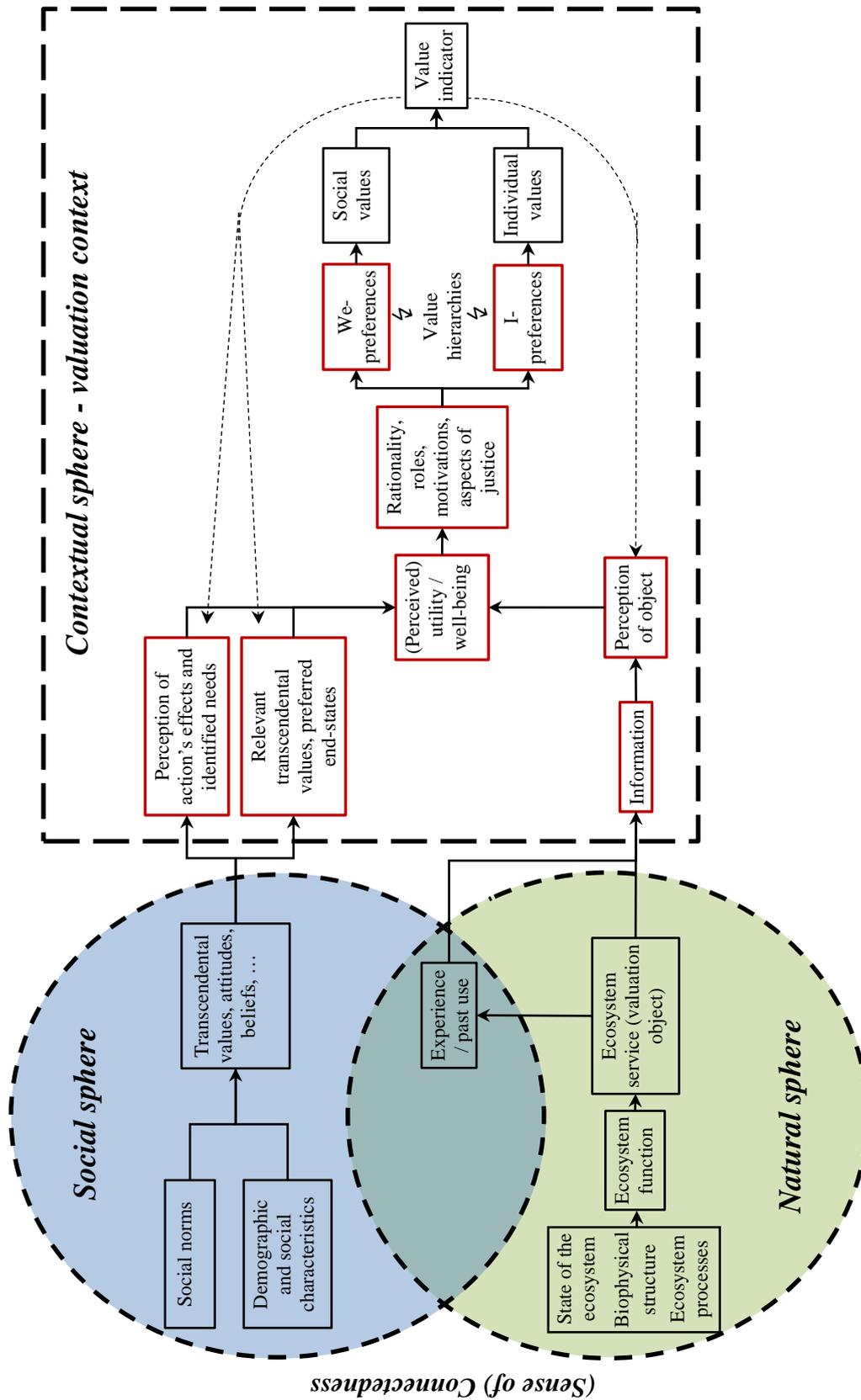
4.1.2 Conceptual framework

The novel conceptual framework that will be developed in this section aims at integrating social values in a preference-based utility framework. The latter will emphasize an economic perspective to reconcile social values and economic environmental valuation. As illustrated above, social values revolve around a variety of overarching issues which shall be addressed in the framework by integration of the identified contributions (see again Table 4-2). To achieve this, the framework will consider economic as well as interdisciplinary methods to develop a consistent approach that extends conventional economic environmental valuation towards identification and elicitation of social values of ES.

Generally, social values are considered to be boundary objects analysed in context of epistemic pluralism (see Kenter et al., 2019). Heterogeneous concepts and methods are necessary due to the axiomatic diverging disciplinary foundations. Although, several theories delivered insights about determinants of WTP for public goods, often it is relied upon a single theory. Theories based on different disciplines, e.g. economic valuation theory, Ajzen's *Theory of Planned Behaviour* (Ajzen, 1991), and Schwartz's *Norm Activation Model* (Schwartz, 1977), are usually considered to be competing and regarded as substitutes for each other. However, relying on a single theory may lead to deceptive results, calling for the incorporation of different theories into the analysis of WTP (Liebe et al., 2011). Still, even as necessary condition, pluralism by itself will not certainly advance the theory of social values but needs a unified basis (see Baumgärtner et al., 2008; Winthrop, 2014). Hence, to strengthen the theoretical foundation, the framework will incorporate current insights as well as findings associated with the long-standing debate on social values within economics.

To account for the multidimensionality of factors, to integrate insights from psychology and ethics, and to account for the associated diverging value concepts the framework developed in this section will incorporate three different spheres: social, natural and contextual (see Figure 4-1). The social sphere incorporates all factors with regard to human embeddedness in society and associated social influences on preferences. The natural sphere is primarily covering aspects of the ecosystem in more general terms (e.g. biophysical structure) and comprises the object of valuation. The social sphere and the natural sphere are linked through human-nature relationships represented by the (subjective) *sense of connectedness*.

Figure 4-1 Conceptual framework integrating social values in a preference-based utility framework



Source: Own illustration based on Brown and Slovic (1988, p. 24)

The contextual sphere depicts the valuation context. In this context, an economic valuation method is understood as *value articulating institution* (VAI). VAI can be conceived as a set of rules based on a certain ontology and epistemology. Thereby, each valuation method is embedded in a specific institutional structure, e.g. with reference to who participates, how information is communicated, what is considered as relevant data and how the data is processed. Further, also underlying theoretical assumptions, e.g. with respect to rationality or preference construction (for a discussion of diverging theoretical assumptions underpinning economic valuation see again Chapter 2 and Chapter 3), define a VAI (Vatn, 2005, p. 300f.).

Following the above-described logic, I will first outline the underlying value concepts in order to clarify the integration of diverging value concepts into the framework (Section 4.1.2.1); followed by the description of the social sphere (Section 4.1.2.2), natural sphere (Section 4.1.2.3), (sense of) connectedness (Section 4.1.2.4), and the contextual sphere (Section 4.1.2.5).

4.1.2.1 The underlying value concepts

The conceptualization of values varies according to the scientific discipline (or even within disciplines as discussed in context of social values in economics) and the term *value* has various meanings. Within economics value is usually conceptualized in relation to preferences and relative importance of an object (Brown, 1984; Kant & Lee, 2004). In other disciplines value is often understood in more abstract or generic terms. Schwartz and Bilsky (1987, p. 551) identified five common features in the literature, accordingly values are ‘(a) concepts or beliefs, (b) about desirable end states or behaviors, (c) that transcend specific situations, (d) guide selection or evaluation of behaviour and events, and (e) are ordered by relative importance’. Hechter (1992, p. 215) argues that values can be distinguished from preferences and norms because values are ‘relatively general and durable internal criteria for evaluation’. Thereby, they can be distinguished from preferences which are particular and labile, and norms which are external criteria for evaluation whereas values are internal criteria. While the conventional model of rationality does not incorporate values in their general form (Dietz et al., 2005), they are nevertheless relevant in case of ES (see Brown, 1984; Lockwood, 1999; Stern & Dietz, 1994). Yet, if they are relevant, how can they be included into a preference-based utility framework? This question shall be answered in the following.

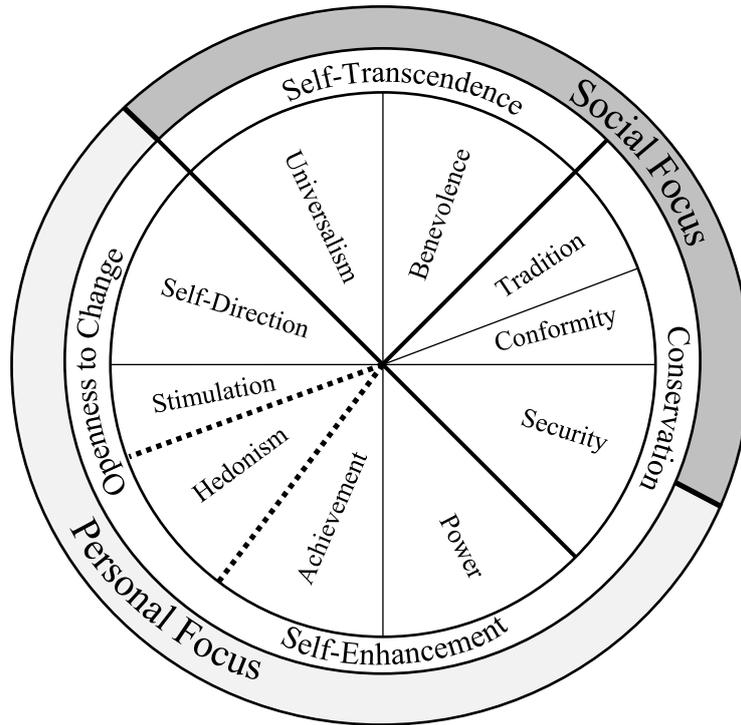
The varying concepts of value can well be synthesized with an economic conception of value through acknowledging three preference-related *realms of value*, ranging from abstract value towards expressed value, that are interrelated. The *conceptual realm* is associated with the ‘basis of preferences’, the *relational realm* deals with the ‘act of preferring’ and the *object realm* concerns value expression (Brown, 1984, p. 232).

The conceptual realm defines value in terms of *ideals* referred to as *held values* (see also Rokeach, 1973). The latter are associated with i.a. modes of behaviour (e.g. bravery), end-states (e.g. freedom) and qualities (e.g. beauty) which influence individual choice. Generally speaking, held values⁸ are ideals or principles of what is desirable and important (Bengston, 1994; Lockwood, 1999). A set of specific held values reflects a *value orientation* (Axelrod, 1994).

In context of held values, value orientations and the environment it is often referred to Schwartz’s *Theory of Basic Human Values* (Schwartz, 1992; Schwartz & Bilsky, 1987). As illustrated in Figure 4-2, the model comprises ten universal values: *Universalism, benevolence, tradition, conformity, security, power, achievement, hedonism, stimulation* and *self-direction*. These values can be organized on a circular continuum along two dimensions that reach from *openness to change* to *conservation* and from *self-enhancement* to *self-transcendence*. Accordingly, values may either have a personal focus, e.g. related to personal *achievement* and *power*, or a social focus, e.g. when people care for other humans and nature (*universalism*) or are linked to culture and community such as traditions and security. In this regard security is two-fold as it may either refer to personal security or to a societal scale, e.g. national security.

⁸ As discussed above, in the current debate on social values of ES values that transcend specific contexts are referred to as transcendental values and distinguished from contextual values understood as opinions about an object’s worth of importance (Kenter et al., 2015). In the following, the terms transcendental values and held values will be used interchangeably, just like assigned values and contextual values. Still, it is noteworthy that Kenter et al. (2015) argue that *transcendental* and *contextual* are semantically more precise because opinions about worth of importance could be held and assigned. In addition, Kenter et al. (2019) argue that value may also refer to indicators (in this thesis it is simply referred to *value indicators*). Lastly, an argument of Kenter et al. (2019) is that held and assigned values are referring to certain (contested) knowledge traditions of ex-ante given values.

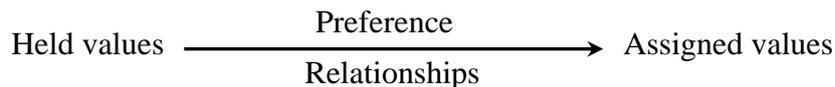
Figure 4-2 Schwartz's model of ten basic values and their relation on a circular continuum



Source: Own illustration adapted from Schwartz et al. (2012, p. 669)

In the relational realm value is understood in terms of a preference relationship between a subject and an object in a specific context. However, value in the relational realm is not observable as it involves feelings. Still, in the object realm the relative importance of the object may be expressed by the subject in terms of *assigned value*. Assuming a linear relationship, value that reflects the worth of an object to an individual (or group) stems from a *preference relationship* which is based on held values (Brown, 1984; Brown & Slovic, 1988). This relationship between held values, preference relationships and assigned value is illustrated in Figure 4-3.

Figure 4-3 Relationship between held and assigned values



Source: Own illustration adopted from (Brown, 1984, p. 234)

Hence, values assigned to an object are dependent on factors which are determined outside the valuation context, such as held values which are considered to be relatively stable over time

and to a certain extent affected by perception and context which may change more quickly over time (Brown, 1984).

Assuming that the relative worth of an environmental good – its assigned value – is to some degree influenced by abstract held values and perception leads us to the role of societal influences on individual behaviour which will be discussed in the following section.

4.1.2.2 The social sphere

The review of the “old” theories discussing social values illustrated that humans are not necessarily considered to be *atomistic individuals*. Kapp (1936, p. 43) emphasised that humans can alternatively be seen as social being embedded in society (*Gesellschaftswesen*). Conceptualised as social beings, humans have also an interest in the development of society. Yet, Kapp’s argument is not about constructing two opposing views but to consider individuals as social beings which recognize also social needs. However, this does not exclude the possibility that the individual considers herself to be isolated and therefore, only considers individual preferences as relevant (Kapp, 1936, p. 45). Also Dewey (1938, p. 43) regarded humans as *social animals* which are distinct from other social animals such as bees or ants due to one important difference: their actions are shaped by their cultural environment (see also Hayek, 1961). Hence, behaviour is to a certain extent determined by culture, institutions and beliefs. Adopting a holistic view which emphasises human embeddedness in society characterised by institutions, cultural factors and interdependences, seems to be conflicting with the conventional assumptions of *methodological individualism* which defines all social phenomena as result of individual behaviour. The conceptualisation of the individual in society that transcends individual context and values is often associated with *methodological holism*. In contrast to methodological individualism, methodological holism, in economic theory primarily associated with old institutional economics, recognises social influences (e.g. norms and institutions) on individual choice. The individual is not considered to be isolated or atomized but regarded as a member of society that internalizes norms and societal values (Rutherford, 1994, p. 27f.).

According to Rutherford (1994, p. 28) methodological holism can be defined based on three assumptions:

- i) The *social whole* exceeds the sum of its components.
- ii) The *social context* influences and conditions individual behaviour.
- iii) Individual behaviour should be understood in terms of embeddedness in a social system which incorporates social laws from which individual behaviour can be deduced.

The third assumption is by far the most controversially debated, equivalent to the assumption that all social phenomena can be explained in terms of individual decisions in case of methodological individualism.⁹ Yet, excluding these two controversial assumptions leads to a harmonisation of methodological individualism and methodological holism. In this case, the first two assumptions of methodological holism are recognised while at the same time it is acknowledged that individual decisions may lead to social phenomena (Rutherford, 1994, p. 36f.). Thus, social influences condition individual preferences but individual responses towards social influences differ, resulting in varying preferences across individuals (Musgrave, 2008; Vatn, 2017).

The conceptual framework incorporates the social influences associated with human embeddedness in society by including a social sphere. The latter comprises all factors determined outside the valuation context which are “brought” to the valuation by the individual i.a. held values, beliefs, dispositions, physical and emotional state, endowment, social influences, aspects of culture and socio-demographics (see again Figure 4-1).

4.1.2.3 The natural sphere

In addition to the social sphere, a natural sphere is incorporated which will be depicted in the following. The natural sphere relates to the ecosystem in more general terms in form of the state of the ecosystem, ecosystem processes and the biophysical structure. These are the basis for ecosystem functions and accordingly also for ES which represent the object of valuation. Experience and past use are placed somewhere in-between the social and natural sphere as it is directly related to the good under valuation but may also have a social component especially with reference to public goods. For example, public goods may be consumed together or own

⁹ See Rutherford (1994) for an extensive discussion.

consumption may have direct impacts on others. Experience and past use will be discussed in more detail later on in connection with complex human behaviour.

The question to which extent humans are part of nature or at least to some extent connected to it involves also the more substantial ethical questions of the existence of intrinsic value and moral responsibility. If humans are considered to be independent of nature or superior to nature, only instrumental values would be relevant precluding the existence of intrinsic values of nature. For example, Tool's instrumental concept of social values builds upon this argument (Tool, 1977). Drawing upon the work of Veblen and Dewey, Tool (1977) adapts an anthropocentric view and discusses a *principle of social value* which states that individual actions should contribute to the human survival and that knowledge should be instrumentally used in order to re-create the community (Tool, 1977). This implies that the environment serves only human survival and must only be preserved in order to serve this need (Spash & Villena, 1999).

In environmental economics the discussion about intrinsic value usually refers to deontological theories (see Davidson, 2013; Spash, 1997). Yet, as discussed by O'Neill et al. (2008, p. 114ff.) the concept of intrinsic value is complex and it may have different meanings. Firstly, it can refer to *non-instrumental values* in terms of objects, states or activities being ends in themselves in contrast to means to an end (instrumental value). Commonly, this conception of intrinsic values is associated with Kant's moral philosophy and his *categorical imperative* to treat humans as ends in themselves and never as means to an end. Rational beings are considered to be ends in themselves and hence, have a *moral standing*. In a Kantian sense humans have a duty towards things which have a moral standing (see Kant, 1785/1906). Some authors argue that Kant's ideas can be extended beyond persons (see e.g. Korsgaard, 2004). Hence, if a rare species or plant is considered to have a moral standing, a duty exists to consider its good when making choices. Put differently, the perception of nature influences behaviour due to the *scope of justice*. The latter defines the perceived *moral community* and thereby, the boundaries for the application or consideration of fairness and justice (Opatow, 1990, 1994). Secondly, intrinsic value may refer to an object's value associated with non-relational properties – intrinsic properties (see Moore, 1922/1970, p. 260f.). O'Neill et al. (2008, p. 115) give dampness of wetlands as example of an intrinsic property of wetlands, whereas the endangering of wetlands is extrinsic. Lastly, intrinsic value may refer to objective value – value that is independent of any subject's valuation (cf. Moore, 1922/1970, p. 254ff.). As highlighted by Stålhammar and Thorén (2019) these three conceptualisations of intrinsic value are independent.

Since the ethical foundation of economic valuation is anthropocentric, in the following intrinsic values will generally be understood in terms of non-instrumental values. Assuming any objective value would be a fallacy considering the subjectivist approach of economic valuation. However, this does not mean that the other two definitions are considered to be irrelevant in general but only in the context of economic environmental valuation (for a discussion of objectivist and subjectivist intrinsic value see e.g. Hargrove, 1992).

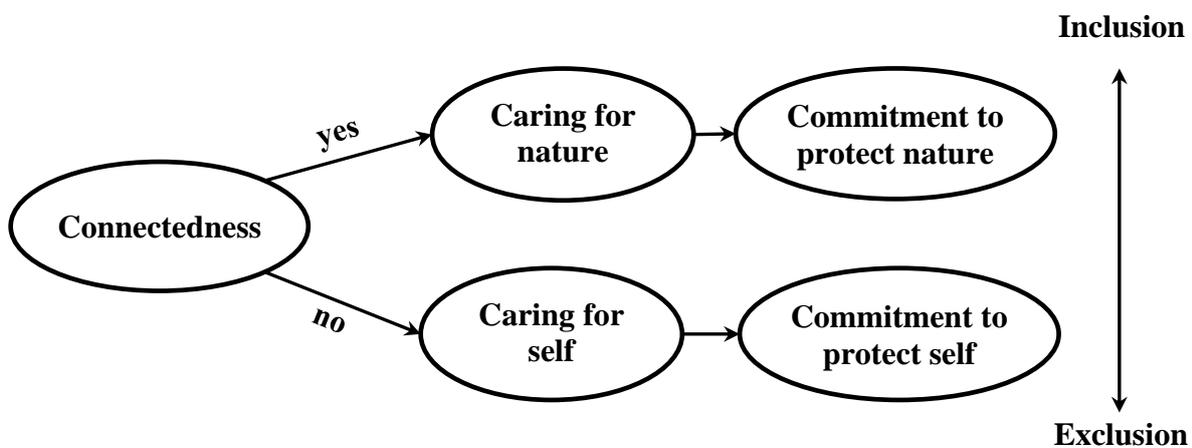
4.1.2.4 Human-nature relationships and (sense of) connectedness

After having discussed two individual elements of the frame – the social sphere and the natural sphere – we now turn to their link in form of human-nature relationships and (sense of) connectedness. In the following, the role of human embeddedness in society and nature and the relevance for social values of ES and their economic valuation will be emphasised.

Recently, scholars argued in favour of a third class of values besides the notion of instrumental and intrinsic values: *relational values* (Chan et al., 2016). The latter are not clearly defined and it is ambiguous how they relate to existing concepts of values (Stålhammar & Thorén, 2019). Often relational values are considered to be anthropocentric non-instrumental values which have the characteristic that the relationships between humans and non-human entities are the object of value or rather source of value (see e.g. Himes & Muraca, 2018; Muraca, 2011). Scholars criticize that this conceptualisation is based on an oversimplistic understanding of intrinsic value (and the dichotomy together with instrumental values) (Piccolo, 2017). Others argue in favour of the relational value concept based on the argument that it shifts environmental valuation away from preferences towards *meaning* (Tadaki et al., 2017). Here, relational values are considered of relevance in order to account for human embeddedness in nature and society and intersubjectivity of preference and values (see also Kenter et al., 2019).

Since the discussion about relational values gained momentum, human-nature relationships are of interest again. Already Wilson (1984) argued that humans have an innate, so biologically based, affinity and connection to nature, his so-called *biophilia hypothesis*. While this evolutionary concept is not without criticism (see e.g. Joye & De Block, 2011), a variety of validated instruments have been developed to assess human-nature relationships. One of the alternative models of human-nature relationship is the so-called *inclusion of nature in self* scale developed by Schultz (2002). Schultz (2002) developed a psychological model which explains human-nature relationship through *connectedness* (see Figure 4-4).

Figure 4-4 Connectedness, caring, and commitment – the core components of inclusion



Source: Own illustration adapted from Schultz (2002, p. 69)

The model links cognitive (*connectedness*), affective (*caring*) and behavioural components (*commitment*). Decisive for the valuation of objects (e.g. people or non-human entities) is the degree of inclusion in the individual's representation of self (Schultz, 2000, 2001; Wesley Schultz & Zelezny, 1999). People may perceive varying degrees of connectedness to nature (Schultz, 2002) because the amount of interaction with nature and associated importance ascribed to it differ. In case that an individual feels connected to nature, the emotional dimension of caring motivates individual behaviour – commitment to protect nature – which can ultimately be expressed in terms of WTP (Kals et al., 1999; Schultz, 2002). However, a human-nature relationship may also be characterised by a sense of disconnection from nature causing caring and commitment to be concerned with the self instead of nature.

While the current discussion of relational values focuses on human-nature relationships, human-human relationships share many similarities. Hence, they should be included to broaden the discussion to connectedness to nature and society. Due to interdependencies between the actions of people also human-nature-human relationships may be relevant. To understand

complex human behaviour, it should be considered that humans may base their decisions regarding the environment on the effects it has on other humans in case that interdependencies exist. In this line of thought, also the concept of transcendental values (self-enhancement versus self-transcendence) relates to the relational value discussion. Self-transcendence comprises benevolence as well as universalism which may relate to humans and/or nature (Schwartz, 1994). Hence, instead of socially isolated individuals which maximise self-interested utility as assumed in neoclassical economics, in the conceptual framework (represented in Figure 4-1) humans (may but not must) be *Gesellschaftswesen*. The latter are assumed to be embedded in society and may feel a subjective connectedness to society, other members of society and/or nature. Similarly, Stern and Dietz (1994) linked environmental behaviour to egoistic values, socio-altruistic values and biospheric values based on Schwartz's value scale (see also Stern et al., 1995, 1998). In the framework (represented in Figure 4-1) the sense of connectedness to nature and society is depicted by the dotted line around the natural sphere and social sphere.

The social sphere, the natural sphere and their interconnectedness in form of human-nature relationships highlighted the relevance of factors which are determined outside the valuation context for economic environmental valuation. It has been shown that diverging value concepts and multidimensional aspects can be reconciled with a subjectivist economic valuation approach.

In the following section, the role of the contextual sphere – the valuation context – will be discussed for two reasons. Firstly, it still needs to be clarified how these relevant dimensions “enter” the valuation context, how this affects preferences and which role social values play. Secondly, the causal relationship between factors embedded within the social and natural sphere can explain the discrepancy between neoclassical economic assumptions about behaviour and behaviour violating the axioms of rationality revealed in economic experiments to a certain extent. Yet, it cannot clarify the observed divergence of decisions caused by minor variations in the valuation framing (see Brown & Slovic, 1988). Therefore, the role of the contextual sphere – the valuation context – will be discussed in the next section.

4.1.2.5 The contextual sphere

Brown and Slovic (1988) emphasized the importance of the *valuation context* in the determination of assigned value. In this line, also (Vatn, 2005, p. 300f.) argued that economic valuation methods act as VAI defining a set of rules and thereby, influence the expressed value. Therefore, the valuation context represents the third sphere (*contextual sphere*) in the

conceptual framework (see again Figure 4-1). As depicted in the framework, the valuation context is characterised by a range of factors which lead from the abstract to the practical – from relevant transcendental values and perception, over utility, rationality and preferences to the value indicator. These numerous factors (namely, perception of action's effects, identified needs, relevant transcendental values and preferred end-states; information and perception of the object; rationality, roles, motivations and aspects of justice; We-preferences and I-preferences; value hierarchies; value indicator; and deliberation) will be discussed in detail in the following.

Perception of action's effects, identified needs, relevant transcendental values and preferred end-states

The assigned value is assumed to be dependent on the individual's perception of action's effects – the perceived behavioural control – and perception in general terms. In general, perception is shaped by the social sphere through socialisation. The latter may have two forms: primary socialisation which is associated with cultural norms and concepts, and secondary socialisation which is associated with one's profession. The latter is concerned with special knowledge and competences which shape the perception, e.g. a farmer may perceive environmental regulations different from an advocate for nature and environment. Hence, the perception caused by secondary socialisation may also lead to conflicts due to divergent values (Trainor, 2006; Vatn, 2017).

Further, Ajzen's *theory of planned behaviour* delivered insights about the effect of perception on behaviour (Ajzen, 1991), also in context of economic environmental valuation. For example, if the hypothetical market or the financing vehicle lack trust, participants are assumed to state a behavioural intention (e.g. WTP) which is smaller than their actual preferences for the ES. The individual must have the feeling of control meaning that the payment is affordable, the contribution will actually be directed towards the project under consideration, and that the described project really contributes to the desired outcome (see Ajzen, 1991; Spash et al., 2009).

Besides the effects of one's action also the *problem awareness*, so to say, the identified needs are of relevance (Vatn, 2017). Based on the value-belief-norm theory a chain of causality is formed from general values over general beliefs or rather *environmental concern* to specific beliefs, e.g. how the problem is perceived which is associated with problem awareness (see de Groot & Steg, 2008; Stern, 2000). So, the beliefs about the effects of behaviour in combination with the identified needs influence behaviour while at the same time the perception may be

influenced by the valuation context (see Schwartz, 1977; Vatn, 2017). Accordingly, the valuation context may also induce which held values etc. are perceived as relevant. Only the relevant ones will “enter” the valuation while the others remain implicit.

The framework incorporates these aspects for two reasons. Firstly, factors that are determined outside the valuation context but “enter” it and thereby, also influence preferences, need to be made explicit. It is necessary to account for underlying attitudes, beliefs and perception in order to understand their effects on preferences and to correctly interpret resulting stated preferences. Conventional economic valuation methods lack the capacity to do so and therefore, the incorporation of psychological tools was suggested. Secondly, assuming that economic valuation methods represent a VAI, the valuation methods applied may actively shape the valuation context and hence, influence stated preferences. As discussed in context of the different paradigms (deliberative) valuation methods may be based on, the method may for example define a certain way of communicating information or lay the focus on specific information like costs and benefits. Thereby, also the perception is assumed to be affected and only a certain set of transcendental values will be considered relevant.

The above-described factors referred to the social sphere, yet, perception is also relevant for the natural sphere as will be shown in what follows.

The role of information and perception of the object

Regarding the natural sphere, the relevant factor associated with the valuation context and perception is information. To be precise, the perception of the valuation object is shaped through information. As for the social sphere, there is a passive and an active component to contextual effects caused by information. On the one hand, information may have effects on assigned value in the way it is presented to survey participants (see e.g. Tversky & Kahneman, 1981) which is defined by the valuation method – VAI. On the other hand, participants may simply lack relevant information on the environmental good – *ill-informed preferences*.

An individual may not have complete knowledge about a good’s ability to satisfy her preferences (see Kapp, 1936, p. 37f.; Menger, 1871, p. 3ff.) which is especially relevant in case of complex environmental goods.¹⁰ In principle, obtaining information is costly and the associated benefits may be smaller than the costs. Less well-informed individuals may be more

¹⁰ This will be elaborated on in Section 4.1.3 discussing the implications of social values for economic environmental valuation.

heavily influenced by the valuation context. Hence, it seems adequate or even necessary to provide information about complex environmental goods to participants of valuation studies because it cannot be expected that participants possess an adequate level of information. However, participants' attitudes may change due to information provision (Ajzen et al., 1996). On the one hand, this can be considered to be a bias, on the other hand, it can be opposed that this represents a desired bias as it suggests more complete and accurate preferences compared to the original state of ill-informed preferences (see e.g. Bergstrom et al., 1990).

However, even if information is available, it is not necessarily made use of which suggests that costly information is not the only reason for contextual effects. For instance, Thaler (1980) argued that the inconsistency of the normative economic theory of the consumer and the consumers' actual behaviour occurs because of what Simon (1957, p. 198) referred to as *bounded rationality*. The latter argues that due to constraints on cognition, information and time the human mind lacks the capacity to behave objectively rational (Simon, 1957, p. 198). Hence, Brown and Slovic (1988) deduce that contextual factors act as a substitute for (a lack of) cognitive abilities and thereby, facilitate to respond to a survey. While ill-informed preferences can be handled by attempting to make information costless, the issue associated with bounded rationality is harder to address in case of complex environmental goods. The possibility of contextual factors to serve as substitutes for cognitive abilities should be considered when designing a valuation study.

Ultimately, relevant held values, perception of effects of one's actions, and perception of the object influence the perceived utility and may result in undervaluation for two reasons. Firstly, with respect to the social sphere not all relevant value dimensions may be considered. Secondly, regarding natural sphere participants may be ill-informed about the good under valuation. In both cases the expressed assigned value is influenced by the context.

Irrespective of the question if undervaluation occurs, the effects of perception emphasize the role of economic valuation methods as VAI. The latter shapes the context by information provision and by affecting which information, subjects and transcendental values are perceived as relevant. Again, this highlights the need to understand underlying attitudes, norms, beliefs and transcendental values when analysing and interpreting stated preferences in order to increase relevance for decision-making. Otherwise, misinterpreted stated preferences may lead to false conclusions and inefficient recommendations. Conventional economic valuation methods are not capable to identify underlying attitudes, beliefs and transcendental values.

Hence, the combination of economic valuation methods with psychological methods and tools is necessary.

After having discussed the role of perception, we will now turn to the long-debated concept of human behaviour which is represented by rationality, roles, motivations and aspects of justice in the framework (represented in Figure 4-1).

Rationality, roles, motivations and aspects of justice

As discussed above, the concept of rationality is one of the main targets with respect to criticism against economic environmental valuation. Commonly it is argued that it depicts an unrealistic picture of human behaviour. Yet, rationality in itself should not be deemed, even if it represents an idealised and potentially unrealistic concept. It is sensible to assume that people act rational in the context of subjective preferences. Further, rationality should not be confused with egoism. An act is termed egoistic if the only intention is to promote self-interest. The outcome is irrelevant, so also an act that benefits others may be motivated by egoism (Von Kutschera, 1982, p. 59). However, rationality must not be understood in narrow terms such as in neoclassical economics. In case that subjective preferences extend beyond self-interest, rationality does not infer egoism (Von Kutschera, 1982, p. 62). Further, rationality can be based on logical consistency suggesting that a rational person aims for logical consistency and is open to change her views if they are found to be inconsistent (Von Kutschera, 1982, p. 25). Thus, the criticism that the *isolated individual approach* does not correspond to the complexity of ES and social values can be addressed from a theoretical perspective by extending the scope of rationality.

The identified “old” economic theories provided a complex picture of human behaviour which shapes the rationality, roles and motivations. Values are not only originating due to individual utility maximisation and/or individual preferences but allow for the recognition of plural values e.g. values and wants of the community and/or preferences beyond self-interest. Human behaviour may not only be instrumental and rational (utility-maximising homo economicus), but may transcend the common assumption of means-ends instrumentalism. This implies that values may not only be based on individual preference satisfaction but may also be affected by morality, value hierarchies (different rankings of values may exist leading to conflicting values), multiple preference orderings (implying that each individual has *multiple selves* which cause context dependent preferences) and/or interdependencies. Hence, preferences may also be motivated based on e.g. deontological ethics, considerations of justice, and norms. Thus, the

identified theories challenge the assumption of narrow individualism and regard humans as social beings. However, rationality, preferences and underlying motivations may themselves be subject to the valuation context. This will be discussed together with complex human behaviour (We-Preferences) in the following.

We-preferences and I-preferences

As illustrated in the framework (represented in Figure 4-1) preferences are distinguished based on individual and social orientation (I-preferences and We-preferences) which results in the expression of individual values or social values. I-preferences reflect the conventionally assumed preferences based on self-interested utility maximisation. We-preferences are associated with complex human behaviour of individuals which feel a sense of connectedness to society and nature characterised by interdependencies. As argued above, interdependencies arise due to the assumption that humans are *social animals* as well as due to the common good characteristics of ES. If ES are considered to be processes instead of single items, interdependences between individuals and their choices are caused by physical linkages (Vatn, 2009).

Physical linkages are not the only reason for interdependencies. Interdependent preferences have a long tradition in economic theory (see e.g. Pigou, 1910; Veblen, 1899/1918). Various explanations for the relevance of interdependent preferences have been given in economic theory. Veblen (1899/1918, p. 68ff) emphasized the importance of social comparison for consumption, the so-called *conspicuous consumption* in which case (luxury) goods are consumed in order to be observed by others. Hence, conspicuous consumption aims at obtaining social rank and to alleviate the dissatisfaction of being ‘the normal pecuniary standard of the community’ (Veblen, 1899/1918, p. 31).

In the tradition of Veblen’s value theory, also Duesenberry (1949, p. 48) argued that individual consumption is influenced by the consumption of social contacts. Further, he stressed social influence on consumption via *demonstration effects* suggesting that consumption choices are reconsidered after being exposed to superior goods (Duesenberry, 1949, p. 27f.). If each individual’s preferences change over time due to experience and past use, preferences are endogenous (see also Randall & Stoll, 1983). Further, also heuristics are influenced by social interaction and social norms (Rand et al., 2014), which becomes relevant in case of incomplete information or rather the above discussed bounded rationality (see also Camerer & Fehr, 2006).

In addition, Loomis (1988) discussed interdependent preferences in context of *existence value* and recommended the following form:

$$U_a = F_a[f_{1a}(X_a, R_a) + f_{2a}(Q_a, (R_b, Q_b))] \quad (3)$$

Where U_a is the weakly separable utility function of individual a which comprises the individual's own consumption of private goods (X_a); the individual's use of the natural resource R_a ; satisfaction from knowing that the resource exists (Q_a); knowledge that others (here person b) are able to use the natural resource as well (R_b); and knowledge about person b 's satisfaction of knowing that the resource exists (Q_b).

When the individual a does not derive utility from knowing that the resource exists ($\frac{\partial U_a}{\partial Q_a} = 0$), the utility function simplifies to:

$$U_a = F_a[f_{1a}(X_a, R_a) + f_{2a}(R_b, Q_b)] \quad (4)$$

These utility functions or rather the underlying motivations are associated with altruism. Although, some scholars argue that these altruistic motivations are just expressions of option value (intragenerational altruism) and bequest value (intergenerational altruism) (see e.g. Brookshire et al., 1986).

As already mentioned above, also neoclassical economics does not preclude altruism, and some neoclassical economist point out the relevance of embeddedness. Already Clark (1907/1918, p. 39), one of the pioneers of the marginal revolution, stated:

‘Except in a perfectly isolated individual life, there is opportunity for ethical motives to affect men’s economic actions. Altruism has a place in any social system of economics, and so have the sense of justice and the positive compulsion of the law.’

Also in more contemporary neoclassical economic literature some scholars argue to incorporate altruism in models of human behaviour. For example, Becker relaxed the assumption of exogenous preferences, emphasising the influence of experience (Becker, 1996, p. 4f.), social interaction (Becker, 1974) and culture in form of shared values on individual behaviour (Becker, 1996, p. 16f.). Experience and past consumption are included into an extended utility function in form of *personal capital* while social influences are incorporated as *social capital* (Becker, 1996, p. 4f.). Becker (1996, p. 17f.) argues that moral and cultural judgements influence behaviour only through effects on personal and social capital. Hence, they are not

different from any other determinant of individual behaviour. As Pies (1998) notes, Becker's focus remains on self-interested rationality and motives behind behaviour are extended to such a degree that every action is in line with utility maximisation. Underlying are two competing conceptualisations of individual behaviour (Pies, 1998, p. 110):

$$\textit{Individual behaviour} = f(\Delta\textit{Preferences}, \textit{Restrictions}_{const.}) \quad (5)$$

$$\textit{Individual behaviour} = f(\Delta\textit{Restrictions}, \textit{Preferences}_{const.}) \quad (6)$$

It can either be assumed that morality influences restrictions of individual behaviour while preferences are constant (as argued by Gary Becker; see Equation (6)), or that individual behaviour is influenced through changing preferences whereas restrictions are assumed to be constant (see Equation (5)). Thus, in Becker's concept the *atomistic individual* remains and is just confronted with additional restrictions. Ultimately, moral considerations that have negative effects on individual utility, e.g. feeling guilty when personal choice contrasts a social norm, are understood in terms of irrational behaviour. In contrast, Sen's (1977b) above-discussed concept of sympathy and commitment differentiated between preferences related to individual utility and independent of it. Preferences motivated by commitment, based on what is right or wrong from a moral perspective, are considered independent of individual welfare (Edwards, 1986). Hence, the neoclassical conception is simply captured by sympathy while commitment may in extreme cases lead to counter-preferential choices, e.g. motivated by moral imperatives or social norms (Sen, 1977b, 1997). Minkler (1999) argues that the inclusion of commitment is important because otherwise certain behaviour gets excluded from the economic analysis or behaviour is mischaracterized. In the context of environmental goods, people are likely to have these *impersonal preferences*, preferences which are considered to be independent of the personal state, besides individual preferences (Dworkin, 1981). It is worth noting that impartial preferences are independent of *reciprocity* because the underlying motives are not related to the self (Gutmann & Thompson, 1998, p. 54). In case of preferences based on reciprocity aspects of fairness and equal treatment are of relevance. The concept of *homo reciprocans* suggests that humans react positively to sympathetic actions and negatively otherwise. This may also result in punishing free-riders without personal benefits – altruistic punishment (Bowles & Gintis, 2002; Gintis, 2000). However, this type of behaviour can be assumed to be of less relevance in case of *one-shot games* which most economic valuation studies represent. *Impartial preferences* are rather germane for valuation of public goods if respondents reflect individually or collectively on public interests instead of only considering individual interests. Further, these

preferences violate the consequentialist assumptions behind utility maximisation because in the conventional framework the act is the mean to the preferred end (increased utility). Yet, acts of commitment are associated with duty instead of a specific end and hence, are non-consequentialist (see Minkler, 1999).

It has been illustrated that moral values or motivations and subjective preferences may well be linked by assuming that morality is always a reason to prefer one state of affair over another but not always a sufficient reason (Von Kutschera, 1982, p. 55ff.). Further, it has been argued that self-interested utility maximisation ignores moral motivations if they are independent of the personal state and that certain acts are performed due to commitment and a sense of duty instead of self-interested utility maximisation (see Sen, 1977b). Thus, one state of affair may be preferable in terms of self-interest but morally inferior to another. According to Sen (1977b, p. 337f.), it should therefore be distinguished between personal welfare, “*isolated*” *personal interests* (which exclude sympathy), and actual choice. Yet, if preferences have several components which may be contraindicating it poses the question ‘why to act morally?’ (Von Kutschera, 1982, p. 57).

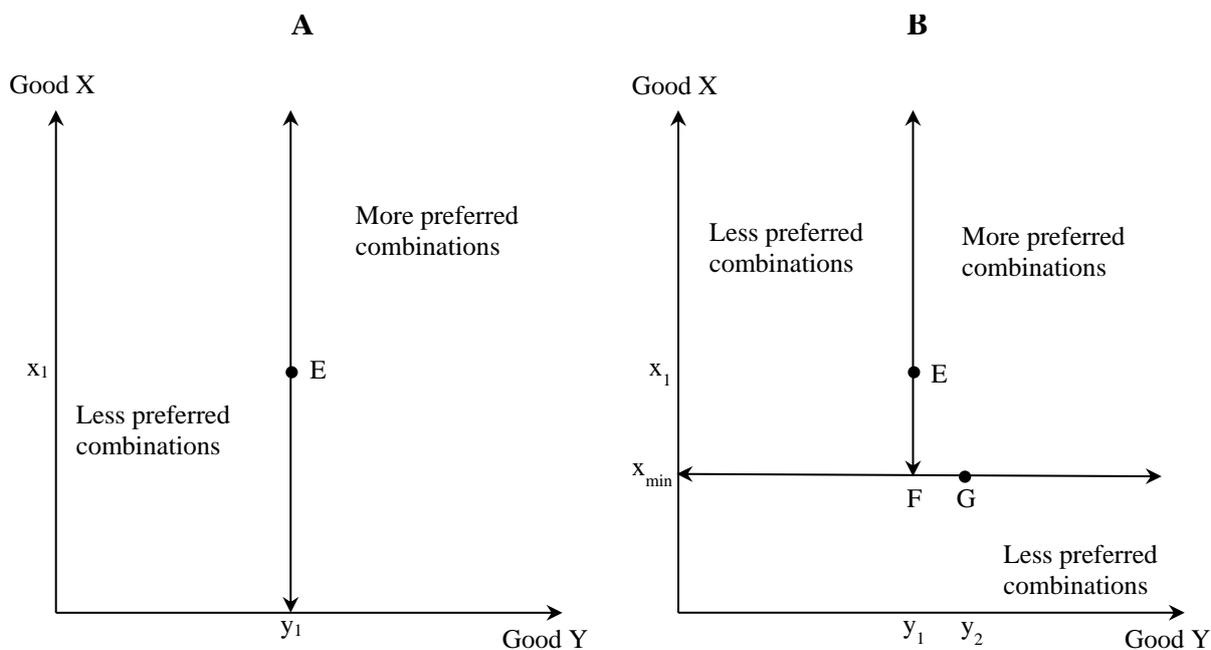
Value hierarchies

Simply put, the question of value hierarchies can only be answered based on the motivations associated with preferences (see Rohs, 1985). Sen (1977b) argued that given a system of morality the various options can be ranked through a meta-ranking.¹¹ So, a “*most moral*” *ranking* exists which may (but not must) coincide with personal welfare, “*isolated*” *personal interests* (which exclude sympathy) or actual choice. Etzioni (1986) argued that choice always involves trade-offs between utility maximisation and commitments and moral preferences. Building upon the normative work of Ross (1939), who argued that moral duties can be ranked over preferences, Minkler (1999) developed a positive framework which adds commitment to a standard utility function through an iterative process. The individual first considers if commitment and duties are of relevance and if so maximises utility in a second step.

¹¹ Note that *meta-rankings* can also be based on other criteria than morality. Hence, the latter is a sufficient, but not necessary, condition.

Accordingly, extreme and less extreme cases of conflicting values can be distinguished. In neoclassical economic theory hierarchical values are commonly associated with *lexicographic preferences*, irrational behaviour and protest responses. Lexicographic preferences violate the neoclassical assumption of continuous preferences, yet they may express consistent preferences in context of hierarchical values (Lockwood, 1996; Spash, 2000a). It has been argued that lexicographic preferences, as described so far are an extreme case which is rather unrealistic because a single good is always prioritised over the alternative. While this argument is often used to exclude lexicographic preferences as irrelevant in economics analysis (see Malinvaud, 1972, p. 20), distinguishing between *extreme lexicographic preferences* and *modified lexicographic preferences* based on thresholds weakens this criticism (Lockwood, 1996). Figure 4-5 illustrates the case of extreme lexicographic preferences (panel A) and modified lexicographic preferences (panel B).

Figure 4-5 Extreme and modified lexicographic preferences



Source: Own illustration adopted from Spash (1998, p. 52f.)

Good Y represents an environmental good and good X is a composite good. In case of extreme lexicographic preferences (Panel A) an increase of both goods is always a more preferred combination while decreasing both goods is always less preferred. Also, when holding Y constant an increase in X is also always more preferred and a decrease in X is less preferred. Yet, no increase in X can compensate a decrease in Y implying that WTA for a decrease in Y is infinite. In contrast an increase in Y can compensate any reduction in X without being worse-off. This implies that in comparison to the bundle E any reduction in the environmental good Y

will make the individual worse-off in terms of utility even if X is increased. Further, no other combination will give equal welfare. Thus, the indifference curve is reduced to a single point.

Panel B illustrates the modified version of lexicographic preferences incorporating a threshold x_{\min} . Starting at bundle E an individual would be willing to pay for an increase in Y as long as X does not fall below the threshold (x_{\min}). The individual would be willing to give up the amount $(x_1 - x_{\min})$ for an increase in Y , e.g. towards bundle G . The welfare of bundle G exceeds the one of bundle E . Thus, once G is reached the individual would not be willing to give up Y in order to gain X . So, returning to bundle E again would be inferior to remaining in G . Hence, X will always be reduced in favour of Y but not vice versa.

Hence, on the one hand, multiple preference-orderings and hierarchical values may result in ethical dilemmas and protest bids (see e.g. Spash, 1997; Vatn, 2000) but, on the other hand, deontological ethics and rights-based beliefs can also be an underlying motivation of stated preferences and behaviour (see e.g. Spash, 2000b, 2006; Stevens et al., 1991). This latter will be elaborated upon in the following.

Transcendental values, representing desirable end states (see Schwartz & Bilsky, 1987), may help to resolve conflicts between preference(s) (orderings). Choices can be made even when preferences are conflicting because based on transcendental values desirability (what *should* be desired) can be distinguished from desire (Dewey, 1939, p. 31f.; Hechter, 1994). Hence, desirable ends are normative value judgements (Farley, 2012) on which basis preferences can be ranked according to a meta-ranking. However, some authors criticise multiple utility conceptions for the possibility to simply extend the utility function(s) to include any kind of motivation (see e.g. Brennan, 1989) just like in case of Becker's mono utility concept and associated criticism. Yet, multiple-preferences orderings such as the above-described consumer-citizen dichotomy, Sen's (1977b) notions of sympathy and commitment and meta-rankings, and Harsanyi's (1955) subjective preferences and ethical preferences, allow for the operationalisation of individual preferences and social preferences even if the latter may be based on non-consequentialist motivations (in the framework presented in Figure 4-1 referred to as I-preferences and We-preferences). Furthermore, altruism may be grounded in identification with other individuals, groups or communities (Jencks, 1990; Minkler, 1999; Sen, 1999). It may also be directed towards a broader moral community including non-human entities (Stern & Dietz, 1994; Stern et al., 1993). In the framework (represented in Figure 4-1) identity and identification with other people and nature is associated with sense of

connectedness as subjectively felt interdependence and interconnectedness (see also Roszak et al., 1995).

Again, contextual effects may be relevant in case of conflicting values or existence of multiple preference orderings. The contentious, yet persistent, hypothesis is that markets erode moral values (Falk & Szech, 2013). As discussed above, Kapp (1936, p. 42ff.) builds his argumentation that exchange value and markets cause individuals to only reveal preferences as *isolated individuals* while neglecting social needs on social embeddedness of individuals. Also Marglin (1963) and Sen (1967) argued that decision-making in a market context (consumer) diverges from the behaviour in a social context (citizen). Again, the valuation context is of relevance because based on the survey design participants may only consider certain values and preferences (Brown & Slovic, 1988). The valuation context defines the value source (associated with value provider) and constituency (associated with value scale) which may lead to diverging I-preferences and We-preferences (see again Figure 4-1).

The valuation context implicitly or explicitly answers the controversial question who the value provider should be. As illustrated above, a long discourse deals with the question if society or only conscious beings can hold values (see Schumpeter, 1909). Yet, the question how social values may be elicited, through individuals or through a supra-individual entity, remains to be answered (see Kenter et al., 2015; Musgrave, 1959). Underlying this question are additional fundamental questions and diverging philosophies of science. Philosophy and ethics as normative science consider the valuing agent as ‘self-defining subject within a social process’ whereas modern economics being a rather positivist science considers the valuing agent as object of analysis (Lo & Spash, 2013, p. 771). For example, based on Kantian ethics the questions would not be which preference an individual has but which ones the individual *ought* to have. The latter cannot be inferred from exogenously given preferences but requires democratic and participative processes about conflicting values and interests in order to determine social choice (see Kapp, 1978, p. 317; Rohs, 1985). Hence, some scholars argue that social values are a sole normative case and that the individual is not an appropriate value provider for social values (see e.g. Ravenscroft 2019).

In contrast, the identified “old” economic theories suggest that individuals are able to hold or rather express social preferences. The arguments brought forward to support the analysis based on individuals as value providers were diverse such as preferences behind a veil of ignorance, commitment, meta-rankings and common wants. Hence, individuals may not only consider

their personal wants but also what is desirable from a societal point of view. Further, especially the theories of Kapp, Buchanan and Musgrave reason about social ends and/or social value judgments with regard to social well-being and individual utility. In this respect these economic theories share many aspects that overlap with the broad definition of sustainability such as long-term focus due to social ends, justice, fair distribution and allocative efficiency (see Norton et al., 1998). Hence, normativity cannot be precluded completely, considering that social values of ES incorporate inherently normative aspects such as individual value judgements about desirable ends. Further, it is debated whether positive and normative analysis can be completely separated in social sciences at all (see Hodgson, 2000). Besides the source also the constituency may either refer to individuals or groups. In other words, the constituency defines which individual or group the value provider is representing within the valuation process, e.g. an individual could be asked to represent themselves or society at large. Further, assigned value can either be expressed by an individual or a group which results in four possible scenarios (see also Table 4-3) (Brown, 1984):

- i) An individual expresses assigned value to themselves (as conventionally done when asking for individual WTP) or to another individual, e.g. in form of a trustee.
- ii) An individual expresses assigned value for a group, e.g. a politician concerned with public policy.
- iii) A group expresses assigned value for an individual, e.g. parenting.
- iv) A group expresses assigned value for a group, e.g. market prices or elections.

It has been argued that the constituency should be in accordance with the characteristics of the good to be valued: self-centred for private goods and society-centred for public goods (Brown, 1984; Brown & Slovic, 1988; Randall & Stoll, 1983). Thus, when emphasising complex systems, the (economic) analysis has to account for this complexity instead of limiting itself to the smallest unit of analysis (Vatn, 2017).

Table 4-3 Cases of value expression with regard to constituency and source.

Constituency	Source	
	Individual	Group
Individual	1	3
Group	2	4

Source: Own illustration adapted from Brown (1984, p. 235)

The discussion of value hierarchies has illustrated that lexicographic preferences should not be dismissed as irrational if they are based on commitment. In this case lexicographic preferences are consistent even though violating the neoclassical economic assumption of continuous preferences. Further, it has been illustrated that the issue of conflicting values can be overcome based on meta-rankings associated with multiple-preference orderings and/or the individual considers social values in form of desirability from a societal point of view alongside personal wants.

Clarifying the importance of the constituency as well as the value source, highlighted again the role of economic valuation methods as VAI and leads us to the next factor defined by the valuation context: deliberation.

Deliberation

As discussed in Chapter 2 and Chapter 3, economic valuation methods may be based on different paradigms. In the context of DMV (PE versus PM), it has been illustrated that the focus may either be on informational and cognitive deficits, or on value pluralism.

In the former case the *valuing agent* is of interest and the focus is laid upon level of information, cognitive enhancement and social interaction. In this case, the intention is to improve consumers' decision-making regarding environmental valuation through provision of information (see e.g. Gregory (2000)) and through interaction between consumers, see e.g. the market stall approach of Lienhoop and MacMillan (2007b). In contrast to the assumptions of economic welfare theory, empirical research suggests that people do not hold well defined preferences for complex and unfamiliar goods. Therefore, contextual factors may play a significant role in the process of preferences construction during the elicitation process (Payne et al., 1992; Payne et al., 1999).

Alternatively, the focus can lay on value pluralism and preferences beyond self-interested utility maximisation (Lo, 2014). In this context the valuation process is understood as social act (O'Neill, 1997, 2017; O'Neill & Spash, 2000). Social learning and understanding of other arguments, perspectives and world views is central (Kenter, 2016b; McCrum et al., 2009; Vatn, 2005). Hence, this type of environmental valuation may involve a process of collective identity formation which considers social embeddedness and interdependence of humans contrasting conventional approaches (Ward, 1999). Further, it is argued that transcendental values are often latent and have to be made explicit in the process (Niemeyer, 2004). Put another way, not all

deeper held values are active at the same time but must be activated by specific modes of thinking, rationality, roles or information, e.g. through discussion about a moral topic (see LeBoeuf et al., 2010; Verplanken & Holland, 2002). It is argued that by incorporation of moral and public concerns into the valuation process the valuing agents adopt the citizen instead of consumer role and hence, introduce also further concerns such as fairness (Sagoff, 1998; Stevens et al., 1993; Vatn & Bromley, 1994). However, empirical evidence regarding the consumer-citizen dichotomy is ambiguous (see Curtis & McConnell, 2002; Martínez-Espiñeira, 2006; Mill et al., 2007; Ovaskainen & Kniivila, 2005; Soma & Vatn, 2014).¹²

In both cases, the underlying intention is to introduce ‘the right principles’ to evaluate complex goods such as ES which is referred to as *positional modification* (Lo, 2014, p. 260). In the conceptual framework (represented in Figure 4-1) all factors potentially affected by deliberation are highlighted by a red box. As illustrated, the aim of deliberation may be twofold and hence not all aspects may be touched upon. Preference information is rather concerned with the lower part of the framework resulting in well-informed I-preferences. On the contrary, preference moralisation is expected to have an influence on the relevant transcendental values, identified needs and desired end-states resulting in adaptation of a citizen perspective and associated We-preferences.

Having clarified the role of deliberation, we now turn to the discussion of the last factor comprised by the valuation context: the value indicator.

Value indicator

The *response mode* defines the value indicator. For example, value indicators may involve ratings or ranking and can be monetary or non-monetary (Brown & Slovic, 1988). An already discussed example in which case the response mode affects assigned value is the discrepancy between WTP and WTA. Further, Brown (1984) found that WTP for consumer goods was higher than WTP for environmental amenities when a monetary value indicator was used, although most participants assigned higher value to the environmental amenities on a non-monetary rating scale. Another example is the prominence effect in which case expressed preferences and preferences revealed through choices differ significantly because dominant attributes are given more weight by the choice mode (Tversky et al., 1988). In addition, Irwin and Baron (2001) found that modes of preference elicitation reflect moral values to varying

¹² Empirical evidence will be discussed in detail in Section 5.3.

degrees in which case price modes induced less importance on moral values compared to non-price judgements, e.g. likelihood of purchase rating. In line, Martínez-Espiñeira (2006) used a payment vehicle that was not based on an individual maximum WTP but on a socially acceptable standard that every member of the group has to pay (variable tax). He argued that therefore the *valuing agents* would adopt a social rationality or rather citizen perspective in accordance with Nyborg's (2000) concept of *homo politicus* instead of *homo economicus*. Thus, the value indicator may also affect the valuing agents' perceptions as indicated by the dotted arrows in the framework resulting in an iterative process of reflection within the valuation context (see again Figure 4-1).

The novel framework developed in this section fills the gap of a lacking conceptual framework by integrating social values into a preference-based utility framework. Against the manifold criticism of economic value theory and economic valuation, it has been demonstrated that social values and economic environmental valuation are reconcilable.

To achieve consistent integration of social values, economic theories beyond neoclassical economics as well as insights from psychology and philosophy were taken into account in order to address the relevant theoretical and methodological issues associated with economic environmental valuation:

- i) View of individual
- ii) View of society
- iii) Preferences
- iv) Rationality
- v) Value concept
- vi) Value scale
- vii) Preference aggregation
- viii) Valuation process
- ix) Basis for normative evaluation

It has been argued that value pluralism as well as methodological pluralism is a necessary but not sufficient condition to consider these relevant issues. To ensure the framework's consistency and to synthesise diverging concepts of values, the framework incorporated three different spheres: natural, social and contextual. These three spheres depict a holistic frame to analyse social values of ES.

Regarding the natural sphere, the framework illustrated the importance of considering the complexity of the good under valuation. ES can be considered to be common goods if they are understood in terms of processes instead of single items implying that interdependencies between individuals and their choices exist due to physical linkages (Vatn, 2009). These interdependencies result in collective consumption and shared benefits (Samuelson, 1954; Sen, 2000, p. 127f.) and introduce moral issues into decision-making.

Regarding the social sphere, it has been discussed that preferences are also shaped by social, institutional and cultural context. The assumption of exogenous preferences was relaxed and therefore, methodological individualism in its purest form cannot hold. However, it has also been argued that individual behaviour is not completely socialised in a sense of determined by socialisation suggesting that also methodological holism is inadequate. Hence, a form of ontological individualism is maintained while acknowledging shared and social values with reference to reflexive individuals instead of a supra-individual entity.

Further, human behaviour may be characterised by multiple identities, e.g. consumer and citizen (Pearce et al., 1989), and preferences involve not only values concerned with the individual (self-enhancement) but also with the welfare of others (self-transcendence) (Schwartz, 1992). Additionally, it has been suggested that individuals do not necessarily express individual preferences but may also state social preferences due to interdependencies and public preferences when ascribing intentions to the group, community or society. Thus, the individual is not conceptualised as atomistic being but is considered to be embedded in complex interrelations with society and nature. This shifts the view from the individual perspective (consumer) towards the individual in a social context (citizen).

The contextual sphere emphasised the roles of the valuation process, deliberation and contextual effects. Understanding economic valuation methods as VAI highlights the need to carefully design valuation studies, e.g. with respect to choosing a constituency in accordance with the good, and to apply qualitative methods in order to distinguish We-preferences from I-preferences as well as value conflicts from true zero-WTP.

Identification and elicitation of social values requires a consistent conceptual framework as the one developed in the study at hand which may serve for future studies about economic valuation of ES and biodiversity. As illustrated above, primarily heterodox economic theories form the framework's theoretical basis. Yet, as explained in Chapter 2, economic environmental

valuation is mainly grounded in neoclassical economic theory. Therefore, in the following section the implications of social values for economic environmental valuation will be discussed.

4.1.3 Implications for economic environmental valuation

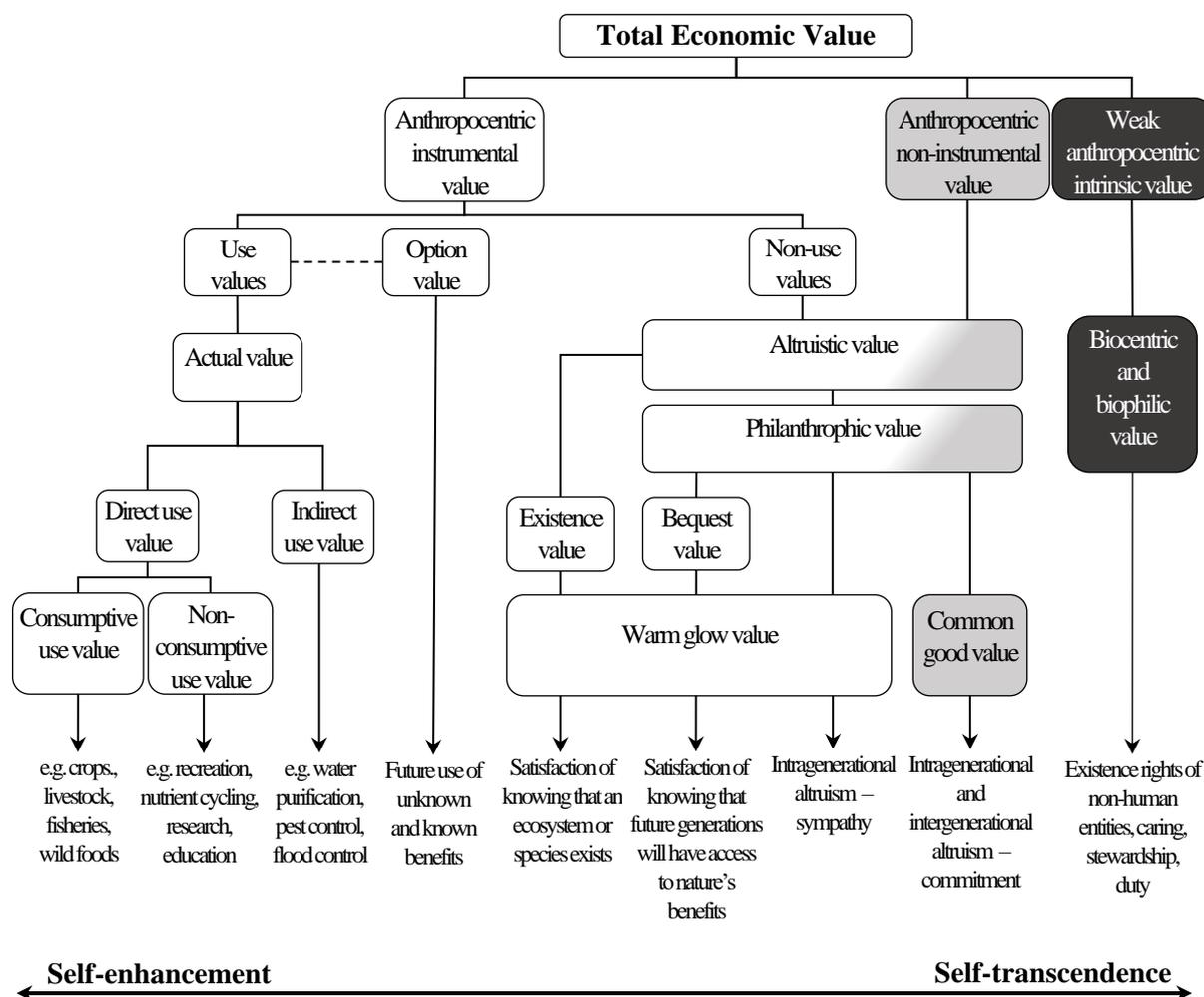
After having developed a novel framework on the basis of an individualistic economic approach that is nevertheless able to explicitly address social values, we now turn to the implications of including social values into the consideration for economic environmental valuation.

The above discussed value pluralism and multidimensionality of motivations behind preferences is not adequately reflected by the current conception of TEV. For non-use values the classification is rather imprecise and does not allow for value justifications beyond instrumentalism nor can it capture values associated with human embeddedness in nature. Therefore, Figure 4-6 illustrates an extended and refined TEV in order to account for the complexity in terms of value dimensions and motivations (for the original TEV concept see Figure 2-3). The differences between the “traditional” TEV and the extended version associated with social values (Figure 4-6) will be described in the following.

Firstly, the extended framework explicitly accounts for the fact that ES and economic environmental valuation are inherently anthropocentric concepts and hence, following the valuation’s subjectivist approach only anthropocentric values can be accounted for. Secondly, the extended framework distinguishes between instrumental and non-instrumental values. As discussed above, this is relevant because altruism may either be linked to a human valuer’s utility (sympathy) or be independent of the latter (commitment). Altruism motivated by sympathy is here designated as *warm glow value*, whereas altruistic value associated with commitment is referred to as *common good value*. The latter refers to what is beneficial to other members of a community/society but independent of the valuer’s personal welfare. As outlined in Figure 4-6, *warm glow value* may relate to nature and non-human entities (*existence value*) or humans (*philanthropic value*). *Bequest value* is depicted as special form of altruism or rather warm glow towards future generations. *Existence value*, *bequest value* and *intragenerational altruism* based on sympathy are all captured by anthropocentric instrumental value as it is assumed that the person valuing obtains satisfaction herself from these types of values. While various definitions of existence value exist, it is often understood as special form of altruism (see e.g. Turner, 1999), motivated by sympathy towards non-human entities, and hence in the

original framework associated with ‘altruism to nature’ (see e.g. TEEB, 2010, p. 195). This definition is also adopted in the TEV concept presented here.

Figure 4-6 Extended total economic value framework to account for value pluralism and multidimensional motivations



Source: Own illustration based on TEEB (2010, p. 195)

Colours indicate if values are associated with anthropocentric instrumental value (white), anthropocentric non-instrumental value (light grey), or weak anthropocentric intrinsic value (dark grey).

However, this concept of existence value does not account for the complex human-nature relationships and connectedness as discussed above, criticism generally voiced in the context of the ES framework (see Chan et al., 2012a). In response to this criticism and to account for value pluralism, *weak anthropocentric intrinsic value* is included as third overarching value category besides *anthropocentric instrumental value* and *anthropocentric non-instrumental value*. At a first glance, the label of *weak anthropocentric intrinsic* appears to be an oxymoron, it shall be illustrated why it is an adequate description. In a strict sense anthropocentrism is the belief that value is only associated with humans implying that non-human entities are only means to human ends. In its “weak” form anthropocentrism does not imply that nature does not

have value in itself (intrinsic value) but simply that the act of humans valuing is always anthropocentric, even if they try to adopt the view of a non-human entity (Callicott, 1989; Hargrove, 1992), but not necessarily instrumental. Hence, weak anthropocentric intrinsic value is not an oxymoron but suggests that humans value a non-human entity for itself. That is to say, from an anthropocentric point of view the non-human entity is valued as an *end* instead of a *mean to an end* (Hargrove, 1992). Incorporating this category of value does not overcome the criticism that objective intrinsic value of nature cannot be incorporated in economic environmental valuation.¹³ Yet, it broadens the scope of values and allows for more complex preferences and human behaviour. Importantly, this category of intrinsic value is not only associated with a deontological sense, meaning ascribing existence rights towards non-humans and duties towards species or ecosystems (*deontological biocentrism*), but also understood in the context of sense of connectedness and related concepts of caring and stewardship (*virtue biocentrism*) (see Palmer, 2017). To make this argument of virtue, caring and human-nature relationships distinct, this category is further specified as *biocentric and biophilic value*. Further, as indicated by the arrow at the bottom of Figure 4-6, these values as well as anthropocentric non-instrumental values are assumed to be *self-transcendent*. In contrast moving towards the left, values become more and more focussed on individual interests and use. Hence, these values are linked to *self-enhancement* with reference to Schwartz's theory of basic values (see Schwartz et al., 2012).

Conceptualising intrinsic value in a deontological sense implies moral rights which are in conflict with welfarism and generally, consequentialism. The same applies to the typology of non-instrumental common good value. Hence, these value typologies are also conflicting with conventional economic valuation due to violation of the axioms described in Chapter 2. In contrast, *consequentialist biocentrism* values *states of affairs* instead of non-human entities as ends in themselves. Simply put, well-being of (living) non-human entities is valued instead of nature in itself (Attfield, 1995; Attfield, 1998). However, this does not suggest that all living things are treated equally (Attfield, 2005). All three forms of biocentrism are assumed to be action-guiding (Palmer, 2017). Hence, they are relevant for economic valuation. Generally, economic valuation methods lack the ability to uncover motivations behind value expressions.

¹³ Cf. Ward (1999) who argues that objective value can be incorporated into economic environmental valuation based on Harsanyi's utilitarianism. Following Goodin's idea that interests originate from objective value (Goodin, 1996), Ward (1999) argues that utility functions can be ascribed to non-human entities through humans empathising with them. In this case, utility is not understood in terms of pleasure and pain but refers to interest and risk as in Harsanyi's expected utility maximisation approach.

Accordingly, conventional valuation methods and the associated market context have been criticised for being unable to meet this complexity. Ignoring plural values, multiple preference orderings and/or preference endogeneity may result in double-counting or undervaluation (Blamey et al., 1995; Brekke & Howarth, 2000). Further, adequacy of self-interested individual preferences in a social context and in case of value pluralism have been questioned.

It has been illustrated that the valuation context may influence value expressions. The context shapes the form of interaction by influencing the perception of the object as well as which transcendental values, beliefs, etc. are considered to be relevant which ultimately results in the expression of assigned value (Brown & Slovic, 1988). Hence, economic environmental valuation is considered to represent a VAI which affects the type of knowledge and knowledge construction, as well as perception and type of motivation or rationality (Jacobs, 1997; Vatn, 2017). The institutional context defines the rules of the game, facilitating certain rationalities while reflexive humans still have to interpret the context (Hansjürgens et al., 2017; Vatn, 2017). These contextual effects are especially relevant for complex public goods as people usually lack experience in paying for them because these goods are usually not paid for in real life. Hence, hypothetical markets have to be designed. Due to lack of experience people often do not have well-established preferences which makes them more sensitive towards contextual effects (Brown & Slovic, 1988). This poses the question what value expressions may potentially be elicited through economic valuation methods and additionally, when deviations from individual rationality in form of social value expressions become relevant.

As discussed above, social values are a broad concept associated with value pluralism, hierarchical values, multidimensionality of motivations, social influences and interdependencies. In valuation contexts social values can be identified based on the *value provider*, *value scale*, *intention*, and/or *elicitation process* (Brown, 1984; Hansjürgens et al., 2017; Kenter et al., 2015). The value provider may either be an individual as in conventional methods, an individual in a group context, e.g. a focus group followed by elicitation of individual WTP, or a group agreeing on a WTP. In line, the scale may refer to the individual, groups or society. As discussed above, intention can be self-regarding (I-preferences), other-regarding (We-Preferences) or impartial and impersonal (We-Preferences). In the following, various elicitation processes are considered which either elicit stated preferences individually, in a social context (potentially) characterised by a social learning process or behind a veil of ignorance. On the basis of four relevant dimensions of social values (*value provider*, *value scale*, *intention*, and *elicitation process*) cases will be developed in order to illustrate the various

potential forms of value expression in an economic environmental valuation and to identify which of these cases are associated with social values.

Table 4-4 illustrates the multiple forms of value expression based on the various combinations of the four characteristics. The resulting value indicator is either *disaggregated* (individual scale) or *aggregated* in terms of a larger entity such as groups, communities or societies. Social value expressions are marked bold and are underlined. As indicated by the table, value expressions may be “social” with respect to all four characteristics or just a single one. The various forms of value expression will be discussed in more detail.

The first four cases focus on the individual value provider. The first case (I) describes conventionally elicited WTP. An individual is asked for her WTP under consideration of personal costs and benefits. Assuming a rational individual self-interested utility will be expressed in form of exchange value. The latter can be aggregated in order to express value to society (case II). Hence, the second case has a social scale and reflects social value as conceptualised in neoclassical economics. Further, individuals can be asked how much society should be willing to pay for an environmental good (e.g. how to split a public budget) which without time to reflect or deliberation results in a *speculative value* (case III) (Sagoff, 1998; Spash, 2007).

Case IV places individuals behind a veil of ignorance in order to elicit public preferences of impartial *citizens*. Behind the veil of ignorance, the valuing agents do not know their position in society (Harsanyi, 1953, 1955; Rawls, 1971/2009). Hence, it is assumed that the value indicator reflects a *just price* based on the principle of justice concerned with distribution. Yet, the principles differ between Harsanyi and Rawls. According to Harsanyi (1955) citizens would maximise utility under uncertainty suggesting that equal probability is given to all outcomes. Hence, the average utility principle serves as principle of justice. Put another way, an individual is expected to maximise the expected utility of the average citizen. Hence, on a social scale, value is expressed as weighted sum of expected utilities.

Identifying social values of ecosystem services

Table 4-4 Identifying multiple forms of (social) value expression

Case	Provider	Scale	Intention	Elicitation process	Value indicator	
					disaggregated	aggregated
I		Individual	Self-regarding	Individually stated preferences	Exchange value	
II	Individual	<u>Social</u>	Self-regarding	Aggregation procedure		Aggregated individual WTP
III		<u>Social</u>	Self-regarding	Individually stated preferences		Speculative value
IV		Individual	<u>Impartial and impersonal</u>	Individually stated preferences behind a ' <u>veil of ignorance</u> '	Just price	
V		Individual	Self-regarding	Individually stated preferences	Well-informed WTP	
VI		Individual	Self-regarding	Individually stated preferences	Charitable contribution (sympathy)	
VII	Individual in group context	Individual	<u>Other-regarding</u>	Individually stated preferences <u>Social learning process</u>	Charitable contribution (commitment)	
VIII		Group	Self-regarding	Individually stated preferences Social conformity, manipulation, power relations, strategic behaviour	Distorted WTP	
IX		<u>Social</u>	<u>Other-regarding</u>	Individually stated preferences <u>Social learning process</u>	Expressed social WTP / WTA	
X		Individual	<u>Impartial and impersonal</u>	Consensus or majority voting <u>Social learning process</u>	Fair price	
XI	Group	<u>Social</u>	<u>Impartial and impersonal</u>	Consensus or majority voting <u>Social learning process</u>	Arbitrated social WTP	
XII		Group	In-group regarding	Group or powerful individuals may enforce convergence - social pressure	Dictated price	
XIII		Group	In-group regarding	Consensus or majority voting	Idiosyncratic group WTP	

Source: Own illustration based on Spash (2007, p. 696)

Attributes associated with social values are in bold and underlined.

In contrast, Rawls (1971/2009) argued that in the *original position* rational behaviour is characterised by application of the *maximin rule*. According to the latter all alternatives should be ordered based on their worst possible outcomes. The “best” alternative to be chosen is the one which performs best among the worst outcomes. Thereby, an adequate minimum for everyone is secured which according to Rawls is rational when no one knows her position in society nor any probabilities. However, he argues that this outcome is non-utilitarian (Rawls, 1971/2009). No matter which principle of justice is applied, in case IV the outcome is associated with social values due to impartial and impersonal preferences which involve fairness and the social good.

Placing the individual in a group context (cases V to IV), e.g. focus groups, results in different value expressions. In line with preference economisation approaches, after deliberation the participants are expected to be better informed consumers stating well-informed WTP amounts (case V). As discussed in context of complex human behaviour, also altruism can determine behaviour.

Cases VI and VII refer to Sen’s concept of *sympathy* and *commitment* (Sen, 1977b). As discussed above, in case that altruism is also linked to self-interest, e.g. due to interdependent preferences, the underlying motivation is sympathy. Thus, the underlying intention may be completely self-interested or somewhere in-between self-interest and other-regarding preferences. Yet, commitment is other-regarding as the WTP is independent of personal utility. Further, commitment may involve fairness considerations. The point of reference may either be the individual, e.g. choosing a fair amount in terms of ability to contribute to a common good, or societal costs, in which case it can be reasoned what a fair amount for everyone would be. Although, this type of behaviour would be termed strategic behaviour or rather free-riding in neoclassical economics, it can also be understood in terms of community members’ WTP representing a fair share for a public good (see Sagoff, 1998, p. 226). While preference endogeneity suggests that in the best case a social learning process takes place, this cannot be guaranteed.

In the worst case (case VIII) the individual is negatively influenced by other group members, e.g. through social desirability bias, manipulation or power relations (see e.g. Norwood & Lusk, 2011). Hence, the WTP amounts would be distorted. Also, strategic behaviour can occur in case that individuals observe the behaviour of other group members and choose their WTP in response, e.g. decide to free-ride (see e.g. Bateman et al., 1995; Samuelson, 1954). Lastly,

individuals in group contexts can be asked how much society should be willing to pay for an environmental good (case IX). In contrast to case III, this value is not considered to be speculative anymore as deliberation and time to reflect are part of the elicitation process. Hence, in case IX the resulting aggregated value indicator is *expressed social WTP* stated by citizens instead of consumers.

Furthermore, groups can express monetary value indicators in form of collective value judgements (cases X to XIII). In case X, the group decides on a fair price an individual should pay, whereas in case XI the value indicator is on a social scale reflecting *arbitrated social WTP*. These two cases are associated with impartiality and impersonality. Also in DMV studies these intentions are often linked to Rawls' theory of justice and liberal democracy (Lo & Spash, 2013). For example, Brown et al. (1995) refer to Harsanyi's and Rawls' *original position* in their *values jury* approach. Selected members form a values jury in order to obtain public value judgments. To do so, jury members are asked to act as representatives of current and future generations. Again, the underlying assumption is that a social learning process takes place which enables mutual understanding to reach consensus. However, in practical terms consensus is often unrealistic and in line with other supermajority rules, it tends to favour the status quo (Gaus, 2008). Also, majority voting is a two-sided medal. On the one hand, the majority can limit individually rational unsustainable use of environmental resources, on the other hand, it can also result in collective harm in form of support for overexploitation of environmental resources. Further, while majority voting emphasises participation and democracy it may also lead to a trade-off between two democratic values: equality (e.g. preservation of resources for future generations) and freedom (due to restriction of individual consumption) (Edney, 1980). Still, majority voting is commonly accepted as alternative procedure when consensus fails (see e.g. Howarth & Wilson, 2006; Ward, 1999; Wilson & Howarth, 2002).

Further, as indicated by cases XII and XIII, deliberation may fail the original objective, resulting in diverging value indicators. Before turning to the non-social value judgements in a group setting, first it shall shortly be discussed why deliberation could fail. According to Habermas (1984, p. 285), types of action can be distinguished along two dimensions: action orientation and action situation (see Table 4-5). Action orientation can be oriented towards success or towards reaching understanding. The action situation can either be non-social or social. According to Habermas, instrumental action is always characterised as non-social and directed towards own benefits. In contrast, not every action in context of a social action situation is oriented towards reaching understanding (which represents Habermas' ideal of

communicative action). Hence, also an action in a social setting can be success oriented which represents strategic action (Habermas, 1984, p. 285). Therefore, also in a group context not every preference must be social.

Table 4-5 Habermas' types of action

Action Situation	Action Orientation	
	Oriented to Success	Oriented to Reaching Understanding
Non-social	Instrumental action	-
Social	Strategic Action	Communicative Action

Source: Own illustration adapted from Habermas (1984, p. 285)

Turning back to the value expressions identified in Table 4-4, case XII and XIII describe situations in which case a “false” consensus or rather preference convergence is caused by social pressure either due to group dynamics or powerful group members. Hence, the value indicator does not reflect social value but idiosyncratic characteristics of a smaller entity (e.g. subpart of society, a particular group, or powerful group member(s)) (Dietz et al., 2009; Janis, 1982; Maier, 1967; van Mill, 2007, p. 66). “False” consensus may also occur due to *groupthink* in which case in-group members aim to reach (unanimity) consensus which is considered a self-serving end and perceived more important than reaching mutual understanding and consensus through the best argument (see Janis, 1972). In line, group polarization may occur in deliberative settings. In case of group polarization deliberation causes groups to take more extreme positions towards opinions they were prone to in the beginning of the process (Brown, 1986, p. 206ff.). Thereby, on an individual scale fair prices may turn into “dictated” prices and on a social scale the group WTP lacks arbitration (here referred to as *idiosyncratic group WTP*).

As illustrated above, only in one case actual exchange value is measured suggesting that in most of the cases WTP is not an individual welfare measure in a strict neoclassical economic sense. Quite severely, Brown (1984, p. 244) notes that ‘there is no such thing as *the* value of an object (...) because assigned value reflects the context in which the valuation took place and the perception and held values of those assigning value’. The same applies to the concept of social value as it was shown that social value expressions or judgements are feasible in completely different valuation contexts.

This contextuality of value (expressions) highlights the need for qualitative analysis of value indicators. Economic methods cannot adequately account for the multidimensionality of

motivations, value pluralism and the associated manifold value indicators. Incorporating psychological factors helps to understand the motives behind stated preferences (Ajzen, 1991; Spash, 2002).

Yet, even if qualitatively interpretable, quantitative measures obtained in valuation studies may not be comparable between studies and potentially also within studies if respondents adopt varying rationalities. So, even if the value expressions can be distinguished, the question remains how to compare apples (individual preferences) with oranges (social preferences, e.g. including morals) (see Nyborg, 2000)? The problem is that in case of WTP associated with social values, *Hicksian welfare changes* cannot be defined because social preferences are not strictly utilitarian nor consequentialist. One possible solution is to adopt a pragmatic, instrumental perspective – to nevertheless compare conceptually different preferences if the value indicator is identical (e.g. monetary). However, while it is possible to do so, it diminishes the insights provided by cost-benefit analysis as the *Hicksian equivalence* between WTP and compensating variation cannot be assumed to hold. Hence, in this case stated preferences are not appropriate for conventional welfare analysis. Thus, although individual and social preferences and values may (at least to a certain degree) be expressed on a common scale through monetary value indicators, they differ substantially. This poses the question what the aim of economic valuation actually should be?

Brown (1984, p. 244f.) argues that due to the context dependency of assigned values, it may be more appropriate to elicit values of ‘responsible individuals’ in a valuation context that accounts for the social constituency of public goods, e.g. behind a veil of ignorance (see Buchanan & Tullock, 1999; Rawls, 1971/2009). In line, also Harsanyi (1955, p. 316) argues to focus on impersonal and impartial ethical preferences and to ‘exclude nonethical subjective preferences from social welfare functions’.

This rather normative appearing approach seems hard if not impossible to justify from the neoclassical perspective. As discussed above, it would violate the essential conceptual core of methodological individualism, welfarism and consumer sovereignty. Deviation from methodological individualism has been discussed extensively and was justified based on conceptualising humans as embedded in society and nature which leads to interdependencies, social influences and endogenous preferences. Further, it has been shown that social preferences and individual preferences can be distinguished based on multiple preference orderings. However, in general the identification of diverging sets of preferences does not justify an

intervention or “correction” of preferences. So, the question remains why in context of social values individual preferences are distorted and how thereby, a “corrective” intervention in form of choosing a valuation context for eliciting social preferences can be justified. Reasons were already provided in the discussion of the merit good argument (see again Section 3.2.5.4):

- i) Preferences may already be distorted;
- ii) suggesting that individual welfare is independent of individual preferences (also discussed in the context of commitment);
- iii) common wants lead to diverging social preferences and individual preferences;
- iv) and lastly, the constituency and associated preferences have to be in accordance with the nature of the good.

The first two reasons are concerned with the lack of knowledge of individuals about a good’s ability to satisfy preferences (see Kapp, 1936, p. 37f.; Menger, 1871, p. 3ff.). An individual may ascribe certain characteristics to a good which are not existent in reality resulting in so-called *imaginary goods* (‘eingebildete Güter’) (Menger, 1871, p. 4). Hence, instead of objective utility, market prices reflect only subjective utility (see Kapp, 1936, p. 38). As Pigou (1920, p. 23) phrased it:

‘That is to say, the money which a person is prepared to offer for a thing measures directly, not the satisfaction he will get from the thing but the intensity of his desire for it.’

In this line, Head (1988, p. 11) developed two additional interpretations of the social welfare function (see Equation (1)):

$$W = W(I^1, I^2, \dots, I^n) \quad (7)$$

$$W = W(P^1, P^2, \dots, P^n) \quad (8)$$

Where Equation (7) represents *desires* which relate to *revealed preferences* (I^i), while Equation (8) is associated with *true preferences* (P^i) which account for potential differences between revealed preferences and the individual’s satisfaction. Similarly, Rolston (1985) distinguished between *individual preference value* and *individual good value*. Individual preference value reflects satisfaction of individual preferences in contextual choice situations. The individual good value considers what actually contributes most to an individual’s well-being independent of individual choice and accounts for potentially distorted preferences, e.g. due to lack of

information. Based on this divergence between preferences expressed in social choice context and market context, Brennan and Lomasky (1983) refined the concept of *individual sovereignty*. The authors distinguish between *consumer sovereignty* (market context), *voter sovereignty* (political context) and *reflective sovereignty* which are associated with meta-rankings of preferences. When individuals are considered reflectively sovereign, deviations from individual preferences based on consent or another form of democratic accountability is justifiable (see Hoberg & Strunz, 2018).

So far, the discussion has been generic without paying special attention to environmental goods. ES can be considered to be merit goods because, firstly, associated economic decisions are based on other normative values than consumer preferences (see Musgrave, 2008; Ver Eecke, 2007, p. 62). Secondly, individual preferences are considered to be distorted due to imperfect knowledge and undervaluation of future benefits (see Head, 1974, p. 219f.). Hence, the “correction” of preference in case of ES is justifiable (see Musgrave, 2008; Ver Eecke, 2007, p. 62). Yet, preference “correction” is based on the implicit assumption that participative and democratic processes, e.g. in form of DMV, are actually able to “correct” distorted preferences (see Brennan & Lomasky, 1983). This assumption should be treated with caution as, firstly, it has been shown that deliberation may fail, and secondly, also *social preference value* can be distinguished from *social good value* (Rolston, 1985). Hence, while individuals can express social wants, e.g. in the political sphere or a deliberative valuation process, this is not necessarily identical with the best outcome in terms of societal welfare. As discussed above, also consensus or majority voting may be misguided resulting in overexploitation of environmental resources.

Nevertheless, deliberation appears to be a promising approach in context of a concept of social value characterised by social and natural embeddedness defined by interdependencies between institutions, preferences and transcendental values. As discussed above, deliberation shifts the focus from expression of particular interest towards development of generalisable interests (see Habermas, 1984). Even if consensus is not reached, these generalisable interests persist, especially in case of ecosystems (see Dryzek, 1987, p. 204; 1990, p. 54). Further, albeit guidance towards some form of objective preferences seems unreasonable in practice, the advantage of defining the valuation context in order to activate a certain type of rationality is that the elicited preferences are comparable because they are based on a common standpoint (see Martínez-Espiñeira, 2006). Yet, while “objective” social preferences may be adequate in terms of meeting the complexity of the constituency and being able to account for value

pluralism, as illustrated, they do not represent conventional measurements of individual welfare (changes). Hence, they cannot be used in a conventional cost-benefit analysis.

As illustrated above, the implications for economic environmental valuation are manifold and severe. In the following section the implications for policy-making shall be considered briefly.

4.1.4 Implications for policy-making

Another concern in context of social values are the implications for policy-making. Some scholars argue to limit individual choice sets due to incompatibility of consumer sovereignty and sustainability (Menzel & Green, 2013) or rather promote solutions based on societal preferences (O'Hara & Stagl, 2002) in order to enhance sustainability. For example, if human-nature relationships are a value themselves, merit subsidies could be implemented for nature recreation (Hoberg & Strunz, 2018). Others question the adequacy of individual decisions with respect to public choices due to diverging individual and social time preferences (Marglin, 1963). The theories identified in Section 3.2 illustrate that society may hold values different from individual values, for example due to longer existence and/or merit wants. Thus, state intervention to correct individual preferences which are against sustainability may be justified if the socially accepted norms transcend consumer sovereignty. In the evaluation of certain goods different norms are already considered (Musgrave, 2008). Yet, it is not clear how individual preferences should be corrected if consumer sovereignty is dismissed. Hence, the challenge to identify desired social ends remains. Based on the assumption of preference endogeneity, participation and deliberation could play an important role for the development of criteria for correction of individual preferences and determination of socially preferred end-states. Ravenscroft (2019) suggested a new normative approach inherently linked to sustainability which emphasises the formation and articulation of shared social values in order for society to express how resources ought to be allocated before their actual allocation. This approach acknowledges that ends are not necessarily given and only emerge in the process (see Buchanan, 1987, p. 78).

Further, Renner (1999) argues that linking theories of constitutional economics to sustainability policy will make normative assumptions explicit in such a way alternative policy options can be deliberated upon. This may lead to more democratic decision-making, and criteria in line with sustainability may be guiding policy-making. Theoretically, institutions could be designed in a “good” way in order to incorporate sustainability as a factor.

In general policy implications derived from these theories are far from clear. Recommendations based on the neoclassical paradigm have the advantage that the only normative aspect is the efficiency criterion and policy makers can fairly easily include obtained insights into decision-making. In contrast, the above presented theories would introduce different criteria and, therefore, involve also more complex normative considerations. Thus, the ability to provide policy recommendations regarding the current societal framework are limited (Buchanan, 2008).

4.2 Concluding remarks

In Chapter 4 it has been illustrated that a consistent integration of social values into a preference-based utility framework is possible. This is the first time that a comprehensive economic framework for social values is presented. The theoretical basis brings together understandings of social values of ES in the current debate as well as the insights of so far neglected economic theories which are outside of mainstream neoclassical economics. The resulting framework is complex and pluralistic in order to account for the many topics and issues revolving around social values. Essential topics in context of social values were the value concept; the view of the individual and society involving questions of rationality, preference orderings and embeddedness; value scale; intention with respect to multidimensional motivations and plural values; the valuation process; and the question of who the value provider should be. To account for this multidimensionality of value, the framework integrated a natural, social and contextual sphere.

Based on a holistic view of society the role of institutions, the social environment, culture, and transcendental values was emphasized. Accordingly, individuals were considered to be embedded in society and nature. However, embeddedness does not suggest methodological holism. Instead, the sense of connectedness is subjective and is assumed to vary between individuals. Accordingly, also different degrees of interdependencies and variation in individual behaviour exist. Additionally, preferences and values were expanded beyond self-interest and individual value in order to account for interdependencies, preference endogeneity, multidimensional motivations, impartiality and impersonality. Hence, individuals are considered to be in a position to evaluate social wants. Further, it has been argued that individuals may have multiple preference orderings which can be ranked. This may also result in hierarchical and conflicting values. It has been assumed that rationalities are activated by the

valuation context as illustrated in the contextual sphere. The latter emphasises the role of economic valuation methods as value articulating institutions.

The implications for economic environmental valuation are rather severe. From a theoretical perspective it has been shown that the TEV concept can be extended in order to account for social values of ES. Social values may be directed towards other humans in form of philanthropic values motivated by commitment or towards non-human entities in form of weak anthropocentric intrinsic value. Yet, based on the anthropocentric and subjectivist approach of ES and economic valuation also these additional value categories are considered to ultimately reflect anthropocentric subjectivist values. However, these values are influenced by social factors and human-nature relationships as emphasised by the incorporation of the social and natural sphere.

In general, the implications seem quite severe, as preferences which are independent of individual welfare are not in line with the welfarist and utilitarian approach of mainstream neoclassical economics. Regarding the question how social values relate to conventional measures of individual welfare, it has been illustrated that there is not *the* social value nor *the* assigned value. Further, it has been shown that social values can be identified based on different criteria: scale, intention and process. With this in mind, the role of moral values, impartiality, civic virtues, altruism, etc. was emphasised. Thereby, they extend economic theory beyond utilitarian welfare measurements with the focus on the individual. In fact, it has been demonstrated that value indicators may have various meanings even if expressed on a common scale and additionally, values may be hierarchical and conflicting.

The existence of differing preference orderings and the role of the valuation context introduces normative aspects into economic environmental valuation. Although, as argued above, these normative aspects were beforehand implicitly given and were only made explicit. That is to say, also conventional valuation methods are based on a specific ethical framework, e.g. preference utilitarianism, and thereby, they are implicitly normative. Nevertheless, asking what preferences for ES *should* be is contentious. In general, it has been argued that “corrective” interventions are justifiable in case of ES due to the nature of the good being complex. Two justifications were provided. Firstly, interventions can be justified based on ill-informed and/or distorted preferences. Hence, if ex-ante preferences are distorted due to the complex nature of ES, individual preferences do not necessarily correspond with individual welfare. In this case, information interventions were considered an appropriate intervention as discussed in the

context of preference economisation. Secondly, interventions can be justified based on the argument that the constituency has to be in accordance with the nature of the good. The underlying assumption is that common wants lead to diverging individual and social preferences. In this case, preference moralisation and positional modification were discussed as interventions. Valuation was then considered to be social acts characterised by a social learning process and/or diverging sets of preferences based on consumer or citizen perspective. Further, it was argued that transcendental values enter the valuation context only when they are perceived as relevant. These deliberative approaches often build on the theory of communicative rationality and implicitly assume that participation and democratisation of valuation processes are actually able to correct preferences and that a consensus about desirability can be reached. Put differently, the process is meant to define what preferences *ought* to be. Yet, it has been discussed that this assumption does not necessarily hold and that therefore, also deliberative processes may fail. Hence, values expressed by a group are not necessarily social and consequently it has been argued that the value provider is not a sufficient dimension to identify social values. Further, value indicators that reflect more than individual welfare changes and definition of desired social ends through participative and democratic processes leads to a dismissal of sovereignty and the efficiency criterion as normative evaluation criteria for policy-making. However, introducing more complex normative considerations reduces the ability for policy recommendations and more generally, implications for policy-making are obscure.

To assess the implications for economic environmental valuation and policy-making besides theoretical investigations also additional empirical evidence about social values is needed. Various valuation approaches have been developed but they often lack a solid theoretical foundation. As discussed above, comparing deliberated preferences to conventional welfare measures resembles comparison of apples and oranges. Hence, there is a lack of studies that systematically analyse the role of social values in economic environmental valuation, particularly in regard to VAIs.

Therefore, in the following two chapters (Chapter 5 and Chapter 6), a valuation study tacking WTP for wolf management in Germany as an example will be presented. The aim of the study is twofold: Firstly, to test the validity of the conceptual framework developed in Chapter 4 and secondly, to compare the effect of three different valuation methods on the expression of social values.

Chapter 5 Exploring social values and motivations: Study design

This chapter (in conjunction with Chapter 6) addresses the third identified research gap with respect to empirical identification and elicitation of social values. A case study, tacking WTP for wolf management in Germany as an example, contributes to the filling of the gap. In the following chapter first some background information about the valuation object – wolves in Germany – will be provided (Section 5.1) and challenges associated with valuing “the wolf” will be discussed (Section 5.2). Thereafter, building on the conceptual framework developed in Chapter 4, hypothesis will be derived (Section 5.3) and the methodology presented (Section 5.4).

In general, monetary valuation has proven itself as useful tool to evaluate biodiversity changes despite its controversies and limitations. Yet, as discussed above economic valuation is heavily criticised, especially due to its individualistic and instrumental approach and reliance on methods that elicit preferences of “socially isolated” individuals. Recently, social valuation of public goods has gained scientific interest and in response to criticism of conventional monetary valuation new approaches such as DMV have been suggested as alternatives. As discussed above, DMV approaches are based on different paradigms such as focus on provision of and discussion about information (preference economisation) or discussion about broader values that transcend the context, e.g. desired end-states (preference moralisation). Yet, little empirical evidence exists that elicited preferences differ between the various approaches and interpreting obtained value indicators remains a challenge calling for the incorporation of qualitative approaches.

The aim of this case study is two-fold. Firstly, it tests the validity of the conceptual framework developed in Chapter 4. This will be done by analysing determinants of WTP and motivations underlying stated preferences in order to assess consistency with the conceptual framework. Secondly, this case study contributes to the existing empirical literature by comparing three different economic valuation methods, namely *Contingent Valuation* (CV), *Preference Economisation* (PE) and *Preference Moralisation* (PM). All three methods elicit WTP amounts for wolf (*Canis lupus*) management in Germany as value indicator.¹⁴ In addition, data about participants’ underlying motivations associated with WTP is collected. It is analysed if

¹⁴ The environmental good under investigation serves just as one example of a public good and the underlying theoretical concept (see Section 4.1.2) could be applied to other environmental goods as well.

significant differences in preferences or rather assigned value are the result of diverging methods and underlying paradigms. Put differently, through empirically investigating conventional and deliberative valuation methods, this study sheds light on the question if identification and elicitation of social values is dependent on the method implying that economic valuation methods represent VAIs.

This will be assessed by comparison of i) absolute magnitude of WTP, ii) determinants of WTP, and iii) motivations behind stated preferences. This mix of quantitative analysis of willingness to pay and underlying motivations allows to identify social values based on intention (type of preferences expressed), process (significant changes in preferences due to preference construction caused by deliberation / social learning), and/or scale (values beyond the individual e.g. with reference to society).

5.1 Background: The return of wolves to Germany

Wolves were exterminated in Germany in the middle of the 18th century out of fear and human-wolves-conflicts. Thereafter, wolves were still occasionally spotted and/or killed in Germany because quite commonly single wolves migrate over long distances to establish their own territory. Yet, it wasn't until 150 years later that the first wolves became territorial in Germany again. This first couple immigrated from Poland to Saxony, Upper Lusatia, in the year 2000 and started reproducing (Ansorge & Schellenberg, 2007). Since then, wolves were able to re-establish a small population that currently consists of 105 wolf packs, 29 wolf pairs and 11 territorial single animals and spread over eleven states within Germany (status as of monitoring year 2018/19) (DBBW, 2020b). These numbers are still far below the ecological *carrying capacity*, the maximum number of a population that a given environment can sustain, which was estimated to be around 400 wolf packs. Although dependent on the model's parameters 154 – 1759 packs were feasible (Fechter & Storch, 2014). Further, the current wolf population is below the number needed for a *favourable conservation status* defined by 1000 mature animals (IUCN, 2019; Linnell et al., 2008). Hence, wolves are still considered a *critically endangered* species in Germany (status as of 2009) and *endangered* species in Saxony (status as of 2015), threatened especially by fragmentation as well as direct effects (Zöphel et al., 2015).

Since 1992 wolves are legally protected in Europe by the Habitats Directive (92/43/EEC) (European Council, 1992) which implements the 1979 Bern Convention. The above-mentioned population number is only one factor that delineates the favourable conservation status.

The latter is defined by the Directive's Article 1(i) and states that (European Council, 1992, p. 9):

- I. 'Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- II. The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- III. There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.'

While minimum population levels are legally binding, the high number of illegal killings, around 13% of all deaths since 1992 (DBBW, 2020a), as well as the heated political and public debates about wolf management in Germany illustrate that the return of wolves and the associated management does not only cover ecological aspects but that it also has socio-economic and cultural relevance (see e.g. Köck & Kuchta, 2017; Trouwborst et al., 2017).

The argument of ecological, socio-economic and cultural relevance sounds rather general; however, it reflects the essential idea of the conceptual framework developed in Chapter 4 to incorporate different spheres. Hence, specific reasons for the suitability of the wolf as an example to investigate social values are linked to the conceptual framework (see again Figure 4-1) and will be illustrated in the following.

Firstly, concerning the valuation object, rare species conservation and associated ES represent a highly complex and unfamiliar good. Hence, the information level of participants in the valuation study is expected to be relatively low. Further, wolf conservation represents a non-marketed good with little use value. Nevertheless, wolf management appears to be of high public interest as demonstrated by public debates as well as media coverage. This indicates that besides use values other value dimensions must be important (reference to value scale and multidimensionality of value). In this line, only a small number of people is directly affected by consequences so far. Yet, as for other rare species, people nevertheless have an interest in rare species management and/or conservation. Regarding wolves in Germany it is expected that also We-preferences (e.g. other-regarding preferences towards affected livestock farmers) as well as value conflicts and socially desired ends (e.g. predator conservation versus traditional livestock farming) are of importance.

Furthermore, embeddedness in nature and society is assumed to be relevant suggesting social influences and relevance of transcendental values (value concept). Social influences and human-nature relationships are in this case assumed to influence the perception of wolves as well as the perception of relevant transcendental values. This is suggested due to the cultural and historical significance of wolves associated with German prose, myths, and historical extinction.

Perception leads us to the contextual sphere and the role of economic valuation methods as VAI. The diverse above-discussed topics (embeddedness, values beyond individual, other-regarding preferences, etc.) make wolf management perfectly suitable for the comparison of valuation methods based on diverging paradigms. On this basis it can be investigated if expressed values, intentions and preference construction differ dependent on the method. Thus, through empirically analysing conventional as well as deliberative valuation methods, this study assesses if elicitation of social values is dependent on the valuation method applied.

However, even if well suited as exemplary case study, valuing the wolf is also a challenging task for numerous reasons which will be discussed in the following section.

5.2 Challenges of valuing the wolf

Environmental goods are usually considered to increase utility and hence, WTP for a marginal increase in provision or WTA for a marginal decrease in provision is elicited (Clinch & Murphy, 2001). It has been argued that otherwise public goods are irrelevant if they do not increase utility (see Bohara et al., 2001; Haab & McConnell, 1998). Still, it can be reasoned from a theoretical as well as a methodological perspective that negative WTP and respective decreases in utility are relevant in certain cases as a change in public good provision may involve “winners” and “losers” (Haab & McConnell, 1998; Kriström, 1997). Hence, what is considered as public good by some could simultaneously be considered as public bad by others (Kriström, 1997), as illustrated by Bostedt’s (1999) theoretical model for the special case of species conservation. In fact, if an individual is indifferent towards wolf management a zero WTP is expected, whereas a negative WTP is feasible if an individual is worse off due to a higher wolf population (see Bateman et al., 2002; Bostedt, 1999). As wolves are habitat generalists, they are not dependent on “wild” nature but can adopt to all kinds of landscapes including cultural landscapes which creates potential for conflicts (Reinhardt & Kluth, 2007). Potential *faunal ecosystem disservices*, e.g. risks to sheep husbandry, may lead to the simultaneous consideration of wolves as public bad and public good (provision of ES). This results in ambiguous effects

on human-wellbeing and the need to distinguish between “winners” and “losers” (Clinch & Murphy, 2001).

From the theoretical perspective it is debatable if in case of existence of “losers” the environmental good represents still a public good or instead a merit good (see Jois, 2006; Ver Eecke, 2013). Further, this divergence may lead to conflicts on an interpersonal level suggesting goal interference between individual actions and actions on a social level (Carothers et al., 2001; Vaske et al., 1995; Vaske et al., 2007). This may arise when different groups (e.g. hunters and wildlife watchers) hold different norms (see e.g. Ruddell & Gramann, 1994), values (see e.g. Saremba & Gill, 1991) and/or beliefs, e.g. about certain activities (Carothers et al., 2001).

From a methodological perspective the existence of heterogeneous preferences based on the perception of the commodity as *good* or *bad* appears less “special” but nevertheless challenging. Less special because economic valuation studies commonly rely on parametric models to estimate WTP assuming a normal or logistic distribution which are symmetrically defined on a continuous interval from minus infinity to plus infinity. Therefore, negative and/or positive infinitive WTP are feasible (Borzykowski et al., 2018). Nevertheless, it is common practice to exclude negative WTP or WTA, infinitively high values (lexicographic preferences), and zero WTP statements which results in biased estimates due to selectivity bias (Clinch & Murphy, 2001; Hanley et al., 2009; MacMillan et al., 2001; Strazzera et al., 2003).

Various approaches have been suggested to deal with negative WTP which can be roughly clustered into three groups. These suggestions have in common that the sample is split into subsamples in form of the respective groups of supporters and opponents which likely correlates with welfare-gainers and welfare-losers. The first approach is to estimate WTP for each group in separate functions (see e.g. Clinch & Murphy, 2001; Keith et al., 1996). The second approach is to incorporate positive-, zero- and negative responses into one function. For example, MacMillan et al. (2001) elicited WTA amounts and included these as negative WTP amounts into the regression. While the last approach relaxes the non-negativity assumption it may introduce other issues as WTA can lead to strategic behaviour and protest voices resulting in inconsistent WTP and WTA amounts (Arrow et al., 1993; Hanemann, 1991; Mitchell & Carson, 1989). Kriström (1997) suggested the spike model as further alternative. The “spike” represents the distribution at zero and accounts for individuals without utility increase which would therefore not participate in the market. The model combines a continuous distribution for positive WTP amounts with a non-zero probability of zero WTP to account for the negative

part of the distribution (see also Hanley et al., 2009; Loureiro et al., 2004). Although primarily discussed and applied in the context of dichotomous choice designs (close-ended), the spike model can also be applied in an open-ended Contingent Valuation study (Reiser & Shechter, 1999). As an alternative to account for many zero-responses, Martínez-Españeira (2006) used a *double-hurdle* model to model the probability of contributing to the public good.

The third approach is to loosen the assumption of a parametric distribution and to model WTP's distribution non-parametrically (see e.g. Clinch & Murphy, 2001; Haab & McConnell, 1997; Loureiro et al., 2004). Yet, the drawback of a non-parametric distribution is that only median WTP amounts can be analysed while the analysis of determinants of WTP has to rely on parametric approaches (Clinch & Murphy, 2001; Haab & McConnell, 1998).

A further issue is the lack of empirical literature. A small amount of economic valuation studies on WTP for wolf management exist for Sweden (Boman & Bostedt, 1999; Bostedt & Boman, 1996; Ericsson et al., 2008; Johansson et al., 2012) and North America (Chambers & Whitehead, 2003; Jorgensen et al., 2001; Martínez-Españeira, 2006) but none for Germany so far. Thus, little knowledge about how people value wolves in general and especially in Germany exists and the literature and discussion are so far dominated by people's perception of and attitudes towards wolves (see Decker et al., 2004; Ericsson et al., 2008). Another question is how generalisable the results of individual studies are. Wolves can be problematic because local studies may not be generalisable to a larger scale (e.g. state or national) (Ericsson et al., 2008) due to relevance of the social, cultural and situational context which affect attitudes towards wolves and may shape cultural-specific stereotypes towards wolves (Jürgens & Hackett, 2017; Kleiven et al., 2004).

These above-described issues have to be accounted for but they do not jeopardise the study's objective. Regarding the first issue, the study design as well as the methodology will be designed in accordance with potentially heterogeneous preferences of "winners" and "losers". Regarding the second issue, as discussed above, the objective of the study is not only the quantitative analysis of preferences for wolf management but also the analysis of underlying motivations. Hence, even if so far little is known about how people value wolves, the study itself will be able to provide these insights.

After having discussed the challenges of valuing wolf management, we will now turn to the formulation of hypotheses.

5.3 Hypotheses

The framework developed in Section 4.1.2 has illustrated that based on theoretical insights social values can well be integrated into a preference-based utility framework (see again Figure 4-1). The theoretical framework is based on several assumptions that can be translated into hypotheses in order to empirically test the framework's consistency and to compare results between the different valuation methods (CV, PE and PM).

Hypothesis 1 (H1): Stated preferences will differ significantly between the three valuation approaches (CV, PE and PM) due to three treatment interventions: citizen-consumer framing, deliberation and moralisation.

$$wtp_{CV} \neq wtp_{PE} \neq wtp_{PM}$$

Hypothesis 2 (H2): Stated preferences will differ significantly within the two deliberative valuation methods (PE and PM) due to preference construction caused by deliberation and/or the moralisation intervention.

$$wtp_{PE_1} \neq wtp_{PE_2} \wedge wtp_{PM_1} \neq wtp_{PM_2}$$

It is assumed that preferences will change due to the consumer-citizen framing, deliberation and/or moralisation intervention which will result in diverging WTP between methods (H1) and within deliberative methods (H2).

So far, the empirical findings about preference changes due to deliberation are ambiguous. As illustrated in Table 5-1 only around half of the economic valuation studies found significant changes in stated preferences and/or choices. Furthermore, significant preference changes were not consistent, meaning that WTP in some cases increased (see e.g. Lienhoop & MacMillan, 2007a; Szabó, 2011; Urama & Hodge, 2006) and in other instances decreased (see e.g. Kenter, 2016b; Liski et al., 2019; MacMillan et al., 2002).

Table 5-1 Overview about empirical literature investigating effects of deliberation on preferences

Authors	Significant change in preferences / choices / WTP
Álvarez-Farizo and Hanley (2006)	yes
Álvarez-Farizo et al. (2009)	
Kenter (2016b)	
Kenter et al. (2016b)	
Kenter et al. (2011)	
Lienhoop and MacMillan (2007a)	
Liski et al. (2019)	
MacMillan et al. (2002)	
MacMillan et al. (2006)	
Robinson et al. (2008)	
Szabó (2011)	
Urama and Hodge (2006)	
<hr/>	
Álvarez-Farizo et al. (2007) ¹⁵	no
Christie and Rayment (2012)	
Dietz et al. (2009)	
Ito et al. (2009)	
Kenyon and Hanley (2005)	
Lienhoop and Fischer (2009)	
Lienhoop and Völker (2016)	
Lienhoop and MacMillan (2007b)	
Philip and MacMillan (2005)	
Vargas et al. (2016)	

Source: Own illustration

¹⁵ Álvarez-Farizo et al. 2007 found only a significant change when further distinguishing between participants with and without commercial interest in the environmental good.

In two studies participants even expressed lexicographic preferences after deliberation, meaning that ES became “priceless” (Álvarez-Farizo & Hanley, 2006; Kenter et al., 2011). Further, MacMillan et al. (2006) found varying results between different goods. The WTP was significantly higher in case of a complex good but not significantly different in case of a familiar good.

As discussed in context of the conceptual framework, theoretical reasons for changes in preferences caused by deliberation are manifold. Consistently, also in the empirical literature the arguments brought forwards are diverse, i.a. participants are confronted with information shared by others and awareness gaps are closed (see e.g. Lienhoop & Völker, 2016; Liski et al., 2019); preference discovery/construction in case of complex goods (see e.g. MacMillan et al., 2002; Völker & Lienhoop, 2016); possibility to discuss ethical concerns (Kenter et al., 2016b); social learning and understanding of other arguments, perspectives and world views (see e.g. Kenter, 2016b; McCrum et al., 2009); changes in subjective norms and transcendental values (Raymond & Kenter, 2016); and/or group effects (Turner et al., 2010).

Other studies have not found a significant difference in mean WTP. Still, changes in individual bids occurred due to deliberation. Yet, if overall the changes are bidirectional, mean WTP will remain unchanged (see e.g. Kenyon & Hanley, 2005; Philip & MacMillan, 2005; Vargas et al., 2016).

While it is assumed that deliberation leads to changes in WTP between treatments ($CV \wedge PE \wedge PM$) due to changes within treatments caused by deliberation and/or moralisation ($PE_1 \wedge PE_2 ; PM_1 \wedge PM_2$), it is further assumed that WTP differs between the two methods with a consumer framing ($CV \wedge PE$) and the one with a citizen framing (PM). This has to be seen in context with the third hypothesis that the valuation context, shaped by the respective method, activates a certain set of preferences.

Hypothesis 3 (H3): People hold multiple preference orderings which are activated through the valuation context.

While H1 and H2 will be evaluated based on a regression analysis, H3 will be assessed by examining the motives behind WTP. Little empirical evidence regarding the existence of the consumer-citizen dichotomy and its impact on WTP exists and findings are ambiguous.

Using a referendum-style survey concerned with conservation in Finland, Ovaskainen and Kniivila (2005) found supportive evidence that individuals have multiple identities which are

activated through the valuation context. Mean WTP elicited through the referendum question (citizen – consideration of benefits to society) was significantly higher than the conventionally framed mean WTP (consumer – consideration of personal benefits). Also Mill et al. (2007) found a difference in personal and social WTP (consumer versus citizen perspective) for forest conservation. However, in this case personal WTP exceeded social WTP. Furthermore, personal WTP was more concerned with the specific good under valuation while social WTP referred in a more general way to public goods rather than the specific task of valuing the hypothetical good in question. Further, the findings of Soma and Vatn (2014) showed a difference in the stakeholder and citizen perspective and highlighted the effect of framing.

Howley et al. (2010) found minor differences in personal and social importance for conservation of traditional landscapes which resulted in a slightly higher social WTP (€44 compared to €43). This amount was, however, still in the range of personal WTP's confidence intervals. Resultingly, WTP appeared to be insensitive to the consumer or citizen perspective. Also Curtis and McConnell (2002) did not find any difference in citizen and consumer preferences for deer control in the US. Hence, they conclude that consumer and citizen preferences cannot be distinguished.

Another study was conducted by Martínez-Espiñeira (2006). Instead of comparing consumer and citizen preferences, only the determinants of citizen preferences were investigated because it is debatable if and to which degree consumer and citizen preferences are comparable at all if they measure completely different preferences. Therefore, Martínez-Espiñeira (2006) aimed at activating Nyborg's (2000) homo politicus instead of the homo economicus to avoid the mixture of citizen and consumer preferences. His payment vehicle was not based on an individual maximum WTP but on a socially acceptable standard that everyone had to pay. This leads to the fourth hypothesis concerned with underlying motivations.

Hypothesis 4 (H4): Besides motivations in line with neoclassical economics also non-utilitarian and non-consequentialist preferences as well as attitudes explain WTP.

In line with H3 it is assumed that preferences associated with complex public goods involve value pluralism or rather motivational pluralism. Individuals may not only act as self-regarding utility maximiser but also ethical positions (e.g. deontological) and psychological factors (e.g. Perceived Behaviour Control) may explain human action (see e.g. Spash, 2000a, 2002, 2006). Hence, to better understand the meaning behind WTP and to account for potential value pluralism, motivations behind WTP will be analysed.

5.4 Methodology

To test the four above-described hypotheses a method comparison of CV, PE and PM was designed and analysed based on economic methods extended by psychological approaches and philosophical attributes, in order to explore elicited WTP as well as underlying motivations stated by participants. In the following, the methodology comprising the study design (Section 5.4.1), the quantitative approach for WTP analysis (Section 5.4.2) and the approach for exploration of motivations behind WTP statements (Section 5.4.3) will be described in detail.

5.4.1 Study design

So far, a clear guideline, comparable e.g. to the NOAA Panel's guidelines (Arrow et al., 1993) or the guidance developed by Johnston et al. (2017), is lacking for the development of DMV workshops. Still, Schaafsma et al. (2018) developed a first guidance based on existing literature. The reporting requirements suggested by Schaafsma et al. (2018) will be accounted for as far as applicable in the following description of the study design. In addition, further considerations about the study design will be developed. In the following, the logistics and sampling (Section 5.4.1.1), the valuation workshops' procedures (Section 5.4.1.2), the hypothetical market and payment format (Section 5.4.1.3), the treatments and interventions (Section 5.4.1.4), the follow-up questions (Section 5.4.1.5) and the pre-test (Section 5.4.1.6) will be presented.

5.4.1.1 Logistics and sampling

The sample consists of 143 participants which were allocated to 18 valuation workshops carried out between 26th of March 2019 and 28th of May 2019. The response rate was 99%. Two participants were eliminated from the analysis because one participant did not complete all questionnaires and another participant stated a higher WTP than the available income which is beyond the feasible interval $[0, y]$ in which case y represents income.¹⁶ The resulting final panel consisted of 141 participants of which 48 participated in the CV workshops, 46 in the PE workshops and 47 in the PM workshops. Out of the 18 workshops seven were conducted in the premises of the Helmholtz-Centre for Environmental Research (UFZ), one at the UFZ in Halle (Saale) and the remaining ten workshops were carried out in rooms of the University of Leipzig. Groups were planned to consist of around 10 participants in case of the deliberative workshops

¹⁶ This could also have been an expression of lexicographic preferences in form of *unreasonable sacrifices* (see e.g. Rosenberger et al., 2003). Yet, it was not clear if the participant expressed lexicographic preferences or did not understand the task correctly. Therefore, the participant was excluded from the sample.

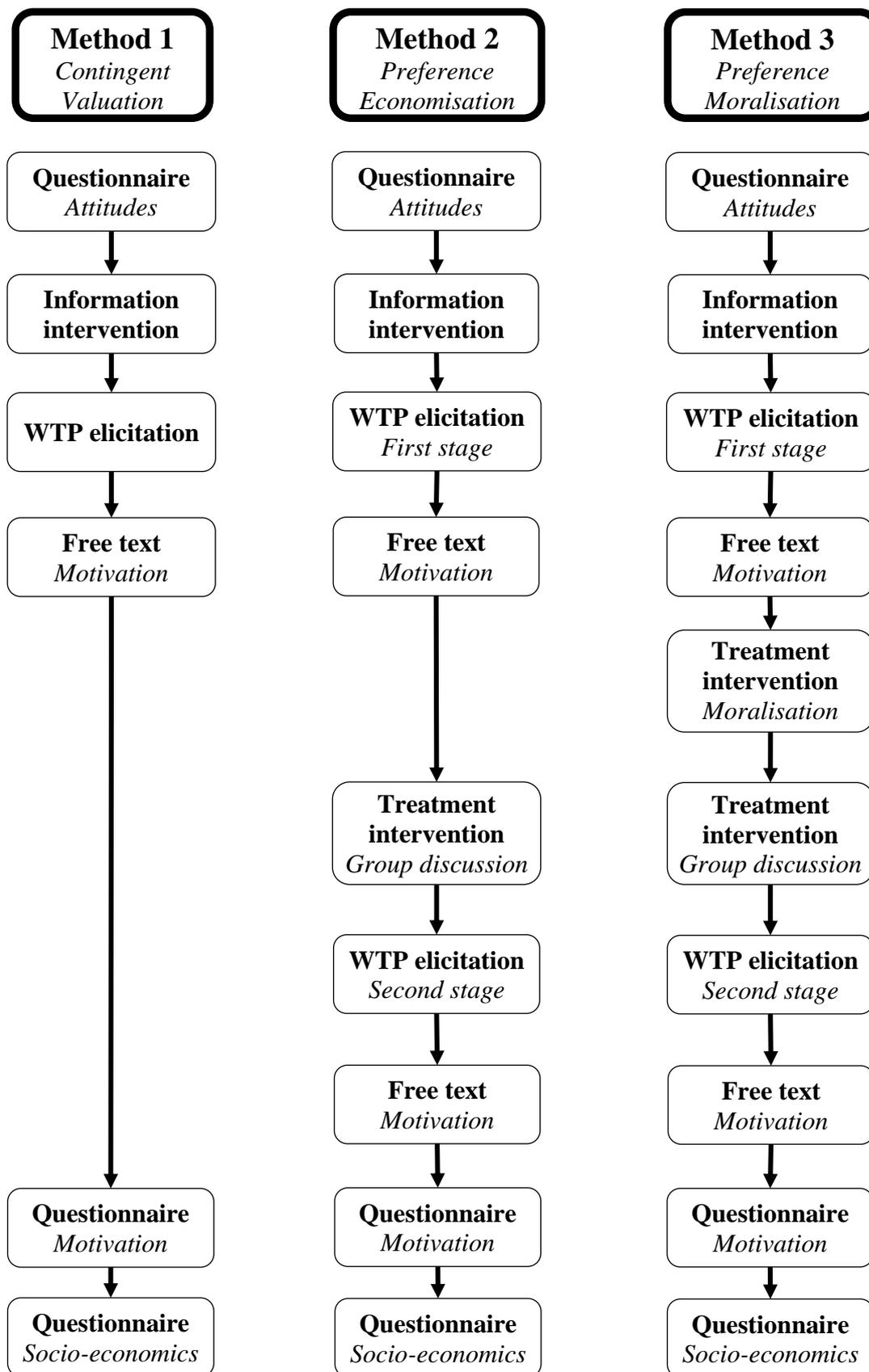
but due to inconsistent show up rates the sizes varied between four and eleven. For the CV workshops group size was irrelevant and ranged from three to fourteen.

The sample is not in any way representative. However, this is not a concern, as the aim was to have a relatively homogenous sample to minimise potential biases in the treatment groups. While this approach serves well in order to answer the research questions and test the hypotheses outlined above, statements about (representative) WTP amounts for wolf management in Germany (or Saxony) cannot be made. To obtain a homogenous sample the target group were students based in Leipzig and Halle (Saale). The acquisition of participants was based on e-mail advertisements through university mailing lists, adverts on notice boards in university buildings and distribution of leaflets in front of universities' canteens, libraries and in general on campuses. Participants were paid a compensation for expenses (€10 for the shorter CV workshops and €20 for the longer deliberative workshops). Self-selection bias may be present because the sampling procedure was not completely random, extrinsic motivations were provided by the monetary allowance and participants might have participated out of special interest in the topic. These potential biases would be a concern regarding liability of absolute WTP amounts but do not pose a problem with respect to the method comparison as long as the treatment groups are homogenous.

5.4.1.2 Description and comparison of valuation workshops' procedures

The three valuation methods applied (CV, PE, and PM) differ in their treatments and respective procedure which is illustrated in Figure 5-1. PE and PM can be considered extensions of CV. The latter serves as a foundation which is extended by additional treatments or rather interventions. PE and PM are extended by group discussions which can be considered a treatment intervention in the method comparison and repeated elicitation of WTP after the intervention(s). The PM incorporated an additional treatment intervention before the group discussion, here referred to as *moralisation* intervention. The procedure, schedule and interventions will be described in more detail in the following.

Figure 5-1 Comparison of the procedures of the three methods applied



Source: Own illustration

The valuation workshops' procedure is outlined in detail in Table 5-2 together with the scheduled time for each activity. All workshops started with a short welcoming and a brief personal introduction of the scientists. Participants were encouraged to always ask questions in case that a task or information provided is unclear or if they've had any question related to the topic. Straight after the introduction, the first questionnaire had to be answered which asked about general views, attitudes and a self-reported measure of connectedness to nature and society. After the completion of the first questionnaire the survey background was explained verbally by the moderator and a quick overview of the valuation workshop procedure was given. This was followed by the information intervention. The latter comprised an information folder containing general information about wolves and specific information about wolves in Germany.¹⁷ Thereafter participants were again encouraged to ask questions in order to clarify any ambiguities. After all questions were answered, the (first) elicitation of WTP was prepared. Participants were introduced to the hypothetical market (details will be given below) and the moderator explained how to fill out the WTP questionnaire. The explanation was given verbally by means of a poster explaining the format. After participants filled out the WTP questionnaire, they were asked to write about their personal motivation behind the stated amount.

At this point the first difference between the methods occurs, in the PM workshops the moralisation intervention (*Short Schwartz's Value Survey – SSVS*¹⁸) took place, followed by the group discussion and second elicitation of WTP including free texts about motivation. In contrast, in the PE workshops the only treatment intervention were group discussions. After the second elicitation of WTP the procedure is identical for all methods. Participants were first asked to fill out a questionnaire about their personal motivation in addition to the free text(s). This questionnaire contained (up to) 37 items which were classified based on the conceptual framework and mainly designed as Likert-scales.¹⁹ Thereafter a final questionnaire was given out to obtain information about socio-demographics. Finally, participants were handed their allowance and were dismissed with the end of the meeting. The CV workshops lasted in total around 60 minutes, whereas the deliberative valuation workshops took approximately twice as long. It is assumed that mental depletion does not affect WTP.

¹⁷ See Appendix A – *Workshop Materials* for details.

¹⁸ Details about the SSVS will be given below. For the theoretical background see again Section 4.1.2.1.

¹⁹ The CV questionnaire contained less items because the ones referring to deliberation were redundant.

Table 5-2 Design of the valuation workshops

Steps	Time scheduled
<i>Welcoming and warm-up</i>	10 minutes
1. Brief presentation of scientists / moderators.	
2. Participants filled out first questionnaire regarding initial views, attitudes, a self-reported measure of connectedness to nature and society.	
<i>Information intervention</i>	20 minutes
3. Survey background explained and rough overview of the valuation workshop procedure given (verbal explanation by moderator).	
4. Participants read information folder about wolves in Germany and moderator presented potential effects and conflicts of wolves in Germany (verbal with poster).	
<i>WTP elicitation - first stage</i>	20 minutes
5. Participants read hypothetical market and chose the preferred project.	
6. Moderator explained how to fill out the willingness to pay questionnaire (verbal with poster).	
7. Participants filled out WTP questionnaire. The moderator read the payment card amounts out in random order.	
8. Participants wrote about their personal motivation behind their stated willingness to pay amounts (free text).	
<i>Treatment intervention – Moralisation (only Method 3)</i>	10 minutes
9. Participants filled out Short Schwartz’s Value Survey.	
<i>Treatment intervention - Group discussion (only Method 2 and 3)</i>	30 minutes
10. All participants were placed on a single table and could discuss the topic together. The discussion was initiated by the moderator.	
<i>WTP elicitation – second stage (only Method 2 and 3)</i>	15 minutes
11. Again, participants chose their preferred project and filled out the second WTP questionnaire. The moderator read the payment card amounts out in random order.	
12. Participants wrote about the motivation behind their willingness to pay (free text)	
<i>Motivation behind willingness to pay</i>	10 minutes
13. Participants filled out a questionnaire about their personal motivation behind stated willingness to pay amounts.	
<i>Follow-up question and closure</i>	5 minutes
14. Participants filled out questionnaire regarding socio-demographics.	
15. End of meeting	

Source: Own illustration

5.4.1.3 Hypothetical market and payment format

As discussed above, one of the challenges associated with valuing the wolf is the need to account for potential negative WTP. Therefore, following Hanley et al. (2009) the hypothetical market was twofold meaning that participants were confronted with two project proposals of which participants had to (anonymously) choose the preferred one (or the status quo in case of indifference). One project proposal aimed at reducing the current wolf population in Germany, whereas the other one aimed at increasing the wolf population. The first scenario would lead to an increased wolf population containing 500 adult animals – around 170 wolf packs. The second scenario followed the Swedish wolf management, Sweden lifted the hunting ban in 2010 and agreed upon a fixed quota, implying that the current wolf population would be reduced to 20 wolf packs (ca. 50 adult animals) within the next five years. The baseline at that time were around 213 to 246 adult animals which were split upon 73 wolf packs, 31 pairs and 3 territorial animals. While in theory the changes in the environmental good should be symmetric, an asymmetric change seemed more realistic (see Hanley et al., 2009). Additionally, the scenario increasing the wolf population does not guarantee the survival of the population according to the favourable conservation status defined by 1000 mature animals (IUCN, 2019; Linnell et al., 2008). While valuation of species populations is often based on guaranteed survival (see Jacobsen et al., 2012), such a rapid increase within five years seemed unrealistic and hence, a smaller target population was chosen.

Both scenarios would evoke costs. Hence, no matter which project was chosen WTP was elicited. The projects duration was set to five years and the payment vehicle was identical. Participants were asked which yearly amount they are willing to pay into a fund earmarked for wolf management.

The use of voluntary contributions may be problematic. Firstly, it has been argued and empirically shown that differences between payment vehicles exist and that individual contribution mechanisms may reduce contribution to a public good (see e.g. Arrow et al., 1993; Champ et al., 2002), although other studies did not find a significant difference (see e.g. Ajzen et al., 1996). Further, it has been argued that voluntary contributions may lead to free-riding, strategic behaviour or overstatement of WTP (Bateman et al., 2002; Carson, 1997; Johannesson et al., 1998). Still, there are good arguments to prefer this type of payment vehicle, especially when the alternatives are either unfeasible or suffer from the same drawbacks. Firstly, people are more used to individual contributions than to taxes when the public good relates to rare species and biodiversity conservation. Hence, voluntary donations are a commonly applied

payment vehicle in studies investigating these types of goods (see e.g. Bandara & Tisdell, 2005; Bosetti & Pearce, 2003; Jobstvogt et al., 2014; MacMillan et al., 1999). To further reduce incentives to free-ride, participants were told that if not enough money is paid into the fund, none of the projects' measures will be undertaken. Secondly, in this study the target group (students) may not have a regular income and therefore may not pay taxes on a regular basis which may as well cause an overstatement bias.

Following MacMillan et al. (2002) a payment card with five (un-)certainty levels was applied to elicit WTP for the preferred project. The participants were asked to indicate for each amount if they *definitely pay*; *probably pay*; *unsure*; *probably do not pay*, or *definitely do not pay*. Ten amounts were read out loud in random order to reduce anchoring effects. After the completion of the payment card participants were asked to state their maximum WTP by an open-ended question which allows for amounts outside of the payment card range (see Lienhoop & MacMillan, 2007b). Further, the open-ended questions increase precision as the “true” WTP lies somewhere between the lower and upper bound of one of the payment card's intervals. In case of the deliberative workshops, WTP was elicited twice with this format, the only difference with regards to payment format was the order of the amounts in the payment card.

5.4.1.4 Treatments and interventions

As illustrated above, the workshops contained up to three interventions: information intervention, deliberative intervention and moralisation intervention. Furthermore, in the PM workshops questions were “socially” framed instead of individually, in the following referred to as consumer-citizen framing.

All workshops, independent of the method, incorporated an information intervention. This was included as no detailed knowledge about wolves in general and especially wolves in Germany and Saxony could have been expected from the majority of participants. The participants were handed out an information folder containing information about wolves in general and specifically in the context of Germany.

In detail the information provided covered the following topics:

- Portrait (in a sense of small description of characteristics) of the European Wolf
- Social behaviour and structure
- Diet
- Distribution, habitat and population
- Legal protection status
- Threats for wolves
- Are wolves a threat for humans?
- Conservation status of German wolf population
- Potential effects and conflicts

Participants read the folder by themselves and could ask questions at any time. The last section of the information folder containing an overview about potential effects and conflicts associated with the return of wolves to Germany was presented verbally by the moderator with the help of a poster. The information intervention aimed at creating a common reference point considering that knowledge about wolves may be low among the general public and to counteract the potential existence of stereotypes based on false information being viral in the internet and German media. Although efforts were undertaken to describe the environmental good scientific accurate and balanced, the information provided may alter participants' attitudes (Ajzen et al., 1996). Assuming that the bias is consistent among individuals as everyone is confronted with the same information it does not pose a threat to this study design and appears favourable over an uninformed or ill-informed situation. In fact, it can be argued that the impact of information on preferences should not be considered to be an undesired bias but to lead to more complete and accurate preferences (see e.g. Bergstrom et al., 1990).

The moralisation intervention consisted of two alterations compared to the other treatments. Firstly, the Short Schwartz's Value Survey (SSVS) (Lindeman & Verkasalo, 2005), which is a shortened version of *Schwartz's Value Survey* (SVS) (Schwartz, 1992), was given to participants as additional questionnaire.²⁰ The aim of the intervention was to make transcendental value explicit based on the assumption that they thereby "enter" the valuation context. The original SVS comprises more than 50 value items and was applied by Kenter et al. (2014) in a valuation workshop. Consideration of such a high number of items is a demanding

²⁰ The SSVS was translated into a German version (SSVS-G) by Boer (2014).

task and may cause high fatigue during the valuation workshop (see Stern et al., 1998). Therefore, it was decided to use the SSVS which is reduced to 10 value items while having a high validity and reliability with regards to the original scale (Lindeman & Verkasalo, 2005). The participants had to evaluate each of the value item's importance for them personally. The ten value items comprise (Lindeman & Verkasalo, 2005):

- Universalism
- Benevolence
- Conformity
- Tradition
- Security
- Power
- Achievement
- Hedonism
- Stimulation
- Self-direction

Secondly, the PM treatment incorporated a citizen(-consumer) framing implying that the wording of the questions and tasks differed in order to emphasize the society instead of the individual. The underlying assumption is that thereby participants consider We-preferences instead of I-preferences. As illustrated by Table 5-3, a handful of studies investigated WTP with reference to an individual and/or a social framing.

Identifying social values of ecosystem services

Table 5-3 Comparison of WTP questions' verbal-framing in citizen-consumer-dichotomy literature

Authors	Environmental good	Individual framing	Social framing
Curtis and McConnell (2002, p. 75)	Deer population control	‘If you consider only yourself, and not what has happened to your friends or others, would you prefer that there were more deer?’	n.a. ²¹
Ovaskainen and Kniivila (2005, p. 384f.)	Conservation areas	‘Consider the pros and cons of the alternatives solely from the point of view of your own welfare. (...)’	‘Consider the pros and cons of the alternatives as a citizen from the point of view of your own welfare as well as the whole society. (...)’
Martínez-Espiñeira (2006, p. 194)	Coyote conservation	n.a. ²²	‘If farmers were to be compensated for the loss of livestock to coyotes and a compulsory tax were imposed on all PEI residents to fund the conservation of coyotes, how much would you say would be a reasonable annual contribution?’
Mill et al. (2007, p. 644f.)	Forest conservation	‘We are interested in your personal opinions about forests in general.’ ‘Bearing in mind the importance or unimportance of forest for you personally, are you willing to pay (...)’	‘Would you now think about the same characteristics from the point of view of society as a whole, (...) and keeping in mind the interests of future generations (...)’ ‘Bearing in mind the importance or unimportance of forest for society as a whole’
Howley et al. (2010, p. 1526)	Conservation of rural landscapes	‘Bearing in mind the importance or unimportance of conserving traditional landscapes for you personally’	‘Bearing in mind the importance or unimportance of conserving traditional landscapes for society as a whole’

Source: Own illustration

²¹ Curtis and McConnell (2002) assumed that participants automatically take on the citizen role when confronted with an environmental good that has private and public benefits (and costs).

²² Only a framing to activate the citizen perspective was used and no consumer preferences elicited.

Based on the existing literature the verbal-framing and tasks differed between the treatments as illustrated in Table 5-4. The individual or rather consumer framing was identical in case of CV and PE.

Table 5-4 Comparison of verbal framing between methods

Document	Individual framing	Social framing
Survey background	We would like to know how important a change in the German wolf population is to you personally.	We would like to know how important a change in the German wolf population is to society.
Hypothetical market – selection of project	n.a.	(...) These costs are unequally distributed within society (because predominantly persons in agriculture or rather livestock farming are affected. (...)
	We are interested to know how important such a project is to you.	We are interested to know how important such a project is to society.
Payment card / willingness to pay elicitation	When answering all questions, please consider: <ul style="list-style-type: none"> • (...) • How important is the project to you personally? 	When answering all questions, please consider: <ul style="list-style-type: none"> • (...) • How important is the project to society?

Source: Own illustration

As discussed above, only the PM workshops incorporated the moralisation intervention which was followed by the deliberative intervention. The deliberative intervention was only conducted in the PE and PM valuation workshops. The intervention differed (partly) due to the different aims of deliberation. As illustrated in Section 3.1.2, the aim of PE is primarily on information provision, information sharing and complexity reduction, while in PM the focus is on revealing implicit values, social learning and accounting for multidimensionality of value. This was primarily implemented by the discussion guidance. In the PE workshops, the questions initiating the discussion were focussing on the perception of the projects and their perceived necessity, resulting costs and benefits for humans and wildlife, and aspects of biodiversity loss.

In contrast, the discussion in the PM workshops was initiated by referring to the moralisation intervention participants completed just before. While in the SSVS participants evaluated which of the ten basic values are most important for them personally, in the group discussion the moderator asked the group which of these values they consider most important for society or rather within society. After discussing the basic values in a societal context, the next question asked participants which of these ten basic values they consider relevant for the suggested projects. Thereafter, the questions were the same as in the PE groups.

The moderator had several tasks during the group discussion: i) facilitating the discussion; ii) answering questions; iii) correcting false information voiced by participants; iv) creating a pleasant atmosphere so participants would feel comfortable to contribute; v) giving everyone the opportunity to talk and counteracting domination of speaking time. The moderator did not voice any personal positionality (at least he sought not to do so). All discussions were recorded.

5.4.1.5 Follow-up questions

To investigate motives behind stated WTP, the underlying type of preferences (I-preferences and We-preferences), and more general aspects, such as perception of difficulty to state an amount, participants were given a questionnaire containing follow-up questions. 26 potential motives were derived from the conceptual framework or rather from the theory it is based on. The analysis of these follow-up questions is of interest for two reasons. Firstly, the answers help to better understand the stated WTP amounts and to put them in context with the conceptual framework. The framework's consistency cannot be assessed solely based on elicited WTP amounts. Instead, relevant questions that require the analysis of motives are: Which motives are behind the stated amounts? Which rationality was adopted? Are the stated preferences consistent with the neoclassical assumption of isolated individuals that act as utility maximiser or do participants perceive themselves as *Gesellschaftswesen* connected to nature and society as argued by some (old) institutional economists (see Section 3.2.4)? Secondly, patterns can be identified and it can be assessed if differences between the three valuation methods exist. The content of the questionnaire will be described in more detail below in Section 5.4.3.

5.4.1.6 Pre-test

A qualitative pre-test was conducted with a small focus group ($n = 4$) to assess the questionnaires' and information material's comprehensibility, occurrence of fatigue and adequacy of difficulty level. Based on the pre-test and participants' feedback, adjustments to

wording were made. Furthermore, the workshop duration was shortened by compressing information in order to minimize fatigue throughout the valuation workshop.

Having outlined the study design, we can now turn to the estimation strategy – the quantitative approach to test the four above-described hypothesis.

5.4.2 Quantitative approach

WTP analysis were performed using the statistical software *R* (Version 3.5.1; R Core Team, 2018).²³ *Linear mixed effects models*²⁴ (Laird & Ware, 1982) were used for the quantitative analysis of the data and estimated using the *lme4* package (Bates et al., 2015b).²⁵

In the following, the model specification (Section 5.4.2.1), residual analysis and robust approaches (Section 5.4.2.2), evaluation of model fit and intraclass correlation coefficient (Section 5.4.2.3), reporting of statistical significance (Section 5.4.2.4), detection of multicollinearity (Section 5.4.2.5), amount of missing data and its treatment (Section 5.4.2.6) and predictor variables (Section 5.4.2.7) will be described.

5.4.2.1 Model specification

Linear mixed effects models are applied in variety of scientific fields i.a. economics, ecology and medical science (see e.g. Goldstein, 2011; Zuur et al., 2009). This class of models was selected due the hierarchical nature of the data meaning that participants are *nested* in groups (see Figure 5-2 for a simplified visualisation of the hierarchical structure or rather the multi-level modelling). By clustering participants into groups, it is controlled for possible effects of groups on participants stated WTP. This impact is also referred to as *session effects* suggesting that variation within sessions is lower than between sessions (Fréchette, 2012). In general, group effects in valuation studies have not been sufficiently explored yet to evaluate if they are relevant or not. The study by Vargas et al. (2017) has shown that social influences on WTP occur but without systematically influencing stated WTP after deliberation. Chanel et al. (2006) found that public opinion did not affect WTP, instead scientific information was of relevance.

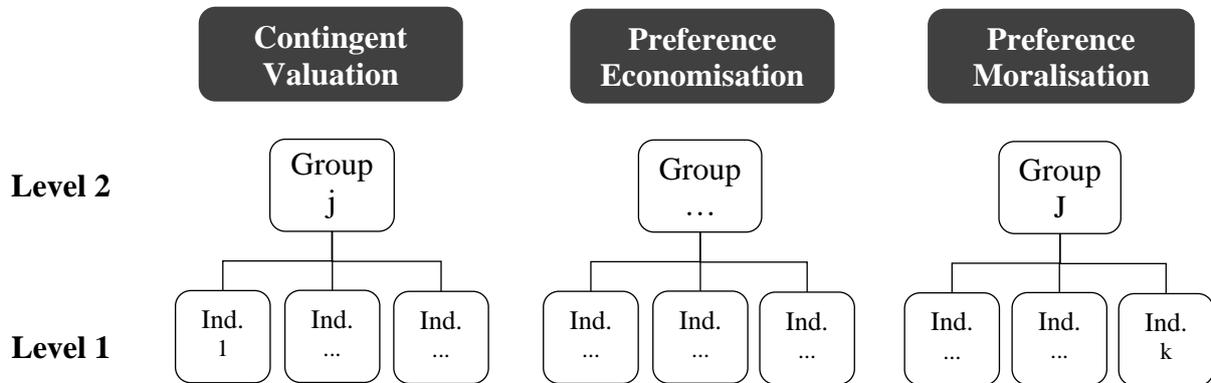
²³ For an overview of all R packages used in the analysis see Table B-1 in Appendix B – *R Packages*.

²⁴ The simultaneous analysis of fixed and random effects' contribution on a dependent variable has various names and may be referred to as *hierarchical model*, *multilevel model* or *mixed (effects) model* (see e.g. Gelman & Hill, 2007, p. 2). In the following the term mixed effects model will be used to refer to this class of model.

²⁵ The above-discussed (extended) spike model was not applied due to the small amount of negative and zero WTP responses.

To account for the possibility of group effects, and to explicitly model the data's dependence (within clusters), mixed effects models incorporate random effects besides fixed effects.

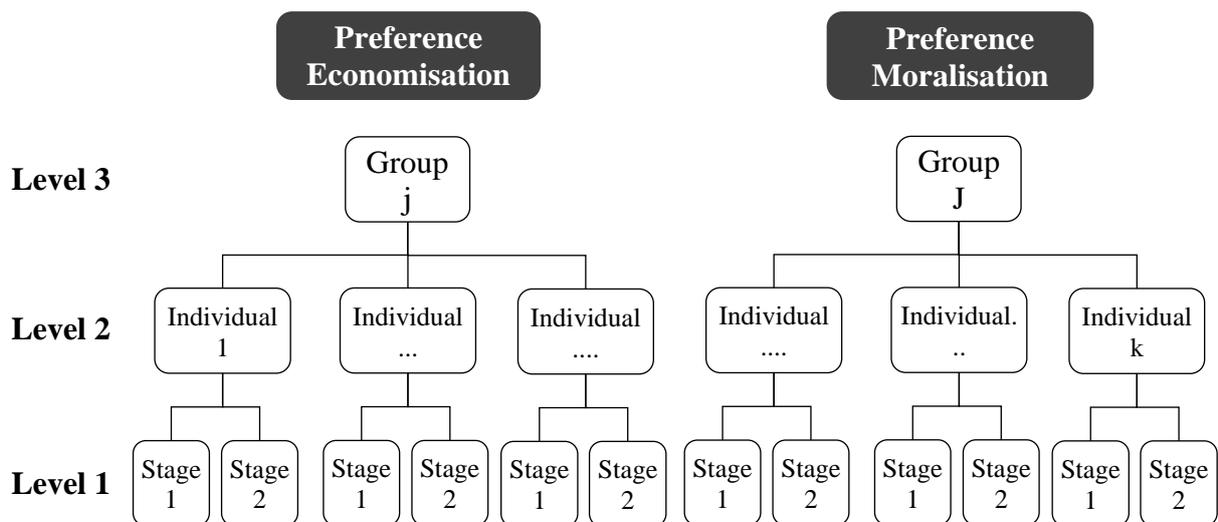
Figure 5-2 Visualisation of the two-level model investigating WTP – between-group design



Source: Own Illustration

Concerning the repeated measurements in case of the two DMV methods the model has to not only account for potential group effects but also for potential inter-correlation of repeated measurements. Put differently, individual effects are likely to occur and can be problematic in terms of analysis (Houser, 2010). This means that the second stated WTP may be dependent on the first amount elicited (see Figure 5-3 for a simplified visualisation of the multi-level modelling extended by repeated measures). In this more complex design random effects are not only *nested* (participants in groups) but also *crossed* (repeated measurements within an individual) in order to account for non-independence both within groups and within individuals.

Figure 5-3 Visualisation of the three-level model investigating WTP – within-group design



Source: Own Illustration

To test H1 and H2, two mixed effects models were estimated. One compares the WTP between the treatments, hereafter referred to as *between-group design*, while the second model estimated the change in WTP within the DMV, in the following designated as *within-group design*. The two models take the following simplified form.

1. *Between-group design*:

$$wtp_{ijkl} = \beta_0 + \beta_1 x_{ijkl} + \dots + \beta_n x_{ijkl} + u_j + \varepsilon_{ijkl} \quad (9)$$

$$u_j \sim N(0, \sigma_u^2)$$

$$\varepsilon_{ijkl} \sim N(0, \sigma^2)$$

A random-intercept model was used in order to allow the intercept to vary for each random effects' level. In equation (9) wtp_{ijkl} is the l^{th} response of the k^{th} individual in the j^{th} group and i^{th} treatment. Random effects, more precisely random intercepts, are represented by the term u_j which allows group-specific intercepts of WTP and loosens the strict assumption of an identical intercept among all groups. In other words, the grouping factor is the specific group (*group identity*) each participant was placed in. ε_{ijkl} is the error term. It is assumed that the random effects and the errors follow a normal distribution with a zero mean and variance σ_u^2 and σ^2 , respectively.

2. *Within-group design*:

$$wtp_{ijkl} = \beta_0 + \beta_1 x_{ijkl} + \dots + \beta_n x_{ijkl} + u_j + b_{jk} + \varepsilon_{ijkl} \quad (10)$$

$$u_j \sim N(0, \sigma_u^2)$$

$$b_{ij} \sim N(0, \sigma_b^2)$$

$$\varepsilon_{ijkl} \sim N(0, \sigma^2)$$

Equation (10) is almost identical with equation (9) yet, has an important additional term, b_{jk} , which is also assumed to follow a normal distribution with zero mean and variance σ_b^2 . Therefore, the model or rather estimation strategy takes the dependency of repeated measures into account by a *nested and crossed random effect structure*, represented by b_{jk} , allowing the intercepts to vary among groups and among individuals within groups. So, the random effect

accounts for the fact that WTP statements from the same participant are not independent and that within groups WTP statements may be non-independent. Simply put, they are likely to be more similar. Not accounting for dependency of the observations would lead to a pseudoreplication and violate the assumption of independence of observations.

The dependent variable was censored at zero and negative WTP values were transformed to zero. The censoring was applied because of the low number of “opponents” with negative WTP. Therefore, the two groups of “supporters” and “opponents” cannot be analysed separately nor does the small number of negative amounts allow for the application of the spike model. As a result of restricting WTP at zero, the data is right skewed. Therefore, the dependent variable (WTP) was log-transformed, resulting in the following alterations to the models described in equation (9) and equation (10):

1. *Between-group design:*

$$\ln(wtp_{ijkl} + 1) = \beta_0 + \beta_1 x_{ijkl} + \dots + \beta_n x_{ijkl} + u_j + \varepsilon_{ijkl} \quad (11)$$

$$u_j \sim N(0, \sigma_u^2)$$

$$\varepsilon_{ijkl} \sim N(0, \sigma^2)$$

2. *Within-group design:*

$$\ln(wtp_{ijkl} + 1) = \beta_0 + \beta_1 x_{ijkl} + \dots + \beta_n x_{ijkl} + u_j + b_{jk} + \varepsilon_{ijkl} \quad (12)$$

$$u_j \sim N(0, \sigma_u^2)$$

$$b_{ij} \sim N(0, \sigma_b^2)$$

$$\varepsilon_{ijkl} \sim N(0, \sigma^2)$$

As shown in equation (11) and equation (12) one was added to the WTP measures before the logarithmic transformation to keep the zero WTP statements in the dataset. The natural logarithm (base e) is preferred over alternatives (e.g. \log_{10}) because predictors' estimates are easier to interpret. For example, an estimate (β_n) of 0.05 implies an approximate 5% difference in WTP if the predictor (x) increases by one ($\% \Delta wtp \approx 100(\beta_n)$) (Gelman & Hill, 2007, p. 60 f.). Yet, this approximation works only for relatively small numbers as the approximation

$\% \Delta wtp \approx 100 * \Delta \ln(wtp)$ becomes less accurate for an increasing $\ln(wtp)$. The correct calculation for the percentage change is (Wooldridge, 2013, p. 191 f.):

$$\% \Delta \widehat{wtp} = 100(e^{\widehat{\beta}_n \Delta x_n} - 1) \quad (13)$$

Which in case of $\Delta x_n=1$ simplifies to:

$$\% \Delta \widehat{wtp} = 100(e^{\widehat{\beta}_n} - 1) \quad (14)$$

While the random effect structure of the *within-group design* appears to be rather complicated, keeping in mind the relatively low number of observations, Barr et al. (2013) argue based on theoretical considerations and Monte Carlo simulations that it is best to include a maximal random effect structure as long as the (experimental) design justifies it. Otherwise *Type I error rates*²⁶ will increase. Hence, a simplification of the random effects structure seems unreasonable irrespective of the fit of the model (Barr et al., 2013; Bolker et al., 2009). Further, the random effects structure is design-driven and not data-driven. Therefore, variance due to random effects may be just noise but may also deliver insights about the importance of group effects. Nevertheless, for the sake of consistency model fit will be assessed and tested if alternative random effects structures would improve goodness-of-fit (details are given below).

In fact, one could think of an even more complex random effects structure: including random slopes for each treatment. So, the data's non-independence would not only be modelled by group-specific random intercepts but would also loosen the assumption that the treatment predictors' coefficients have a common slope. Put another way, the treatment effects' slope may differ between groups. Furthermore, it has been shown that in case of within-group designs a bare random-intercept model can lead to high Type I error rates irrespective of the method applied to obtain p-values (Barr et al., 2013; Schielzeth & Forstmeier, 2009). Yet, modelling random slopes requires a substantial amount of data for accurate estimations and therefore, the most complex random effects structure must be chosen in accordance with the data (Bates et al., 2015a).

Hence, complexity of the model cannot be discussed without considering sample size. The complexity of the model containing all predictors of interest referred to as *maximal model* or *global model* is dependent on the number of observations (see Burnham & Anderson, 2002;

²⁶ The rejection of true null hypothesis suggesting that results are falsely significant (Wooldridge, 2013, p. 779). Hence, also referred to as "false positive".

Crawley, 2013). Over-fitted models, implying a low ratio between sample size and number of predictors, increase type I error rates. Yet, there is an ongoing debate about adequate sample sizes and appropriate ratio of predictors and observations. Consequently, various recommendation or rather rules of thumb exist (Crawley, 2013; Forstmeier & Schielzeth, 2011). Some scholars suggest a simplified approach relying on a specific constant for the minimum number of participants (e.g. some number between 30 and 500 participants) or the participant-to-predictor ratio, e.g. 3:1 or 10:1 (Crawley, 2013; Harrison et al., 2018). Yet, Green (1991) argues that selection of an adequate sample size that consider also the expected effect size and desired power, the probability of correctly rejecting the null hypothesis, are more useful. Usually a power of 0.2 is considered to be small, 0.5 as medium and 0.8 as large (Cohen, 1988). Green (1991) has illustrated that two more complex rule-of-thumbs perform better (for medium effect sizes): a minimum sample size consistent of 50 plus eight times the number of predictors ($N = 50 + 8k$) in case of overall model tests and 104 plus number of predictors ($N = 104 + k$) if tests of individual predictors are of interest. Others argue that in case of mixed effects models the higher-level sample is more important. And based on simulation studies two further rules of thumb have been suggested: 30 level 2 units to analyse fixed effects and 50 to analyse random effects should be met (Maas & Hox, 2004, 2005).

As illustrated various rules of thumb exist and while ex-ante calculation of adequate sample size is recommendable, it requires solid expectations about the effect size which was not given in the context of the thesis at hand due to the lack of empirical literature. Furthermore, to a certain degree deliberative valuation studies are driven by pragmatism, as they are cost and time intensive (see Lienhoop et al., 2015). Bunse et al. (2015) found in their review that studies conducting Market Stall valuation workshops and focus groups had a sample size of 52-109.

In order to account for a potential small sample bias bootstrapping, a resampling approach (details are given below), and robust estimation methods will be applied and compared with the parametric model.

A common approach to simplify complex models are *stepwise methods* also referred to as *stepwise regression*. As implied by the name, stepwise methods evaluate in an automated procedure step-by-step all possible regressions or rather candidate variables. The procedure (algorithm) may either start without any variable and add them step-by-step until a specified criterion, also referred to as *stopping rule*, is satisfied (e.g. adding statistically significant variables to the point that only insignificant variables remain) or begin with the full model and

exclude insignificant variables step-by-step. The former is called *Forward Selection* while the latter is referred to as *Backward Elimination*. A third option is the combination of Forward Selection and Backward Elimination to a bi-directional procedure. Following basically the approach of Forward Selection, at every step variables may be excluded again as in case of Backward Elimination (Efroymson, 1960; Hocking, 1976). In general, Backward Elimination is preferred in automatic procedures because of the consideration of predictors' correlation (see e.g. Mantel, 1970), although other authors disagree (see e.g. Beale, 1970). In the thesis at hand, the analysis will rely on Backward Elimination.

In mixed effects model the fixed effects as well as random effects may be simplified. As mentioned above, the random effects selection is based on a specific criterion. One possibility is to base the decision on the conditional Akaike Information Criterion (cAIC) (see Section 5.4.2.3 for details), so random and fixed effects are excluded until the lowest cAIC is found as implemented by the *stepAIC* function in the *cAIC4* package (Grevén & Kneib, 2010; Säfken et al., 2018). The *step* function in the *lmerTest* package uses a different approach to Backward Elimination. Firstly, the random effects structure is simplified if necessary. This is done by estimating a model with a reduced random effect structure for each random effect (in case of a simple random-effect term such as (1 | id_group) the term is just removed) and then comparing the original model's fit with the reduced model's fit based on a likelihood ratio test. If the highest p-value out of all models is higher than then pre-defined significance level, the random effect is eliminated from the model. In a next step, the fixed-effects structure is simplified. This is done based on F-statistics and p-values which are calculated using Satterthwaite's approximation for degrees of freedom (see Section 5.4.2.4 for details). The fixed effect with the highest p-values is step-by-step eliminated. If interactions are significant, the main effects are retained. The elimination continues until the pre-defined stopping rule, the minimal significance level, is met (Kuznetsova et al., 2017). Based on a relative efficiency comparison of various significance levels (α) Kennedy and Bancroft (1971) recommend an α of .10 for Backward Elimination in order to eliminate noise and still include authentic predictor variables.

However, the application of stepwise deletion procedures is controversial for several reasons. Predictors' effect sizes may be positively biased in the *minimum adequate model*, the model with the minimal number of predictors with respect to a certain criterion, e.g. predictors significance at a specified level (see e.g. Forstmeier & Schielzeth, 2011; Steyerberg et al., 1999; Whittingham et al., 2006). Stepwise procedures are sensitive to changes in data implying that slight changes may cause alterations in the selection process and hence final models may differ

(James & McCulloch, 1990). Another issue is that the three different algorithms (Backward Elimination, Forward Selection and their combination) and the number of potential predictors may cause differing final models, especially when predictors have high collinearity (see e.g. Derksen & Keselman, 1992). Hence, stepwise methods suffer from a lack of reliance that the resulting final model is actually the best model as variables that do not have an influence on the dependent variable might be included or ones with influence are falsely eliminated (Derksen & Keselman, 1992; Miller, 1984). Further, also non-significant predictors can be of interest as in the thesis at hand the study's design is theory-driven. In the words of Burnham and Anderson (2002, p. 147):

‘ “Let the computer find out” is a poor strategy for researchers who do not bother to think clearly about the problem of interest and its scientific setting.’

Therefore, in the following the full models will be presented and stepwise reduction methods will only be used to assess full models' robustness.

5.4.2.2 Residual analysis and robust regression approach

In both above-presented linear mixed effect models (between-group design and within-group design) a linear relationship of fixed and random effects on WTP is assumed and, as mentioned above, residuals are assumed to be normally distributed. Residuals were analysed visually using diagnostic plots of the residuals against fitted values, histograms of the distribution and Quantile-Quantile plots (Q-Q plot). In addition, statistical tests were used. Deviances from normality were tested by the Shapiro-Wilk's Test.²⁷ To test for homogeneity of variances the (modified) Levene's test (Brown & Forsythe, 1974; Levene, 1960) was applied which tests for deviations from the median. This test was preferred over alternative tests (e.g. Bartlett's test) because of its robustness against deviances from normality and for being a rather conservative test in case of small samples (see e.g. Ekstrøm, 2016, p. 211; Lim & Loh, 1996).

In case of violation of statistical assumptions (non-normal distribution of residuals, heteroscedasticity, potential small sample bias and potential undue influence of outliers) a sensitivity analysis was conducted based on comparing the estimates with the ones obtained through robust regressions and resampling procedure (bootstrapping, details given below).

²⁷ The latter was chosen because it has been proven powerful compared to the Kolmogorov–Smirnov test, the Lilliefors test, the Anderson–Darling test, the Cramer–von Mises test, the D'Agostino–Pearson test, the Jarque–Bera test and the chi-squared test (Razali & Wah, 2011; Yap & Sim, 2011).

Validation of models and correction of potential bias based on simulation methods is especially relevant for small sample size analysis (Van der Leeden et al., 2007).

The robust linear mixed effects models apply robustness weights based on the random effects contamination model and the central contamination model. These models are able to estimate unbiased estimators even when the assumptions of normality and homogeneity of variance are violated and/or when influential outliers are existent. Influential outliers are especially of concern when participants' WTP is elicited via open-ended payment questions as the mean WTP is simply the average WTP:

$$\overline{wtp} = \frac{1}{n} \sum_{i=1}^n wtp_i \quad (15)$$

Where \overline{wtp} represents the mean WTP, n the sample size and each elicited WTP amount is indicated by wtp_i . So, for small sample sizes few high WTP amounts may heavily influence mean WTP. Hence, their influence should be reduced. The advantage of using a robust mixed effects model is that the sample size is not reduced as outliers may remain in the dataset without being problematic in terms of undue influence due to the applied robust weights. Robust mixed effects models were performed using the *rlmer* function included in the *robustlmm* package (Koller, 2016; Koller & Stahel, 2011).

Another technique to measure the accuracy of estimators, the so-called *bootstrap*, was introduced by Efron (1979) and represents a resampling approach based on the observed data. The general idea behind bootstrapping is to generate a certain number of replicates or rather *bootstrap samples* (B) by drawing with replacement from the original sample (Efron & Tibshirani, 1993). An often voiced advantage of bootstrapping is that it does not necessarily rely on distributional assumptions like parametric estimation strategies and hence, inference can also be assessed when (mixed effect) models' assumptions are violated (Davison & Hinkley, 1997).

Basically, three different bootstrapping approaches can be distinguished: *(fully) nonparametric bootstrap*, *(fully) parametric bootstrap* and the *semiparametric bootstrap* (also referred to as *residual bootstrap*). In case of the *nonparametric bootstrap* observations are resampled and therefore, the estimated model and distribution of noise is not relevant. The resampling can only take place on one level of a multilevel model. Resampling on the first level is inadequate for multi-level (mixed effect) models as it assumes that responses are identically distributed.

Alternatively, the resampling can only consider the second level. Yet, this is not recommendable if the number of level two units is small. The *parametric bootstrap* follows a different approach, it does not resample all observations but estimates the model and simulates the outcome variable from the estimated model. Hence, it makes the same assumptions about distributions as the original model. Thus, it also relies on the assumption of normally distributed residuals and the “trust” in the models’ correctness is high (Goldstein, 2011, pp. 95-101). Residual resampling is chosen in this thesis for two reasons. Firstly, resampling should “mimic” the original process of data generation. That is to say, the residual resampling accounts for the models’ structure, illustrated in equation (9) and equation (10), and the resulting dependence. Secondly, it does not make assumptions about the residuals’ distribution.

The semiparametric resampling used for bias-correction is also known as *CGR bootstrap* and is outlined by Carpenter et al. (2003) as follows:

1. Obtain the parameter estimates from the fitted model and calculate the residuals at level 1 and level 2.
2. Centre and rescale the residuals in order to have identical empirical variance of these residuals and the corresponding model’s estimates.
3. Sample independently with replacement from the rescaled level 1 and level 2 residuals in order to obtain two new sets of residuals.
4. Obtain the bootstrap data by combining the original model with the residuals sampled in step 3.
5. Refit the model and extract the (parameter) estimates of interest.
6. Repeat the process B times.

The CGR bootstrap is implemented in R by the *bootstrap* function in the *lmeresampler* package and accounts for the nested model structure (Loy & Steele, 2019). Following the recommendation of Burnham and Anderson (2002) ten thousand bootstrap samples were generated ($B = 10,000$).

5.4.2.3 Evaluating model fit and intraclass correlation coefficients

Concerning model selection, the aim is to find the model which is closest to the “true model”. Usually selection methods rely on an *information criterion* which enables ranking various models through assigning each model a score (Claeskens & Hjort, 2008, p. 22). The *Akaike Information Criterion* (AIC) (Akaike, 1973/1998) is a commonly used selection criterion. It estimates the distance between true density which is unknown and the parametric model. Thus,

it minimises the statistical distance from the “true model” (Claeskens & Hjort, 2008, p. 30). While the absolute values of AIC themselves are hardly interpretable, the relative comparison of different models’ AIC allows for assessing goodness-of-fit (Säfken et al., 2018). As an early rule of thumb Burnham and Anderson (2002, p. 70 ff.; 2004) suggested that models with a difference in AIC below 2 are equivalent. A difference between 4 and 7 implies that models are less likely to be best fitting and models with a difference in AIC above 10 are unlikely to be best fitting. However, findings of Richards (2005, 2008) suggest that a larger threshold may be more adequate (include all models with a difference below six) (see also Burnham et al., 2011). Further, he argues that in general a pre-specified threshold should be handled with care. Hence, models shouldn’t be simply ignored if they are above the AIC threshold.

AIC suffers from bias in form of overfitting in case of small sample sizes or overparameterized models. Hence, Hurvich and Tsai (1989) suggested a modification to correct the AIC criterion in order to incorporate a greater penalty term for the number of parameters. Thus, for linear mixed effect models with small sample sizes the use of this corrected AIC (AIC_c) is recommended (Greven & Kneib, 2010; Liang et al., 2008). Burnham and Anderson (2002) suggest the use of AIC_c when the ratio of observations to model parameters is below 40. However, regarding selection of mixed effect models’ random effects (marginal) AIC is inadequate (Vaida & Blanchard, 2005) and biased implying that it favours simple models without random effects (Greven & Kneib, 2010). Therefore, the use of an extended AIC, the so-called *conditional AIC* (cAIC), has been recommended (see e.g. Greven & Kneib, 2010; Vaida & Blanchard, 2005). The cAIC maximises the conditional log-likelihood and incorporates a penalty term based on the models’ effective degrees of freedom. As in the case of model selection based on AIC as measure of goodness-of-fit, the model with the smallest cAIC is closest to the true model. It is worth noting that for robust mixed effects models information criteria like the AIC cannot be reported or rather calculated as the robustified estimating equations do not correspond to a likelihood function (Koller, 2016).

While information criteria such as the above-describe AIC provide insights about the relative fit of models, they lack the ability to assess the absolute fit of models and cannot evaluate the variance explained by a model (Burnham & Anderson, 2002; Orelien & Edwards, 2008). Therefore, to evaluate linear models’ goodness-of-fit often the coefficient of determination (R^2), which ranges between zero and one and describes the proportion of explained variance, is commonly used. However, conventional R^2 measures cannot account for mixed effects models’ complexity in terms of the random effects and the various levels in hierarchal models. A variety

of R^2 extensions have been developed for mixed effects models but no consensus on one extension has been reached (see e.g. Liu et al., 2008; Nakagawa & Schielzeth, 2013; Orelieen & Edwards, 2008; Xu, 2003). The extension accounting for random intercepts that gained most support over the last years was the one developed by Nakagawa and Schielzeth (2013).²⁸ They suggested a method that distinguishes between the coefficient of determination considering only fixed effects (*marginal R^2*) and the coefficient of determination considering also random effects (*conditional R^2*). Hence, marginal R^2 and conditional R^2 are complementary. To estimate the conditional R^2 and marginal R^2 the *r.squaredGLMM* function has been implemented in R through the *MuMIn* package (Barton & Barton, 2019). For the robust mixed effects model the R^2 values had to be calculated manually following Nakagawa's and Schielzeth's (2013) approach:

$$\text{marginal } R^2 = \frac{\sigma_f^2}{\sigma_f^2 + \sigma_u^2 + \sigma_b^2 + \sigma_\varepsilon^2} \quad (16)$$

In equation (16) the numerator is the fixed-effects variance σ_f^2 . The denominator consists of the total variance explained by the model incorporating the fixed-effects variance σ_f^2 , the random variance components σ_u^2 and σ_b^2 (here the model illustrated in equation (10) comprising two random effects is considered) and the residual variance σ_ε^2 .

$$\text{conditional } R^2 = \frac{\sigma_f^2 + \sigma_u^2 + \sigma_b^2}{\sigma_f^2 + \sigma_u^2 + \sigma_b^2 + \sigma_\varepsilon^2} \quad (17)$$

As discussed above, the conditional R^2 , equation (17), represents variance explained by the full model. Therefore, the numerator incorporates besides the variance explained by fixed effects σ_f^2 also the variance explained by random effects σ_u^2 and σ_b^2 . The denominator is identical with the one in equation (16).

Accordingly, two measures of the *intraclass correlation coefficient* (ICC) exist. In general, the ICC is a measure of the proportion of variance explained by the grouping structure of the hierarchical model. So, in the context of this study it reflects the amount of variation attributed to the grouping variables (*id_group*) and/or the repeated measurements of individual WTP. Thus, the ICC quantifies to which extent WTP amounts are similar for individuals belonging to

²⁸ For a further extension of Nakagawa's and Schielzeth's (2013) R^2 that also incorporates random slopes see Johnson (2014). For the models outline in equation (9) and equation (10) the extension considering only random intercepts is sufficient.

the same group and/or belonging to the same individual in case of repeated measurements. The first is the so-called *adjusted ICC* which relates only to the random effects (Nakagawa et al., 2017):

$$adjusted\ ICC = \frac{\sigma_u^2 + \sigma_b^2}{\sigma_u^2 + \sigma_b^2 + \sigma_\varepsilon^2} \quad (18)$$

The second is the *conditional ICC* which considers not only random effects but also fixed effects:

$$conditional\ ICC = \frac{\sigma_u^2 + \sigma_b^2}{\sigma_f^2 + \sigma_u^2 + \sigma_b^2 + \sigma_\varepsilon^2} \quad (19)$$

As it can be seen from equations (18) and (19) the two measures differ only in the consideration of the fixed effects variance in the denominator. Usually the adjusted ICC is of interest when analysing random effects and therefore, only the adjusted ICC will be reported in this thesis. Furthermore, for the within-group design which incorporates the nested random effect structure the ICCs for specific levels are of interest. Equation (18) can be simplified in order to account for specific levels. The ICC between level 1 (repeated measurements of WTP at stage one and two) and level 2 (participant) is represented by:

$$ICC_{id:id_group} = \frac{\sigma_b^2}{\sigma_u^2 + \sigma_b^2 + \sigma_\varepsilon^2} \quad (20)$$

The ICC between level 2 (participant) and level 3 (group) is simplified to:

$$ICC_{id_group} = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_b^2 + \sigma_\varepsilon^2} \quad (21)$$

While in R the adjusted ICC and conditional ICC are implemented in the *icc* command in package *performance*, the level-specific ICCs have to be calculated manually. The fixed effects', random effects' and residuals' variance components can be extracted with the *get_variance_fixed*, *get_variance_random* and *get_variance_residual* commands implemented in the *insight* package (Lüdtke et al., 2019b).

5.4.2.4 Reporting of statistical significance

Generally, reporting, interpretation and usefulness of *p-values* is a controversially discussed topic (see e.g. Berger & Sellke, 1987; Halsey et al., 2015; Murtaugh, 2014; Wasserstein et al., 2019) and specifically in the context of linear mixed effects models (see e.g. Bates et al., 2015b; Luke, 2017). The problem in case of mixed effects models is that the null distributions do not follow the *t-distribution* for finite samples (Bates et al., 2015b) and that due to mixed effects models' complexity (e.g. hierarchal structure) calculation of degrees of freedom is not straightforward (Baayen et al., 2008).

A variety of methods have been proposed in order to test fixed effects' statistical significance: Satterthwaite's method (Satterthwaite, 1941; Satterthwaite, 1946) and Kenward-Roger's method (Kenward & Roger, 1997) for approximating degrees of freedom for *t* distributions and *F* statistics; Markov-chain Monte Carlo sampling (Baayen et al., 2008); Likelihood ratio tests; *t-as-z* approach which uses the *z* distribution to assess statistical significance based on the model's *t-values*; and parametric bootstrapping.

In terms of Type 1 error rates Kenward-Roger's and Satterthwaite's approximation methods are most reliable and are preferable, especially in case of a small number of subjects (see Luke, 2017). Therefore, predictors' *p-values* were derived based on Satterthwaite's approximations (see Giesbrecht & Burns, 1985; Hrong-Tai Fai & Cornelius, 1996; Manor & Zucker, 2004). This was done in *R* using the *lmerTest* package (Kuznetsova et al., 2017). Robust implementations of the approximation approaches are currently lacking. Therefore, to calculate *p-values* based on the student's *t* distribution for the robust models the Satterthwaite's approximated degrees of freedom from the non-robust model were used in combination with the *t-values* from the robust model (see Geniole et al., 2019).

As mentioned above the use of *p-values* is debated and some scholars argue to rely on confidence intervals (CI) instead (Nakagawa & Cuthill, 2007). CIs are the range of value that comprises the "true" value with a specified probability, often 95% (see e.g. Zuur et al., 2009, p. 17). Therefore, in this study in addition to *p-values* also 95% CIs will be reported for each predictor. Statistical significance is given, or, to put it differently, the null hypothesis is rejected if the CI does not include zero. An advantage of CIs compared to *p-values* is that CIs give a range of possible estimate sizes with a certain confidence, whereas *p-values* only provide a dichotomous interpretation (Nakagawa & Cuthill, 2007). Uncertainty of parameter estimates (95% CIs) was assessed deriving *Wald Confidence Intervals* in case of the non-robust mixed

effects model using the *confint* function and for robust mixed effects model using the *confint.merMod* function which is part of the *lme4* package (Bates et al., 2015b). Bootstrapped confidence intervals were calculated based on semi-parametric bootstrap replication via the *boot.ci* function (*boot* package) (Canty & Ripley, 2019; Davison & Hinkley, 1997).

5.4.2.5 Multicollinearity detection

A further issue that may arise in linear models is the so-called *multicollinearity*. It implies the occurrence of highly correlated predictors inferring a lack of independence between predictors. Multicollinearity may be problematic as it increases the predictors' variances and thereby also standard errors (see e.g. Wooldridge, 2013, p. 94 ff.). In this study existence of multicollinearity was tested by checking correlation coefficients and predictors' *variance inflation factor* (VIF). Predictors' VIF should be close to one. In case that a VIF exceeds a certain benchmark value multicollinearity is existent and the variable with the highest VIF should be eliminated from the model. The process is repeated until all predictors' VIFs are below the benchmark value. However, there is no agreement on the benchmark value and various rules of thumb exist (e.g. VIF smaller 2, 4, 5 or 10) (see Hair et al., 2017, p. 143f.; Kutner et al., 2005; O'Brien, 2007) and some scholars question their usefulness (see e.g. Wooldridge, 2013, p. 97 f.). In this study VIFs were calculated based on the *vif* function included in the *car* package. As benchmark a value smaller five was considered appropriate.

5.4.2.6 Missing data and imputation

Missing data was not a major concern in this study apart from the two participants that were excluded from the analysis (see above). With less than one percent of total questions unanswered, the amount of missing observations is negligible relative to the total amount of obtained answers. Most importantly, the missing data appears to be random in a sense that there is no pattern evident. Further, WTP amounts were always stated and roughly half of the missing observations relate to the motivations behind WTP which were not part of the mixed effects model. Yet, how to handle the few missing observations needs to be carefully considered. A common procedure is to exclude participants with incomplete surveys from the analysis. In case that the data is missing at random this simply reduces the sample size and does not violate the random sampling assumption. For analysis with small sample sizes it still implies a loss of valuable information. In case of data that is not missing at random deletion may lead to imprecise or in the worst-case biased estimators (King et al., 2001; Nakagawa & Freckleton, 2011; Wooldridge, 2013, p. 324).

An alternative to deletion is *imputation* which became more prominent in recent years. For this analysis, it was decided to use imputation instead of dropping observations in order to keep the loss of valuable information minimal. Imputation may be conducted in a simple manner such as replacing missing values with the mean value, also referred to as one type of *single imputation*. This approach is problematic as it does not account for uncertainty and may artificially reduce standard errors or lead to biased estimators (see e.g. Little & Rubin, 2002, p. 57 ff.). A more powerful mechanism is the so called *multiple imputation* (Rubin, 1977, 1996) which is preferable over single imputation (see e.g. Nakagawa & Freckleton, 2011). Multiple imputation was conducted using *multivariate imputation by chained equations* (MICE) which is implemented in an R package of the same name (*mice*). For each missing value plausible values are imputed based on modelling the conditional distribution of one variable given all other variables. This is done as iterative process until the dataset is complete (van Buuren & Groothuis-Oudshoorn, 2011).

5.4.2.7 Predictor variables

Based on the theoretical framework a variety of predictors were included in the models. Table 5-5 gives an overview about predictors, their description, coding and coefficients' expected signs. The predictors are classified into four categories: i) (experimental) study design; ii) socio-demographics; iii) sense of connectedness as well as usage of ES / being in nature; and iv) attitudes, perceptions and knowledge regarding ecosystems, species conservation and wolves.

(i) Concerning the method comparison, the predictor variables of primary interest are *stage*, *treatment* and their interaction. In case that one of the *treatment* levels is significant, the associated method would have a significant effect on WTP irrespective of the stage. If *stage* is significant both deliberative methods would be significantly different from CV irrespective of stage. In case that the interactions of *stage* and *treatment* are significant, the WTP differs significantly after deliberation. Thus, a difference between the deliberative methods exists if only one interaction turns out to be significant. As illustrated above, the existing empirical research gives no clear indication how WTP amounts are altered through deliberation. Therefore, the expected direction of the estimates is unpredictable.

Table 5-5 Description, coding and expected sign of predictor variables

Predictor variable	Description	Coding	Exp. sign		
Study <i>stage</i>	Valuation stage within valuation workshop.	1 = first stage	?		
		2 = second stage			
<i>treatment</i>	Indicator for the valuation method used in the specific valuation workshop.	1 = CV 2 = PE 3 = PM	?		
<i>age</i>	Participants' age (measured in categories)	7-point scale from 1 = 16-25 years to 7 = > 75 years	○		
<i>gender</i>	Participants' gender	1 = female 2 = male 3 = diverse	?		
<i>income</i>	Personal disposable income per month	6-point scale from 1 = < €500 to 6 = > €4000	+		
Socio-demographic <i>edu</i>	Highest educational level	6-point scale from 1 = no graduation to 6 = university degree	○		
	<i>urban.residence</i>	Current place of residence	0 = countryside 1 = city	+	
	<i>urban.origin</i>	Predominant place of residence until 16 years old	0 = countryside 1 = city	+	
	<i>member</i>	Participant or person in household is member of an environmental organization	0 = no 1 = yes	+	
	<i>donation</i>	Donation to environmental organisation within past 12 months	0 = no 1 = yes	+	
	<i>hunter</i>	Participant or person in household owns hunting licence	0 = no 1 = yes	-	
	<i>dog</i>	Participant or person in household owns dog	0 = no 1 = yes	?	
	<i>farmer</i>	Participant or person within family engaged in agriculture and/or livestock farming	0 = no 1 = yes	-	
Connectedness & usage <i>INS</i>	Inclusion of Nature in Self (INS) scale – measurement of relationship with nature	7-point scale from 0 = total separation to 7 = total connection	+		
		<i>ICS</i>	Inclusion of Community in Self (ICS) scale – measurement of relationship with society at large	7-point scale from 0 = total separation to 7 = total connection	?
		<i>activities</i>	Recreational activities undertaken in forests, fields, and/or pasture landscapes within past year	Count from 0 to 9	?

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Table 5-5 (continued)

Predictor variable	Description	Coding	Exp. sign
<i>pref_env</i>	Environmental protection ranked as most important spending of public funds	0 = no 1 = yes	+
<i>pref_animal</i>	Protection of rare animal species ranked as most important spending of public funds towards environmental projects	0 = no 1 = yes	+
<i>know</i>	Self-assessed knowledge about wolves	10-point scale from 0 = none to 10 = expert	+
<i>att_sc_1</i>	Attitude toward preservation of rare species for future generations (bequest value)	5-point Likert scale	+
<i>att_sc_2</i>	Attitude toward unimportance of a single species' extinction	5-point Likert scale	-
<i>att_sc_3</i>	Attitude toward mastery of nature in order to meet human needs	5-point Likert scale	-
<i>att_sc_4</i>	Attitude toward satisfaction contributing to species conservation (warm glow)	5-point Likert scale	+
<i>att_sc_5</i>	Attitude toward nature conservation due to intrinsic value	5-point Likert scale	+
<i>att_sc_6</i>	Attitude toward species conservation due to existence rights of animals	5-point Likert scale	+
<i>att_w_1</i>	Attitude toward impossibility of coexistence of humans and wolves	5-point Likert scale	-
<i>att_w_2</i>	Attitude towards wolves' and other predators' contribution to natural balance	5-point Likert scale	+
<i>att_w_3</i>	Attitude toward historic extinction of wolves	5-point Likert scale	-
<i>att_w_4</i>	Attitude toward wolves' benefits for humans	5-point Likert scale	+
<i>att_w_5</i>	Attitude toward wolves as competitors for hunters	5-point Likert scale	?
<i>att_w_6</i>	Attitude toward wolves as hazard for humans	5-point Likert scale	-
<i>att_w_7</i>	Attitude toward wolves as a species worthy of protection	5-point Likert scale	+
<i>att_w_8</i>	Attitude toward wolves as threat for other native species	5-point Likert scale	-
<i>nimby</i>	Support of wolves' establishment close to own residence	0 = no 1 = yes; 2 = maybe	no- yes+ maybe○

Source: Own Illustration

(ii) Turning to the predictors with reference to socio-demographics, no effect is expected for *age* and education (*edu*) due to the nature of the sampling going hand in hand with a low variability of these variables. Although, reviewing 38 quantitative surveys Williams et al. (2002) found that age has a negative correlation with attitudes towards wolves and education a positive one (see also Kleiven et al., 2004; Naughton-Treves et al., 2003).²⁹ The effect of participants' *gender* on stated WTP amounts is unclear. Some studies found that women have a more positive attitudes towards wildlife (Czech et al., 2001; Teel & Manfredo, 2010), whereas others found the opposite to be true in case of attitudes towards wolves (see e.g. Kleiven et al., 2004). The effect of income is expected to be positive as an increasing income is associated with a higher *ability-to-pay* (see e.g. Bateman et al., 1994) and more positive attitudes towards wolves (Williams et al., 2002). Participants having the place of residence currently in a city (*urban.residence*) or grew up in a city (*urban.origin*) are predicted to have a higher WTP, as in general attitudes towards wolves of rural residents are less positive (Heberlein & Ericsson, 2005; Kleiven et al., 2004; Williams et al., 2002). A positive correlation is expected between WTP and membership in an environmental organisation (*member*) (Williams et al., 2002) or donations to the latter within the last year (*donation*). Whereas being engaged in farming or livestock production (or at least having ties to it) (*farmer*) is associated with negative attitudes towards wolves (Naughton-Treves et al., 2003; Williams et al., 2002) and therefore, also an expected negative effect on WTP. The same applies to being engaged in hunting (*hunter*). While attitudes of hunters towards wolves are heterogeneous in a global context (Williams et al., 2002), in Sweden hunters expressed most negative attitudes (Ericsson & Heberlein, 2003). How ownership of a dog (*dog*) effects WTP is unclear. On the one hand, wolves are a potential threat to dogs, on the other hand, dog owners may be more animal-friendly in general.

(iii) Regarding the two measures of connectedness, a high subjective sense of connectedness to nature (*INS*) is likely to result in higher WTP amounts stated, while the opposite is the case for connectedness to society (*ICS*). It is assumed that participants with self-reported strong relationship to society place more weight on the concerns of specific groups effected by wolves, such as farmers and hunters, and/or on the potential threats to human-beings. It is not obvious

²⁹ In their review Williams et al. (2002, p. 577) define attitudes towards wolves simply as 'liking or disliking wolves'. Also the studies of Naughton-Treves et al. (2003) and Kleiven et al. (2004) investigated correlations between socio-demographic variables and attitudes or rather tolerance towards wolves instead of WTP. Still, it is assumed that the directions of correlations are similar.

how the amount of recreational *activities* alters WTP as it could reflect opportunity costs but only if wolves are considered to be a threat which hinders participants from practicing activities.

(iv) Considering attitudes, perception and knowledge the predictor variables can be roughly divided in two groups either in favour of wolves or with negative attitudes towards them. A strong preference for spending public funds towards the environment (*pref_env*) and towards protection of rare animal species (*pref_animal*) are expected to have a positive impact on WTP. The same applies to a high knowledge about wolves (*know*) which can lead to more positive attitudes (Ericsson & Heberlein, 2003), although little empirical evidence for Europe exists and globally the results are mixed (Williams et al., 2002). General attitudes that link rare nature and rare species with bequest value (*att_sc_1*), intrinsic value (*att_sc_5*), existence rights (*att_sc_6*) as well as specific attitudes towards wolves' contribution to a natural balance (*att_w_2*), benefits to humans (*att_w_4*) and worth of protection (*att_w_7*) are expected to increase WTP as well. Lastly *warm glow* (*att_sc_4*), the satisfaction of donating for a good cause in this case species conservation, has a positive expected sign.

On the contrary, participants which consider wolves as a threat towards humans (*att_w_6*) or native species (*att_w_8*), who do not believe in the possibility of coexistence of humans and wolves (*att_w_1*) and think that wolves were extinct for good reason (*att_w_3*) are expected to have a lower or rather negative WTP. This applies also to more general attitudes towards the environment or nature such as the attitude towards (un-)importance of species extinction (*att_sc_2*) and anthropocentric attitudes towards human nature relationships or rather *mastery of nature* (*att_sc_3*). If participants state a *not in my backyard attitude* (NIMBY) – a reluctance against wolves' establishment close to one's place of residence – they are expected to have a lower or even negative WTP. Karlsson and Sjöström (2007) have found that as distance to nearest wolf decreases, attitudes towards wolves become more negative. NIMBY attitudes are not necessarily irrational but may be rational risk averse behaviour (Fischel, 2001). Further, local opposition may arise as the conservation of wolves and their protection status is legally bound on an international and European level.

As illustrated by the overview, the expected signs of the coefficients' estimates are derived from existing literature. The latter is dominantly focussing on countries that have longer experience with wolves or their return such as North America and Scandinavia. Yet, some of these studies found contradicting results. As discussed above, empirical evidence for Germany is lacking so far and it is unclear in how far results are generalisable between countries and

respective culture as well as from a local to a larger scale. Hence, the directions of the predictors may not be as expected based on the literature review.

By means of the quantitative analysis absolute magnitude of WTP and determinants of WTP can be compared between and within the three applied valuation methods. This analysis will shed light on the question whether economic valuation methods represent VAIs implying that elicitation of social values is dependent on the method. Further, social values can be identified based on the process – preference construction due to deliberation and social learning.

To gain a deeper understanding of motivations behind stated preferences in order to identify social values based on intention and value scale, and to assess the consistency of the novel conceptual framework (developed in Section 4.1.2), the regression analysis will be complemented by the analysis of motives behind WTP. The approach to analyse the motives will be described in the following.

5.4.3 Approach towards analysis of motives behind WTP

Besides the quantitative analysis of WTP, the motives behind the stated amounts shall be analysed to evaluate the conceptual framework, better understand responses, e.g. the underlying type of preferences, and to investigate if differences between the methods exist. While the quantitative analysis will show whether WTP differs between methods (H1) and how it changes (H2), the analysis of motives behind WTP shall shed light on the questions why WTP diverges and why it changes, if at all. H3 and H4 suggest that differences exist due to multiple preference orderings which are “activated” through the valuation context and that plural motivations explain the stated WTP. Consistently, these hypotheses will be tested based on stated motives. Also, more general matters related to complexity of the valuation workshop (e.g. difficulty of tasks) and the possibility of preference construction were targeted with follow-up questions and will be compared between the three methods.

In the following, the approach to assess similarity between the three treatment groups (Section 5.4.3.1), the questions/items regarding motives behind WTP (Section 5.4.3.2), the questions/items with respect to the valuation context (Section 5.4.3.3), and the elicitation of subjective sense of connectedness (Section 5.4.3.4) will be described.

5.4.3.1 Similarity between treatment groups

To validate that (potentially found) differences between valuation methods were not the result of some bias or artifacts caused by the sampling into treatment groups, the (dis-)similarity of the latter was assessed by a *Principal Component Analysis* (PCA). PCA is similar to clustering and aims at simplifying complex data into less dimensions while keeping patterns within the data (Lever et al., 2017). Here, PCA was conducted based on participants' socio-demographics, initial attitudes and perceptions, to investigate whether differences exist. Thereby, it can be examined whether a specific group, e.g. members in environmental protection organisations with strong preferences for environmental protection, was clustered in one treatment while another group, e.g. hunters with strong negative preferences towards wolves, was present in another treatment. In the results section a graphical analysis, visualising individuals on the principal component map according to treatment, will be presented in order to identify potential clusters. This was done with the *factoextra* package in R (Kassambara & Mundt, 2017).

5.4.3.2 Motives behind willingness to pay

The development of the questionnaire was based on a deductive approach, meaning that the questions were derived from specific aspects of the conceptual framework. The survey items associated with motives behind WTP were all designed as Likert items. For the analysis the Likert items will be grouped per treatment to identify any potential differences between the valuation methods. Table 5-6 provides an overview about the 26 items (last column).

The left column reports the part of the conceptual framework the items were based on, the centre column specifies the conceptual core and the last column states the specific statements respondents were asked to respond to.³⁰ The 26 potential motives behind WTP are clustered into four major topics within the framework: (perceived) utility; We-preferences and I-preferences; identified needs, preferred end-states, and value indicator; and perception of action's effects.

³⁰ The respective questionnaire can be found in Appendix A – *Workshop Materials*. All statements were originally formulated in German and translated for illustrative purposes here.

Table 5-6 Overview of potential motives behind WTP asked as follow-up questions

Context	Conceptual core		Statement
Perceived (dis-) utility	TEV	Use value	direct Wolves produce a benefit for me because e.g. I like to watch or photograph them.
			indirect Wolves undertake important tasks in nature.
		Bequest value	Wolves should be preserved for future generations.
		Existence value	I may never see a wolf, still it is important for me to know that wolves exist.
		Option value	Wolves should be protected to maintain genetic diversity.
We-preferences / I-preferences	Deontology	Duty	I have a duty to donate when it serves biodiversity and/or nature conservation.
	Interdependent preferences	Sympathy	Donating satisfies me.
		Individual scale	I considered what would be a fair contribution from myself.
	Fairness	Social scale	I considered what would be a fair contribution from everyone.
		Existence rights	Ethical preferences
	Consumer-citizen	Personal (un-) importance	The amount reflects the project's importance for me.
		Societal (un-) importance	The amount reflects the project's importance for society.
		Societal cost scale	Wolves cause excessive costs for society.
		Individual cost scale	Wolves cause excessive costs for me personally.
		Individual utility / self-regarding	People affected should bear the cost themselves.
Societal utility / other-regarding		Wolves threaten the existence of traditional livestock farming.	
Anthropocentric utilitarianism – societal scale		Rare species should only be protected if it does not entail costs to society.	
Anthropocentric utilitarianism – individual scale		Rare species should only be protected if it does not entail costs to me.	
Identified needs	Anthropocentric utilitarianism	Money used for species conservation should rather be used to help people.	
	Project's legitimacy	Wolf management does not need any financial support.	
Preferred end-states	Project's legitimacy	Wolves are superfluous in Germany because they are not threatened globally.	
	Value indicator	Commensurability	Money is not a suitable means to protect wolves, a solution should not be linked to money.
Perception of action's effects	Perceived behaviour control	(Dis-)trust in payment vehicle	I do not trust this type of funding but would provide financial support by other means.
		Project's incredibility	I do not think that I really have to pay.
		Budget constraint	I am not sure if I can afford the stated amount.
		Realisability of project due to payment	I think that the project can be realised due to the payment.

Source: Own illustration

The theoretical foundation of these clusters is more diverse as illustrated in the second column. Although, in the table every item is linked to a single cluster and a single specific theoretical background, items may actually cover more than one topic and/or be interlinked as illustrated in the conceptual framework. For example, anthropocentric utilitarianism occurs with reference to the consumer-citizen dichotomy as well as in a more general form with concern of value hierarchies. The general anthropocentric utilitarianism refers to the “traditional” question of how much weight is given to utility of non-human entities. Another example is the category of utility which refers in Table 5-6 only to the TEV, while interdependent preferences in form of Sen’s sympathy are here subsumed under “We-preferences versus I-preferences”, although certainly also links to utility theory exist. Further, it has to be noted that the concepts may be interpreted differently from a narrow neoclassical economic perspective. For example, a competing explanation for *fairness on a societal scale* (see Table 5-6) would be strategic behaviour.

To further analyse the motives with respect to how they relate to each other and to test the theoretical consistency of the conceptual framework’s dimensionality in form of the clusters, *exploratory graph analysis* (EGA) (Golino & Epskamp, 2017) was applied. EGA is a relatively recent developed method in the field of psychology, to be precise in *network psychometrics*. The implementation was done in R using the *EGAnet* package (Golino et al., 2020; Golino & Demetriou, 2017; Golino & Epskamp, 2017). EGA identifies the dimensions in the network as latent variables by firstly constructing a network via estimating the variables’ correlation matrix, followed by the *graphical LASSO* estimation to obtain the covariation matrix. Then, to identify the network’s dimensions, the *walktrap*, a random walk algorithm (see Pons & Latapy, 2006), is applied. The advantage compared to other network approaches is that EGA does not only estimate the number of clusters within the network but also identifies the variables within each cluster (Epskamp et al., 2017; Golino & Epskamp, 2017). Further, bootstrap with replacement (Efron, 1979) can be applied in order to test the network’s stability and to address potential sample-specificity of the network. Hence, *Bootstrap Exploratory Graph Analysis* will be applied in order to test the dimensions’ stability (see Christensen & Golino, 2019).

5.4.3.3 Valuation context – process

Besides motives, the questionnaire contained further items, summarized in Table 5-7, concerned with the valuation context, to be precise, the process. Three items are associated with the construction of preferences. Participants were asked to evaluate how helpful the discussion was, and if they would need more time and/or more information to state their WTP. All of these items would suggest that participants did not have well-formed or rather ex-ante given preferences. The second theme is associated with environmental goods’ complexity and its relevance for economic valuation. Of interest is what kind of information provision was most helpful, if participants knowledge improved due to the workshop, and how difficult they experienced the task of stating a WTP amount. The latter is especially of concern because stating a WTP amount from a citizen perspective may be perceived as difficult.

Table 5-7 Overview of follow-up questions associated with the valuation context – process

Valuation context Process	Construction of preferences	Information	I do not have enough information to choose an amount.
		Time to reflect	I need more time to reflect to decide.
		Deliberation	The group discussion introduced new aspects that would otherwise not have been included in my decision.
	Complexity	Information provision	What helped you choosing an amount? Information folder; Group discussion; or explanations of the moderator
		Change in knowledge	Did your knowledge about wolves change because of this meeting?
		Difficulty of tasks	How hard or easy was it for you to state an amount (of money)?

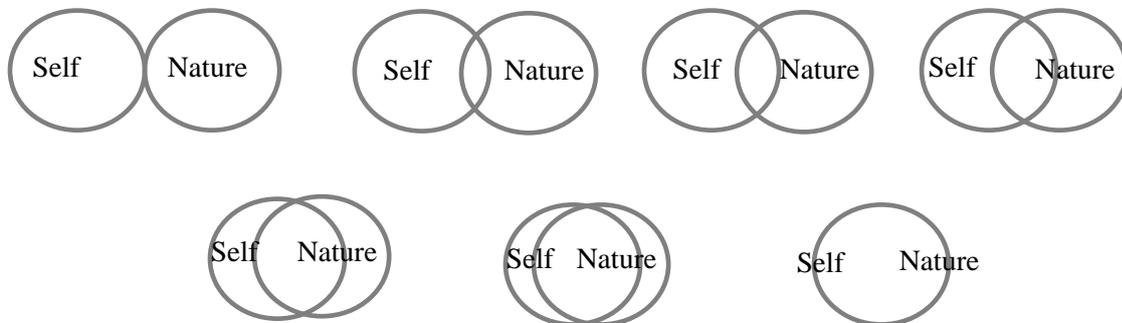
Source: Own illustration

5.4.3.4 Sense of connectedness – “Gesellschaftswesen”

Lastly, the sense of connectedness to nature and society was elicited to evaluate if the conception of *atomistic individuals* as in the neoclassic economic concept or the *Gesellschaftswesen* conceptualised by Kapp’s institutional economic approach is more realistic. To measure the self-assessed connectedness to nature the *Inclusion of nature in self* (INS) scale, an environmental psychological approach, was adapted from Schultz (2002). The advantage of this scale is that it consists of a single pictogram, as illustrated in Figure 5-4, which makes the task fairly easy for participants.

Figure 5-4 Inclusion of Nature in Self (INS) Scale

Please circle the picture below that best describes your relationship with the natural environment. How interconnected are you with nature?

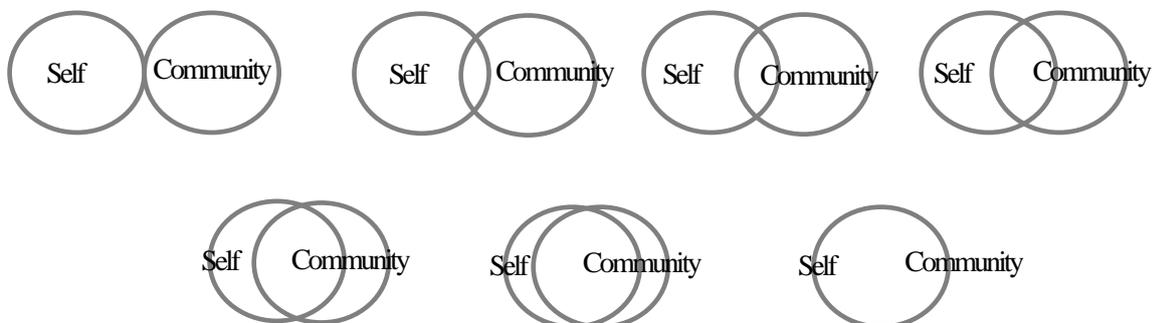


Source: Own illustration adapted from Schultz (2002, p. 72)

To measure the connectedness to society the *Inclusion of Community in Self Scale* (ICS) (Mashek et al., 2007; Mashek et al., 2006) was used. It is basically identical to the INS Scale but instead of asking for the relationship with the natural environment it asks for the relationship with the community at large (see Figure 5-5). Although, these two measures were primarily incorporated for the analysis of motives, due to their quantitative nature they were also included in the quantitative analysis as predictors as discussed above.

Figure 5-5 Inclusion of Community in Self (ICS) Scale

Please circle the picture below that best describes your relationship with the natural environment. How interconnected are you with nature?



Source: Own illustration adapted from Mashek et al. (2006, p. 15)

On the basis of the methodology outlined in this chapter, the four above-described hypothesis can be tested and the two overarching aims of the case study can be analysed: Firstly, test the validity of the conceptual framework developed in Chapter 4 based on analysis determinants of WTP and motivations underlying stated preferences in order to assess consistency of theory and empiricism. Secondly, compare three different economic valuation methods, namely *Contingent Valuation*, *Preference Economisation* and *Preference Moralisation*, with regards to their effects on WTP and motivations and the associated identification and elicitation of social values.

Having outlined the methodology, in the following chapter the results of the case study will be presented and discussed.

Chapter 6 Exploring social values and motivations: Results

This chapter presents the results of the case study taking wolf management in Germany as an example. As discussed in the foregone chapter, the aim of the study is two-fold. Firstly, the validity of the framework developed in Chapter 4 shall be tested and secondly, a method comparison of CV, PE and PM will shed light on the role of the valuation method for elicitation of social values. The analysis focuses on i) absolute magnitude of WTP, ii) determinants of WTP, and iii) motivations behind stated preferences. On this basis, social values can be identified with respect to intention (type of preferences expressed), process (significant changes in preferences due to preference construction caused by deliberation/social learning), and/or scale (values beyond the individual, e.g. with reference to society).

The assessment of the framework's consistency as well as the identification of social values comprises the following consecutive steps: Firstly, the results of a descriptive analysis will be presented (Section 6.1). Secondly, the results of the regressions will be presented to test H1 and H2 (Section 6.2). Thirdly, the analysis of motives behind WTP will address H3 and H4 (Section 6.3). Fourthly, the follow-up questions regarding information, complexity of tasks and preference formation will be analysed (Section 6.4). Lastly, the results will be discussed and conclusions about the study's results will be drawn (Section 6.5).

6.1 Descriptive analysis

The descriptive analysis provides an overview about the sample, project support and WTP. First, the sample's characteristics with respect to socio-demographics and initial survey questions, e.g. attitudes, will be described with a special focus on similarity between the treatments' subsamples (Section 6.1.1). On this basis, the project support in terms of preferred projects (increase in wolf population versus decrease in wolf population) and changes in preferred projects after deliberation will be compared between the treatments (Section 6.1.2). Thereafter, WTP will be described in terms of mean WTP, individual bids and changes after deliberation. These three dimensions of WTP will be compared between all relevant units of analysis – treatments, groups and individuals (Section 6.1.3).

6.1.1 Sample characteristics

Table 6-1 presents the sample characteristics regarding the socio-demographic variables for each subsample, corresponding to the valuation methods (CV, PE and PM), and for the overall sample. Due to the sampling strategy participants were relatively young without large variability in age, mainly with low income, highly educated and primarily living in cities. The sample is relatively balanced regarding participants' origin from either cities or countryside. Around one third of participants are members of an organisation related to environmental topics and about the same number of participants has donated money towards environmental projects within the last twelve months. Around 18% of the sample own a dog and the same percentage of participants had a connection to farming in form of either being active themselves or someone within their family/household. Only a small fraction of participants owns a hunting license or has someone within their household/family owning one.

The sample cannot claim to be representative in any way, yet, as discussed above this is not of concern for the method comparison. Instead, the sampling aimed at obtaining relatively homogeneous subsamples in order to avoid artifacts when analysing and interpreting the regression results. The sample characteristics show that the subsamples are well balanced regarding socio-demographics (see Table 6-1), initial attitudes, perception and knowledge (see Table C-1 in Appendix C – *Supplementary descriptive statistics*), and self-reported connectedness to nature and society as well as usage of relevant ES (see Table C-2 in Appendix C – *Supplementary descriptive statistics*).

Identifying social values of ecosystem services

Table 6-1 Sample characteristics: Socio-demographics

	CV (n=48)	PE (n=46)	PM (n=47)	Overall (n=141)
age				
Mean (SD)	1.23 (0.425)	1.28 (0.544)	1.30 (0.462)	1.27 (0.476)
Median [Min, Max]	1.00 [1.00, 2.00]	1.00 [1.00, 3.00]	1.00 [1.00, 2.00]	1.00 [1.00, 3.00]
gender				
female	24 (50.0%)	20 (43.5%)	33 (70.2%)	77 (54.6%)
male	24 (50.0%)	25 (54.3%)	13 (27.7%)	62 (44.0%)
diverse	0 (0%)	1 (2.2%)	1 (2.1%)	2 (1.4%)
income				
Mean (SD)	1.85 (0.684)	1.98 (0.649)	1.89 (0.634)	1.91 (0.654)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]
edu				
Mean (SD)	4.52 (0.875)	4.52 (0.983)	4.55 (0.880)	4.53 (0.907)
Median [Min, Max]	4.00 [4.00, 6.00]	4.00 [2.00, 6.00]	4.00 [4.00, 6.00]	4.00 [2.00, 6.00]
urban.residence				
0	2 (4.2%)	4 (8.7%)	1 (2.1%)	7 (5.0%)
1	46 (95.8%)	42 (91.3%)	46 (97.9%)	134 (95.0%)
urban.origin				
0	23 (47.9%)	25 (54.3%)	27 (57.4%)	75 (53.2%)
1	25 (52.1%)	21 (45.7%)	20 (42.6%)	66 (46.8%)
member				
0	39 (81.2%)	28 (60.9%)	28 (59.6%)	95 (67.4%)
1	9 (18.8%)	18 (39.1%)	19 (40.4%)	46 (32.6%)
donation				
0	38 (79.2%)	26 (56.5%)	24 (51.1%)	88 (62.4%)
1	10 (20.8%)	20 (43.5%)	23 (48.9%)	53 (37.6%)
hunter				
0	46 (95.8%)	42 (91.3%)	46 (97.9%)	134 (95.0%)
1	2 (4.2%)	4 (8.7%)	1 (2.1%)	7 (5.0%)
dog				
0	42 (87.5%)	38 (82.6%)	35 (74.5%)	115 (81.6%)
1	6 (12.5%)	8 (17.4%)	12 (25.5%)	26 (18.4%)
farmer				
0	40 (83.3%)	37 (80.4%)	38 (80.9%)	115 (81.6%)
1	8 (16.7%)	9 (19.6%)	9 (19.1%)	26 (18.4%)

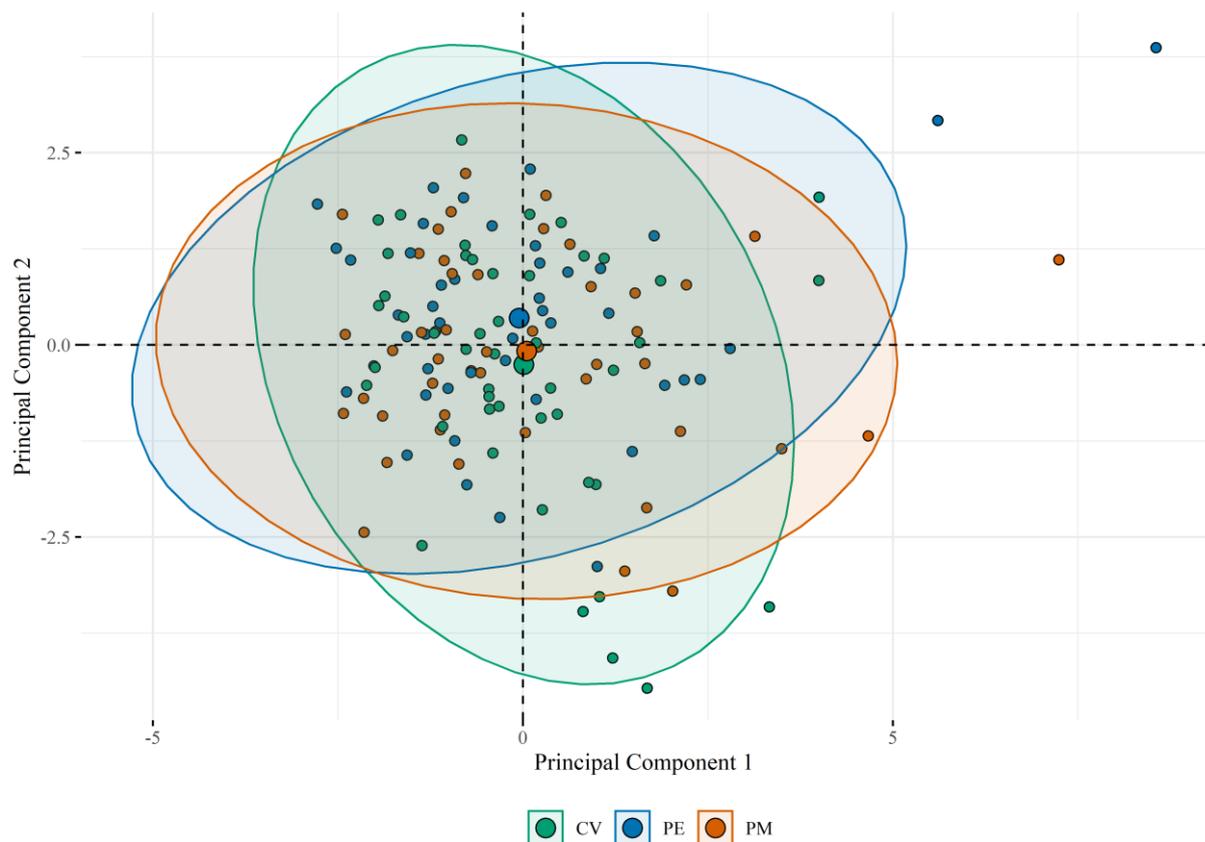
Source: Own illustration

Note that as discussed in the methods (Section 5.4), age, income and education are referring to categories and not absolute numbers.

As discussed in the methods (Section 5.4), also a PCA analysis was conducted in addition to the descriptive statistics in order to assess the similarity of subsamples. Figure 6-1 illustrates this comparison of subsamples based on the PCA analysis. The important finding is the heavy overlap of subsamples' ellipses which implies low variability between them. This confirms the analysis of the sample's characteristics.

Further, the mapping of the individuals shows that in each subsample the participants are spread over all quadrants and do not show any clustering. A cluster would indicate a specific grouping structure, e.g. only participants with a membership in an environmental organisation and positive attitudes towards wolves. In other words, the similarity map (Figure 6-1) suggests that, although the sampling strategy was not completely random and not aiming at a representative sample, within the acquired sample the data is random and does not show any obvious patterns. This is a prerequisite for the method comparison. Hence, potentially found effects and differences in WTP and motives are not caused by biased subgroups.

Figure 6-1 Comparison of similarity between subgroups based on PCA



Source: Own illustration

6.1.2 Project support

Having illustrated the sample’s characteristics, we now turn to the description of the project support. Table 6-2 summarises the project support per treatment and stage (two WTP elicitation rounds in case of deliberative valuation). While WTP is also considered to be an expression of project support, the results illustrated in Table 6-2 are based on the explicit question which project is supported before the WTP elicitation. The majority of participants were in favour of an increased wolf population, whereas only a small amount supported a decrease in wolf population. About the same number of participants were in favour of the status quo.

Table 6-2 Number of participations with preference for and against increase of wolf population in first and second elicitation

	Contingent Valuation	Preference Economisation		Preference Moralisation	
		Stage			
Preferred project		First	Second	First	Second
Increase population	41	41	40	40	42
Status quo	4	2	3	3	3
Decrease population	3	3	3	4	2

Source: Own illustration

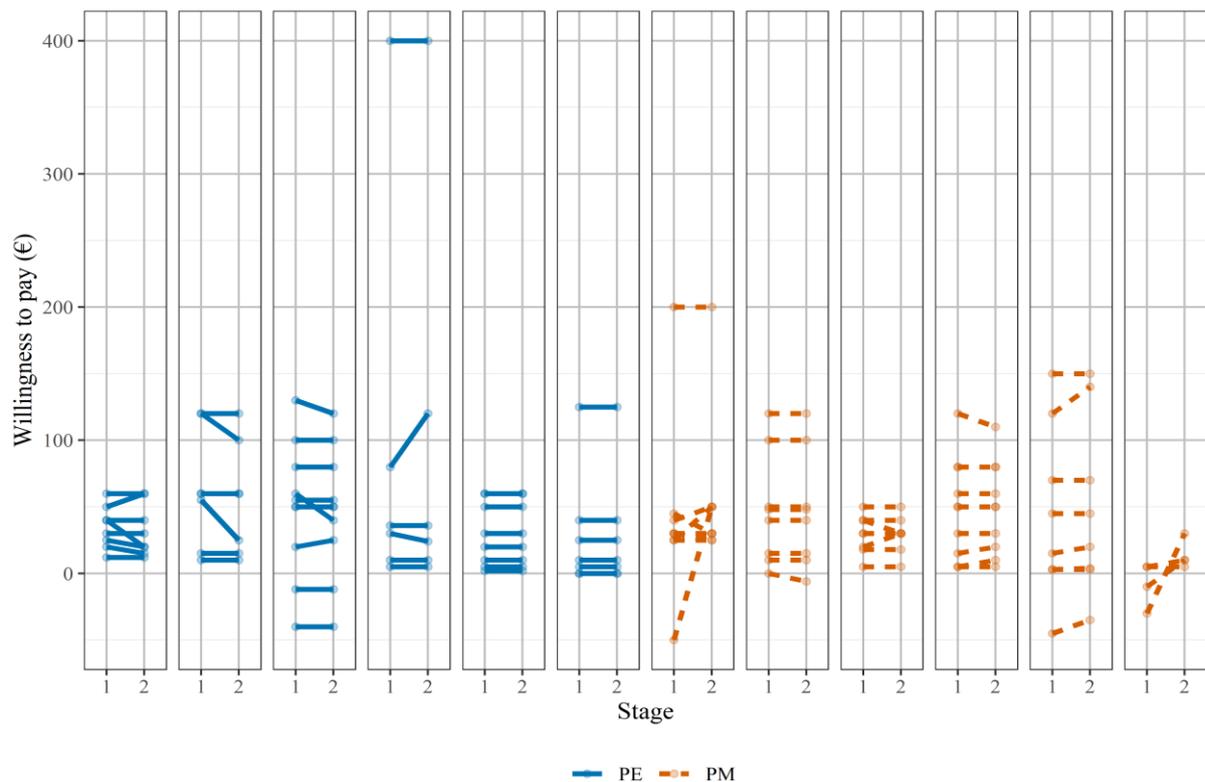
In the deliberative treatments minor differences can be seen after the group discussions. In the PE treatment one participant less supported the increase, while one more supported the status quo. In contrast, in the PM treatment the decrease in wolf population was supported by two participants less, whereas two additional participants supported the increase.

6.1.3 Willingness to pay

On the basis of the project support, in the following the aggregated and disaggregated WTP will be depicted. Beginning with disaggregated WTP, Figure 6-2 illustrates changes in individual WTP after deliberation. Each panel represents one of the twelve deliberative valuation workshops. Within each panel, dots reflect participants’ stated WTP amounts and lines connect each participants’ elicited amounts before and after the deliberative intervention. A WTP below zero implies that participants are in favour of decreasing the wolf population.

Figure 6-2 shows that only in two groups (both PE treatment) none of the participants stated a WTP amount diverging from the first elicitation. In contrast, alterations of individual WTP occurred in the other ten groups. As indicated by the steepness and length of the lines, some changes were minor while others appear to be major. It is noteworthy that in three PM workshops participants' WTP changed from negative to positive. On contrary, one participant in the PM treatment changed preferences from a zero WTP to a negative one at the second stage.

Figure 6-2 Changes in individual WTP per stage



Source: Own illustration

Table 6-3 provides a summary about the number of changes and the direction of change regarding participants' WTP after deliberation for each (deliberative) treatment. The table reports the count of changes as well as the percentage change relative to the subsample size. In the PE treatment around three quarter of participants did not alter their stated amounts. While one quarter of participants did report different amounts, most of them reduced their stated amounts compared to before. Only three participants, 6.5% relative to the 46 participants in the subsample, had a higher WTP than before. In contrast, in the PM treatment more than a third of the participants changed their stated amounts and mostly stated a higher amount (27.7%), whereas 10.6% reported a lower WTP than before.

Table 6-3 Number of changes in participants' WTP after deliberation

Change in WTP	Method	
	Preference Economisation	Preference Moralisation
↑	3 (6.5%)	13 (27.7%)
=	35 (76.1%)	29 (61.7%)
↓	8 (17.4%)	5 (10.6%)

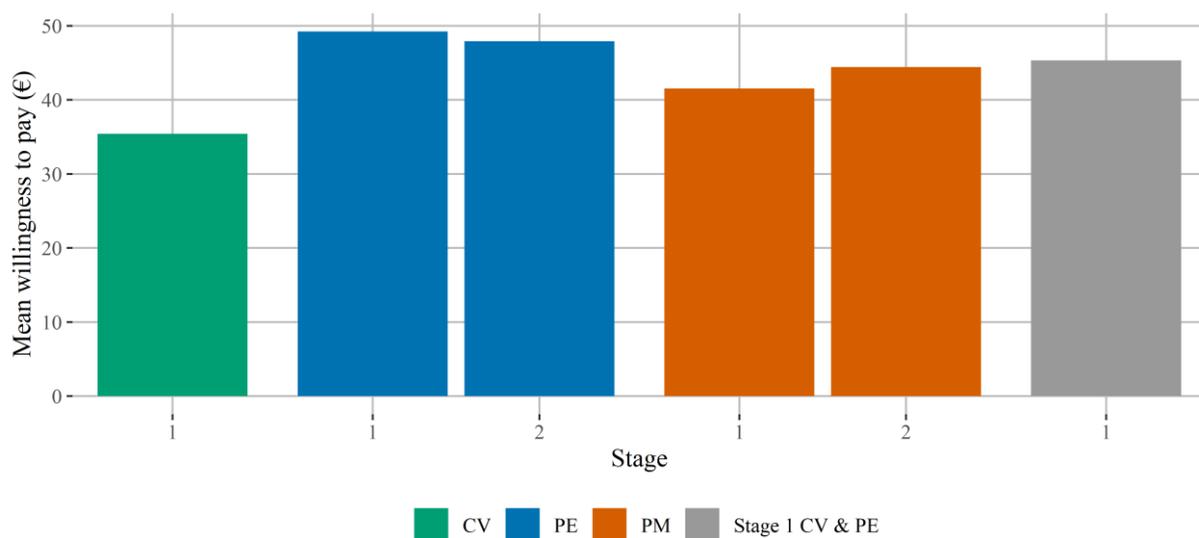
Source: Own illustration

The figures represent absolute numbers and the figures in brackets the change relative to subsample size.

Turning to mean WTP, the simultaneous aggregation of negative and positive WTP would be problematic. Hence, in the following the summary statistics will be based on WTP amounts left-censored at zero.

Figure 6-3 reports mean WTP per valuation method and stage. In addition, the sixth bar (grey) reports mean WTP for the CV treatment and the WTP amounts elicited at the first round of the PE treatment. In the PE treatment, WTP amounts before deliberation are elicited on the basis of the CV procedure and have an identical framing. Hence, also the PE amounts at stage one can be considered to be amounts elicited by CV which justifies the aggregation. Note that this does not apply to WTP amounts elicited at the first stage in the PM treatment due to the social framing of the tasks/questions.

Figure 6-3 Mean WTP per method and stage



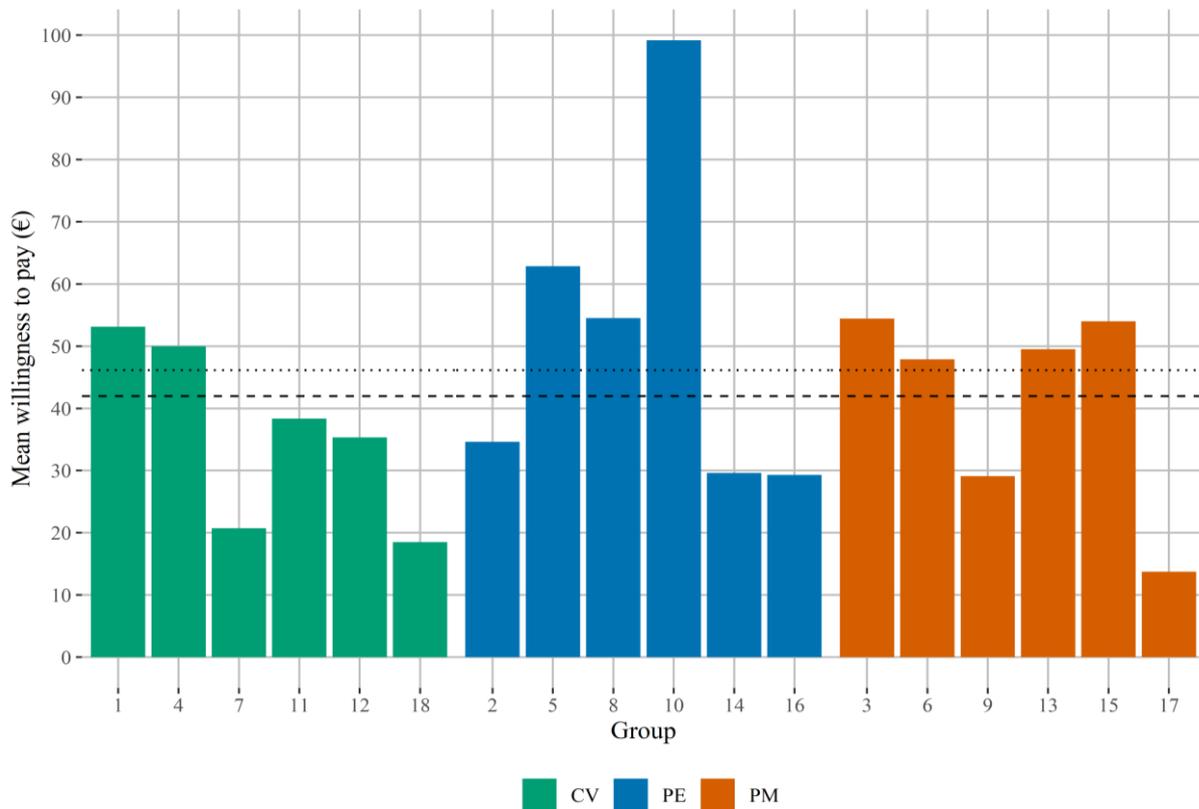
Source: Own illustration

At a first glance, the mean WTP of the CV treatment group (€35.4) appears to be considerably smaller than mean WTP of the PE treatment (stage one: €49.2) and the mean WTP of the PM treatment (stage one: €41.5). Yet, this disparity may rather be caused by the small sample size as indicated by the grey bar, the aggregated mean of CV and PE amounts elicited at stage one.

Comparing mean WTP between the two deliberative methods and stages confirms the first indications gained by the analysis of individual WTP amounts: firstly, mean WTP is smaller (-2.6%) after deliberation in case of the PE treatment. Secondly, mean WTP is higher (+7%) at stage two in the PM treatment.

Figure 6-4 shows that substantial differences between mean WTP of the eighteen groups exist. The dashed line indicates the overall aggregated mean at the first stage, while the dotted line represents the overall aggregated mean at the second stage. As seen in the figure, the overall mean is larger at the second stage than at the first stage (€46.15 compared to €41.96). Further, these differences seem to occur irrespective from the valuation method as the variation within treatments appears to be large.

Figure 6-4 Mean WTP per group

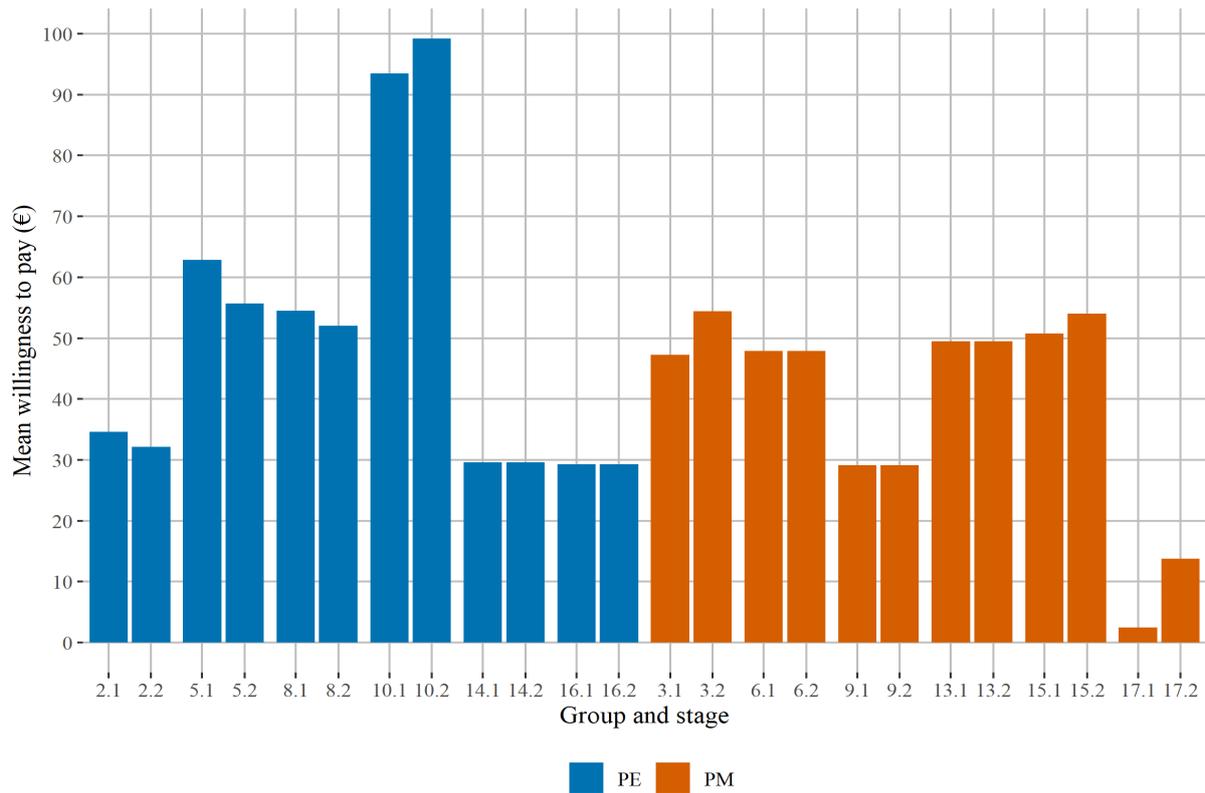


Source: Own illustration

The dashed line indicates the mean WTP at stage one and the dotted one the mean WTP at stage two.

Figure 6-5 illustrates the changes of mean willingness within the groups with respect to stage in more detail. It is noteworthy that in half of the PE valuation workshops the mean WTP was smaller at the second stage, only once higher and two times unchanged. In contrast, in the PM valuation workshops for half of the groups the mean WTP increased after the treatment interventions. For the other half the mean WTP remained identical.

Figure 6-5 Mean WTP per group and stage



Source: Own illustration

Considering the small sample size and potentially influential observations, Table 6-4 reports median WTP in addition to mean WTP. The overall findings do not seem to differ to a large degree. The median WTP at stage two decreased in case of the PE treatment by €8 which is more than a fifth, while it did not change in the PM treatment.

Table 6-4 WTP summary statistics per treatment

Variable	Contingent Valuation	Preference Economisation		Preference Moralisation	
		Stage			
		First elicitation	Second elicitation	First elicitation	Second elicitation
N	48	46	46	47	47
Mean WTP (€)	35.4	49.2	47.9	41.5	44.4
Mean WTP change (€)	-	-1.3 (-2.6%)		+2.9 (+7%)	
Median WTP (€)	22.5	38	30	30	30
Median WTP change (€)	-	-8 (-21%)		0 (0%)	
Minimum bid (€)	0	0	0	0	0
Maximum bid (€)	120	400	400	200	200

Source: Own illustration

In summary, the analysis suggests that mean WTP differs between the valuation methods and that WTP was altered by the different interventions. The next section will assess whether these differences are significant and test the associated hypotheses. Additionally, based on the regression analysis further determinants of WTP will be identified.

6.2 Regression analysis

The regression analysis is split into three parts. The first part deals with methodological concerns, namely treatment of predictor variables (Section 6.2.1) and residual analysis (Section 6.2.2). The latter involves checking if the assumptions of the applied estimation strategies are met. Based on these two topics of methodological nature, the part of primary interest follows which presents the results of differences in WTP and the identification of determinants of WTP (Section 6.2.3).

6.2.1 Testing variable transformation: Age and income

As indicated by the above-described predictor variables (see again Section 5.4.2.7, Table 5-5), age and income were originally coded as ordinal response variables despite their continuous nature. Treating these variables as either numerical, ordinal or categorical is a trade-off between

loss of information considering complex relationships between predictors and WTP and degrees of freedom. On the one hand, age and income may in theory be better predicted incorporating a non-linear relationship (quadratic and/or cubic polynomials). On the other hand, this would introduce additional predictors into the model. Keeping in mind the relatively low sample size and the sample's homogeneity regarding these variables due to the nature of the sampling process, it may be adequate to treat age and income simply as integers for the sake of reducing the models' complexity, although, the data was collected in terms of age groups.

Alternatively, Pasta (2009) suggests to account for unequal spacing among ordinal variables and to code these variables corresponding to the categories' midpoints. So, participants' age groups (originally coded as 16-25; 26-35; and 36-45) would be coded numerically as 20.5; 30.5 and 40.5. Accordingly, income categories would be transformed to 419; 750; 1500.5 and 2500.5. Due to the trade-offs involved, it will be tested how the models perform regarding coding of the variables *age* and *income* by comparison of AICc and cAIC (see Table 6-5 for models' performance).

Table 6-5 Comparison of model performance regarding treatment of ordinal variables as numeric

Model / criteria	AICc	cAIC	R ²	
			marginal	conditional
m1	840.49	728.13	0.42	0.5
m1.ord	846.53	730.82	0.42	0.5
m1.trsf	858.34	729.18	0.42	0.49
m2	574.91	306.00	0.42	0.92
m2.ord	581.45	306.95	0.41	0.92
m2.trsf	592.16	306.02	0.42	0.92

Source: Own illustration

Regarding the first mixed effects model (between-group design, see Section 5.4.2.1), the model that treats the ordinal response variables simply as continuous, *m1*, performs best in terms of AICc in comparison to the model that treats these variables as ordinal, *m1.ord*, and the transformed-numerical model, *m1.trsf*. The latter followed the transformation recommended by Pasta (2009). Also in terms of cAIC model *m1* performs best, although the differences are smaller. In terms of R²s, the models do not show any substantial difference in performance. The same applies for the second mixed effects model (within-group design, see Section 5.4.2.1), *m2*, and the respective models with alternative variable treatment, *m2.ord* and *m2.trsf*. This suggests that the model's performance is not positively affected by treating age and income as

ordinal or by applying a transformation. Therefore, in the following the variables age and income are simply treated as numerical without transformations.

6.2.2 Residual analysis

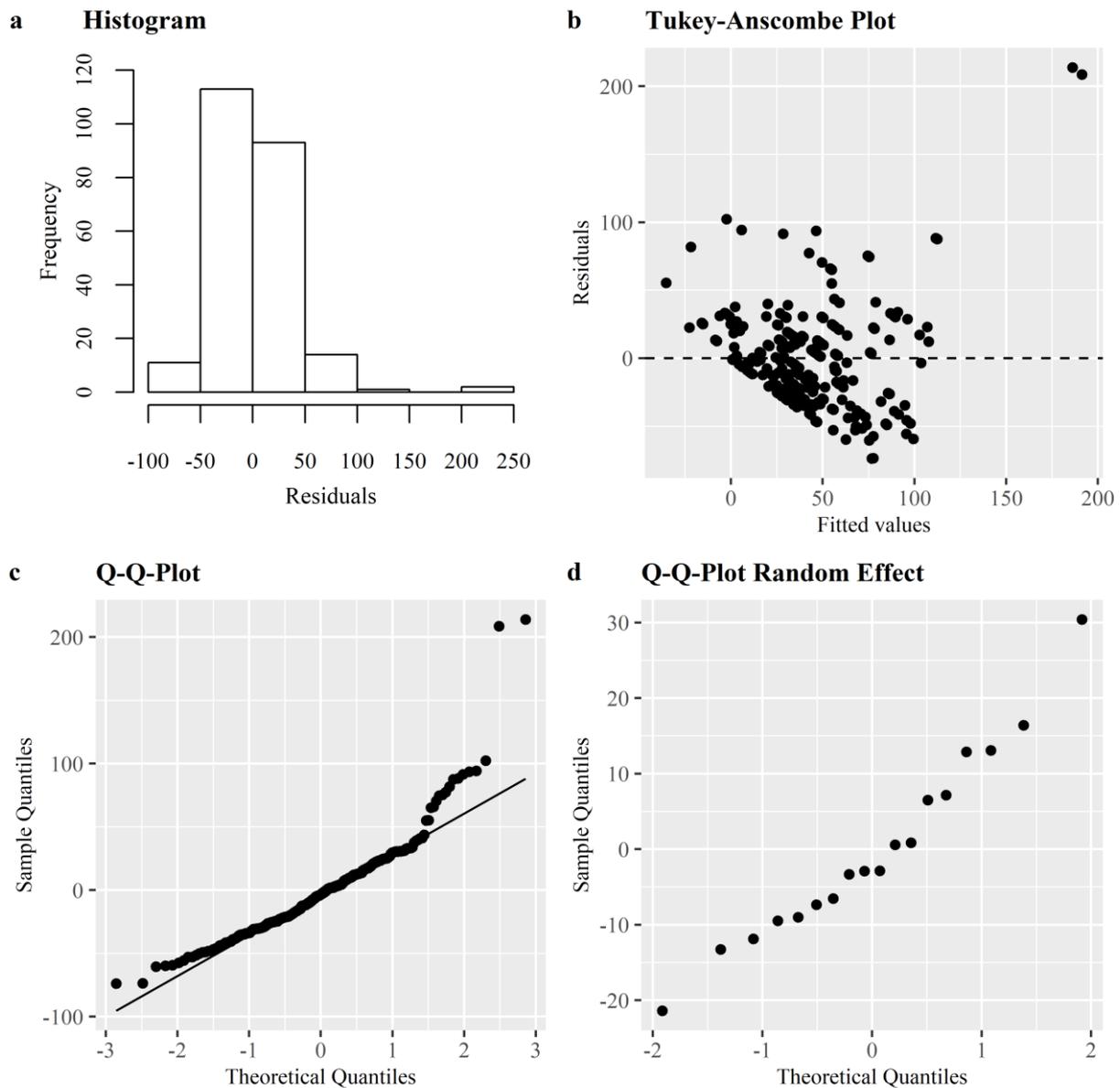
As discussed above, residuals were analysed on the basis of a graphical analysis, the Shapiro-Wilk normality test and Levene's Test. Thereby, deviations from normality and existence of heteroscedasticity will be checked. In case of presence of non-normality and/or heteroskedasticity the application of the above-described robust regression method is necessary.

As discussed above, the elicited WTP was restricted at zero.³¹ The residual plots for the model with restricted (but untransformed) WTP are illustrated in Figure 6-6. Panel *a* contains the histogram of residuals, panel *b* plots the fitted values against the residuals (Tukey-Anscombe Plot), panel *c* shows the Q-Q plot which plots normal quantiles versus residuals quantiles, and in panel *d* normal quantiles are plotted against the random effect quantiles.

The histogram (panel *a*) and the Q-Q plot (panel *c*) clearly indicate deviations from normality which the Shapiro-Wilk normality test ($W = 0.8894$, $p\text{-value} < 0.001$) also suggests. The random effects appear to be roughly normal. In the Tukey-Anscombe plot it can be seen that the variance of residuals is not equally spread which is caused by the restriction at zero (bottom left corner) and some observations which may be outliers (e.g. top right corner). The Levene's test ($F = 2.512$; $p\text{-value} = 0.001$) suggests presence of heteroscedasticity.

³¹ For the residual analysis of the between-group design model with the "raw" data, meaning unrestricted and untransformed willingness to pay, see Figure E-1 in Appendix E – *Supplementary residual plots*.

Figure 6-6 Residual plots of untransformed mixed effects model: between-group design

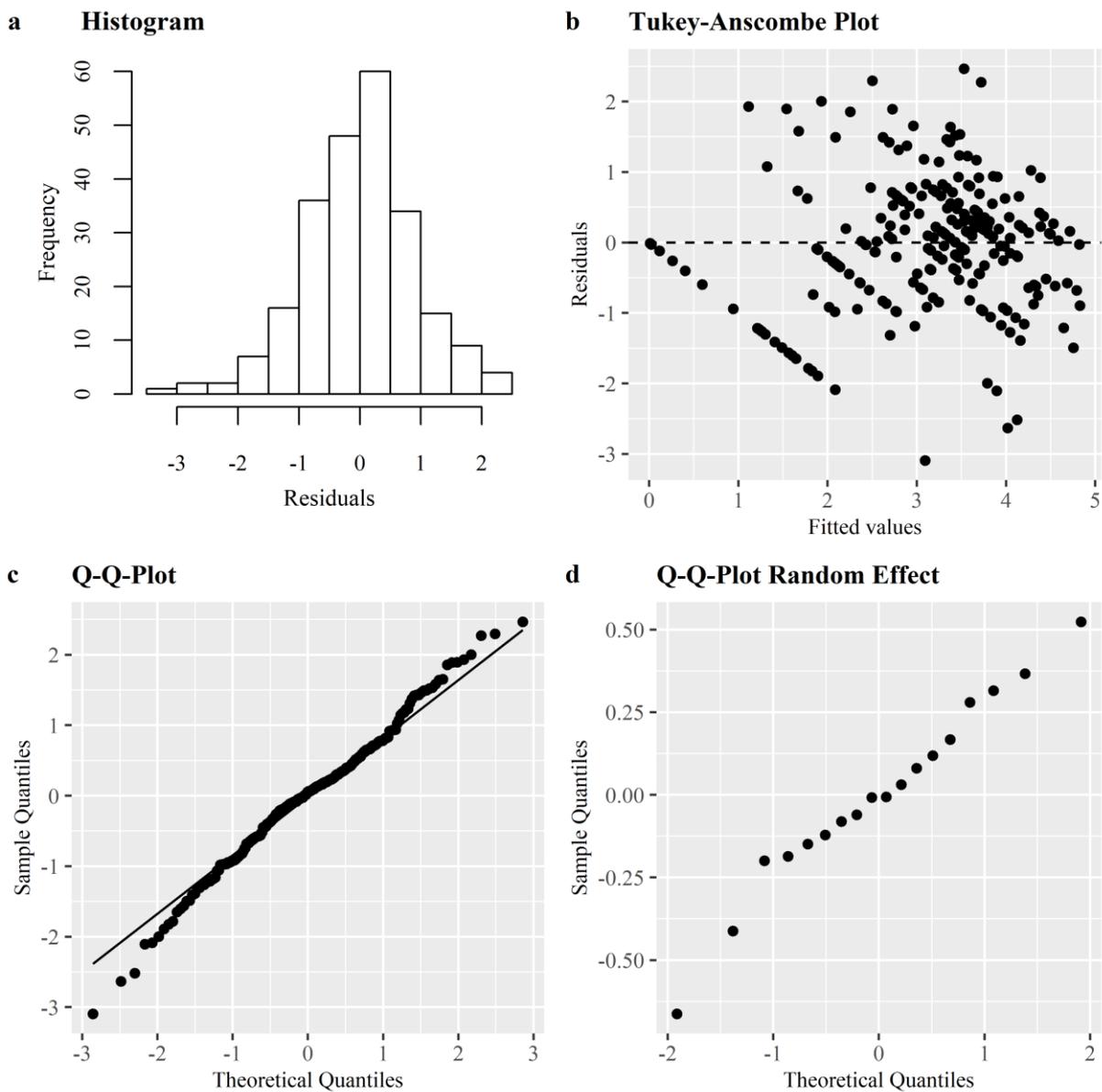


Source: Own illustration

Figure 6-7 illustrates the residual plots for the between-group design model with the above-discussed logarithmic-transformation of WTP. As it can be seen from the histogram (panel *a*), the transformation was useful as the distribution of the histogram roughly follows a normal distribution. The Q-Q plot (panel *c*) does not show complete alignment with the trend line, yet, the “tails” deviate only a little bit and also the Shapiro-Wilk test ($W = 0.991$; $p\text{-value} = 0.155$) does not suggest a deviation from normality. In addition, the random effects appear normally distributed as illustrated in the Q-Q plot in panel *d*.

The Tukey-Anscombe plot (panel *b*) illustrates that the logarithmic transformation dealt with the extreme outlier, yet, it still suggests heteroscedasticity. In the bottom left corner, a pattern becomes visible due to the truncation of WTP at zero. Additionally, there appears to be a slight bulk above the zero-line. The Levene’s Test confirms the existence of heteroscedasticity ($F = 2.5472$; $p\text{-value} = 0.001$).

Figure 6-7 Residual plots of mixed effects model: between-group design



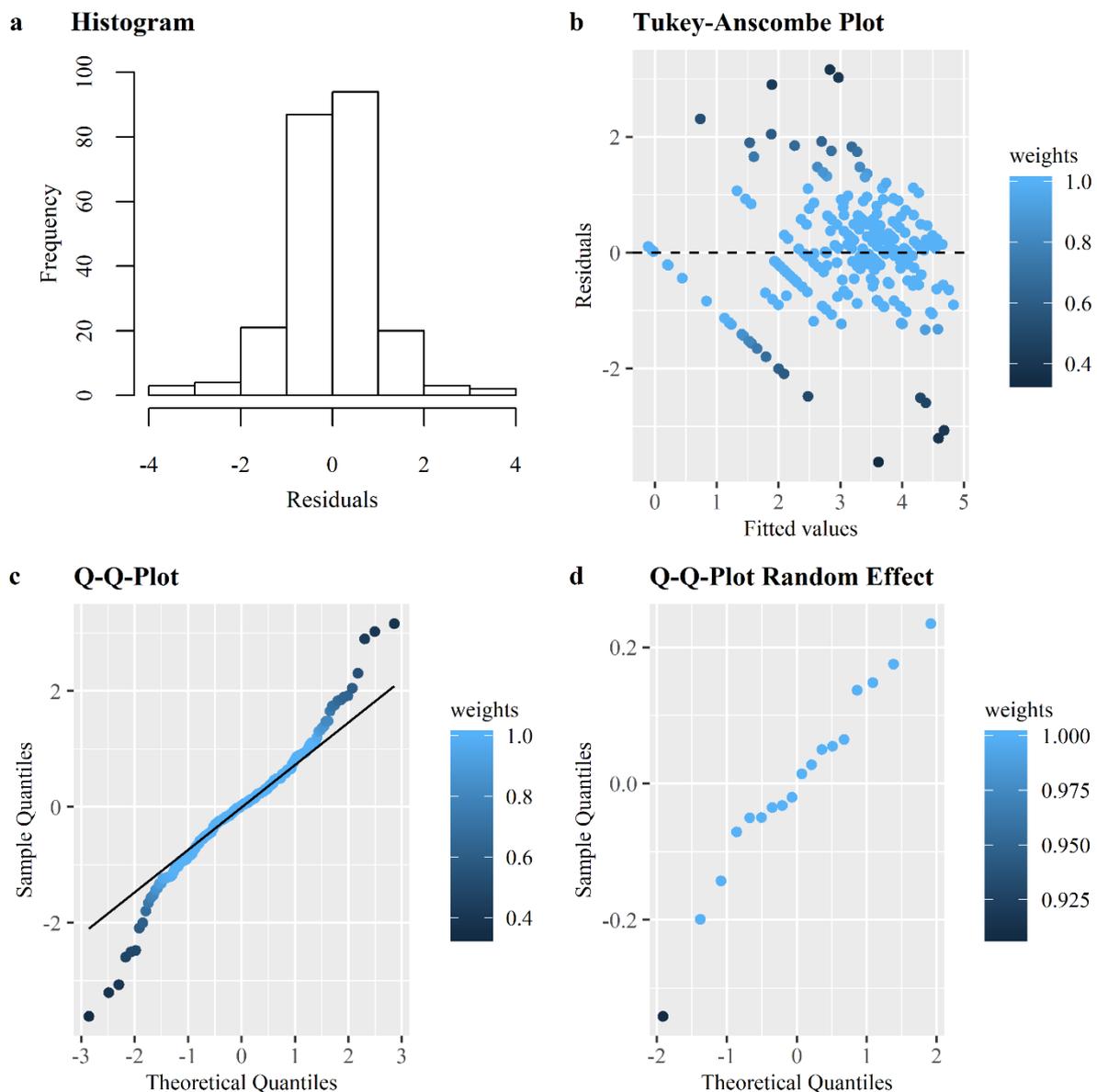
Source: Own illustration

As discussed in the methods (Section 5.4), bootstrapping and robust regression methods can be applied in order to cope with the issues of small sample size and deviations from normality. Robust regressions are also able to handle heteroskedastic data, whereas the above-described

bootstrap approach, *residual resampling*, is sensitive to heteroskedasticity (Davidson & MacKinnon, 2006). Thus, in the following only the robust regression results will be presented.³²

As it can be seen from the residual plots of the robust mixed effect model (Figure 6-8), robustness weights are applied to outliers occurring in observations and/or random effects as indicated by the dark blue points to account for heteroscedasticity and/or deviations from normality.

Figure 6-8 Residual plots of robust mixed effects model: between-group design.

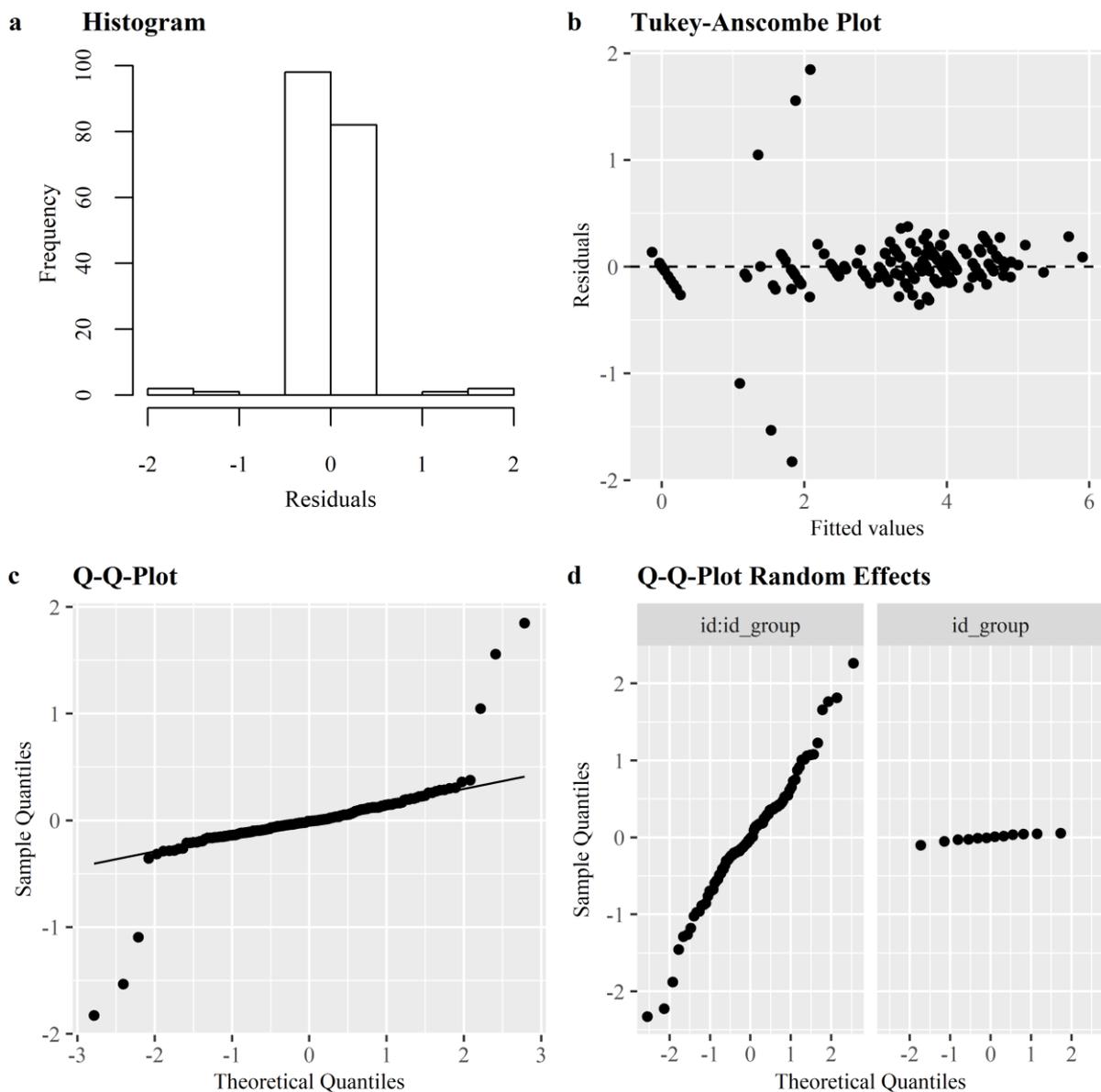


Source: Own illustration

³² For consistency, the bootstrap results are included in Table D-1 and Table D-2 in Appendix D – *Supplementary regression results*. However, due to the presence of heteroscedasticity the results are not reliable.

Turning to the second model (within-group design), Figure 6-9 illustrates the residual plots. The histogram (panel *a*) and the Q-Q plot (panel *c*) clearly indicate deviations from normality which is also confirmed by the Shapiro-Wilk normality test ($W = 0.634$; $p\text{-value} < 0.001$). The distribution of the random effects seems to be of less concern (see panel *d*). Further, based on the Tukey-Anscombe plot (panel *b*) the variance of the residuals does not appear to be constant which is confirmed by the Levene's Test ($F = 6.731$; $p\text{-value} < 0.001$).

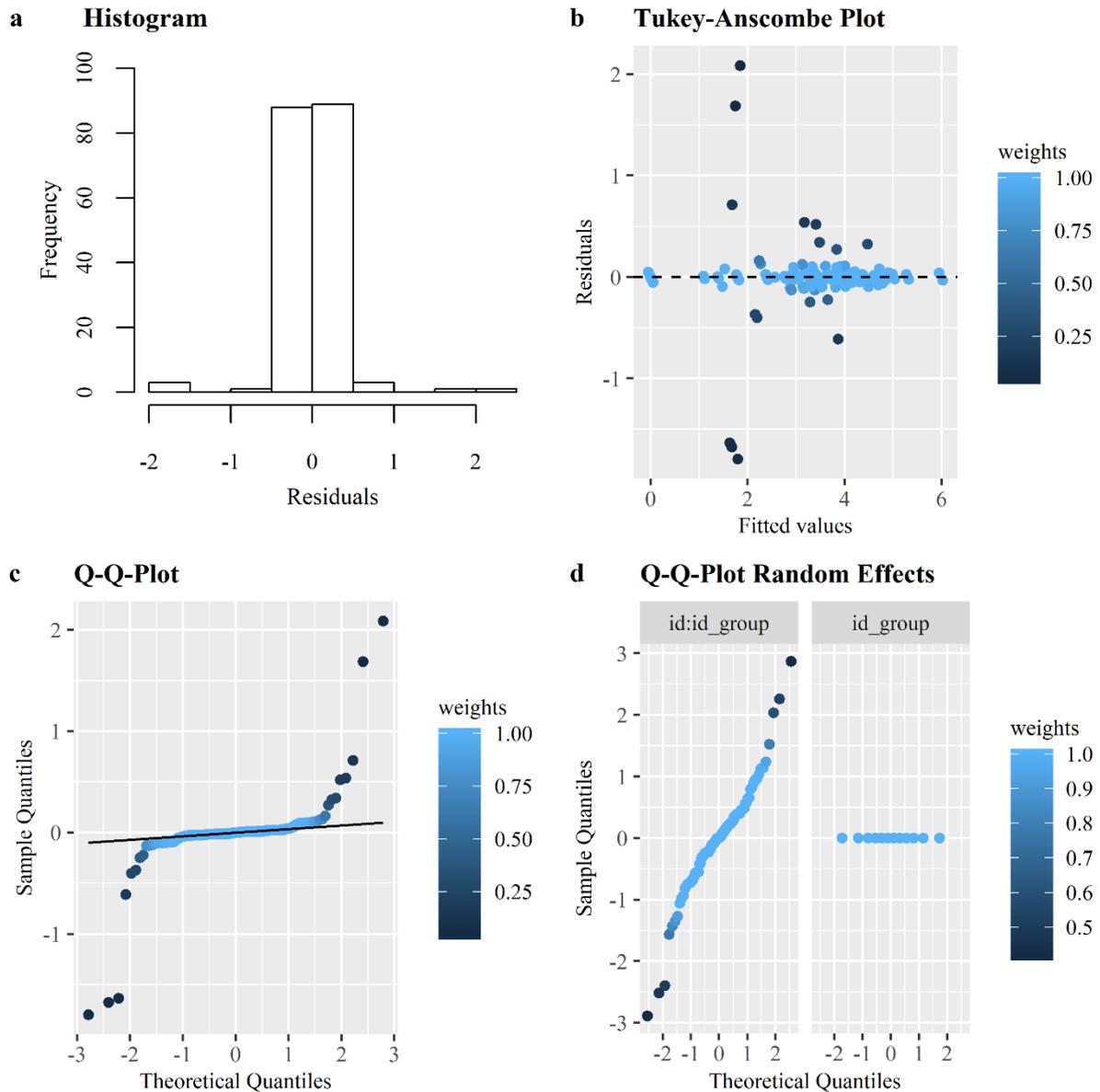
Figure 6-9 Residual plots of mixed effects model: within-group design



Source: Own illustration

Again, a robust linear mixed effect model was applied to account for deviations from normality and presence of heteroscedasticity. In Figure 6-10 the dark blue shades indicate the down-weighting by the applied robustness weights.

Figure 6-10 Residual plots of robust mixed effects model: within-group design



Source: Own illustration

Due to the illustrated deviations from normality and/or existence of heteroscedasticity in both models, the results of the robust regressions will be presented in the following because robust regressions are able to deal with these issues.

6.2.3 Identifying determinants of willingness to pay

The following section analyses the predictors determining variation in WTP for an increase in Germany's wolf population. The analysis is based on the theoretical framework developed in Chapter 4 and the methods described in Section 5.4. H1 will be tested on the basis of the first mixed effects model and H2 will be tested by means of the second mixed effects model. Further, the analysis of determinants of WTP will provide insights about H4 with regards to the role of attitudes (note that the role of non-utilitarian and non-consequentialist preferences will be analysed based on the motives).

Table 6-6 presents the regression results of the between-group design.³³ The first column reports the predictor variables (*Predictors*), followed by the estimated coefficients (*Coef.*), the associated standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*) and p-values (*p*). As discussed earlier, the dependent variable (WTP) was log-transformed. Therefore, the last column reports the back-transformed estimated coefficients (*back-transf. coef.*) representing the proportional change (%) in WTP for each coefficient, all other things being equal. The bottom part of the table summarises measures related to the random effects: the total variance explained by the model (σ^2), the variance explained by the random effects ($\sigma^2_{id_group}$), the *ICC*, the number of groups (N_{id_group}), the number of overall *observations*, the marginal R^2 (R_m^2) and the conditional R^2 (R_c^2). Multicollinearity was not a concern as the VIFs were far below the benchmark of five.

The marginal R^2 is quite considerable for a contingent valuation study implying that the fixed effects explain almost 53% of variation in WTP. Yet, many predictor variables turned out to be insignificant. In comparison to the predictor variables, the grouping structure was of relatively low importance as suggested by the slightly larger conditional R^2 (0.556) compared to the marginal R^2 (0.526) and the relatively low *ICC* (0.06). The latter shows that only six percent of the variation in WTP is explained by belonging to a specific group, hence group effects did not play a severe role.

³³ Only the robust regressions results will be presented in the following.

Identifying social values of ecosystem services

Table 6-6 WTP robust mixed effects model regression results: between-group design

<i>Predictors</i>	Robust model 1					<i>Back-transf. coef.</i>
	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	
(Intercept)	0.37	1.19	-1.96 – 2.70	0.31	0.754	44.8
PE	0.17	0.25	-0.31 – 0.65	0.69	0.500	18.5
PM	0.01	0.25	-0.48 – 0.50	0.05	0.964	1.0
stage	0.09	0.14	-0.18 – 0.36	0.64	0.524	9.4
pref_env	-0.21	0.25	-0.69 – 0.27	-0.85	0.395	-18.9
pref_animal	0.63	0.29	0.06 – 1.19	2.17	0.031*	87.8
know	-0.01	0.04	-0.09 – 0.07	-0.29	0.772	-1.0
att_sc_1	-0.15	0.11	-0.37 – 0.07	-1.37	0.171	-13.9
att_sc_2	-0.08	0.08	-0.24 – 0.07	-1.08	0.281	-7.7
att_sc_3	-0.08	0.09	-0.26 – 0.10	-0.85	0.396	-7.7
att_sc_4	-0.06	0.10	-0.25 – 0.14	-0.58	0.565	-5.8
att_sc_5	0.03	0.10	-0.16 – 0.23	0.35	0.728	3.0
att_sc_6	0.32	0.13	0.07 – 0.57	2.53	0.012*	37.7
att_w_1	-0.19	0.08	-0.35 – -0.03	-2.27	0.024*	-17.3
att_w_2	-0.08	0.08	-0.23 – 0.07	-1.09	0.276	-7.7
att_w_3	-0.38	0.11	-0.59 – -0.17	-3.55	<0.001***	-31.6
att_w_4	0.12	0.05	0.02 – 0.22	2.41	0.017*	12.7
att_w_5	0.18	0.06	0.06 – 0.30	2.86	0.005**	19.7
att_w_6	-0.17	0.10	-0.38 – 0.03	-1.68	0.095	-15.6
att_w_7	-0.03	0.14	-0.30 – 0.23	-0.25	0.804	-3.0
att_w_8	0.11	0.06	-0.00 – 0.23	1.94	0.053·	11.6
nimby - no	1.62	0.31	1.01 – 2.24	5.21	<0.001***	405.3
nimby - maybe	0.81	0.34	0.14 – 1.48	2.37	0.019*	124.8
INS	0.18	0.07	0.05 – 0.32	2.71	0.007**	19.7
ICS	-0.02	0.06	-0.14 – 0.09	-0.42	0.674	-2.0
activities	-0.02	0.05	-0.12 – 0.08	-0.43	0.664	-2.0
age	0.07	0.18	-0.27 – 0.41	0.39	0.696	7.3
male	0.13	0.18	-0.22 – 0.48	0.74	0.457	13.9
diverse	-1.11	0.59	-2.27 – 0.04	-1.89	0.060·	-67.0
income	-0.01	0.12	-0.25 – 0.22	-0.11	0.914	-1.0
edu	0.01	0.09	-0.17 – 0.19	0.12	0.907	1.0
urban.residence	0.71	0.36	-0.00 – 1.42	1.96	0.052·	103.4
urban.origin	0.07	0.16	-0.23 – 0.38	0.47	0.638	7.3
member	-0.28	0.18	-0.64 – 0.08	-1.50	0.135	-24.4
donation	0.66	0.19	0.30 – 1.03	3.57	<0.001***	93.5
hunter	-0.77	0.36	-1.47 – -0.07	-2.17	0.032*	-53.7
dog	0.75	0.21	0.34 – 1.15	3.61	<0.001***	111.7
farmer	-0.19	0.18	-0.55 – 0.16	-1.06	0.291	-17.3
Random Effects						
σ^2	0.83					
$\sigma^2_{id_group}$	0.05					
ICC	0.06					
N_{id_group}	18					
Observations	234					
R_m^2 / R_c^2	0.526 / 0.556					

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

In the following, the discussion of predictors follows the categorisation of predictors outlined in the methods (see again Section 5.4.2.7, Table 5-5). Thus, the four relevant categories are: study design; socio-demographics; connectedness and usage; and attitudes, perception and knowledge.

To begin with, the signs of the significant variables are as expected apart from one exception (*att_w_8*). All predictors which relate to the experimental design (*PE*, *PM* and *stage*) appear to be insignificant. The non-significance indicates that no significant difference in mean WTP exists between the three valuation methods, implying that the three treatment interventions (citizen-framing, deliberation and moralisation) had no significant effect on WTP in terms of absolute magnitude.

Based on these results, H1 stating that significant differences between the three valuation methods exist cannot be confirmed.

Turning to socio-demographic predictors, mean WTP was more than twice as high for urban residents (*urban.residence*). Yet, it barely did not achieve the conventional five percent level of significance but is only significant at the ten percent level ($p = 0.052$). Also donating within the last 12 months (*donation*) increased mean WTP by 93.5%, being highly significant. Ownership of a hunting license (either personally or in the household) (*hunter*) roughly halved mean WTP (significant at five percent level). Dog ownership (*dog*) was highly significant and WTP was more than twice as high, all other things being equal. Regarding gender (*female* serving as benchmark) a trend can be seen that mean WTP was around two-thirds smaller for diverse participants, although only significant at a ten percent level. The predictors *age* and *income* which are usually expected to determine WTP are non-significant in this study which may be caused by the low variability in both variables due to the experimental design of the study.

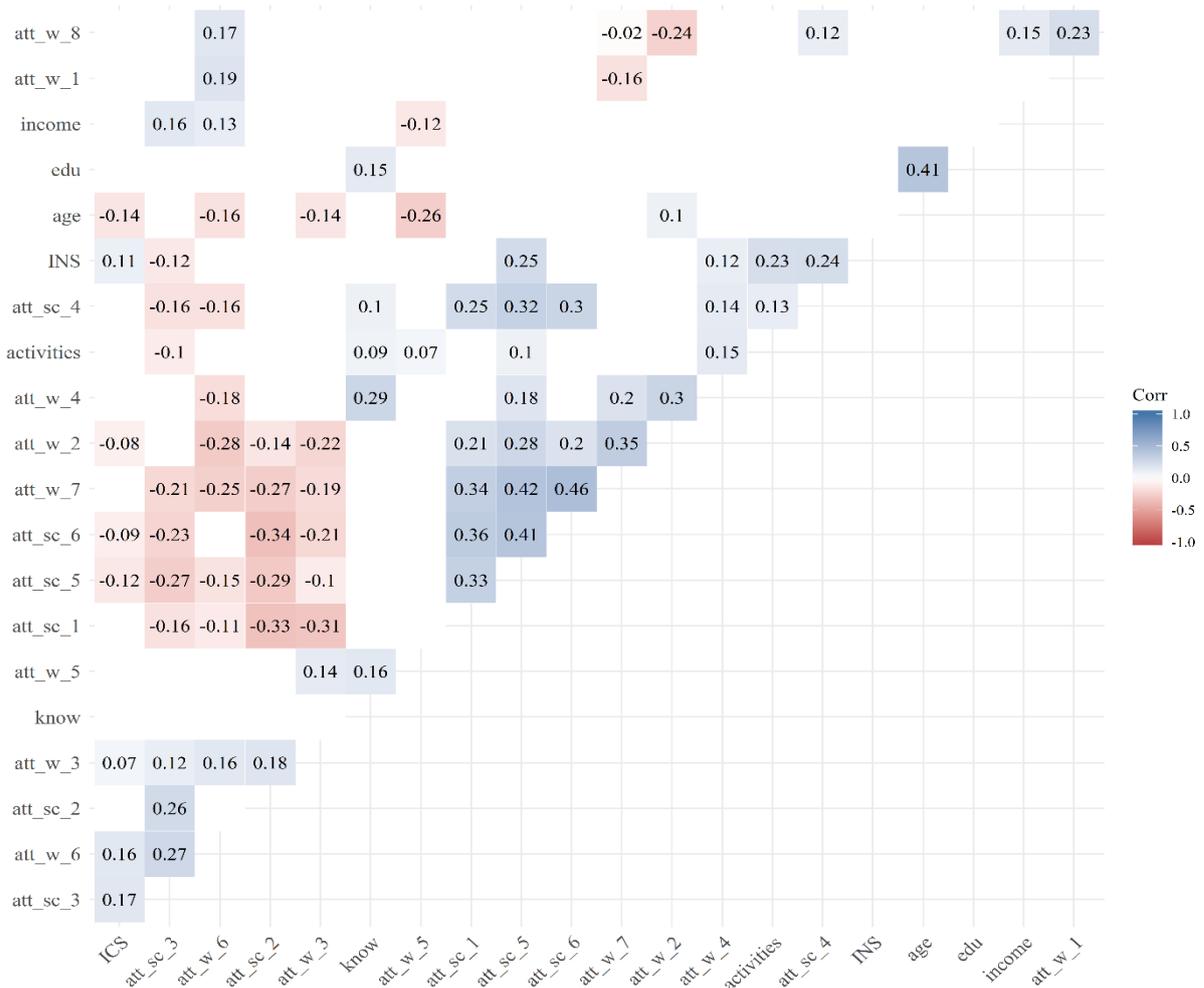
Analysing the next category of predictors (connectedness and usage), usage appeared to be irrelevant, whereas reported *Inclusion of Nature in Self (INS)* is significant at a one percent level. Yet, the effect size (~20% increase) is among the lowest of all significant predictors. Subjective connectedness to society at large (*ICS*) was insignificant.

Several predictors referring to attitudes proved significant. The most dominant was the support of establishment of wolves close to the own place of residence implying that participants do not have a NIMBY attitude. This predictor (*nimby – no*) is highly significant and shows that WTP

is four times higher compared to the case that a NIMBY attitude is held. At a first glance this increase of 405% seems to be quite high, yet, it should be considered that participants having a NIMBY attitude are likely to have a zero or relatively low WTP. Hence, this high proportional increase does not seem unrealistic. In addition, being unsure about the establishment near one's own residence proved significant at a five percent level and mean WTP was more than twice as high compared to participants with NIMBY attitude. From the set of predictors based on attitudes towards animal species in general (*pref_animal* and *att_sc_1 – att_sc_6*) only two turned out to be significant. First, having a strong preference for protection of rare animal species (*pref_animal*) proved to have a significant effect on WTP with a proportional change of almost 88%. Second, attitudes towards existence rights of animals (*att_sc_6*) was significant and led to a relative change of 38% in WTP. While the attitude towards wolves as threat for other native species (*att_w_8*) was expected to have a negative sign, it turned out to have a slight positive effect, although it just did not meet conventional statistical significance ($p = 0.053$). This may be explained by perceiving this *threat* as not necessarily negative but as contribution to the *natural balance* when wolves contribute to nature-management which is usually conducted by forest rangers and hunters.

Half of the specific attitudes towards wolves were significant while the predictors' directions differ. Attitude towards (or perception of) wolves as beneficial for humans (*att_w_4*) and attitude towards (or perception of) wolves as competitors for hunters (*att_w_5*) proved significant at a five percent level. The proportional change of WTP for these predictors is relatively small (13% and 20%) in comparison to other predictors. Surprisingly the predicted sign of *att_w_5* is positive. This may be explained by a tendency of negative attitude towards hunting as sport which was occasionally voiced in the group discussions. Highly significant was the measure of attitude towards (or perception of) the historic extinction of wolves (*att_w_3*), as expected the predicted sign is negative and the proportional change is around 32%. Although this measure is significant, the according general attitude towards mastery of nature in order to meet human needs (*att_sc_3*) was insignificant. Also, the correlation plot (Figure 6-11) indicates a relatively low correlation between these two predictors (0.12). Furthermore, the attitude toward impossibility of coexistence of humans and wolves (*att_w_1*) had a significant negatively effect on mean WTP with a proportional change of 17.3%.

Figure 6-11 Correlation plot of numeric predictor variables



Source: Own illustration
Only significant correlations with a significance level of $p = 0.05$ are shown.

In addition to the full model, two reduced models were estimated. These models also contain the primary variables of interest regarding the method comparison or rather experimental design (*PE*, *PM* and *stage*). Besides these three variables, one submodel contains only the socio-demographic predictor variables (*robust model 1 socio*) and the other one includes only the predictor variables associated with attitudes, perception, knowledge and connectedness, and usage (*robust model 1 attitude*).

Table 6-7 reports the comparison of these models containing the coefficients estimates (*Coef.*), the standard errors (*SE*), level of significance (*p*), the total variance explained by the model (σ^2), the variance explained by the random effects ($\sigma^2_{id_group}$), the ICC, the number of groups (N_{id_group}), the number of overall observations, and the *marginal* R^2 (R_m^2) as well as the *conditional* R^2 (R_c^2).³⁴

Overall, the reduced models appear consistent with the full model. Yet, surprisingly income has a negative predicted sign in the socio-demographic submodel, while it was non-significant in the full model. Usually WTP is positively related to income and wealth. In this study this may not hold because firstly, the sample is not representative but was aimed to be homogenous, and secondly, the environmental good may also be perceived as environmental bad. Although, negative perception may be independent of income, the correlation plot (see again Figure 6-11) shows that income is positively correlated with negative attitudes towards wolves. To be precise, income is positively correlated with the attitudes that wolves are a hazard to humans (*att_w_6*) and a threat for other native species (*att_w_8*). Further, income is negatively correlated with the consideration of wolves as competitors for hunters (*att_w_5*) which was found to have a positive effect on WTP. Additionally, income is positively correlated with the general attitude that nature should be mastered to meet human needs (*att_sc_3*) which was found to have a negative effect on WTP, although insignificant. These correlations further explain the insignificance of the *income* predictor in the full model, as *att_w_5* is significant at the five percent level and *att_w_8* at the 10 percent level (almost five percent).

More interestingly, the comparison illustrates that the explanatory power of the *attitude* model ($R_m^2 = 0.41$) is substantially higher than the *socio-demographic* model ($R_m^2 = 0.16$). Hence, variables normally associated with WTP are less important in this model. Yet, this finding should not be overly emphasised, as the socio-demographics were supposed to be relatively homogeneous due to the experimental design. Thus, it would have been surprising if the small variance in socio-demographics had explained a large amount of total variation. Still, the amount of variation explained by the attitude model is considerably high for a valuation study.

Hence, the high relevance of predictors associated with attitudes confirms H4.

³⁴ See Table D-3 and Table D-4 in Appendix D – *Supplementary regression results* for the complete regression tables of the reduced models, which also report 95% confidence intervals, t-statistics and back-transformed estimated coefficients.

Table 6-7 Comparison of full model's and submodels' regression results: between-group design

<i>Predictors</i>	Robust model 1			Robust model 1 socio			Robust model 1 att.		
	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>
(Intercept)	0.37	1.19	0.754	3.34	0.60	<0.001***	0.57	1.04	0.585
PE	0.17	0.25	0.500	0.03	0.32	0.920	0.16	0.27	0.571
PM	0.01	0.25	0.964	-0.33	0.33	0.333	0.15	0.27	0.570
stage	0.09	0.14	0.524	0.10	0.18	0.578	0.1	0.15	0.510
pref_env	-0.21	0.25	0.395				-0.24	0.24	0.318
pref_animal	0.63	0.29	0.031*				0.49	0.29	0.093*
know	-0.01	0.04	0.772				0.01	0.04	0.855
att_sc_1	-0.15	0.11	0.171				-0.02	0.11	0.883
att_sc_2	-0.08	0.08	0.281				-0.08	0.08	0.303
att_sc_3	-0.08	0.09	0.396				-0.03	0.10	0.785
att_sc_4	-0.06	0.10	0.565				-0.03	0.10	0.781
att_sc_5	0.03	0.10	0.728				0.04	0.10	0.720
att_sc_6	0.32	0.13	0.012*				0.13	0.13	0.301
att_w_1	-0.19	0.08	0.024*				-0.2	0.09	0.023*
att_w_2	-0.08	0.08	0.276				-0.07	0.08	0.361
att_w_3	-0.38	0.11	<0.001***				-0.31	0.11	0.006**
att_w_4	0.12	0.05	0.017*				0.13	0.05	0.011*
att_w_5	0.18	0.06	0.005**				0.11	0.06	0.073*
att_w_6	-0.17	0.10	0.095				-0.12	0.10	0.226
att_w_7	-0.03	0.14	0.804				0.12	0.13	0.376
att_w_8	0.11	0.06	0.053*				0.07	0.06	0.275
nimby - no	1.62	0.31	<0.001***				1.68	0.33	<0.001***
nimby - maybe	0.81	0.34	0.019*				0.92	0.36	0.012*
INS	0.18	0.07	0.007**				0.13	0.07	0.059*
ICS	-0.02	0.06	0.674				-0.04	0.06	0.540
activities	-0.02	0.05	0.664				0.04	0.05	0.422
age	0.07	0.18	0.696	0.32	0.20	0.103			
male	0.13	0.18	0.457	-0.26	0.20	0.190			
diverse	-1.11	0.59	0.060*	-0.66	0.69	0.343			
income	-0.01	0.12	0.914	-0.29	0.14	0.039*			
edu	0.01	0.09	0.907	-0.03	0.10	0.756			
urban.residence	0.71	0.36	0.052*	0.10	0.41	0.805			
urban.origin	0.07	0.16	0.638	-0.15	0.18	0.420			
member	-0.28	0.18	0.135	-0.11	0.22	0.606			
donation	0.66	0.19	<0.001***	0.90	0.21	<0.001***			
hunter	-0.77	0.36	0.032*	-1.30	0.40	0.002**			
dog	0.75	0.21	<0.001***	0.62	0.24	0.010**			
farmer	-0.19	0.18	0.291	-0.33	0.22	0.134			
Random Effects									
σ^2	0.83			1.4			0.99		
$\sigma^2_{id_group}$	0.05			0.12			0.07		
ICC	0.06			0.08			0.07		
N_{id_group}	18			18			18		
Observations	234			234			234		
R_m^2 / R_c^2	0.526 / 0.556			0.164 / 0.231			0.414 / 0.455		

* $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Table 6-8 compares the regressions results of the (non-robust) full model, the reduced stepwise regression following the *Backward Elimination* algorithm and the robust regression.³⁵ In the stepwise results and the robust results, the standard errors are slightly smaller compared to the non-robust full model. Still, the latter suffers from heteroscedasticity. Hence, the results are non-reliable. As mentioned above, the robust mixed effects model does not allow for calculation of log-likelihoods. Thus, the stepwise regression is based on the non-robust full model which suffers from heteroscedasticity. Therefore, also the stepwise regression results should be treated with care, considering also the general criticism of stepwise regressions discussed in Section 5.4.2.

Overall, the stepwise model and the robust model appear consistent, although some deviations exist. The biggest difference between the models appear to be two predictor variables (*att_w_1* and *att_w_4*) that were eliminated in the *Backward Elimination* process but are significant at the five percent level in the robust model. Further, the NIMBY attitude at level *maybe* is significant in the robust regression but not in the stepwise model. In contrary, the predictor *farmer* is significant in the stepwise regression but not in the robust regression. Regarding group specific effects, the ICCs and variance components ($\sigma^2_{id_group}$) show that in the robust regression the effect size is halved compared to the stepwise model and non-robust model. Also, the residual variance (σ^2) is notably smaller.

Still, the comparison illustrates that the differences between the models appear to be minor and may be caused by the presence of heteroscedasticity and potentially influential observations (outliers) in a relatively small sample. For these reasons the robust regression was applied and considered to be most reliable. The comparison confirms overall findings, while the robust regression is more powerful and explains around ten percent more of the total variation in WTP compared to the non-robust regression and the stepwise regression.

³⁵ See Table D-5 in Appendix D – *Supplementary regression results* for the complete regression table of the reduced stepwise model, which also reports 95% confidence intervals, t-statistics and back-transformed coefficients.

Exploring social values and motivations: Results

Table 6-8 Comparison of full model's, stepwise models' and robust model's regression results: between-group design

<i>Predictors</i>	Model 1			Stepwise model 1			Robust model 1		
	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>
(Intercept)	0.77	1.33	0.561	0.35	0.89	0.697	0.37	1.19	0.754
PE	0.25	0.33	0.446				0.17	0.25	0.500
PM	-0.04	0.33	0.902				0.01	0.25	0.964
stage	0.11	0.15	0.482				0.09	0.14	0.524
pref_env	-0.12	0.27	0.650				-0.21	0.25	0.395
pref_animal	0.53	0.32	0.102	0.66	0.28	0.021*	0.63	0.29	0.031*
know	0.00	0.05	0.991				-0.01	0.04	0.772
att_sc_1	-0.1	0.12	0.413				-0.15	0.11	0.171
att_sc_2	-0.11	0.09	0.196				-0.08	0.08	0.281
att_sc_3	0.01	0.1	0.935				-0.08	0.09	0.396
att_sc_4	-0.11	0.11	0.346				-0.06	0.10	0.565
att_sc_5	0.01	0.11	0.918				0.03	0.10	0.728
att_sc_6	0.27	0.14	0.055	0.22	0.10	0.021*	0.32	0.13	0.012*
att_w_1	-0.11	0.09	0.239				-0.19	0.08	0.024*
att_w_2	-0.05	0.08	0.526				-0.08	0.08	0.276
att_w_3	-0.32	0.12	0.009**	-0.34	0.10	0.001**	-0.38	0.11	<0.001***
att_w_4	0.06	0.06	0.316				0.12	0.05	0.017*
att_w_5	0.14	0.07	0.045*	0.15	0.06	0.01**	0.18	0.06	0.005**
att_w_6	-0.28	0.12	0.018*	-0.28	0.09	0.003**	-0.17	0.10	0.095
att_w_7	0.08	0.15	0.587				-0.03	0.14	0.804
att_w_8	0.11	0.07	0.100				0.11	0.06	0.053
nimby - no	1.25	0.35	<0.001***	1.12	0.31	<0.001***	1.62	0.31	<0.001***
nimby - maybe	0.46	0.38	0.230	0.37	0.34	0.283	0.81	0.34	0.019*
INS	0.17	0.08	0.024*	0.13	0.06	0.030*	0.18	0.07	0.007**
ICS	-0.04	0.06	0.499				-0.02	0.06	0.674
activities	-0.03	0.06	0.627				-0.02	0.05	0.664
age	0.12	0.2	0.543				0.07	0.18	0.696
male	0.11	0.2	0.579				0.13	0.18	0.457
diverse	-1.20	0.66	0.069				-1.11	0.59	0.060
income	-0.11	0.13	0.400				-0.01	0.12	0.914
edu	-0.02	0.1	0.866				0.01	0.09	0.907
urban.residence	0.72	0.4	0.075	0.71	0.36	0.053	0.71	0.36	0.052
urban.origin	0.00	0.18	0.979				0.07	0.16	0.638
member	-0.18	0.21	0.370				-0.28	0.18	0.135
donation	0.69	0.21	0.001**	0.54	0.16	0.001**	0.66	0.19	<0.001***
hunter	-0.72	0.4	0.072	-0.76	0.35	0.030*	-0.77	0.36	0.032*
dog	0.73	0.23	0.002**	0.77	0.19	<0.001***	0.75	0.21	<0.001***
farmer	-0.40	0.2	0.050	-0.44	0.19	0.017*	-0.19	0.18	0.291
Random Effects									
σ^2	1.06			1.03			0.83		
$\sigma^2_{id_group}$	0.16			0.14			0.05		
ICC	0.13			0.12			0.06		
N_{id_group}	18			18			18		
Observations	234			234			234		
R_m^2 / R_c^2	0.422 / 0.499			0.411 / 0.480			0.526 / 0.556		

. p<0.1 * p<0.05 ** p<0.01 *** p<0.001

Source: Own illustration

Turning to the analysis of the second model, the regression results of the within-group design are presented in Table 6-9.³⁶ The first column reports the predictor variables (*Predictors*), followed by the estimated coefficients (*Coef.*), the associated standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and lastly the back-transformed estimated coefficients (*back-transf. coef.*). At the bottom of the table measures related to the random effects are summarised: the total variance explained by the model (σ^2), the variance explained by the individual-specific random effects ($\sigma^2_{id:id_group}$) and the group-specific random effects ($\sigma^2_{id_group}$), the overall *ICC* and group-specific *ICC* (ICC_{id_group}), the number of groups (N_{id_group}) and number of individuals (N_{id}), the number of overall *observations*, and the marginal R^2 (R_m^2) and conditional R^2 (R_c^2). Again, multicollinearity was not a concern.

The marginal R^2 illustrates that the within-group design models' fixed effects explain around 54% of variation in WTP. Although, only five predictors are significant at the five percent level and three at the ten percent level. The conditional R^2 appears to be very high with 99.7% explained variance. So, does that imply any concerns about the model? To answer that question both the random effects as well as the fixed effects have to be analysed and set in context. The variance explained by the random effects ($\sigma^2_{id:id_group}$ and $\sigma^2_{id_group}$) and the associated *ICC* measures illustrate that groups did not have any effect on change in WTP "within" individuals. Instead, the individual effects are of importance and the stated measurements at the second stage are highly dependent on the ones stated at the first stage.

As mentioned above most of the fixed effects were proven to be insignificant. Most interestingly one interaction of the variables associated with the experimental design is significant at the one percent level: *PM:stage*. The significant interaction of the deliberative valuation method *Preference Moralisation* and the *stage* dummy implies that this method had a significant effect on WTP at the second elicitation. In contrast, *Preference Economisation* did not have a significant effect on WTP. In case of a significant effect, the predictor *stage* would have been significant. Nevertheless, the *moralisation* interventions' effect is relatively weak, the back-transformed coefficient suggests a relative change in WTP of only 7.3%.

The results suggest that H2 can be confirmed in case of PM but not in case of PE.

³⁶ Again, only the robust regression's results will be presented in the following.

Table 6-9 WTP robust mixed effects model regression results: within-group design

Robust model 2						
<i>Predictors</i>	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	0.97	1.88	-2.71 – 4.66	0.52	0.608	163.8
PM	-0.16	0.25	-0.66 – 0.33	-0.65	0.529	-14.8
stage	-0.02	0.02	-0.05 – 0.01	-1.45	0.152	-2.0
PM:stage	0.07	0.02	0.03 – 0.12	3.24	0.002**	7.3
pref_env	-0.22	0.37	-0.95 – 0.51	-0.59	0.560	-19.7
pref_animal	0.66	0.47	-0.25 – 1.58	1.42	0.162	93.5
know	0.01	0.07	-0.12 – 0.14	0.10	0.918	1.0
att_sc_1	-0.14	0.17	-0.48 – 0.20	-0.80	0.430	-13.1
att_sc_2	-0.15	0.14	-0.42 – 0.11	-1.11	0.270	-13.9
att_sc_3	-0.13	0.15	-0.42 – 0.16	-0.91	0.366	-12.2
att_sc_4	0.00	0.17	-0.34 – 0.34	-0.01	0.995	0.0
att_sc_5	-0.04	0.20	-0.42 – 0.34	-0.21	0.837	-3.9
att_sc_6	0.34	0.20	-0.06 – 0.74	1.67	0.101	40.5
att_w_1	-0.25	0.13	-0.49 – -0.00	-1.96	0.054	-22.1
att_w_2	0.03	0.13	-0.22 – 0.29	0.26	0.793	3.0
att_w_3	-0.41	0.16	-0.73 – -0.09	-2.52	0.015*	-33.6
att_w_4	0.09	0.09	-0.08 – 0.26	1.05	0.296	9.4
att_w_5	0.20	0.09	0.02 – 0.38	2.12	0.038*	22.1
att_w_6	-0.08	0.16	-0.40 – 0.23	-0.52	0.605	-7.7
att_w_7	-0.13	0.21	-0.53 – 0.28	-0.63	0.533	-12.2
att_w_8	0.11	0.09	-0.07 – 0.30	1.23	0.225	11.6
nimby - no	1.68	0.49	0.71 – 2.65	3.40	0.001**	436.6
nimby - maybe	1.00	0.53	-0.04 – 2.05	1.88	0.065	171.8
INS	0.00	0.02	-0.03 – 0.04	0.21	0.838	0.0
ICS	0.02	0.02	-0.01 – 0.05	1.59	0.114	2.0
activities	0.07	0.09	-0.11 – 0.24	0.74	0.465	7.3
age	0.27	0.27	-0.27 – 0.80	0.98	0.332	31.0
male	0.10	0.30	-0.49 – 0.70	0.33	0.740	10.5
diverse	-1.01	0.86	-2.68 – 0.67	-1.18	0.244	-63.6
income	0.03	0.20	-0.36 – 0.42	0.16	0.871	3.0
edu	-0.06	0.15	-0.36 – 0.24	-0.38	0.706	-5.8
urban.residence	0.62	0.56	-0.48 – 1.72	1.11	0.274	85.9
urban.origin	-0.01	0.27	-0.54 – 0.52	-0.03	0.972	-1.0
member	-0.42	0.29	-0.99 – 0.15	-1.44	0.155	-34.3
donation	0.73	0.30	0.14 – 1.32	2.44	0.018*	107.5
hunter	-0.52	0.62	-1.74 – 0.70	-0.84	0.405	-40.5
dog	0.69	0.34	0.01 – 1.36	2.00	0.051	99.4
farmer	-0.12	0.29	-0.69 – 0.44	-0.43	0.672	-11.3
Random Effects						
σ^2	0.01					
$\sigma^2_{id:id_group}$	0.81					
$\sigma^2_{id_group}$	0					
ICC	0.99					
ICC _{id_group}	0					
N _{id}	93					
N _{id_group}	12					
Observations	186					
R^2_m / R^2_c	0.542 / 0.997					

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

As in the first model, the highest proportional change in mean WTP (436.6%) had the non-presence of NIMBY attitudes (*nimby – no*). Also, participants which were unsure about supporting the establishments of wolves near to their place of residence (*nimby – maybe*) had a higher WTP (171.8%), although only significant at the ten percent level. Again, this high alteration can be explained with the perception of wolves as environmental good or bad. Participants with NIMBY attitudes are likely to have a WTP around zero. Regarding the other attitudinal measures, again the attitude toward impossibility of coexistence of humans and wolves (*att_w_1*) and toward historic extinction of wolves (*att_w_3*) had a negative effect on WTP. Only *att_w_3* was significant ($p < 0.05$). Further, the attitude toward wolves as hunters' competitors (*att_w_5*) was significant with a positive effect as for the between-group design.

Regarding socio-demographic variables, a significant effect was only observed for donating within the last 12 months (*donation*) and dog ownership (*dog*). According to the p-value ($p = 0.051$) the conventional significance level is just barely missed, whereas the 95% Wald confidence interval (0.01 – 1.36) suggests significance. Both predictors roughly double WTP.

It has been shown that only in case of preference moralisation WTP significantly changed throughout the valuation process and that the associated proportional change of 7% was relatively low. Further, the results have shown that group effects did not appear. These findings imply that for the within-group design's overall sample (PE and PM treatment) WTP within individuals changed to a minor degree, explaining the high dependency of WTP amounts stated at second stage on the ones stated in the first round. Hence, also the conditional R^2 is high as the dependency is captured by the random effect. Thus, following the analysis of fixed and random effects, it can be assessed that the high conditional R^2 is not a concern.

Table 6-10 reports the comparison of the full model and the two submodels for the within-group design.³⁷ For the fixed effects only the coefficients estimates (*Coef.*), the standard errors (*SE*) and level of significance (p) are reported. The table's bottom summarises the total variance explained by the model (σ^2), the variance explained by the individual-specific random effects ($\sigma^2_{id_group}$) and the group-specific random effects ($\sigma^2_{id_group}$), the overall ICC and group-specific ICC (ICC_{id_group}), the number of groups (N_{id_group}) and number of individuals (N_{id}), the number of overall *observations*, and the marginal R^2 (R_m^2) and conditional R^2 (R_c^2).

³⁷ See Table D-6 and Table D-7 in Appendix D – *Supplementary regression results* for the complete regression tables of the reduced models, which also report 95% confidence intervals, t-statistics and back-transformed estimated coefficients.

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Table 6-10 Comparison of full model's and submodels' regression results: within-group design

<i>Predictors</i>	Robust model 2			Robust model 2 socio			Robust model 2 attitude		
	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>
(Intercept)	0.97	1.88	0.608	3.85	0.83	<0.001***	0.63	1.42	0.662
PM	-0.16	0.25	0.529	-0.37	0.27	0.209	-0.01	0.22	0.977
stage	-0.02	0.02	0.152	-0.02	0.01	0.127	-0.02	0.02	0.152
PM:stage	0.07	0.02	0.002**	0.06	0.02	0.001**	0.07	0.02	0.002**
pref_env	-0.22	0.37	0.560				-0.32	0.32	0.323
pref_animal	0.66	0.47	0.162				0.43	0.41	0.289
know	0.01	0.07	0.918				0.03	0.05	0.614
att_sc_1	-0.14	0.17	0.430				0.02	0.16	0.880
att_sc_2	-0.15	0.14	0.270				-0.15	0.13	0.233
att_sc_3	-0.13	0.15	0.366				-0.07	0.14	0.596
att_sc_4	0.00	0.17	0.995				-0.08	0.16	0.628
att_sc_5	-0.04	0.20	0.837				-0.02	0.19	0.935
att_sc_6	0.34	0.20	0.101				0.16	0.18	0.398
att_w_1	-0.25	0.13	0.054				-0.23	0.12	0.055
att_w_2	0.03	0.13	0.793				0.04	0.13	0.738
att_w_3	-0.41	0.16	0.015*				-0.33	0.16	0.038*
att_w_4	0.09	0.09	0.296				0.10	0.07	0.198
att_w_5	0.20	0.09	0.038*				0.09	0.08	0.273
att_w_6	-0.08	0.16	0.605				-0.01	0.14	0.937
att_w_7	-0.13	0.21	0.533				0.06	0.18	0.724
att_w_8	0.11	0.09	0.225				0.10	0.09	0.233
nimby - no	1.68	0.49	0.001**				1.90	0.47	<0.001***
nimby - maybe	1.00	0.53	0.065				1.13	0.52	0.034*
INS	0.00	0.02	0.838				0.00	0.02	0.793
ICS	0.02	0.02	0.114				0.03	0.02	0.108
activities	0.07	0.09	0.465				0.12	0.07	0.103
age	0.27	0.27	0.332	0.47	0.28	0.099			
male	0.10	0.30	0.740	-0.48	0.31	0.127			
diverse	-1.01	0.86	0.244	-0.95	0.93	0.309			
income	0.03	0.20	0.871	-0.26	0.21	0.205			
edu	-0.06	0.15	0.706	-0.09	0.16	0.559			
urban.residence	0.62	0.56	0.274	-0.23	0.58	0.696			
urban.origin	-0.01	0.27	0.972	-0.18	0.28	0.529			
member	-0.42	0.29	0.155	-0.28	0.32	0.385			
donation	0.73	0.30	0.018*	1.03	0.31	0.001**			
hunter	-0.52	0.62	0.405	-1.68	0.61	0.007**			
dog	0.69	0.34	0.051	0.77	0.37	0.038*			
farmer	-0.12	0.29	0.672	0.03	0.33	0.916			
Random Effects									
σ^2	0.01			0			0.01		
$\sigma^2_{id:id_group}$	0.81			1.28			0.82		
$\sigma^2_{id_group}$	0			0			0		
ICC _{id:id_group}	0.99			1			0.99		
ICC _{id_group}	0			0			0		
N _{id}	93			93			93		
N _{id_group}	12			12			12		
Observations	186			186			186		
R_m^2 / R_c^2	0.542 / 0.997			0.233 / 0.998			0.480 / 0.996		

. $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

The submodels' results confirm the overall findings regarding determinants of WTP in the within-group design. The only noteworthy difference between the full model and the submodel containing the socio-demographic variables is the (lack of) significance of the predictor *hunter*. Regarding the attitudinal submodel, the only substantial difference compared to the full model regression is the insignificance of *att_w_5*. The marginal R^2 indicates again the high relevance of measures of attitudes and perception as predictors of WTP.

Therefore, also the within-group comparison confirms H4.

Table 6-11 reports the regressions results' comparison of the (non-robust) full model, the reduced stepwise regression based on the *Backward Elimination* algorithm and the robust regression.³⁸ The results of the non-robust model should be interpreted with care due to the existence of heteroscedasticity. The same applies to the stepwise regression results as the *Backward Elimination* algorithm was applied to the non-robust model. Hence, the robust model accounting for heteroscedasticity is considered to be most reliable. Regarding the fixed effects the results of the non-robust model and stepwise model confirm the robust regression's results. Only slight deviances in significances occur caused by the robust standard errors which slightly diverge from the non-robust standard errors. Turning to the random effects, the non-robust model still finds a minimal group specific effect of two percent as illustrated by ICC_{id_group} , whereas the stepwise algorithm eliminated the group specific random effect which could have also been done for the robust model as the estimated effect is zero. The residual variance (σ^2) is particularly smaller in the robust regression and therefore also the individual-specific effect is large as shown by $ICC_{id:id_group}$. In terms of marginal R^2 the robust model outperforms the other two models.

³⁸ See Table D-8 in Appendix D – *Supplementary regression results* for the complete regression table of the reduced stepwise model, which also report 95% confidence intervals, t-statistics and back-transformed estimated coefficients.

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Table 6-11 Comparison of full model, stepwise model and robust model: within-group design

<i>Predictors</i>	Model 2			Stepwise model 2			Robust model 2		
	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>	<i>Coef.</i>	<i>SE</i>	<i>p</i>
(Intercept)	0.90	2.25	0.692	1.04	0.88	0.244	0.97	1.88	0.608
PM	-0.31	0.32	0.360	-0.26	0.24	0.276	-0.16	0.25	0.529
stage	-0.04	0.09	0.657	-0.04	0.09	0.627	-0.02	0.02	0.152
PM:stage	0.30	0.13	0.02*	0.30	0.13	0.017*	0.07	0.02	0.002**
pref_env	-0.15	0.45	0.750				-0.22	0.37	0.560
pref_animal	0.73	0.56	0.193				0.66	0.47	0.162
know	0.00	0.08	0.965				0.01	0.07	0.918
att_sc_1	-0.18	0.21	0.398				-0.14	0.17	0.430
att_sc_2	-0.15	0.16	0.355				-0.15	0.14	0.270
att_sc_3	-0.16	0.18	0.382				-0.13	0.15	0.366
att_sc_4	0.04	0.21	0.860				0.00	0.17	0.995
att_sc_5	-0.03	0.24	0.908				-0.04	0.20	0.837
att_sc_6	0.32	0.24	0.194	0.26	0.14	0.068	0.34	0.20	0.101
att_w_1	-0.17	0.15	0.267	-0.21	0.12	0.089	-0.25	0.13	0.054
att_w_2	0.06	0.15	0.701				0.03	0.13	0.793
att_w_3	-0.40	0.19	0.046*	-0.43	0.16	0.009**	-0.41	0.16	0.015*
att_w_4	0.07	0.10	0.519				0.09	0.09	0.296
att_w_5	0.21	0.11	0.065	0.22	0.09	0.015*	0.20	0.09	0.038*
att_w_6	-0.17	0.19	0.372				-0.08	0.16	0.605
att_w_7	-0.11	0.25	0.674				-0.13	0.21	0.533
att_w_8	0.11	0.11	0.346				0.11	0.09	0.225
nimby1	1.40	0.59	0.021*	1.28	0.41	0.003**	1.68	0.49	0.001**
nimby2	0.72	0.64	0.268	0.73	0.50	0.144	1.00	0.53	0.065
INS	-0.01	0.08	0.894				0.00	0.02	0.838
ICS	0.08	0.07	0.280				0.02	0.02	0.114
activities	0.08	0.11	0.447				0.07	0.09	0.465
age	0.36	0.32	0.268				0.27	0.27	0.332
male	0.13	0.36	0.716				0.10	0.30	0.740
diverse	-1.07	1.02	0.300				-1.01	0.86	0.244
income	0.07	0.24	0.757				0.03	0.20	0.871
edu	-0.07	0.18	0.702				-0.06	0.15	0.706
urban.residence	0.59	0.67	0.384				0.62	0.56	0.274
urban.origin	-0.08	0.32	0.795				-0.01	0.27	0.972
member	-0.29	0.35	0.404				-0.42	0.29	0.155
donation	0.74	0.36	0.043*	0.73	0.22	0.002**	0.73	0.30	0.018*
hunter	-0.51	0.74	0.497				-0.52	0.62	0.405
dog	0.70	0.41	0.092	0.66	0.27	0.019*	0.69	0.34	0.051
farmer	-0.32	0.34	0.356				-0.12	0.29	0.672
Random Effects									
σ^2	0.18			0.18			0.01		
$\sigma^2_{id:id_group}$	1.1			0.97			0.81		
$\sigma^2_{id_group}$	0.03						0		
ICC _{id:id_group}	0.86			0.84			0.99		
ICC _{id_group}	0.02						0		
N _{id}	93			93			93		
N _{id_group}	12			12			12		
Observations	186			186			186		
R^2_m / R^2_c	0.422 / 0.920			0.399 / 0.904			0.542 / 0.997		

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

The quantitative analysis tested differences and changes in mean WTP between the valuation methods. In addition, determinants of WTP have been identified based on the mixed effects models. The between-group design has shown that no significant difference in mean WTP exists between the three valuation methods (CV, PE and PM). Hence, in terms of absolute magnitude, the associated treatment interventions (citizen-framing, deliberation and moralisation) had no significant effect. Thus, the results did not confirm H1.

Regarding the between-group design and the associated H2, the results are ambiguous. On the one hand, deliberation did not have a significant effect in the PE treatment, on the other hand, combined with the moralisation intervention (PM treatment) a significant difference between WTP elicited at the first round and second round was found. Thus, the significant change in WTP in the PM treatment indicates that i) social values can be identified based on the valuation process – preference construction – and ii) that significant differences between the deliberative valuation methods exist.

Further, the comparison between the full model and the two submodels (containing either the socio-demographic predictor variables or the attitudinal predictor variables in addition to the three predictor variables associated with the experimental design) highlighted the role of attitudes and perception for the determination of WTP. This was found for the between-group design as well as for the within-group design. Hence, the finding that variables usually associated with WTP are less important than attitudinal measures supports H4.

To gain a better understanding about the motives behind WTP and to identify social values based on value scale and intention – to address H3 and further elaborate on H4 –, in the following section the follow-up questions will be analysed.

6.3 Motives behind willingness to pay

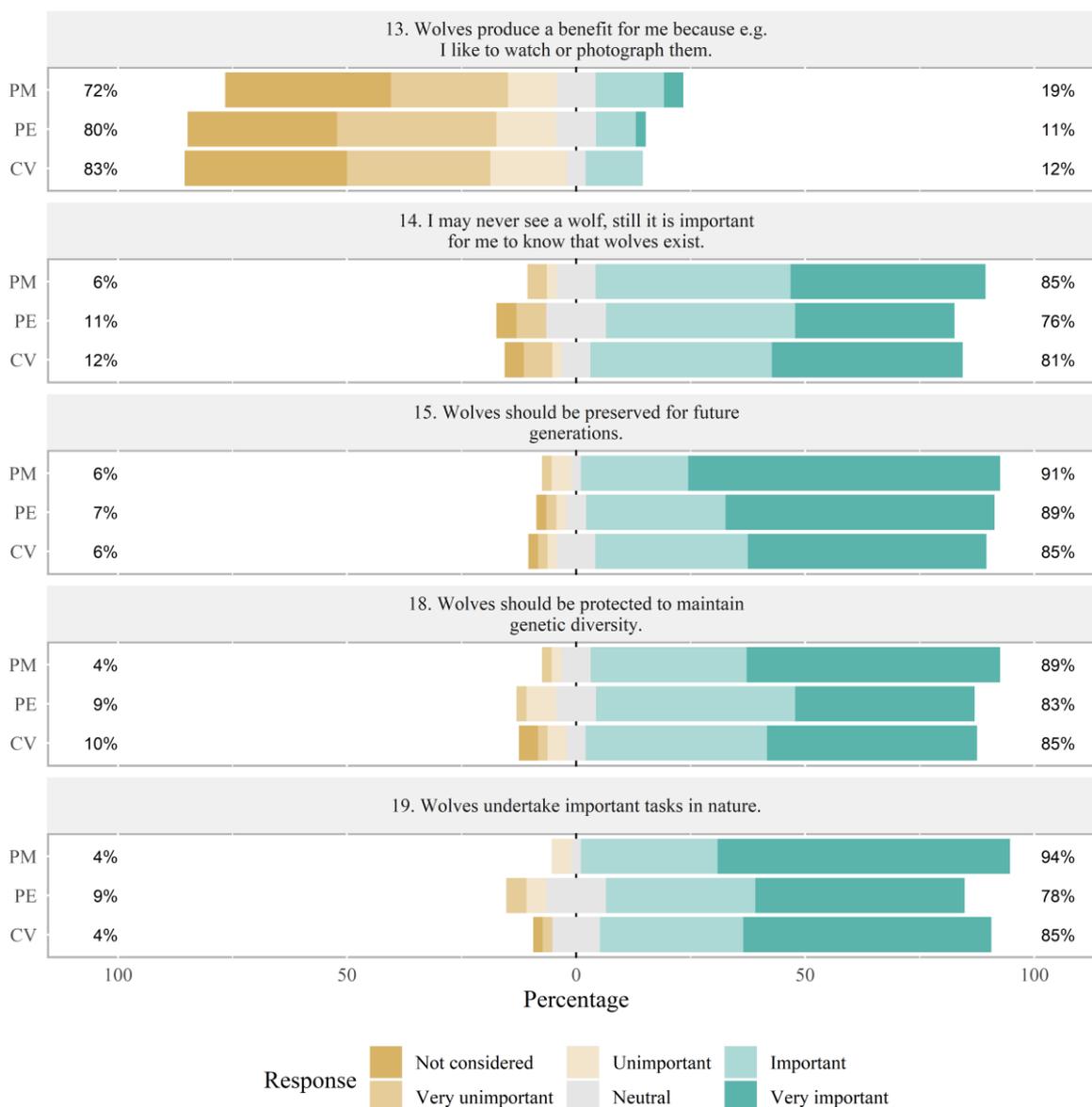
In the following, H3 and H4 will be addressed by investigating participants' motives behind WTP. The comparison of the submodels containing only attitudinal or socio-demographic variables has already shown that stated preferences are affected by latent attitudes. In the following it shall be further explored which underlying motives and values affected WTP. Firstly, motives underlying WTP will be analysed based on the Likert Scales items and the results will be compared between the three valuation methods. Secondly, the dimensionality of motivations relating to the conceptual framework's consistency will be investigated based on an EGA.

The follow-up questions are ordered according to the theoretical dimensionality/clustering (see again Section 5.4.3.2, Table 5-6): i) TEV; ii) fairness, interdependent preferences, existence rights and duty; iii) consumer-citizen dichotomy; iv) Perceived Behaviour Control; and v) value hierarchies. Hence, they cover a broad range of aspects identified as relevant. These are referring to value scale and intention and allow for the identification of potential value pluralism. Further, it can be analysed if substantial differences between the methods exist, and if thereby different rationalities are activated by the valuation context. Lastly, the results will provide insights if stated preferences for wolf management in Germany are consistent with the neoclassical economic assumption of an isolated utility maximiser or if participants state their WTP as *Gesellschaftswesen* which have a connectedness to society and/or nature as argued by the old institutional economists (see Section 3.2.4 and Chapter 4 above).

Beginning with the (perceived) utility, Figure 6-12 illustrates the five items associated with TEV: use value – i) direct and ii) indirect –, iii) existence value, iv) bequest value, v) option value. The responses to the Likert-items are listed per treatment group to allow for a visual comparison. The first item (item 13) suggests that a substantially large part did not consider direct use value at all. Furthermore, many respondents that did consider direct use value when stating WTP evaluated it as unimportant. In the PM treatment, a slightly higher number of respondents considered direct use value as important or very important compared to the other two valuation methods. Indirect use value indicated by “important tasks in nature” that wolves undertake (item 19) were considered important or very important by a majority of participants. Only one participant in the CV treatment did not consider it at all. Comparing importance between treatments, participants in the PM treatment considered it most important, while it was of less importance in the PE treatment.

Existence value (item 14), bequest value (item 15) and option value (item 18) also appear to be important motives behind WTP. PM participants evaluated them as more important compared to CV and PE participants. Furthermore, only in the PM treatment all participants considered all of these values in their decision, in the other treatments some participants did not consider them at all. Overall, importance of the associated motives was similar for participants of CV and PE.

Figure 6-12 Likert scale results of motivation items related to TEV



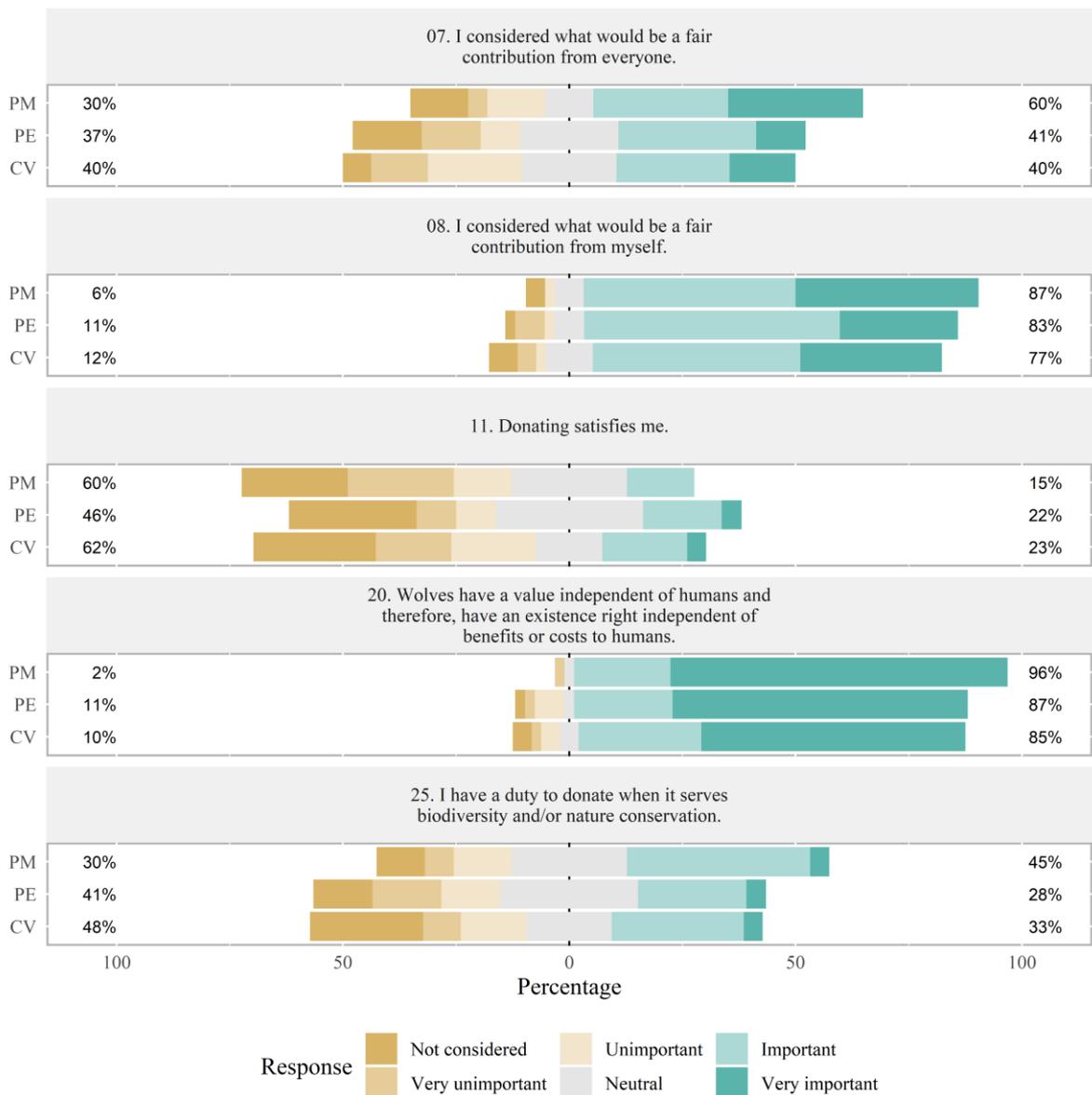
Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the neutral answers reflect the missing difference.

The next set of items related to fairness, sympathy, deontology and existence rights is illustrated in Figure 6-13. Items 07 and 08 indicate that in general for most of the participants fairness was of relevance when stating WTP. In the deliberation workshops fairness on the individual scale (item 08), i.e. consideration of a fair contribution from the participant, was slightly more important than in the CV workshops. The difference is larger regarding fairness on a social scale (item 08), the consideration what would be a fair contribution from everyone. In the PM treatment around 20% more participants considered it to be of importance when stating the amount, indicating that a more social perspective was adopted as intended by the phrasing of

the tasks. At the same time, more participants in the CV and PE treatment indicated that the act of donating (item 11) is of importance in terms of personal utility. As discussed above, according to Sen (1977b) the latter would be interpreted as *sympathy*. At the same time a considerably larger number of participants in the PM treatment felt to have a duty to donate (item 25). In addition, almost all participants stated that wolves' existence rights were of high importance, especially in the PM treatment (item 20).

Figure 6-13 Likert scale results of motivation items related to fairness, interdependent preferences, existence rights and duty



Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the neutral answers reflect the missing difference.

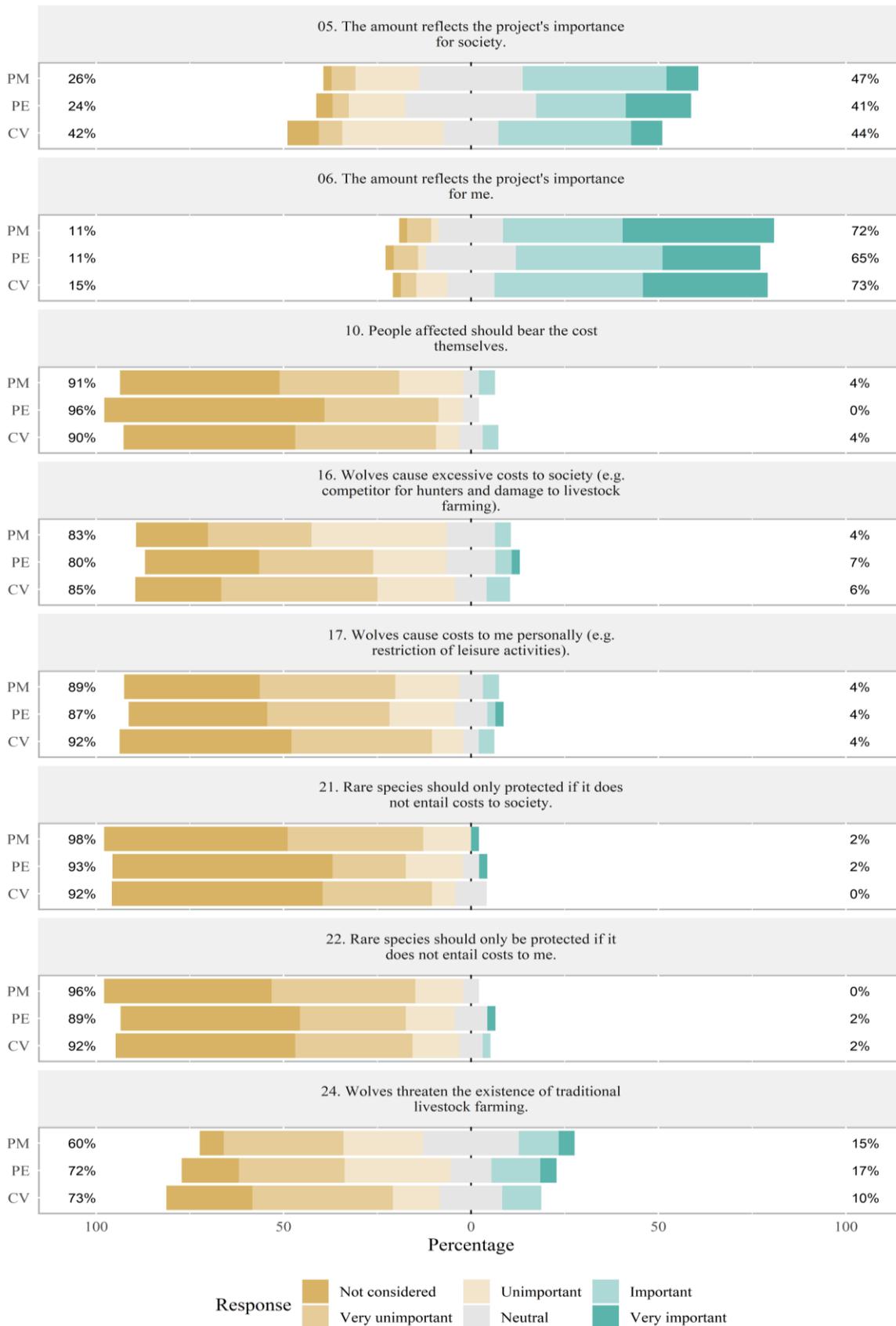
In summary, this set of items suggests that fairness, on an individual scale, and existence rights were of equal importance to the four highly relevant TEV items. Duty and fairness on a social scale were also relevant in all treatments but to a smaller degree. Further, the results suggest that in the PM treatment duty, fairness on a societal scale and existence rights were more important than in CV and PE. This supports the *moralisation* idea to make transcendental values explicit and to shift the focus from instrumental values towards plural values.

Motives with reference to the identification of We-preferences and I-preferences which also indicate if participants adopted a citizen or consumer rationality are shown in Figure 6-14. Surprisingly, at a first glance no major differences between the three valuation methods are apparent. Slightly more participants in the PM treatment found the importance for society relevant (item 05). Substantially less participants in the CV treatment considered importance for society relevant. Yet, this does not result in higher importance in the PM and PE treatments but in more “neutral” responses. In comparison with the societal importance, WTP reflects to a larger degree personal importance (item 06). Illustrating that a majority must have considered personal and societal importance simultaneously.

Furthermore, participants’ answers imply that costs on an individual and social level are of little importance for WTP (see items 16, 17, 21 and 22). Further, most participants did not consider that people affected should bear the costs (item 10) which was assumed to negatively affect WTP and would be in line with a narrow neoclassical economic conception of human behaviour. Also, only 10-17% of participants found a threat to the existence of traditional livestock farming of importance (item 24). While the majority of participants in the PM treatment considered this motive, less did so in the PE treatment and even less in the CV treatment. While this analysis cannot say if the difference is significant, this motive is certainly a more social aspect which appears to be of higher relevance in the PM treatment as expected.

Drawing conclusion from this set of questions, the differences between the valuation methods appear to be relatively small. Personal importance of the project was more relevant than societal importance, still around half of the participants found the latter important. This finding suggests that it cannot clearly be distinguished between a purely self-interested and an other-regarding rationality. Further, it appears that costs to society do not play a major role when discussing wolf management in Germany and even less so personal costs. This may be explained by the non-utilitarian motivations behind WTP, e.g. high importance of existence rights that were ascribed to wolves and motivation based on deontological ethics (duty), as discussed above.

Figure 6-14 Likert scale results of motivation items related to consumer versus citizen preferences

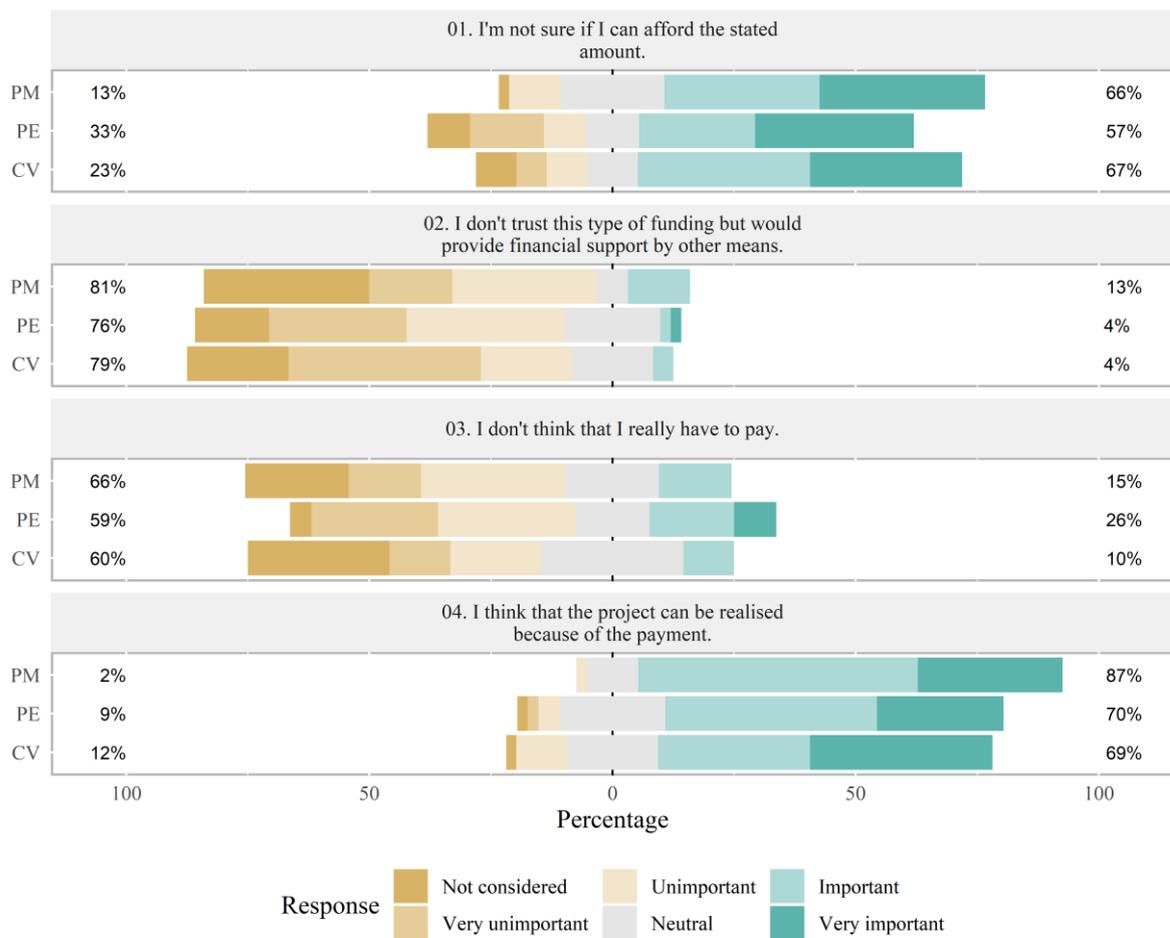


Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the *neutral* answers reflect the missing

Figure 6-15 shows the four items with references to the theory of Perceived Behaviour Control (PCB). The first item shows that only around two-thirds of the participants in each treatment found their personal ability to pay of importance (item 01). The percentage of participants that did consider their ability to pay or found it unimportant is considerably smaller in the PM treatment. This indicates that in the latter participants WTP may be less prone to hypothetical bias. Still, item 03 suggests that hypothetical bias may be an issue, in general a common problem in stated WTP studies, because 10-26% of the participants were influenced by their judgement about likeliness of payment. The highest importance was ascribed to this item in the PE treatment, while also the largest number of participants considered it in general. Distrust in the payment vehicle was of less concern as indicated by item 02. Distrust was highest among participants in the PM treatment. Contradictive to item 02, also *trust in the project's realisability due to payment* (item 04) was highest in the PM treatment.

Figure 6-15 Likert scale results of motivation items related to Perceived Behaviour Control

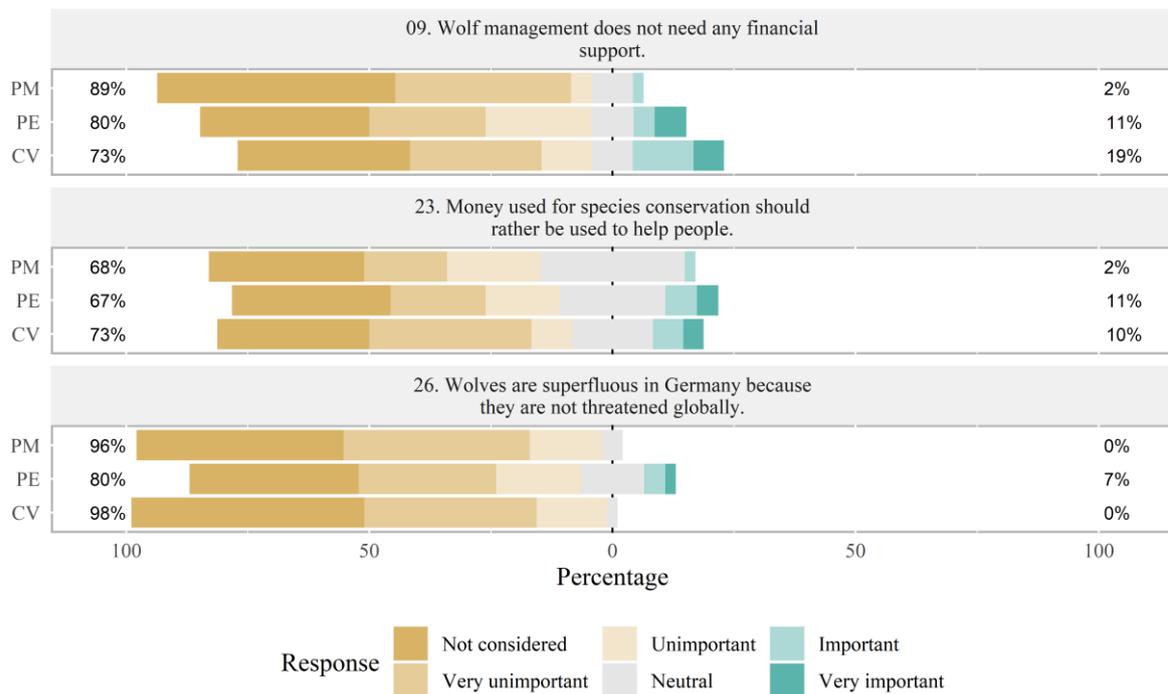


Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the *neutral* answers reflect the missing difference.

As illustrated by Figure 6-16, value hierarchies were considered by roughly half of the participants but by most considered to be unimportant. Although, in the CV treatment around 20% think that wolf management does not need any financial support (item 09). Also, around 10% in the CV and PE treatments favoured an anthropocentric use of public funds instead of species conservation (item 23). Only in the PE treatment a small number of participants considered wolves to be superfluous in Germany as there are not a threatened species on a global scale (item 26).

Figure 6-16 Likert scale results of motivation items related to value hierarchies

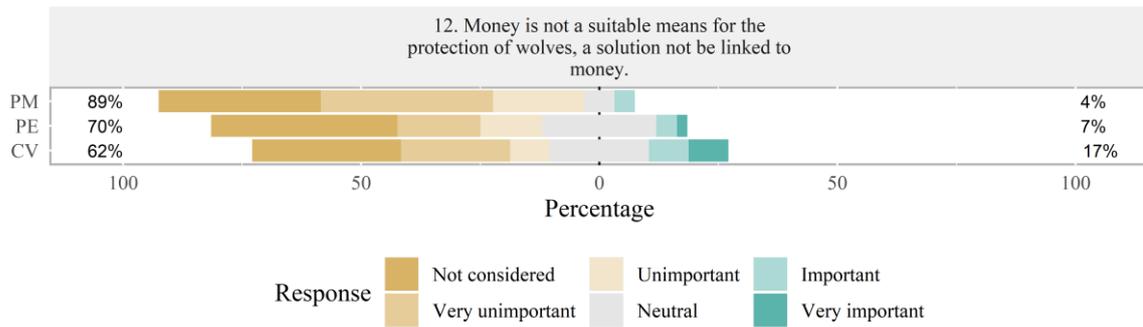


Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the neutral answers reflect the missing difference.

Lastly, it was of interest if the monetary value indicator has an effect on WTP. Figure 6-17 shows participants' answers to the associated item 12. It is noteworthy that opposition towards money as value indicator is largest among participants in the CV treatment and considerably smaller in case of the two deliberative valuation methods. The opposition was lowest in the PM treatment. This comes at a surprise, because as discussed above opponents of economic valuation methods often claim that monetary value indicators are inadequate to capture and express plural values of environmental goods. Hence, it was expected that "protest" against the monetary value indicator would be highest among participants exposed to the moralisation intervention with less focus on costs and benefits.

Figure 6-17 Likert scale results of motivation items related to value hierarchies (commensurability)

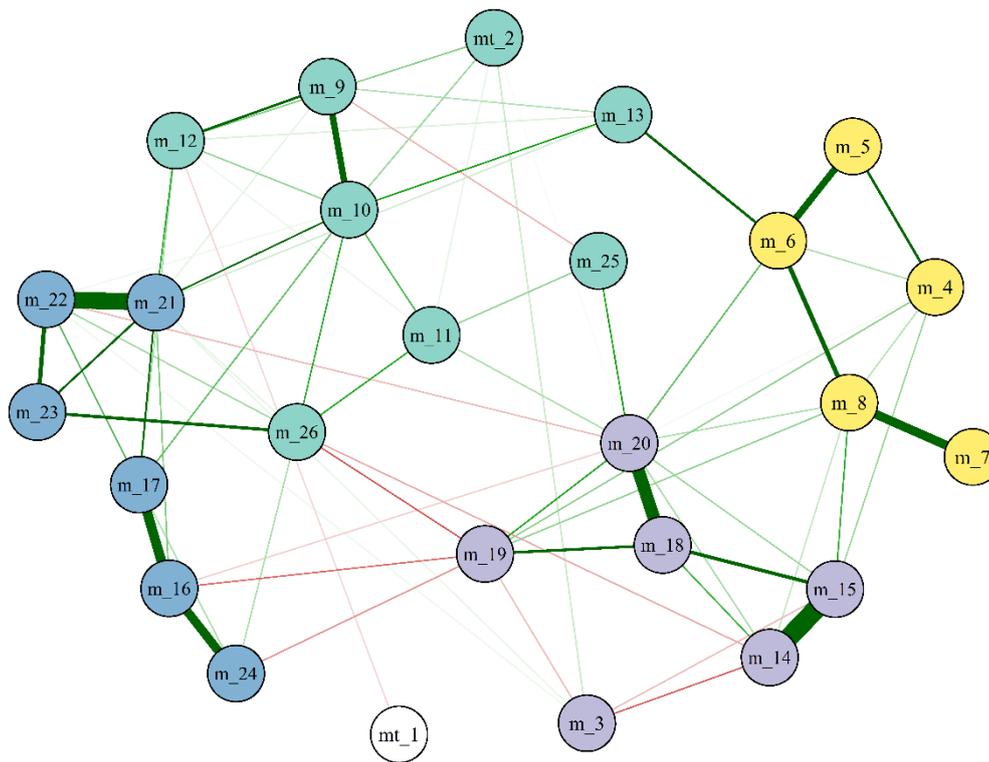


Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the *neutral* answers reflect the missing difference.

Besides, the analysis of motivations underlying WTP and their comparison between valuation methods, also the dimensionality of motivations with respect to the conceptual framework was investigated. As discussed above Exploratory Graph Analysis (EGA) was used as a tool to do so. Figure 6-18 illustrates the identified clusters within the network of motivations based on the EGA. Each node represents one motive (item) and the edges indicate the direction of association between nodes. Green edges show positive (partial) correlations, whereas red edges stand for negative (partial) correlations. Only correlations with 5% significance level are included in the figure. Highly correlated nodes are placed closer together and edges are thicker. As discussed in the methods regarding the approach towards analysis of motives behind WTP, EGA estimates a graphical model followed by cluster detection in order to determine the number of dimensions (see Section 5.4.3.2 above). As indicated by the different colours in Figure 6-18, EGA identified that motivations are clustered within five dimensions. Although, one cluster contains just a single item (mt_1). Yet, the network’s stability remains ambiguous due to the small sample size and potential sample-specificity. Hence, in the following the network’s stability will be assessed before turning to the analysis and interpretation.

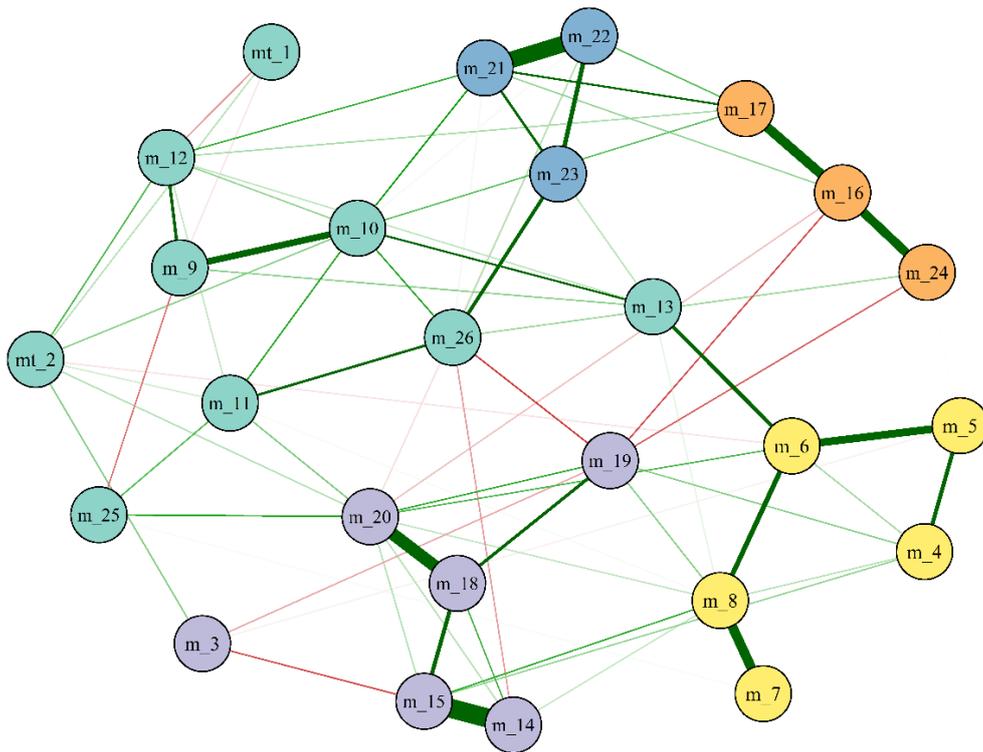
Figure 6-18 Clusters of motivations identified by Exploratory Graph Analysis



Source: Own illustration

As discussed in the methods (Section 5.4.3.2), the stability of the network estimated by EGA was assessed via bootstrap. The bootstrapped EGA is illustrated in Figure 6-19. While the “original” EGA network (Figure 6-18) and bootstrapped EGA network (Figure 6-19) show mainly identical patterns, some minor differences exist. Hence, the bootstrap suggests that the original network lacks stability. This is very likely due to the relatively small sample size. Therefore, in the following the bootstrapped EGA will be discussed and set in context with the motivations’ clustering based on theoretical reasoning (see Table 5-6, Section 5.4.3.2). Generally, EGA results suggest that motivations behind WTP are multidimensional as illustrated by the five identified dimensions in Figure 6-19. Further, controlling for all other variables some of the motivations have a high degree of association.

Figure 6-19 Clusters of motivations identified by bootstrapped Exploratory Graph Analysis.



Source: Own illustration

Comparing the EGA dimensionality with the theoretical clustering (Table 5-6, Section 5.4.3.2), large similarities but also some differences can be identified. The similarities and differences will be highlighted in the following.

TEV is mainly captured by the purple cluster which consists of the payment's incredibility (m_3), existence value (m_{14}), bequest value (m_{15}), option value (m_{18}), indirect use value (m_{19}), and existence rights (m_{20}). Notably direct use value is not part of this dimension. Instead, one item from the dimension related to *We- and I-preferences* is included: existence rights. The latter shows a strong correlation with option value (m_{18}) and to a minor degree with the other TEV related motivations. Interestingly the partial correlation between existence value (m_{14}) and existence rights (m_{20}) is relatively weak. Existence value (m_{14}) and bequest value (m_{15}) have one of the strongest partial correlations. The payment's incredibility (m_3), on theoretical reasoning clustered into Perceived Behaviour Control, is only negatively correlated within this dimension as indicated by the red edges with bequest value (m_{15}) and indirect use value (m_{19}).

The theoretical clustering of motivations with reference to *We-preferences and I-preferences* covered a relatively wide range of motivations which is also reflected in the dimensions identified on the basis of the EGA. This clustering corresponds more with the various conceptual cores than with an overall dimension of We- and I-preferences.

The yellow dimension covers aspects of We- and I-preferences [fairness with respect to social scale (m_7) and individual scale (m_8); and project's societal importance (m_5) and personal importance (m_6)] and includes one item of Perceived Behaviour Control [trust in the project's realisability due to payment (m_4)]. The edges between these motivations show that the two measures of fairness are strongly associated with each other. The same applies for the two measures of project's importance. However, a direct link between these four measures exists only on the personal level. The trust in the project's realisability is linked to all motivations in the yellow dimension with the exception of fairness on the social scale.

While in the original figure the blue dimension contained six motivations, the bootstrapped EGA identified these as two separate dimensions. The orange cluster comprises three motivations from the consumer-citizen dimension: motivation with reference to the individual and societal cost scale (m_{16} and m_{17}) and motivation in form of other-regarding preferences or rather concern for social utility (m_{24}). It should be noted that only the societal cost scale (m_{16}) has a direct link to social utility (m_{24}).

The blue dimension clusters the three motivations with reference to anthropocentric utilitarianism: on the societal scale (m_{21}), on the individual scale (m_{22}) and in its general form (m_{23}). Although the latter was part of the "value hierarchies" dimension based on the theory, it was expected that these motivations are correlated. As discussed above, items may not only belong to one dimension but be tangent to others as well. Thus, EGA identifies an own dimension due to their closeness. Based on theory the two anthropocentric utilitarianism items (m_{21} and m_{22}) were included in the consumer-citizen dimension to shed light on participants' reference to the individual and/or societal scale. At the same time, anthropocentric utilitarianism may link to value hierarchies in terms of species conservation versus other use of money (m_{23}). The edges between the nodes also suggest that the partial correlation between m_{21} and m_{22} is far stronger compared to those with m_{23} .

The largest number of motivations is captured by the green dimension: the personal budget constraint (mt_1); (dis-)trust in the payment vehicle (mt_2); the project's legitimacy regarding need of financial support (m_9); individual utility (self-regarding preferences) (m_{10});

interdependent preferences in form of sympathy (m_{11}); protest against the value indicator (m_{12}); direct use value (m_{13}); duty to contribute (m_{25}); and project's legitimacy regarding wolves' worldwide threat status (m_{26}). Overall the motivations are the most widely spread regarding theories as well as "spatially" within the network structure. This may also be the reason that the partial correlations between the motivations appear to be rather weak relative to the other dimensions identified by EGA. The strongest link is between self-regarding preferences (m_{10}) and the belief that wolf management does not need any financial support (m_9). The latter has also a strong partial correlation with the objection of money as value indicator (m_{12}). The latter is also negatively associated with disability to pay (m_1), so no indication exists that participants simply oppose money as value indicator because of their personal financial situation, at least in this case study.

Although at a first glance the green cluster covers a large variety of motivations, an identifiable pattern is a focus on the individual. Direct use value, self-regarding preferences, duty, sympathy, perceived behaviour control in form of ability to pay and distrust in the payment vehicle as well as the participant's identified needs and preferred end-states are all connected to the individual. In contrast, the other dimensions cover largely motivations related to the societal scale and We-preferences, although not exclusively.

Shifting the focus from the analysis within dimensions towards the links between dimensions, the discrepancy between theoretical clustering and the dimensions identified by EGA becomes smaller. The motivations associated with the consumer-citizen dichotomy (m_{10} , m_{16} , m_{17} , m_{21} , m_{22} , m_{24}) are in relatively close proximity and have many direct links between them. The only exceptions are the societal and personal importance (m_5 and m_6). Also, within the Perceived Behaviour Control cluster distrust in payment vehicle (m_2) and payment's incredibility (m_3) show a direct link, although placed in different dimensions by EGA. The motivation associated with general anthropocentric utilitarianism (m_{23}), which was placed somewhere between value hierarchies and We-preferences on theoretical reasoning, is also located in such a position in the network figure. Further, it has a strong partial correlation with the project's legitimacy (m_{26}) which was also considered to express a value hierarchy. Additionally, self-regarding preferences (m_{10}), which are part of the green dimension instead of consumer-citizen dichotomy, shows direct links to these variables, e.g. individual cost scale (m_{17}). Still, for example the yellow dimension shows no direct link to other We- and I-preferences dimensions but is closely related to TEV, illustrating the link between perceived

importance, perceived utility and aspects of fairness as assumed in the theoretical framework (see again Figure 4-1).

In summary, the results of the EGA analysis confirm the multidimensionality of motives behind WTP for wolf management in Germany. Further, the dimensions identified by EGA largely overlap with the theoretical clustering and, although certain differences exist, the results do not challenge the theoretical clustering.

Overall, the findings of the analysis of motivations behind stated WTP have yielded some interesting insights: firstly, in terms of comparison between treatments based on Likert-items and secondly, regarding motivations' dimensionality based on EGA. The latter shall be discussed in context with the associated hypotheses, H3 and H4. Firstly, the comparison between methods did not suggest that differences in motives behind WTP exist. Put another way, the valuation method applied did not activate a certain rationality or preference ordering as hypothesised based on theory. However, indications were found that duty, fairness on a societal scale and existence rights were more important in the PM treatment than in the other two treatments. This suggests that making transcendental values explicit and shifting the focus towards plural values and a social perspective alters motives behind WTP for wolf management. Yet, this finding was not confirmed with respect to the consumer-citizen-dichotomy.

Hence, the evidence found is not strong enough to support H3.

On the one hand, the analysis has shown that none of the motives was considered by all participants (it only occurred occasionally within treatments). On the other hand, all motives were considered by participants (though to varying degrees) highlighting the relevance of plural motivations. Further, the importance of preferences associated with TEV was given but besides TEV also motivations related to, e.g. fairness, duty and wolves' existence rights were found to be of similar importance. Importantly these motivations were considered simultaneously and were not mutually exclusive. This implies that motivations behind WTP were not in line with the neoclassical economic concept of rationality (individualistic utility maximisation) nor with alternative concepts of rationality such as the consumer-citizen dichotomy or rather homo politicus. Stated preferences appeared to be more complex covering individual as well as social aspects at the same time. Also, the elicited preferences in the CV and PE treatment cannot be assumed to reflect "pure" consumer preferences based on self-regarding utility maximisation.

The multidimensionality and plurality of motives found in the analysis of motives supports H4.

Focussing solely on the outcome in relation to the valuation process it is deduced that the valuation method does not affect motivations behind WTP. However, participants expressed multidimensional motivations even in the context of individualistic valuation methods which do not make transcendental values explicit. This suggest that the valuation object is of equal importance as the valuation process in the context of value pluralism and WTP for public environmental goods.

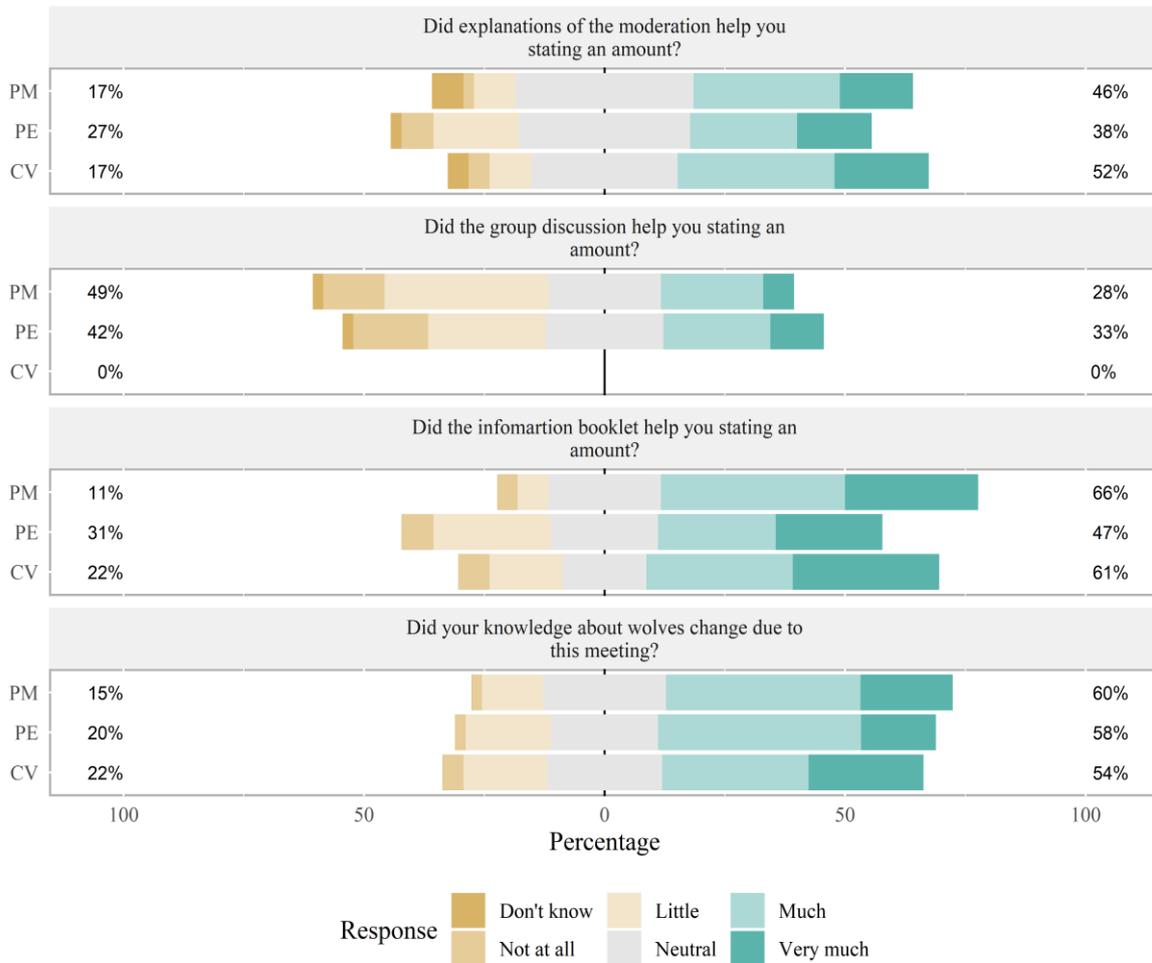
Besides motives, also other relevant aspects which may diverge between valuation methods were included as items in the follow-up questionnaire. Valuation methods based on diverging paradigms may differ with respect to information provision, knowledge increase and complexity of tasks. Further, conventional economic valuation methods assume that preferences are ex-ante given, whereas deliberative valuation allows for preference construction. Hence, preference formation with respect to the valuation process as well as in terms of inability to state an amount, if ex-ante preferences are not given, shall also be investigated. These aspects are relevant in terms of a valuation method's practicability and applicability. Thus, the results about information, complexity and preference formation will be presented in the following.

6.4 Information, complexity and preference formation

As discussed above, participants were asked follow-up questions about information, in terms of provision and change in knowledge, and complexity of tasks. The questions also provide insights if preferences for wolf management were ex-ante given or constructed.

Participants' responses to the first set of questions associated with information and knowledge are illustrated in Figure 6-20. Almost all participants stated that their knowledge about wolves increased due to participation in the valuation workshop. In all treatments more than half of the participants stated that their knowledge changed much or very much. The information booklet was considered as most important source of information. In the PM and CV treatment around two-thirds of the participants found it helpful for stating their WTP amount. In the PE treatment around fifty percent did so. Half of the participants in the CV and PM treatment considered explanations by moderation helpful or very helpful. Again, less participants thought so in the PE treatment (38%).

Figure 6-20 Likert scale results of follow-up question related to information provision and change in knowledge



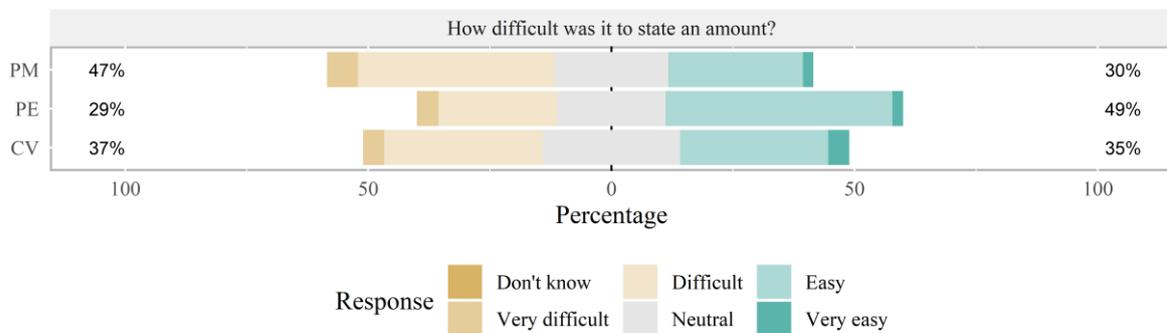
Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the neutral answers reflect the missing difference.

The discussion appears to be least important for stating an amount. Still, 28% and 33% of participants in the deliberative treatments found the discussion helpful, no clear difference between the deliberative treatments is visible. However, substantially more participants in the PE treatment indicated that the group discussion added new aspects that otherwise would have not been considered (see last item in Figure 6-22 below).

Regarding complexity, to be precise difficulty of tasks, participants who were part of the PE treatment had fewest difficulties stating their WTP for wolf management (see Figure 6-21). Still, even in this treatment 29% of participants indicated that they found the task very difficult or difficult. In the CV and PM treatments even more participants considered stating their WTP as difficult. For the PM treatment this was expected, as the framing of questions had the focus on the project’s social importance, while asking for individual WTP and making transcendental values explicit added further complexity to the task. While the focus and framing were identical in the CV and PE treatments, it appears that deliberation in the PE treatment made it easier for participants to state an amount. This may be caused by the discussion due to consideration of more aspects in combination with additional time to reflect on the issue (see e.g. Lienhoop and Völker (2016)).

Figure 6-21 Likert scale results of follow-up question related to complexity

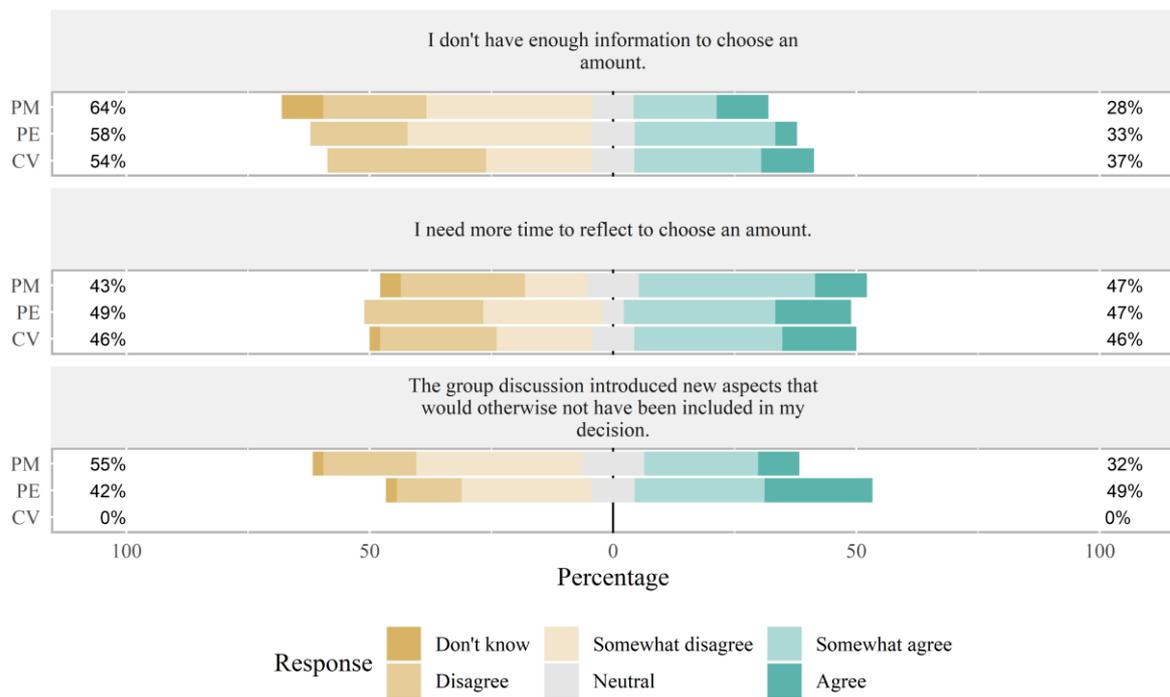


Source: Own illustration

Note that percentages left and right of the bars do not add up to 100%, the neutral answers reflect the missing difference.

In fact, in all treatments approximately half of the participants stated that they would have needed more time to reflect on their WTP and one third that they would need more information to do so (see Figure 6-22, sentences 1 and 2). These statements question the adequacy of ex-ante given preferences for complex environmental goods – in this example wolf population management in Germany – as assumed in neoclassical economics. In line with the additional aspects included in participants’ decision-making after deliberation (as indicated by the last item in Figure 6-22), it appears that to some degree participants formed or found preferences throughout the valuation process.

Figure 6-22 Likert scale results of follow-up question related to construction of preferences



Own illustration

After having presented a great number of descriptive results (Section 6.1), regression analysis results (Section 6.2) and motives behind WTP (Sections 6.3 and 6.4), in the following these empirical results will be discussed in more detail, on which basis conclusions from the case study will be derived.

6.5 Discussion of empirical results and concluding remarks

This study compared three valuation methods (*CV*, *PE* and *PM*) with respect to i) effects on absolute magnitude of WTP, ii) determinants of WTP, and iii) underlying motivations behind WTP. Based on these three analyses social values may be identified with respect to intention (type of preferences expressed), process (changes in WTP due to preference construction caused by deliberation / social learning process), and scale (values beyond the individual e.g. with reference to society).

Overall, the study's results are ambiguous. The results of the *between-group design* (first mixed effects model) have shown that the absolute magnitude of WTP is insensitive towards the valuation method applied when comparing between methods. This finding suggests that citizen-framing, deliberation and moralisation did not lead to significant differences in absolute magnitude of WTP between the valuation methods. However, this insensitivity may also be caused by some of the sample's characteristics. The relatively homogeneous sample consists of

participants with relatively low income – low ability to pay – and hence, a relatively small effect on WTP would be expected. Yet, to discover small effect sizes large samples are needed which in general is a concern when eliciting WTP by deliberative valuation methods. While the sample size of this study is considerably large for a deliberative valuation study, compared to conventional sample sizes it is low and hence, small effects may not have been detected.

The results of the *within-group design* (second mixed effects model) have demonstrated a significant difference between the deliberative valuation methods. WTP was significantly higher in the PM treatment, whereas the alteration in the PE treatment was insignificant. This finding suggests that the moralisation intervention, which aimed at making transcendental values explicit, has had a significant effect on WTP, whereas deliberation did not or only in combination with moralisation. This poses the question why deliberation in the PE treatment did not result in a significant change in WTP. In this study deliberation was only a “one shot game” and compared to other studies (see e.g. Lienhoop and MacMillan (2007b)) time to reflect was relatively short and may not have been long enough to allow for preference construction. Yet, comparing the PE treatment with the PM treatment in which preferences were constructed, the insignificance appears to be rather inherently linked to the valuation method and the corresponding focus on costs and benefits. As discussed above, an argument brought forward for preference construction through deliberation is related to information. It could have been argued that in the PE treatment deliberation did not introduce any new information as the information booklet already covered costs and benefits. However, this seems unlikely as the follow-up questions illustrate that almost half of participants in the PE treatment stated that the discussion added new aspects. Additionally, the number of participants in the PM treatment supporting this view was lower.

It is noteworthy that the direction of change in WTP was different between the two deliberative methods. While it increased in the PM treatment, it decreased in the PE treatment. This may have been caused by the focus on costs and benefits as the cost of wolf management or rather conservation is currently small compared to other public spending. Although not all hypotheses were confirmed, the findings suggest that the valuation context which is defined by the valuation method affects stated WTP. Even relatively small interventions, like the additional questionnaire making transcendental values explicit in combination with a thirty-minute simulation of a deliberation in the public domain, led to significant changes in WTP. Additionally, even though mean WTP did not significantly change in the PE treatment, changes in individual bids were observable. This raises doubts about the appropriateness of valuation

studies eliciting WTP for complex goods being designed as “one shot games” and implies that valuation should rather be considered as an iterative process (see Dietz et al., 2009). Further, the question remains in how far aggregated individual preferences are an adequate measure if they do not reflect the changes in case of heterogeneity, both in terms of bidirectional preference construction and the simultaneous perception of an environmental good as environmental bad. As Hayek (1945, p. 523f.) reasoned:

‘One reason why economists are increasingly apt to forget about the constant small changes which make up the whole economic picture is probably their growing preoccupation with statistical aggregates, which show a very much greater stability than the movements of the detail.’

Turning to the questions what type of WTP was stated, the determinants of the latter and underlying motivations are of interest. Regarding the determinants of WTP, the comparison of submodels has shown that general environmental attitudes and specific attitudes towards and perception of wolves did explain variation in WTP to a large degree. This evidence supports the findings of i.a. Clinch and Murphy (2001); Kahneman et al. (1993); Kahneman et al. (1999); Luzar and Cosse (1998); and Spash et al. (2009). Regarding the underlying motivations, the analysis of responses based on Likert-Scales and EGA has illustrated the multidimensionality of motivations behind WTP for wolf management in Germany. Especially, fairness, duty and existence rights motivated WTP besides non-use values as defined by the TEV concept.

As discussed above, on the basis of theoretical reasoning and empirical findings it may be argued that deontological motivations based on their non-utilitarian and non-consequentialist nature lead to lexicographic preferences and opposition to trade-offs (see e.g. Hanley, 1996; Spash, 2006; Vatn, 2000). Yet, this was not the case in this study as participants considered plural motivations simultaneously and links were identified in the EGA network. This supports the findings of Spash et al. (2009) and Stevens et al. (1991) that right-based beliefs explain WTP to a certain degree. Although participants stated that deontological motivations were an important factor for their decision, it did not lead to protest voices or refusal to trade-off income for wolf management in Germany. Hence, the relevance and consideration of deontological motivations with regards to the environmental good does not generally question the validity of stated willingness. Instead, it is an important factor that determines it. Still, further exploration how right-based ethics and associated ethical preferences are linked to the utilitarian calculus

of WTP is needed. Verbal protocol analysis is one possible tool to analyse the individual decision making of participants (see Schkade & Payne, 1994).

No effect of the valuation method on the type of rationality was discovered. Furthermore, the value pluralism as well as the simultaneous consideration of utilitarian and non-utilitarian preferences challenges the appropriateness of the neoclassical concept of rationality in the case of merit goods. At the same time alternative concepts such as the consumer-citizen dichotomy were also found to be unsuited to explain underlying motivations as consumer and citizen preferences were simultaneously expressed by participants. There is still an ongoing discussion if social preferences can only be distinguished conceptually from consumer preferences with altruism or also empirically (see e.g. Curtis & McConnell, 2002; Nyborg, 2000). This study suggests that consumer preferences as well as citizen preferences represent “extremes” and rather appear to be active at the same time. Hence, a more appropriate conception of rationality and associated behaviour seems to be necessary: individuals embedded in nature and society which may have individual interests, other-regarding preferences and anthropocentric-intrinsic preferences.

On the one hand, the findings undermine some of the criticism against conventional economic valuation methods enforcing a purely myopic self-interested behaviour. On the other hand, this brings new challenges for economic valuation of public goods. WTP cannot be understood simply in terms of market prices if participants express other-regarding preferences towards humans and non-human entities besides self-regarding preferences. Also WTP motivated by ethical preferences may be independent of the utilitarian calculus. Further, if individuals state individual and social preferences this poses issues in terms of aggregation (Nyborg, 2000) and may lead to scope effects (see e.g. Arrow et al., 1993; Kahneman & Knetsch, 1992). While Kahneman and Knetsch (1992) link scope effects to “warm glow”, Boman and Bostedt (1999) found scope effects regarding wolf conservation in Sweden being caused by (perceived) benefits, mainly associated with existence value. These findings raise the question what WTP represents in case of merit goods and complex environmental goods (see also Raymond & Kenter, 2016). The question is, to what extent does WTP reflect an economic welfare measure if ethical motivations play a role? Even if it is assumed that social and ethical preferences enter the utilitarian calculus, the question remains in which way they do so: Are they additive to the “actual” WTP in neoclassical economic terms and when do ethical preferences lead to value hierarchies and associated rejection of trade-offs?

In line with the argumentation that commodification of nature leads to refusal of preference statements, validity of WTP studies is often questioned based on the criticism of value monism. This study contributed to this discussion by two findings: On the one hand, the multidimensionality of motivations behind WTP casts doubts on the interpretability of “simple” value indicators which reduce complexity to a single metric such as WTP amounts. This finding is in line with the common critique against the use of WTP as value indicator (see e.g. Söderbaum, 1987). However, the analysis of motivations behind WTP demonstrated that the multidimensionality is not necessarily lost in the process due to the application of a single metric. Instead, WTP does not necessarily contradict value pluralism or enforce value monism as seen by the plural motivations voiced. Yet, this also highlights the need to better understand determinants of WTP. It is important to combine different methods in order to correctly interpret stated WTP. Otherwise the pluralism would indeed be lost in a single metric and falsely overlooked by the scientist or decision-maker.

Furthermore, the analysis has shown that group effects were irrelevant, and the analysis of follow-up questions indicated that information was most important for participants. Yet, also around 40% of participants in the deliberative treatments stated that the discussion added new aspects that would have not been considered otherwise. Moreover, a large number of participants stated that they would have wanted more information and more time for decision-making. In line, the findings suggest that deliberation and time to reflect make it easier for participants to state their WTP. In contrast, participants of the PM treatment found the task the hardest, which may be explained by the higher complexity of taking into account transcendental values. Considering also the significant change in preferences of the PE treatment, the results question the adequacy of ex-ante given preferences, as assumed in neoclassical economics including environmental economics, for complex environmental goods like wolf population management in Germany.

In summary, the results show that social values are not only integrable into a preference-based utility framework from a theoretical perspective, but can also be identified empirically based on intention, scale and process. It has been seen that social values associated with intention and scale were expressed by participants irrespective of the method. Social values regarding the process were only identifiable in case of the PM treatment by the significant change in WTP between the stages. The latter suggests that making transcendental values explicit is highly relevant for economic valuation of merit goods. However, as mentioned above the results are not completely unambiguous. The analysis of motivations behind WTP based on the Likert

Scales does not suggest any difference between the methods. This methodological “indifference” implies that a clear distinction between consumer and citizen preferences is unfeasible as well as their “activation” through the valuation context (see also Lewinsohn-Zamir, 1998). Nevertheless, this highlights the important role of value pluralism irrespective of the valuation context.

Finally, this study has shown that economic valuation if combined with methods and measures from psychology and philosophy may capture value pluralism and does not necessarily enforce value monism. However, the need to carefully elicit and interpret these values and stated preferences was illustrated and calls for the development of more pluralistic valuation approaches. Otherwise the value pluralism which was also discovered in the conventional experimental design (Contingent Valuation Method) will be lost in the process.

Having discussed the results of the case study as well as implications for economic environmental valuation, in the following and final chapter the contributions of the thesis at hand will be summarised and discussed. Further, limitations of the study as well as suggestions for further research will be depicted.

Chapter 7 Discussion and conclusion

In this final chapter of the thesis, the aim is to summarise the main results (Section 7.1), to elaborate on limitations of the study (Section 7.2) and to suggest further research based on questions that the thesis could not answer or that emerged from new insights gained by the thesis at hand (Section 7.3). The thesis will conclude with some final thoughts (Section 7.4).

7.1 Summary of results

The overall aim of the thesis was to address three identified research gaps. Firstly, reviewing the economic debate about social values beyond neoclassical economics and the current scientific debate linked to ES in order to identify so far neglected but relevant economic theories. Secondly, based on these insights close the gap of a lacking consistent conceptual framework by developing an economic conceptual framework integrating social values into a preference-based utility framework. This was the first time an economic conceptual framework for social values was developed which is essential in order to identify social values in future economic valuation studies of the environment and biodiversity, assess the relevance of social values with regard to the valuation object and to incorporate identified social values into decision-making. Thirdly, empirically test the conceptual framework's validity by conducting a case study regarding WTP for wolf management in Germany and assess whether conventional and recently developed economic valuation methods lead to diverging results. Thereby, in addition to theoretical insights, the thesis at hand also contributes to the rather small amount of empirical studies investigating social values of ES and/or biodiversity. To address these three larger aims, several substeps had to be taken which will be summarised in the following.

Chapter 2 was primarily concerned with laying foundations with respect to economic and ecological theory relevant for valuation of ES and biodiversity. The chapter presented a brief overview about the conceptual core and fundamental assumptions of neoclassical economics. This was necessary as firstly, the topic is of interdisciplinary interest and the non-economic readership may not be aware of underlying assumptions, and secondly, because the current discussion about social values of ES builds to a certain degree on a critique against neoclassical economic theory. Hence, making the theoretical foundations explicit is a necessary condition to i) illustrate how social values are conceptualised in neoclassical economics, ii) address the critique against economic valuation of the environment which is often limited to neoclassical economics, and iii) to emphasize conceptual differences of economic theories beyond neoclassical economics.

Thereafter, the concepts of ES and ES cascades were introduced in order to illustrate the links between nature and human well-being which are the underlying incentive to conduct economic environmental valuation and to discuss on this basis the relevance of social values for environmental goods. Based on an understanding of ES, the object of valuation, concepts and conventional methods for economic valuation as well as their critique were briefly introduced. This was essential in order to be able to highlight differences to subsequent discussed methods and concepts associated with value pluralism and methodological pluralism.

Chapter 3 was primarily concerned with identifying meanings, recurrent attributes and concepts of social values in the existing literature. This was done firstly by reviewing the current debate linked to research of ecosystem services. The first questions that had to be answered was why social values could be relevant at all in the context of economic valuation of ES. Firstly, the fundamental critique against economic environmental valuation was reviewed as the limitations of conventional economic valuation serve often as starting point for the discussion about social values of ES. It has been shown that this fundamental critique extends the common economic critique by addressing various issues and assumptions of economic environmental valuation such as commodification of nature, lack of improved decision-making, value monism, incommensurability, (preference) utilitarianism, the narrow concept of human behaviour, complexity of environmental goods, individualism and instrumentalism. On the one hand, it has been shown that the fundamental critique reinforces limits of conventional economic valuation, on the other hand, it does not eliminate reasons to undertake economic valuation studies. Instead, on the basis of this criticism, theoretical and methodological advances were discussed.

DMV was presented as one of the methodological advances to adress some of the criticism against economic valuation, especially, also with reference to social values of ES. However, the synthesis of diverging approaches and rationalities can be problematic (Vatn, 2009) and it has been argued that the theoretical basis of DMV needs to be strengthened (see also Bartkowski & Lienhoop, 2018; Bunse et al., 2015). Further, it has been discussed that DMV may build upon diverging paradigms leading to different approaches, i.a. preference economisation and preference moralisation, and different aims.

Five relevant aims of deliberation in DMV studies were identified:

- i) Provision and sharing of information
- ii) Preference construction
- iii) Social learning (process)
- iv) Revelation of implicit values
- v) Coverage of multidimensionality of value

Based on an understanding of the fundamental critique and methodological advances i.a. associated with social values, the various understandings, definitions and concepts of social values in the current debate on social values were reviewed (Section 3.1). The review illustrated that while scholars identified a need for accounting for social values of ES, the concept remained ambiguous. A consistent use of the term or consensus on a definition was missing and many questions about ontology, elicitation and aggregation of social values of ES remained (Kenter et al., 2016a; Kenter et al., 2019). Consequentially, the lack of a consistent economic conceptual framework for social values was identified as one of the fundamental research gaps.

In a further step (Section 3.2), the identification of social values was extended to reviewing the long tradition of social values in economic theory and identifying so far neglected contributions of economic theory that explicitly or implicitly discuss social values. This has been done in order to firstly, address the fact that in most cases critique against economic valuation is limited to the realm of neoclassical economic theory, neglecting insights of other economic schools of thought, and secondly, to thereby also strengthen the theoretical basis of social values and DMV. The relevant theories identified were: Kapp's theory of social cost; Harsanyi's utilitarianism; Sen's theories of meta-preferences, commitment and sympathy; Buchanan's constitutional economics; and Musgrave's theory of merit goods. While also other economists addressed social values, they were not as relevant for the current discussion on social values of ES. Hence, the theories' relevance was not simply assessed with respect to reference to/of social values because the concept of economic value as well as the role of nature within economic theory changed throughout history. Therefore, seven recurrent attributes associated with social values were identified: i) complex human behaviour and multiple preferences; ii) relevance of human embeddedness in nature, social relations and culture; iii) value pluralism and hierarchies; iv) public participation and social learning; v) preference aggregation; vi) interdependence of preferences and utility; vii) issues of distribution, power and justice.

On this basis, in Chapter 4 the lack of a consistent economic conceptual framework in the current literature was addressed by integrating social values in a preference-based utility framework. Against the manifold criticism of economic environmental valuation, the framework has illustrated that social values and economic theory are reconcilable when theories beyond neoclassical economics are considered in order to address associated theoretical and methodological issues regarding:

- i) View of individual
- ii) View of society
- iii) Preferences
- iv) Rationality
- v) Value concept
- vi) Value scale
- vii) Preference aggregation
- viii) Valuation process
- ix) Basis for normative evaluation

It has been argued that to account for these relevant dimensions, theoretical and methodological pluralism is a necessary but not sufficient condition. Instead, the theory of social values requires an unified basis (see Baumgärtner et al., 2008; Winthrop, 2014). Hence, to strengthen the theoretical basis, insights from the current debate on social values of ES as well as the so far neglected economic theories were synthesised to ensure the framework's consistency.

However, as discussed, incorporating diverging theories and methods into the analysis of social values and associated WTP is not without difficulties and resulted in the framework's high degree of complexity. To account for all relevant value concepts and topics associated with the act of valuing ES, three different spheres were introduced for the first time: the natural sphere, the social sphere and the contextual sphere. The social sphere emphasised human embeddedness in society. This sphere captures all factors which are determined outside of the valuation context but affect preferences. Hence, the social sphere emphasises the role of institutions, the social environment, and transcendental values. The natural sphere comprised all aspects of the ecosystem, e.g. state, process, biophysical structure and functions, which build the basis for ES as valuation object. More importantly from the economic perspective, it has been argued that the natural sphere is associated with relational values through a sense of connectedness which can motivate appreciation and affect assigned value. Lastly, the role of

the valuation context was highlighted by incorporation of the contextual sphere. It has been argued that various factors determined by the valuation context i.a. information, perception of the object and held values, activation of diverging sets of preferences, deliberation and social learning affect assigned values and hence, elicited WTP. This stresses the role of economic valuation methods as VAI.

Furthermore, it was illustrated in Chapter 4 by development of a novel extension of the “traditional” TEV concept, that the (extended) TEV is able to account for social values of ES and the associated multidimensionality of motivations underlying preferences. However, even though the taxonomy of sources of value can account for social values of ES, some conflicts arose. Preferences which are independent of individual welfare are not in line with the welfarist and utilitarian foundation of conventional economic environmental valuation. Therefore, WTP amounts elicited based on different paradigms are not comparable and it is unclear how preferences based on non-utilitarian motivations affect WTP. Hence, it has been argued that economic valuation methods should be combined with other methods, e.g. from psychology or ethics, in order to understand the motives underlying stated preferences.

Accordingly, in the discussion of implications for economic environmental valuation, it has been demonstrated that neither *the* assigned value nor *the* social value exists. Instead, multiple forms of value expressions exist and none of the potential valuation contexts (purely individual, individual in group context, or group) guarantees the elicitation of social values (or individual values). In total thirteen cases of value expression were identified of which seven have at least one attribute (value scale, intention, or elicitation process) associated with social values. Importantly, social value expression was not limited to groups but certain forms of social values can also be expressed by individuals. Considering economic valuation as VAI – the method affects the assigned value – lead to the question if preference correction is justifiable. This question is contested and can only be answered on normative grounds.

Yet, four reasons justifying such an intervention were provided:

- i) Preferences may already be distorted;
- ii) suggesting that individual welfare is independent of individual preferences (also discussed in the context of *commitment*);
- iii) common wants lead to diverging social preferences and individual preferences;
- iv) and lastly, the constituency and associated preferences have to be in accordance with the nature of the good.

These complex normative considerations limit also general implications for policy-making. It has been argued that even if a corrective intervention is justified, the challenge remains to define the basis and boundaries. Acknowledging that ends may result from a process, a democratic approach based on constitutional economics appeared most promising to form a basis for normative evaluation.

Chapter 5 and Chapter 6 were devoted to the empirical analysis of social values for wolf management in Germany. The study served two goals: Firstly, test the validity of the conceptual framework developed in Chapter 4 by analysing determinants and underlying motivations of WTP – allowing for the identification of social values based on intention (I-preferences vs. We-preferences), process (significant change in preferences due to deliberation / social learning), and/or scale (values beyond the individual). Secondly, the aim was to analyse if significant differences in absolute magnitude of WTP as well as determinants of WTP exist between economic valuation methods based on diverging paradigms: Contingent Valuation, Preference Economisation and Preference Moralisation.

Regarding the first aim, social values with regards to wolf management in Germany were identified based on scale, intention and process based on multidimensional motivations behind WTP as suggested by the theoretical framework. Especially, fairness, duty and existence rights motivated WTP besides non-use values (e.g. option, bequest and existence value) as defined by the conventional TEV framework. Further, the dimensions identified by the EGA largely overlapped with the theoretical clustering. Although, certain differences exist, the results do not challenge the theoretical clustering.

With respect to the second aim, results are ambiguous. In general, the between-group design did not find any significant differences in absolute magnitude of WTP between the three valuation methods nor did the analysis of motivations behind WTP suggest major differences between these methods. As discussed above, this observed insensitivity of absolute WTP towards the method may also be caused by the homogenous sample in combination with small treatment effects. More importantly, the results illustrated that social values based on intention and scale were expressed by participants in all treatments. This finding contrasts the theoretical assumptions of CV and PE to elicit consumer preferences as well as the assumption that consumer or citizen roles can be “activated” through the valuation context. Hence, the need to account for value pluralism in case of merit goods irrespective of the valuation method is emphasized. Further, the analysis of motivations behind WTP demonstrated that WTP does not

enforce value monism. Instead, multidimensionality of motivations behind WTP was implicitly given but had to be made explicit through non-economic methods. Hence, it was found that WTP does not contradict value pluralism but pluralistic valuation approaches are needed to correctly interpret WTP.

Furthermore, only in case of the PM treatment social values with respect to the elicitation process were identified. Preferences were constructed throughout the valuation process as demonstrated by the significant change in WTP. This finding suggests that the valuation method or rather the valuation context significantly affects stated WTP. This finding draws attention to the role of making transcendental values explicit in valuation workshops. However, also the PE treatment indicated variation in individual bids after deliberation. The issue at hand is that changes in individual WTP in opposite directions may lead to insignificant results due to the aggregation and focus on mean WTP.

7.2 Limitations of the study

Commonly micro-econometric estimations suffer from issues such as attrition, censoring, non-random sampling and non-independency of observations (Honoré et al., 2008). While attrition was not a concern in the study at hand, the other issues were of relevance. Ignoring non-independency of observations due to the repeated measurements and the sampling of individuals into groups would bias the estimators. Therefore, an adequate estimation strategy that is able to deal with non-independent observations has to be chosen. In this study a hierarchical linear mixed effect model was applied which can handle the sample's dependency on the individual level (individual effects due to repeated measurements) and on the group level (group effects due to individuals nested in groups).

The study accounted for the possibility of negative WTP for wolf conservation in Germany by designing two hypothetical markets. Still, only a relatively small number of participants stated negative WTP amount. Therefore, for the sake of simplicity WTP was left-censored at zero. This is a common approach as most studies design only one hypothetical market which simply allows for positive WTP. Still, as discussed above heterogeneous preferences are a concern in case of wolf conversation in Germany and models like the extended spike model are able to simultaneously analyse negative and positive WTP. Yet, spike models are conditional on a sufficient number of negative WTP bids and that WTP is normally distributed around zero. The censoring does not limit the findings of this study but negative WTP for wolf conservation

should be accounted for when the intention is to elicit a representative WTP amount. Accordingly, the numbers presented here tend to be biased upwards.

Furthermore, the study suffers from a relatively small sample. This can be considered “normal” in the context of deliberative valuation studies but still poses difficulties for analysis. A power analysis to test the minimum adequate sample size was not conducted. As discussed above, for a power analysis a reliable expectation about the effect size is necessary. Due to the lack of empirical literature any expectation would have only been a best guess. Still, effect sizes may be too small to be identified within the small sample.

Furthermore, the sample is not representative in any way. The sampling strategy aimed at obtaining a homogenous sample in order to minimise artifacts in the observations and to make the identification of small effects easier. In order to minimise uncontrolled variation between subsamples a relatively homogeneous sample was preferred over a representative one. While this approach served the aim of the study, the findings do not allow to make any actual statements about public WTP for wolf management in Germany. That is to say, due to the experimental design the study lacks usefulness for decision-making.

In this line, also hypothetical bias (see e.g. Loomis, 2011) may be an issue. A general concern in stated preference studies is that participants’ stated WTP exceeds the actual WTP e.g. due to the hypothetical bias. Hence, stated preferences can only be considered proxies for actual behaviour as WTP reflects intended but not actual behaviour (Hausman, 2012).

7.3 Suggestions for further research

The study at hand addressed two overarching questions: i) how can social values of ES be conceptualised in theoretical terms from an economic perspective, and ii) how can social values be identified empirically? The first research gap was closed by the development of the economic conceptual framework in Chapter 4. Although, the case study’s results, presented in Chapter 6, illustrated that social values can be identified empirically and also suggested how to achieve this based on operationalising the conceptual framework, the second question still needs to be explored in more detail due to several reasons.

Firstly, a better understanding of the effects of variation in the valuation context is needed. Processes behind deliberation may further be explored in order to improve understanding about effects on preferences. The case study’s sample was homogeneous and non-representative. Future research could recreate the general approach of the study at hand with a representative

sample and investigate the role of heterogeneous ex-ante preferences (see also Völker & Lienhoop, 2016). In this context, also effects of the variation of the value indicator could be analysed, e.g. a systematic comparison between aggregated individual WTP and arbitrated social WTP; individual WTP and individual willingness to give up time (WTT); and/or aggregated individual WTP and rank-based approaches. The study at hand elicited individual WTP or social WTP expressed by individuals. Comparisons to arbitrated WTP and individual WTP behind a veil of ignorance may therefore be explored in future research.

Secondly, the study illustrated that WTP was not only motivated by utilitarian preferences but also right-based ethics or rather ethical preferences. However, it remains unclear how exactly non-utilitarian preferences enter a utilitarian calculus such as stated WTP. This would be worth analysing in combination with general analysis of motivations underlying stated preferences. Verbal protocol analysis is one promising tool to analyse the individual decision making of participants (see Schkade & Payne, 1994) and deliver further insights how to interpret WTP amounts.

Lastly, more work is needed to understand the implications for policy-making and decision-making. The challenge remains how to implement the scientific knowledge obtained about social values of ES into decision-making. The central question is how evaluative criteria that diverge from consumer sovereignty can be defined and which metrics can be designed complementary to monetary values in order to account for value pluralism and multidimensionality of motivations associated with social values of ES.

7.4 Final thoughts

Economic environmental valuation is heavily criticised and some scholars argue that a truly social valuation should replace conventional economic valuation of the environment. As discussed in the thesis at hand, the critique is justified, yet, mainly limited to the realm of neoclassical economics. It has been illustrated that social values can be integrated into a preference-based utility framework. Hence, social values do not challenge economic theory but have a long-lasting tradition in economic theory, although, they never found their way into the mainstream.

Nevertheless, recognition of social values challenges the conventional way of eliciting and interpreting preferences for complex public goods and merit goods in two ways. Firstly, social values shift the focus from the outcome towards the process. The latter gains relevance because

firstly, economic valuation methods are understood as value articulating institutions and aspects of participation and democracy may be of importance. Secondly, social values extend the nature of value. These two aspects are interwoven as not accounting for all relevant dimensions of the valuation object and/or contextual effects of the valuation method results in misconstruing ‘the value of nature by misunderstanding the nature of value’ (Sagoff, 2004, p. 13).

If for example preferences are motivated by ethical factors, WTP does not correspond to the consequentialist utilitarian calculus and hence, cannot be considered to (purely) reflect a market price or economic utility. Consequentially, it has been argued that economic environmental valuation has to account for plural values and plural motivations which are beyond the individual and instrumental values, i.a. associated with interdependent preferences, aspects of fairness, duty, justice or the valuation context.

Yet, even when acknowledging that WTP is partly motivated by non-utilitarian and non-consequentialist motivations, further fundamental questions arise. To what extent does WTP reflect an economic welfare measurement? How do ethical and social preferences enter the utilitarian calculus or how do they relate to it? In which cases do ethical preferences lead to value hierarchies and associated rejection of trade-offs? What role can deliberation play in resolving conflicts?

These questions cannot be answered by simple aggregation of individual values. Instead, oversimplification, e.g. in form of neglect of relevant aspects such as procedural justice, non-utilitarian ethics and social norms’ influence on individual choice (see Jorgensen et al., 2001; Spash et al., 2009), reduces the assessments’ quality (Burney, 2000). Economic valuation is not an end in itself (Daily et al., 2000), hence, to be useful to decision-making it needs not only to be understood to which extent people appreciate and value nature but also for which reasons. Contrary, conceptualising social values as aggregated individual utility as in conventional economic valuation will certainly fail to do so (see also Spash, 2008).

As discussed above, at some point in economic history, to be specific during the marginalist revolution, economics disengaged from other related disciplines such as psychology and philosophy. Recent advances (e.g. in behavioural economics and experimental economics and to a minor degree environmental economics and ecological economics) successfully integrated findings from these disciplines again to gain insights about preferences and human behaviour. Hence, in the author’s opinion it is time to advance valuation of the environment by

interdisciplinary exploring values and human behaviour with respect to ES (and/or NCP) as boundary objects. This comes at the risk of opening Pandora's box suggesting that additional fundamental criticism against economic environmental valuation may arise. In response the theoretical basis of economic environmental valuation needs to be further strengthened. In the author's opinion, despite its criticism economic valuation has an important role concerning values of nature, presuming genuine value pluralism and methodological pluralism. Hence, interdisciplinary analysis of values and stated preferences will advance the disciplines original ambition of extending the considered values in order to prevent underestimation of ES value and unsustainable use of resources.

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Appendices

Appendix A **Workshop Materials**

Note: The following is an example of the final survey for the Preference Moralisation treatment. Not all information was necessarily given out to participants in printed form but may have been communicated verbally by the moderator (either in addition to a print out or solely verbally, e.g. in case of the background information about the survey “Hintergrund der Befragung”). The survey design for Contingent Valuation and Preference Economisation treatments/methods are substantially equivalent, yet have important details altered, in short:

- Not all methods had the same amount of interventions and questionnaires (see Section 5.4.1.2 for a detailed overview which questionnaires were included in each treatment).
- Here (in the Preference Moralisation treatment) formulations often refer to society in order for the participants to adopt a citizen perspective. In the alternative methods it is usually referred to individuals, individual preferences, individual costs, individual benefits, etc. instead of referring to society.
- The group discussion in the preference moralisation treatment was partly based on transcendental values (see questionnaire 3 “Fragebogen 3”).

The designs vary for theoretical and methodological reasons. Section 5.4.1 *Study design* illustrates in detail the differences in the three set ups or rather designs of the valuation workshops following the three different approaches *Contingent Valuation*, *Preference Economisation* and *Preference Moralisation* (see also Figure 5-1 and Table 5-2).

Hintergrund der Befragung

In Deutschland sind viele Tiere und Pflanzen vom Aussterben bedroht bzw. ihre weitere Existenz ungewiss. Bundesweit sind von insgesamt 96 Säugetierarten rund 45% auf der sogenannten *Roten Liste (gefährdeter Arten)*, d.h. diese Arten sind extrem selten, vom Aussterben bedroht oder bereits ausgestorben³⁹. Demgegenüber ist nur rund ein Drittel der Säugetierarten ungefährdet (Stand 2009).⁴⁰

Infokasten - Wie setzt sich die *Rote Liste* zusammen?

Bestandsgefährdete Arten

+ Ausgestorbene Arten

+ Extrem seltene Arten

= Rote Liste insgesamt

Der Wolf galt seit Ende des 19. Jahrhunderts als ausgestorben in Deutschland. Nach über hundert Jahren ist der Wolf zurückgekehrt. Im Jahr 2000 hat sich das erste Wolfspärchen aus Polen kommend in Sachsen angesiedelt und einen Wurf Welpen gebärt. Seitdem konnten Wölfe eine kleine Population in Deutschland etablieren, dennoch ist er immer noch vom Aussterben bedroht. Der aktuelle Bestand ist keine langfristig überlebensfähige Population. Obwohl der Wolf rund 100 Jahre ausgestorben gewesen ist, zählt er zu den heimischen Arten und gilt nicht als neu angesiedelte Art.

Viele Wildtiere, so auch Wölfe, haben sowohl positive als auch negative Effekte für den Menschen. Es verwundert dementsprechend nicht, dass das Thema Wolf kontrovers diskutiert wird und kaum eine Woche vergeht, ohne dass der Wolf in Zeitung, Rundfunk oder im Fernsehen besprochen wird. Uns interessiert, wie die Menschen in Deutschland und auch in der Region über Artenschutz von gefährdeten Arten speziell in Bezug auf den Wolf denken. Wir möchten gerne wissen, wie wichtig der Gesellschaft eine Veränderung des Wolfbestandes in Deutschland ist.

³⁹ In Deutschland ist der Wolf eine vom Aussterben bedrohte Art und im Freistaat Sachsen eines von 7 stark gefährdeten Wirbeltieren, die anderen sechs sind Fledermausarten, die zur Familie der Fledermäuse gehören (Stand 2015). Acht Wirbeltiere sind bereits in Sachsen ausgestorben, u.a. Gartenschläfer, Wisent und Auerochse, und fünf weitere Arten sind vom Aussterben bedroht, u.a. Feldhamster, Wildkatze und Luchs.

⁴⁰ Die Restlichen sind entweder auf der Vorwarnliste (ca. 12%) oder können aufgrund fehlender Daten nicht beurteilt werden (ca. 10%)

Fragebogen 1

Um Ihre Antworten besser verstehen zu können, möchten wir gerne etwas über Ihre Ansichten in Bezug auf Umwelt und Naturschutz erfahren. Ihre Antworten werden vertraulich behandelt und nur anonym analysiert, d.h. es können keinerlei Rückschlüsse auf Ihre Person gezogen werden.

Fragen zur Umwelt

Wir möchten gerne Ihre Meinung zu Themen mit Bezug auf Umwelt und Naturschutz erfahren. Dementsprechend gibt es keine richtigen oder falschen Antworten.

- 1) Der Staat gibt für diverse Dinge öffentliche (Steuer-) Gelder aus. Bitte ordnen Sie die folgende Liste nach Ihrer persönlichen Einschätzung der Wichtigkeit mit den Zahlen 1 (am wichtigsten) bis 5 (am wenigsten wichtig). Bitte verwenden Sie jede Zahl nur einmal.

Bildung	
Arbeitslosigkeit	
Gesundheitswesen	
Umweltschutz	
Innere Sicherheit	

- 2) Für wie wichtig halten Sie die folgenden Umweltprojekte, die mit öffentlichen Geldern finanziert werden? Bitte ordnen Sie die folgende Liste nach Ihrer persönlichen Einschätzung der Wichtigkeit mit den Zahlen 1 (am wichtigsten) bis 4 (am wenigsten wichtig). Bitte verwenden Sie jede Zahl nur einmal.

Förderung und Ausbau erneuerbarer Energien	
Projekte zum Schutz seltener Tierarten	
Projekte zum Schutz von Wäldern	
Verbesserung der Luftqualität	

- 3) Wie schätzen Sie Ihr Wissen über das Thema „Wolf“ auf einer Skala von 0 (keine Kenntnisse) bis 10 (Expertenwissen) ein?

0 1 2 3 4 5 6 7 8 9 10

Identifying social values of ecosystem services

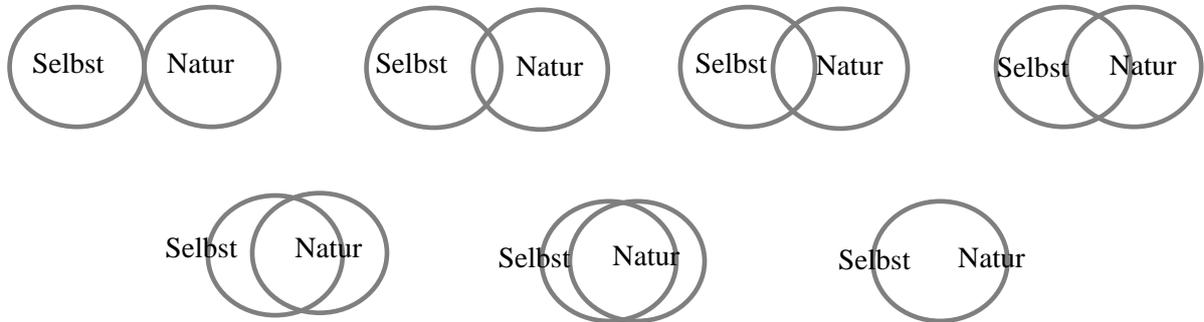
4) Bitte geben Sie an, wie stark Sie den folgenden Aussagen zum Thema Artenschutz zustimmen.

	Stimme zu	Stimme eher zu	Weder noch	Stimme eher nicht zu	Stimme nicht zu	Weiß nicht
Seltene Arten sollten für nachfolgende Generationen erhalten werden.	<input type="checkbox"/>					
Es ist nicht schlimm, wenn eine von vielen Tierarten ausstirbt.	<input type="checkbox"/>					
Der Mensch soll die Natur gemäß menschlichen Bedürfnissen gestalten.	<input type="checkbox"/>					
Ich empfinde Genugtuung, wenn ich einen Beitrag zum Artenschutz leisten kann.	<input type="checkbox"/>					
Die Natur sollte um ihrer selbst willen geschützt werden.	<input type="checkbox"/>					
Vom Aussterben bedrohte Tierarten sollten auf jeden Fall geschützt werden, da sie ein Existenzrecht haben.	<input type="checkbox"/>					

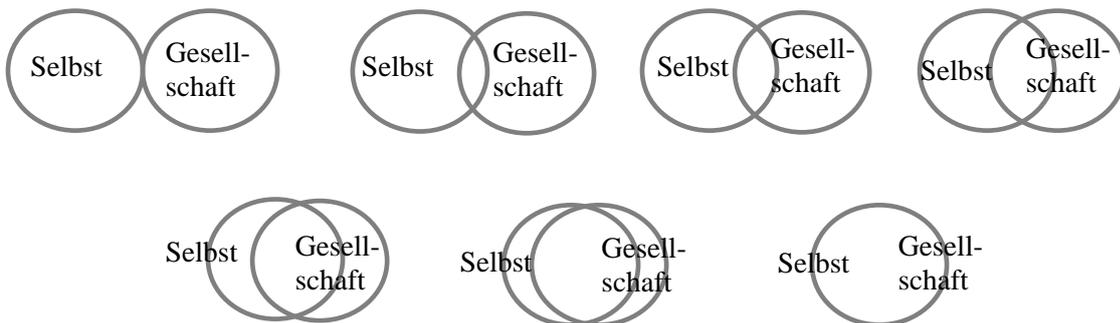
5) Bitte geben Sie an, wie stark Sie den folgenden Aussagen zum Thema „Wolf“ zustimmen.

	Stimme zu	Stimme eher zu	Weder noch	Stimme eher nicht zu	Stimme nicht zu	Weiß nicht
Eine Koexistenz von Wolf und Mensch ist nicht möglich.	<input type="checkbox"/>					
Wölfe und andere Raubtiere sorgen für eine natürliche Balance in der Natur.	<input type="checkbox"/>					
Wölfe wurden aus gutem Grund ausgerottet.	<input type="checkbox"/>					
Wölfe sind für den Menschen nützlich.	<input type="checkbox"/>					
Wölfe sind eine Konkurrenz für die Jägerschaft.	<input type="checkbox"/>					
Wölfe sind eine Gefahr für den Menschen.	<input type="checkbox"/>					
Der Wolf ist eine schützenswerte Tierart.	<input type="checkbox"/>					
Wölfe gefährden die Existenz von anderen heimischen Tierarten.	<input type="checkbox"/>					

- 6) Wie verbunden fühlen Sie sich mit der Natur? Der linke Kreis repräsentiert Sie selbst und der rechte Kreis steht für die Natur. Bitte umkreisen Sie die Darstellung, die am besten Ihr Verhältnis mit der Natur ausdrückt.



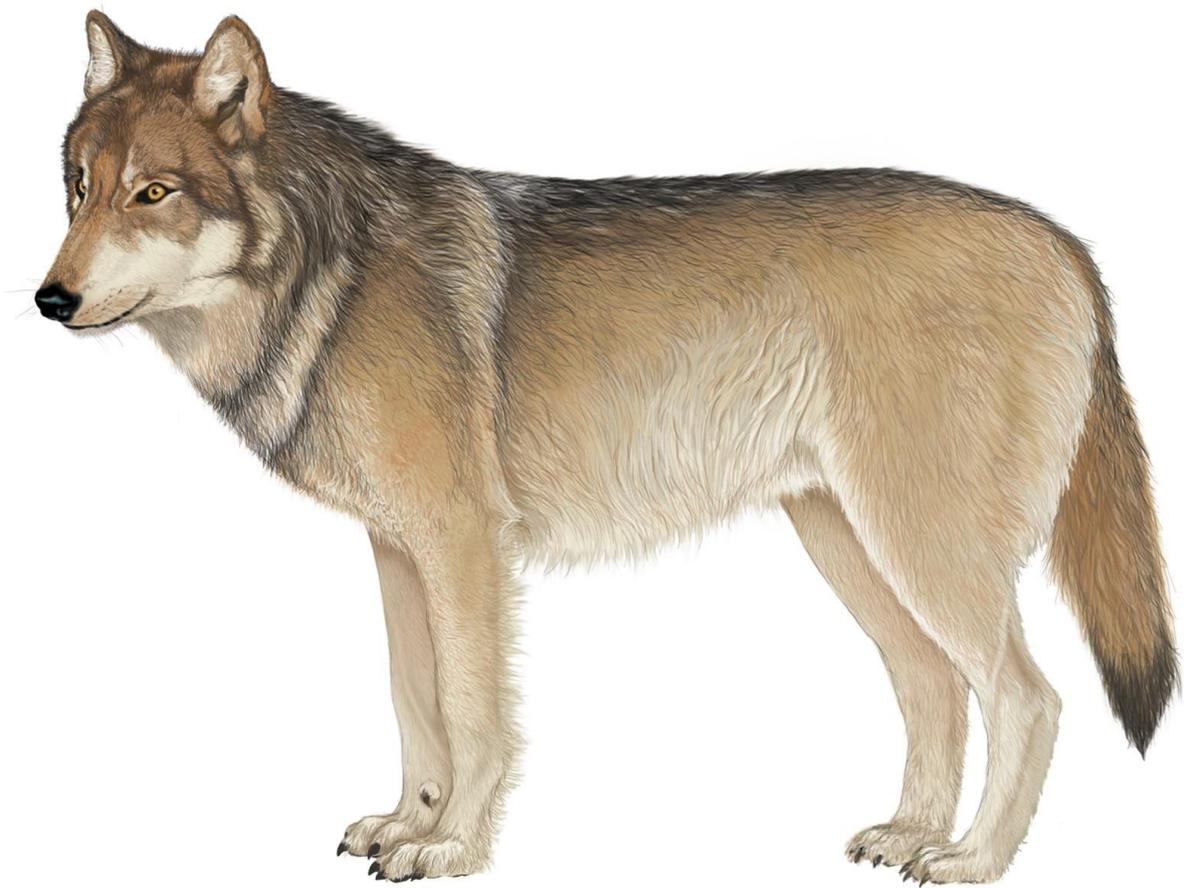
- 7) Wie verbunden fühlen Sie sich mit der Gesellschaft? Der linke Kreis repräsentiert Sie selbst und der rechte Kreis steht für die Gesellschaft. Bitte umkreisen Sie die Darstellung, die am besten Ihr Verhältnis mit der Gesellschaft ausdrückt.



Vielen Dank für Ihre Antworten!

Bitte stecken Sie den Fragebogen in den Umschlag.

Informationsmappe zum Wolf



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1) Portrait

Der europäische Wolf ist ein Säugetier; er ist ein Raubtier und Fleischfresser. Der Wolf gehört zu der Familie der Hundartigen und zur Gattung der echten Hunde. Der engste Verwandte des Wolfes ist der Haushund. Der Körperbau des Wolfes ähnelt dem des deutschen Schäferhundes. Jedoch wird der Wolf mit 1–1,40 Meter Länge und 0,6–0,9 Meter Schulterhöhe etwas größer und hochbeiniger als ein Schäferhund. Das Fell des europäischen Wolfs ist grau und braun gefärbt. Die Lebenserwartung in freier Wildbahn beträgt 8–13 Jahre, wobei die Sterblichkeit vor allem im ersten Jahr sehr hoch ist.

2) Sozialverhalten

Wölfe sind soziale Tiere und leben in Rudeln, welche aus einem Elternpaar, 4–6 Welpen und sogenannten *Jährlingen* (Welpen aus dem Vorjahr) bestehen. Die Größe der Rudel variiert normalerweise zwischen 8 und 12 Wölfen. Sobald die jungen Wölfe geschlechtsreif sind, üblicherweise ab dem dritten Jahr, verlassen sie das Rudel und suchen sich ein eigenes Revier (siehe Abbildung 1).

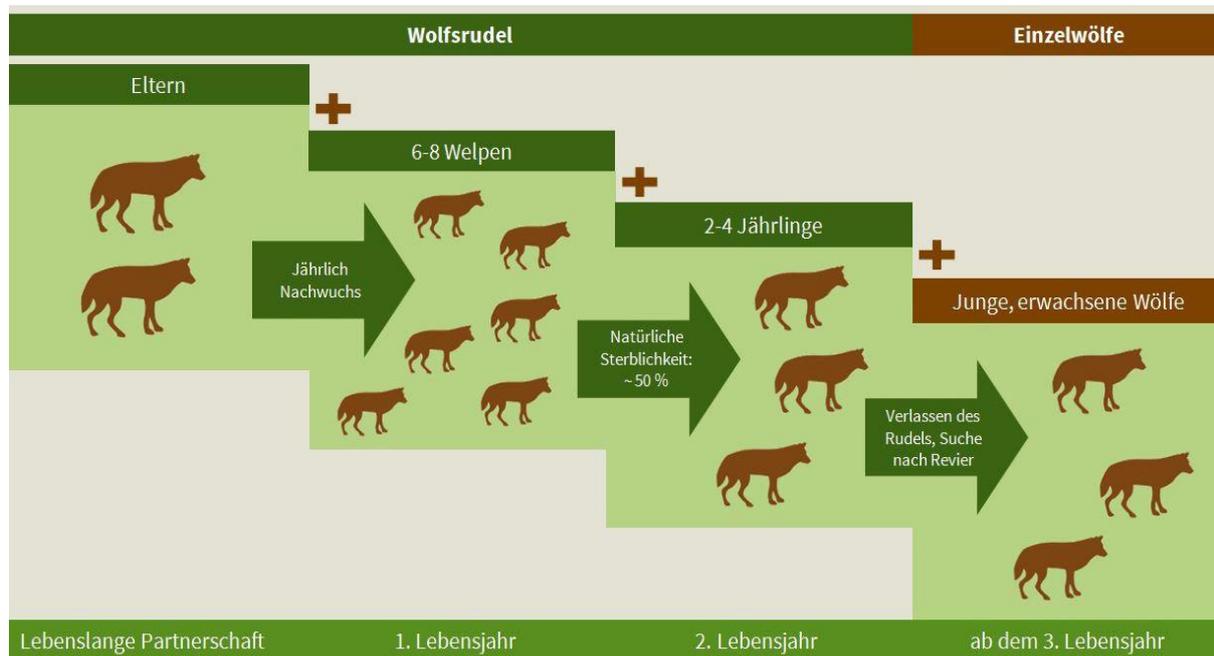


Abbildung 1 - Rudelstruktur. Quelle: NABU.

Durch die abwandernden Jährlinge ist die Wolfsdichte in einem Gebiet relativ stabil. Die Größe des Reviers hängt von der Nahrungsverfügbarkeit ab: je weniger Beutetiere vorhanden sind, desto größer ist das Revier. In Deutschland sind Wolfsreviere durchschnittlich 250 Quadratkilometer groß. Die Reviere werden durch Urin und Losungen markiert und gegen andere Wölfe verteidigt.

3) Ernährung

Wölfe sind auf die Jagd von Huftieren, in Deutschland vor allem Rehe, Rothirsche, Dammhirsche und Wildschweine, spezialisiert. Wölfe jagen die Tiere, die am leichtesten zu erbeuten sind. Es handelt sich oft um alte, kranke und schwache Tiere und/oder Jungtiere. In seltenen Fällen kann die Beute auch nicht ausreichend geschützte Nutztiere sein. Die Analyse der Nahrungszusammensetzung der Wölfe in Sachsen hat ergeben, dass vor allem Rehe, Rothirsche und Wildschweine verzehrt wurden. Nutztiere machten nur rund 1% der Nahrungsaufnahme aus (siehe Abbildung 2).

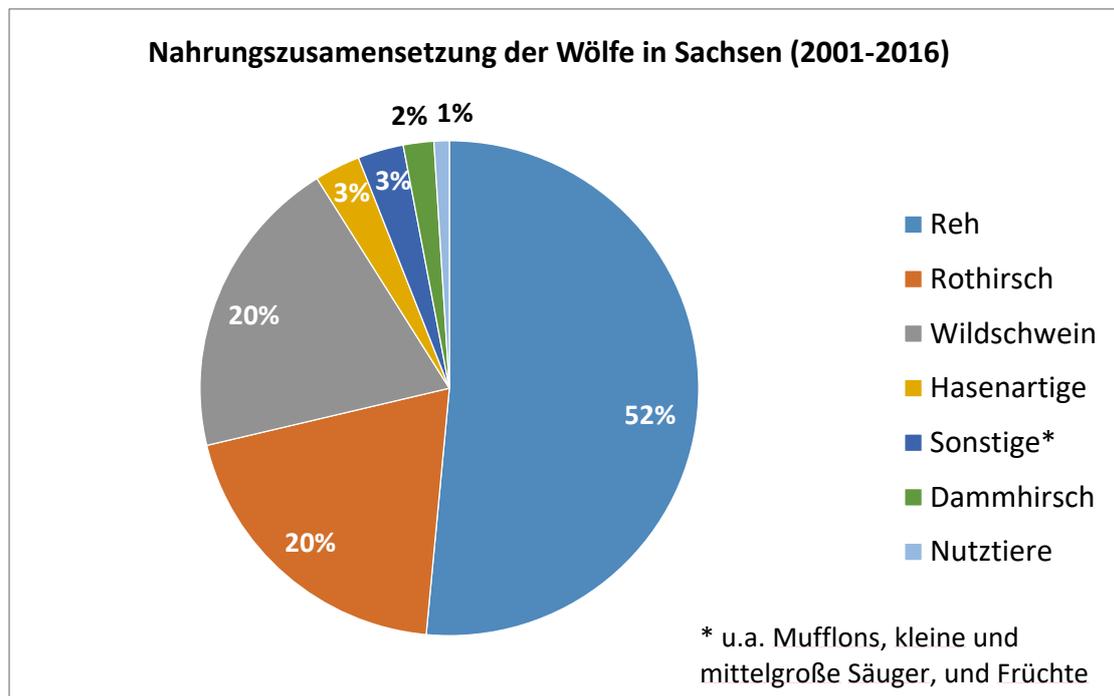


Abbildung 3 - Nahrungszusammensetzung des Wolfes in Sachsen von 2001-2016. Eigene Darstellung nach Holzapfel et al. (2016).

4) Verbreitung, Lebensraum und Population

Der Wolf war ursprünglich auf der gesamten nördlichen Erdhalbkugel verbreitet, wurde aber in den vergangenen Jahrhunderten aufgrund von Konflikten zwischen Wolf und Mensch in Europa und den Vereinigten Staaten von Amerika durch den Menschen stark zurückgedrängt bzw. regional ausgerottet. Der Wolf ist sehr anpassungsfähig und braucht deswegen keinen speziellen Lebensraum. Entgegen der weitläufigen Meinung braucht der Wolf auch keine Wildnis, sondern findet sich selbst in relativ dicht besiedelten Umgebungen zurecht. Bedingungen fürs Überleben sind lediglich ausreichende Nahrung und Rückzugsgebiete für die Aufzucht der Welpen. Weltweit gibt es circa 170.000 Wölfe. Sie sind auf fast dem ganzen

asiatischen Kontinent, Osteuropa und Nordamerika verbreitet. In Europa gibt es circa 12.000 Wölfe. Mittlerweile konnte sich der Wolf aus Gebieten Ost- und Südeuropas, in denen er nie komplett ausgerottet wurde, in West- und Mitteleuropa inklusive Deutschlands wiederansiedeln.

Nachdem Mitte des 19. Jahrhunderts das letzte deutsche Wolfsrudel in Brandenburg verschwunden war, dauerte es 150 Jahre, bis sich Wölfe wieder in Deutschland ansiedelten. Aus Polen kommend etablierte sich das erste Rudel in Sachsen. Lange Zeit gab es nur in Sachsen Wölfe, erst 2006/07 wurde das erste Einzeltier in einem anderen Bundesland ansässig. Abbildung 3 zeigt die aktuelle Verbreitung in Deutschland.

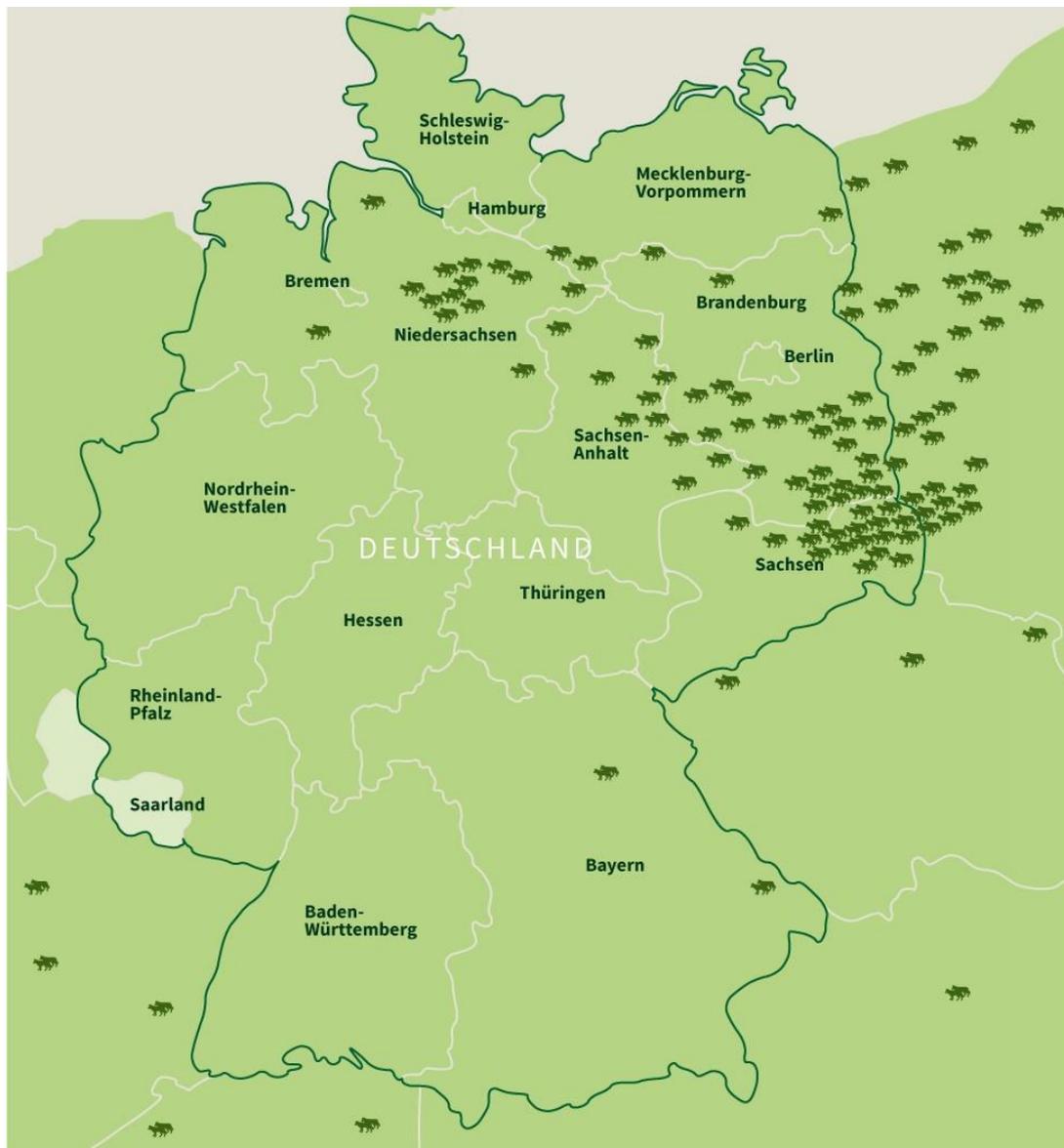


Abbildung 4 - Wolfsvorkommen in Deutschland (Stand 2018). Quelle: NABU.

Aktuell (Monitoringjahr 2017/18) gibt es in sieben Bundesländern 73 Rudel, 31 territoriale Paare und 3 territoriale Einzeltiere. Der Großteil der Wolfsgebiete befindet sich in Brandenburg, Sachsen, Niedersachsen und Sachsen-Anhalt.

5) Aktueller Schutzstatus des Wolfes

In Europa und damit auch in Deutschland ist der Wolf als strenggeschützte Art eingestuft. Das bedeutet:

- Das Töten von Wölfen ist verboten.
- Absichtliche Störung (z. B. bei Fortpflanzung und Aufzucht) und andere Beeinträchtigungen (z. B. Beschädigung von Lebensstätten) sind verboten.
- Es sind Schutzgebiete auszuweisen.

Diese Maßnahmen sollen zum Aufbau bzw. Erhalten einer stabilen Population beitragen und sind Teil des Bundesnaturschutzgesetzes. Außerdem regelt das Bundesnaturschutzgesetz Ausnahmen von dem Schutzstatus. Die Erlaubnis zur Bejagung wird nur in Einzelfällen gewährt, um

- erhebliche wirtschaftliche Schäden für die Land-, Forst-, Fischerei-, und Wasserwirtschaft abzuwenden;
- eine konkrete Gefahr für die Allgemeinheit abzuwenden z. B. Gefährdung der Gesundheit des Menschen oder der öffentliche Sicherheit;
- oder wenn andere Gründe des öffentlichen Interesses (sozial oder wirtschaftlich) einen Eingriff rechtfertigen.

Es dürfen z. B. Wölfe, die keine Scheu gegenüber dem Menschen zeigen oder die mehr als einmal gut geschützte Nutztiere reißen, getötet werden.

6) Bedrohungsfaktoren für den Wolf

In Deutschland sind seit 1991 insgesamt 282 Wölfe zu Tode gekommen. Wie Abbildung 4 veranschaulicht, geht die größte Gefahr für Wölfe von Straßen und Bahngleisen aus. In rund 71% der Fälle war die Todesursache ein Verkehrsunfall.

Während circa 14% der Wölfe illegal getötet wurden, sind nur rund 9% eines natürlichen Todes gestorben. Management bzw. sogenannte *letale Entnahmen* (Tötung von auffälligen Wölfen) haben mit rund 1% den geringsten Anteil.

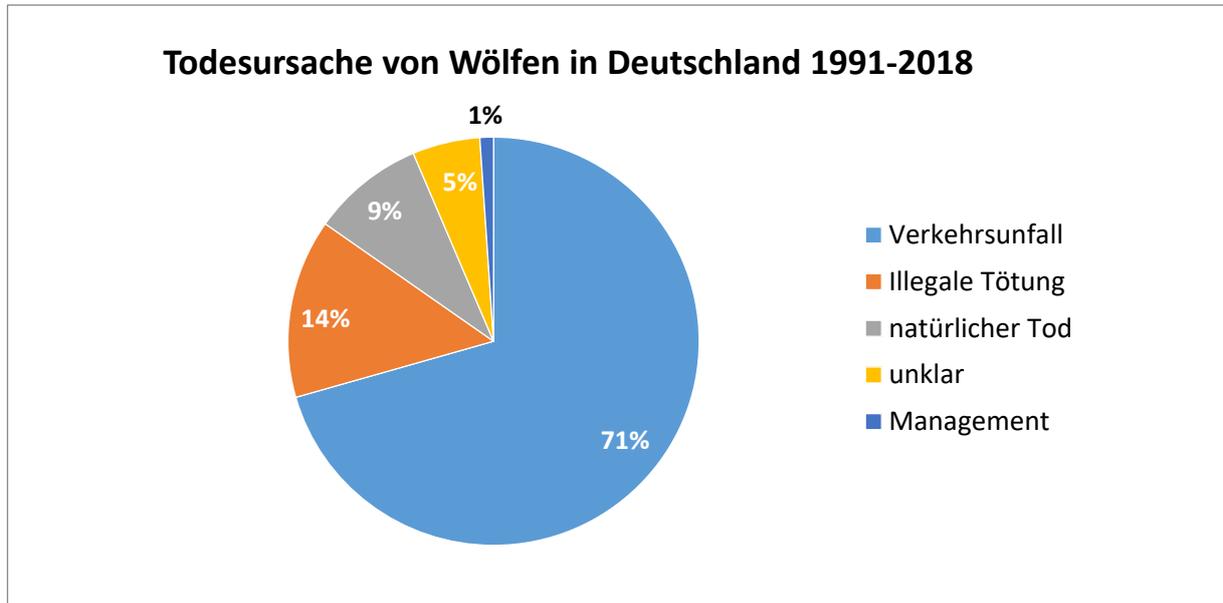


Abbildung 5 - Todesursachen von Wölfen in Deutschland 1991-2018. Eigene Darstellung. Quelle: Dokumentations- und Beratungsstelle des Bundes zum Thema Wolf.

7) Ist der Wolf eine Gefahr für den Menschen?

Gesunde Wölfe sind normalerweise keine Gefahr für den Menschen, weil der Mensch kein Beutetier ist und Wölfe eher vorsichtig gegenüber dem Menschen sind. Normalerweise verhalten sich nur kranke, provozierte oder an den Menschen gewöhnte (z. B. durch Anfütterung) Wölfe aggressiv gegenüber Menschen. Seit der Rückkehr nach Deutschland im Jahr 2000 gab es keine Zwischenfälle. Eine Untersuchung des Norwegischen Institutes für Naturforschung (NINA) hat gezeigt, dass es europaweit zwischen 1950 und 2000 insgesamt 59 Zwischenfälle gegeben hat, bei denen neun Menschen getötet wurden. In fünf von diesen Fällen waren die Wölfe tollwütig (Deutschland ist seit 2008 tollwutfrei). In den anderen Fällen wurden die Wölfe vorher angefütert, provoziert oder es handelte sich um Wolf-Hund-Mischlinge, welche weniger Scheu gegenüber Menschen haben.

8) Erhaltungszustand Wolfspopulation in Deutschland

2013 wurde in einem Bericht über den Zustand von Flora, Fauna und Habitaten der Erhaltungszustand der Wolfspopulation in Deutschland als "ungünstig – schlecht" bewertet. Dementsprechend kann nicht ausgeschlossen werden, dass der Wolf in Deutschland zukünftig erneut aussterben wird.

Werden effektive Schutzmaßnahmen getroffen, kann der Wolf dauerhaft in Deutschland überleben. Das würde voraussetzen, dass

- der Wolf ein ausreichend großes Verbreitungsgebiet hat;
- ein genügend großer Lebensraum vorhanden ist;
- sich die Population auf ein ausreichend hohes Niveau erholen kann (circa 1000 erwachsene Tiere, die sich auf 300-500 Rudel verteilen würden);
- und auch zukünftig keine Gefährdungen des Lebensraumes, der Verbreitung und der Population bestehen.

In diesem Fall wird von einem *günstigen Erhaltungszustand* gesprochen.

9) Potentielle Auswirkungen und Konflikte

Tabelle 1 zeigt mögliche Auswirkungen auf, die in anderen Ländern weltweit nach der Rückkehr von Wölfen diskutiert wurden.

Potentielle Auswirkungen	+	-
Beutetierpopulationen	Weniger Seuchengefahr und verbesserter Gesundheitszustand der Beutepopulationen (z. B. Rehe, Hirsche oder Wildschweine), weil Wölfe alte, schwache und kranke Tiere erbeuten	
Artenvielfalt	<p><u>Positiver Einfluss auf Waldwachstum:</u> Regeneration von Pflanzen und Bäumen durch weniger Verbiss (Abbeißen von Knospen) durch Rehe oder Hirsche</p> <p><u>Positiver Einfluss auf Artenvielfalt:</u> Verbesserte Lebensraumbedingungen für andere Tierarten, z. B. Aas fressende Vögel und Insekten; Erhalt einer vom Aussterben bedrohten Art (Wolf)</p>	Nicht-einheimische (Beute-)Tiere können aussterben (z. B. Mufflons)
Landwirtschaft	Weniger Schaden durch Wild, falls der Wolf die Population reduziert	Töten von Nutztieren bzw. Kosten durch Schutzmaßnahmen (z. B. Zäune und Herdenschutzhunde) oder Schadensausgleichszahlungen; traditionelle Nutztierhaltung wird erschwert
Tourismus	Wirtschaftlicher Nutzen	
Menschen		Töten von Haustieren und Jagdhunden; kranke und gewöhnte Tiere können sich aggressiv gegenüber Menschen verhalten; aufgrund reduzierter Beutetierpopulationen können weniger Tiere durch den Menschen gejagt und getötet werden

Tabelle 1 - Potentielle Auswirkungen des Wolfes in Deutschland. Eigene Darstellung.

Projektpläne

Die Rückkehr des Wolfes ist ein kontrovers diskutiertes Thema in Deutschland. Aktuell gibt es schätzungsweise zwischen 213 und 246 erwachsene Tiere, die sich auf 73 Rudel, 31 Paare und 3 territoriale Einzeltiere verteilen. Die Meinungen, ob die Anzahl der Wölfe in Deutschland erhöht oder gesenkt werden soll, gehen auseinander.

Die Bundesregierung muss eine Entscheidung treffen, wie sich der Wolfsbestand in Deutschland zukünftig entwickeln soll. Die Entscheidungsträger*innen haben zwei verschiedene Projekte vorgeschlagen. Eines hat die Erhöhung des Wolfbestandes zur Folge, während das andere plant, die Wolfspopulation zu reduzieren. Wir werden Ihnen jetzt die beiden Projekte vorstellen und fragen, welchen zukünftigen Bestand an Wölfen Sie unterstützen.

Projektplan 1: Erhöhung des Wolfsbestandes in Deutschland

Die Entscheidungsträger*innen erwägen neue Maßnahmen, um die Wolfspopulation in Deutschland zu vergrößern. Ziel ist es, langfristig einen Fortbestand des Wolfes in Deutschland zu garantieren. Stellen Sie sich vor, die deutsche Regierung würde beschließen, den Wolfsbestand in Deutschland in den nächsten fünf Jahren auf 500 erwachsene Tiere bzw. circa 170 Rudel zu erhöhen. Um diese Populationszahlen zu erreichen, müssten verschiedene Maßnahmen umgesetzt werden, einerseits zum Schutz der Wölfe und andererseits zur Lösung möglicher Konflikte, die zwischen Mensch und Wolf entstehen können.

Eine größere Wolfspopulation und eine weitere räumliche Ausbreitung würden einen Mehraufwand für die Beobachtung und Erfassung der Wolfspopulation bedeuten. Außerdem werden Wölfe bis jetzt überwiegend in Rudeln gezählt, diese Zählweise ist aber recht ungenau. Um Individuen zu zählen müsste man den Aufwand für die Beobachtung und Erfassung zusätzlich erhöhen. Des Weiteren müssten Schutzgebiete, in denen sich der Wolf zurückziehen kann, eingerichtet werden. In Deutschland gibt es zwar schon rund 4.600 Schutzgebiete zum Erhalt von Tier- und Pflanzenarten, diese sind aber oftmals zu klein in Relation zu der Größe von Wolfsterritorien.

Außerdem würden Kosten durch Maßnahmen zum Herdenschutz, auf die Betriebe mit Nutztierhaltung in Wolfsgebieten angewiesen sind, und durch mögliche Ausgleichszahlungen an Betriebe im Schadensfall entstehen.

Projektplan 2: Reduzierung des Wolfsbestandes in Deutschland

Schweden hob Anfang 2010 das Jagdverbot für Wölfe auf, um den Wolfsbestand die nächsten fünf Jahre auf 20 Rudel bzw. auf circa 50 erwachsene Tiere zu begrenzen. Es wurden verschiedene Varianten geprüft, z. B. schwerpunktmäßiger Abschuss in Gebieten, in denen Wölfe besonders hohe Kosten verursachen, oder der Abschuss bestimmter Individuen. Am Ende einigte sich die schwedische Regierung auf eine feste Anzahl an Wölfen (Quote), die ohne bestimmte Auswahl geschossen werden darf.

Stellen Sie sich vor, dass die deutsche Regierung ebenfalls beschließen würde, den Wolfsbestand in Deutschland über die nächsten fünf Jahre auf circa 20 Rudel und dementsprechend circa 50 erwachsene Tiere zu reduzieren. Um dieses Populationsziel zu erreichen, müssen verschiedene Maßnahmen umgesetzt werden. Es müsste wie in Schweden eine Forschungsgruppe damit beauftragt werden, die Reduzierung der Wolfspopulation wissenschaftlich zu kontrollieren und verschiedene Varianten zu prüfen. Außerdem müsste ein hoher Aufwand für die Beobachtung und Erfassung des Wolfsbestandes betrieben werden, um die Anzahl der Wölfe korrekt einzuschätzen.

Die aufgezeigten Projektvorschläge kosten Geld, unabhängig davon, ob der Wolfsbestand erhöht oder reduziert werden soll. Dementsprechend verursacht die Rückkehr des Wolfes nach Deutschland Kosten. Diese Kosten sind innerhalb der Gesellschaft ungleich verteilt (da überwiegend Personen aus Landwirtschaft bzw. Nutztierhaltung betroffen sind). Zusätzlich bedarf es eines guten Managements. Uns interessiert, wie wichtig der Gesellschaft ein solches Projekt in Deutschland ist. Stellen Sie sich bitte vor, dass eine Stiftung „Wolf in Deutschland“ gegründet wird. Die Stiftung verwaltet einen Fonds aus dem die Kosten des Projektes gedeckt werden und somit die Umsetzung des Projektes ermöglicht werden soll.

Wenn keines der Projekte durchgeführt wird, bleibt der gesetzliche Schutz des Wolfes bestehen, aber die deutschen Bestände werden weiterhin stark vom Aussterben bedroht sein.

Bitte kreuzen Sie an, welche der Optionen Sie wie stark bevorzugen.

Ich bevorzuge die Reduzierung des aktuellen Wolfbestandes sehr	Ich bevorzuge die aktuelle Situation	Ich bevorzuge die Erhöhung des aktuellen Wolfbestandes sehr
↓	↓	↓
1 2 3	4 5 6	7 8 9
<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Fragebogen 2

Um herauszufinden, ob genügend Gelder für die Umsetzung des von Ihnen bevorzugten Projektes gesammelt werden können, würden wir gerne wissen, wie viel Sie bereit wären, über die nächsten fünf Jahre jährlich in den Fonds einzuzahlen. Das Geld würde garantiert nur für die Umsetzung der Maßnahmen zur Erreichung des gewünschten Wolfbestandes und **nicht** für andere Naturschutzprojekte genutzt werden.

Bitte beachten sie bei der Beantwortung aller Fragen:

- Es handelt sich um eine jährliche Zahlung für die nächsten 5 Jahre.
- Was können Sie sich leisten?
- Wie wichtig ist das Projekt für die Gesellschaft?
- Wenn nicht genügend Geld in den Fonds gezahlt wird, können die Maßnahmen nicht umgesetzt werden. Der Schutzstatus des Wolfes würde weiterhin bestehen, aber Wölfe in Deutschland würden weiterhin vom Aussterben bedroht sein.

Bitte kreuzen Sie für **jeden** Betrag an, ob Sie bereit sind diesen zu zahlen.

	Betrag 1	Betrag 2	Betrag 3	Betrag 4	Betrag 5	Betrag 6	Betrag 7	Betrag 8	Betrag 9	Betrag 10
Auf jeden Fall bereit zu zahlen										
Wahrscheinlich bereit zu zahlen										
Weiß nicht										
Wahrscheinlich nicht bereit zu zahlen										
Auf keinen Fall bereit zu zahlen										

Wie hoch ist der maximale Betrag, den Sie auf jeden Fall bereit wären zu zahlen? _____ €

Wie hoch ist der maximale Betrag, den Sie auf jeden Fall bereit wären zu zahlen, wenn Sie wüssten, dass alle Haushalte Deutschlands zum Fonds beitragen? _____ €

Ein wichtiger Bestandteil dieser Studie ist zu verstehen, aus welchen Gründen Sie sich für die Beträge entschieden haben. Deshalb möchten wir Sie bitten in den nächsten fünf Minuten Ihre Motivation hinter den Antworten so detailliert wie möglich zu erläutern. Warum haben Sie sich für den oben angegeben Betrag entschieden, den Sie bereit sind zu zahlen?

Fragebogen 3

Bitte lesen Sie sich die folgenden Werte und ihre Beschreibungen durch. Kreuzen Sie danach bitte an, wie wichtig diese Werte für Sie persönlich sind.

	Sehr wichtig	Wichtig	Eher wichtig	Eher nicht wichtig	Nicht wichtig	Überhaupt nicht wichtig
Macht: Sozialer Status und Prestige, Kontrolle oder Dominanz über Leute und Ressourcen.	<input type="checkbox"/>					
Leistung: Persönlicher Erfolg durch die Demonstration von Kompetenz gemäß sozialen Maßstäben.	<input type="checkbox"/>					
Hedonismus: Vergnügen und sinnliche Belohnung des Selbst.	<input type="checkbox"/>					
Anregung: Aufregendes Leben, Reiz des Neuen und Herausforderungen im Leben.	<input type="checkbox"/>					
Selbstbestimmung: Eigenständiges Denken und Verhalten, Kreieren und Erkunden.	<input type="checkbox"/>					
Universalismus: Verständnis, Wertschätzung, Toleranz und Schutz des Wohles aller Menschen und der Natur.	<input type="checkbox"/>					
Sozialität: Erhaltung und Verbesserung des Wohlergehens der Menschen, mit denen man regelmäßigen Kontakt hat.	<input type="checkbox"/>					
Tradition: Respekt, Verpflichtung und Akzeptanz von Bräuchen und Meinungen, die die Tradition oder Religion vorschreibt.	<input type="checkbox"/>					
Konformität: Zügelung von Verhalten oder Neigungen, die Andere verärgern oder schaden könnten und die sozialen Erwartungen und Normen verletzen.	<input type="checkbox"/>					
Sicherheit: Schutz, Harmonie und Stabilität der Gesellschaft, von Beziehungen und des Selbst.	<input type="checkbox"/>					

Fragebogen 4

Wir möchten gerne wissen, ob sich Ihre Einstellung zu den Projektverschlügen verändert hat. Bitte kreuzen Sie erneut an, welche der Optionen Sie wie stark bevorzugen.

Ich bevorzuge die Reduzierung des aktuellen Wolfbestandes sehr	Ich bevorzuge die aktuelle Situation	Ich bevorzuge die Erhöhung des aktuellen Wolfbestandes sehr
↓	↓	↓
1	2	3
4	5	6
7	8	9
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Um herauszufinden, ob genügend Gelder für die Umsetzung des von Ihnen bevorzugten Projektes gesammelt werden könnten, würden wir gerne wissen, wie viel Sie bereit wären über die nächsten fünf Jahre jährlich in den Fonds einzuzahlen. Das Geld würde garantiert nur für die Umsetzung der Maßnahmen zur Erreichung des gewünschten Wolfbestandes und **nicht** für andere Naturschutzprojekte genutzt werden.

Bitte beachten sie bei der Beantwortung aller Fragen:

- Es handelt sich um eine jährliche Zahlung für die nächsten 5 Jahre.
- Was können Sie sich leisten?
- Wie wichtig ist das Projekt für die Gesellschaft?
- Wenn nicht genügend Geld in den Fonds gezahlt wird, können die Maßnahmen nicht umgesetzt werden. Der Schutzstatus des Wolfes würde weiterhin bestehen, aber Wölfe in Deutschland würden weiterhin vom Aussterben bedroht sein.

Bitte kreuzen Sie für **jeden** Betrag an, ob Sie bereit sind diesen zu zahlen.

	Betrag 1	Betrag 2	Betrag 3	Betrag 4	Betrag 5	Betrag 6	Betrag 7	Betrag 8	Betrag 9	Betrag 10
Auf jeden Fall bereit zu zahlen										
Wahrscheinlich bereit zu zahlen										
Weiß nicht										
Wahrscheinlich nicht bereit zu zahlen										
Auf keinen Fall bereit zu zahlen										

Wie hoch ist der maximale Betrag, den Sie auf jeden Fall bereit wären zu zahlen? _____ €

Wie hoch ist der maximale Betrag, den Sie auf jeden Fall bereit wären zu zahlen, wenn Sie wüssten, dass alle Haushalte Deutschlands zum Fonds beitragen? _____ €

Ein wichtiger Bestandteil dieser Studie ist zu verstehen, aus welchen Gründen Sie sich für die Beträge entschieden haben. Deshalb möchten wir Sie bitten in den nächsten fünf Minuten Ihre Motivation hinter den Antworten so detailliert wie möglich zu erläutern. Warum haben Sie sich für den oben angegeben Betrag entschieden, den Sie bereit sind zu zahlen?

Fragebogen 5

1) Wie wichtig waren folgende Überlegungen für Sie bei der Angabe des Geldbetrages? Lesen Sie sich bitte jede Aussage durch und kreuzen Sie die entsprechende Beeinflussung an.

	Sehr wichtig	wichtig	Teils/teils	Eher unwichtig	unwichtig	Trifft nicht zu
Ich bin mir nicht sicher, ob ich mir den angegebenen Betrag leisten kann.	<input type="checkbox"/>					
Ich traue der Art der Finanzierung nicht, würde das Projekt aber auf anderem Wege finanziell unterstützen.	<input type="checkbox"/>					
Ich glaube nicht, dass ich den Betrag wirklich zahlen muss.	<input type="checkbox"/>					
Ich denke, dass durch die Zahlungen das Projekt umgesetzt werden kann.	<input type="checkbox"/>					
Der Betrag spiegelt die Wichtigkeit des Projektes für die Gesellschaft wider.	<input type="checkbox"/>					
Der Betrag spiegelt die Wichtigkeit des Projektes für mich wider.	<input type="checkbox"/>					
Ich habe überlegt, was ein gerechter Beitrag von allen wäre.	<input type="checkbox"/>					
Ich habe überlegt, was ein gerechter Beitrag von mir wäre.	<input type="checkbox"/>					
Die Regulierung des Wolfbestandes bedarf keiner finanziellen Unterstützung.	<input type="checkbox"/>					
Die Kosten sollten von den Betroffenen selbst übernommen werden.	<input type="checkbox"/>					
Spenden befriedigt mich.	<input type="checkbox"/>					
Geld ist kein geeignetes Mittel für den Schutz des Wolfes, eine Lösung sollte nicht mit Geld zusammenhängen.	<input type="checkbox"/>					
Wölfe haben für mich persönlich einen Nutzen, weil ich sie z. B. gerne beobachte oder fotografiere.	<input type="checkbox"/>					

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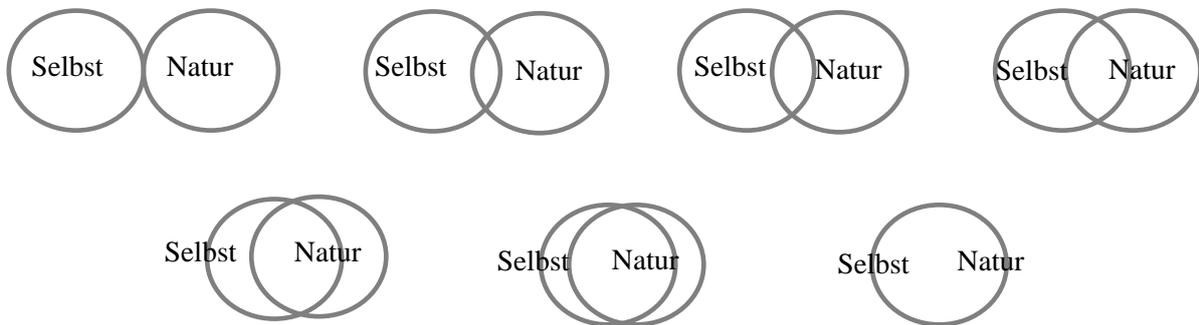
	Sehr wichtig	Wichtig	Teils/teils	Eher unwichtig	Unwichtig	Trifft nicht zu
Es könnte sein, dass ich niemals einen Wolf sehen werde, dennoch ist es wichtig für mich zu wissen, dass Wölfe existieren.	<input type="checkbox"/>					
Wölfe sollen für zukünftige Generationen erhalten bleiben.	<input type="checkbox"/>					
Wölfe verursachen zu hohe Kosten für die Gesellschaft (z. B. Konkurrent für Jägerschaft, Schaden Viehwirtschaft).	<input type="checkbox"/>					
Wölfe würden für mich persönlich Kosten verursachen (z. B. Einschränkung von Freizeitaktivitäten).	<input type="checkbox"/>					
Wölfe sollten geschützt werden, um die genetische Vielfalt zu bewahren.	<input type="checkbox"/>					
Wölfe übernehmen wichtige Aufgaben in der Natur.	<input type="checkbox"/>					
Wölfe haben unabhängig vom Menschen einen Wert. Deshalb besitzen Sie ein Recht auf Existenz unabhängig von Nutzen oder Schaden für Menschen.	<input type="checkbox"/>					
Seltene Arten sollten nur geschützt werden, wenn es keine Kosten für die Gesellschaft gibt.	<input type="checkbox"/>					
Seltene Arten sollten nur geschützt werden, wenn es keine Kosten für mich persönlich gibt.	<input type="checkbox"/>					
Geld, das für den Erhalt von seltenen Arten genutzt wird, sollte lieber genutzt werden, um Menschen zu helfen.	<input type="checkbox"/>					
Wölfe bedrohen die Existenz von traditioneller Viehhaltung.	<input type="checkbox"/>					
Ich habe eine Pflicht zu spenden, wenn es der Artenvielfalt und/oder dem Naturschutz dient.	<input type="checkbox"/>					
Der Wolf ist in Deutschland überflüssig, weil der Bestand weltweit nicht gefährdet ist.	<input type="checkbox"/>					

2) Würden Sie die (natürliche) Ansiedlung von Wölfen in der Nähe Ihres Wohnortes befürworten?

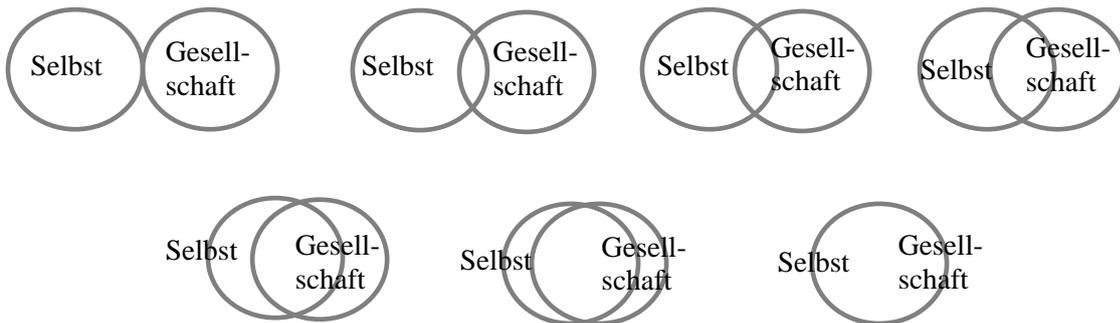
- Ja Nein Weiß nicht

Uns interessiert, ob sich Ihre Einstellungen während des Workshops geändert haben. Bitte geben Sie erneut an, wie verbunden Sie sich mit der Natur bzw. Gesellschaft fühlen.

3) Wie verbunden fühlen Sie sich mit der Natur? Der linke Kreis repräsentiert Sie selbst und der rechte Kreis steht für die Natur. Bitte umkreisen sie die Darstellung, die am besten Ihr Verhältnis mit der Natur ausdrückt.



4) Wie verbunden fühlen Sie sich mit der Gesellschaft? Der linke Kreis repräsentiert Sie selbst und der rechte Kreis steht für die Gesellschaft. Bitte umkreisen sie die Darstellung, die am besten Ihr Verhältnis mit der Gesellschaft ausdrückt.



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5) Was hat Ihnen bei Ihrer Angabe eines Geldbetrages geholfen? Bitte kreuzen Sie die entsprechenden Aussagen an.

	Sehr viel	Viel	Teils/teils	Kaum	Gar nicht	Weiß nicht
Informationsmappe	<input type="checkbox"/>					
Gruppendiskussion	<input type="checkbox"/>					
Erläuterungen der Moderation	<input type="checkbox"/>					

Anderes und zwar: _____

6) Wie schwer bzw. leicht ist es Ihnen gefallen, einen Geldbetrag anzugeben?

Sehr leicht	leicht	Teils/teils	Schwer	Sehr schwer	Weiß nicht
<input type="checkbox"/>					

7) Hat sich Ihr Wissen über den Wolf durch dieses Treffen verändert?

Sehr viel	Viel	Teils/teils	Kaum	Gar nicht	Weiß nicht
<input type="checkbox"/>					

8) Bitte geben Sie an, wie stark Sie den folgenden Aussagen zustimmen.

	Stimme zu	Stimme eher zu	Weder noch	Stimme eher nicht zu	Stimme nicht zu	Weiß nicht
Ich habe nicht genügend Informationen, um mich für einen Geldbetrag zu entscheiden.	<input type="checkbox"/>					
Ich bräuchte mehr Zeit zum Nachdenken, um eine Entscheidung zu treffen.	<input type="checkbox"/>					
Die Diskussion in der Gruppe hat neue Aspekte beigetragen, die sonst nicht in meine Entscheidung eingeflossen wären.	<input type="checkbox"/>					

Vielen Dank für Ihre Antworten!

Bitte stecken Sie den Fragebogen in den Umschlag.

Fragebogen 6

Um Ihre Antworten besser verstehen zu können, möchten wir gerne etwas mehr über Sie erfahren. Die Angaben zu Ihrer Person werden nur für statistische Zwecke erhoben. Ihre Antworten werden vertraulich behandelt und nur anonym analysiert, d.h. es können keinerlei Rückschlüsse auf Ihre Person gezogen werden.

Fragen zu Ihrer Person

1) Welcher Altersgruppe gehören sie an?

- 16-25 26-35 36-45 46-55 56-65 66-75 Über 75 Jahre

2) Ihr Geschlecht?

- Weiblich Männlich Divers Keine Angabe

3) Wie viele Personen leben in Ihrem Haushalt? (Sie selbst mit eingerechnet)

- 1 2 3 4 5 Über 5

4) Wie hoch ist monatlich Ihr individuell verfügbares Nettoeinkommen? (Bei Familien geben Sie bitte das Haushaltseinkommen geteilt durch die Anzahl im Haushalt lebender Personen an)

- weniger als €500
 €500-1000
 €1001-2000
 €2001-3000
 €3001-4000
 über €4000

5) Was ist Ihr höchster Bildungsabschluss?

- (noch) kein Abschluss
 Hauptschulabschluss
 Realschulabschluss
 Fachhochschulreife / Allgemeine Hochschulreife
 Lehre / Berufsschulabschluss
 Fachhochschulabschluss / Hochschulabschluss

Studienfach: _____

- Sonstiges, und zwar: _____

6) Was beschreibt Ihren aktuellen Wohnort am besten?

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Ländlich Städtisch

7) Was beschreibt am besten Ihren Wohnort, an dem Sie bis zu Ihrem 16. Lebensjahr überwiegend lebten?

Ländlich Städtisch

8) Sind Sie oder jemand in Ihrem Haushalt Mitglied in einer Umwelt- oder Naturschutzorganisation?

Ja Nein

9) Haben Sie in den letzten 12 Monaten Geld an eine Umwelt- oder Naturschutzorganisation gespendet?

Ja Nein

10) Besitzen Sie oder jemand in Ihrem Haushalt einen Jagdschein?

Ja Nein

11) Besitzen Sie oder jemand in Ihrem Haushalt einen Hund?

Ja Nein

12) Sind Sie oder jemand in Ihrer Familie in der Landwirtschaft und/oder Nutztierhaltung tätig (falls Nutztiere gehalten werden, geben Sie bitte die Tierart(en) an)?

Ja, und zwar: _____

Nein

13) Welche der folgenden Freizeitaktivitäten haben Sie in den letzten 12 Monaten regelmäßig im Wald oder in Feld- und Wiesenlandschaften unternommen? (Mehrfachnennungen möglich)

Spaziergehen

Joggen

Wandern

Fahrradfahren

Wilde Tiere beobachten

Reiten

Naturfotografie

Pilze sammeln

Anderes, und zwar _____

Vielen Dank für Ihre Antworten!

Bitte stecken Sie den Fragebogen in den Umschlag.

Appendix B R Packages

Table B-1 provides an overview about the R packages used in the analysis. From left to right the table reports the package's name, version, author and the application in the analysis.

Table B-1 R packages used in the analysis

Package	Version	Author	Use
boot	1.3-23	Canty and Ripley (2019)	Generation of bootstrap confidence intervals
broom.mixed	0.2.4	Bolker and Robinson (2019)	Tidying methods
cAIC4	0.8	Säfken and Ruegamer (2018)	Calculation of conditional Akaike information criterion
car	3.0-3	Fox and Weisberg (2019)	Calculation of Variance Inflation Factors
cowplot	1.0.0	Wilke (2019)	Creation of plots
dplyr	0.8.3	Wickham et al. (2019)	Pipe operator; data aggregation
EGAnet	0.9.1	Golino et al. (2020)	Exploratory Graph Analysis technique and visualisation
extrafont	0.17	Chang (2014)	Embedding fonts
factoextra	1.0.5	Kassambara and Mundt (2017)	Visualisation of Principal Component Analysis
ggcorrplot	0.1.3	Kassambara (2019)	Computation and visualisation of correlation matrix
ggplot2	3.2.1	Wickham (2016)	Creation of plots
ggplotify	0.0.5	Yu (2020)	Conversion of basic plots to <i>grob</i> object
insight	0.5.0	Lüdecke et al. (2019b)	Extraction of variance components from mixed effects models
likert	1.3.5	Bryer and Speerschneider (2016)	Analysis and visualisation of Likert items
lme4	1.1-21	Bates et al. (2015b)	Linear mixed effects model fitting; Wald confidence intervals calculation
lmeresampler	0.1.1	Loy and Steele (2019)	Implementation of semi-parametric bootstrap
lmerTest	3.1-0	Kuznetsova et al. (2017)	Provision of p-values; stepwise regression

Table B-1 (continued).

Package	Version	Author	Use
MuMIn	1.43.6	Barton and Barton (2019)	Calculation of conditional and marginal R-squared
mice	3.6.0	van Buuren and Groothuis-Oudshoorn (2011)	Imputation of missing data
performance	0.3.0	Lüdecke et al. (2019a)	ICC calculation
robustlmm	2.3	Koller (2016)	Robust linear mixed effects model fitting and visualisation
Rmisc	1.5	Hope (2013)	Summarisation of data
reshape2	1.4.3	Wickham (2007)	“melt” wide-format into long-format data
sjPlot	2.7.1	Lüdecke (2019)	Creation of plots and regression tables
table1	1.1	Rich (2018)	Creation of HTML tables
xlsx	0.6.1	Dragulescu and Arendt (2018)	Write data from R to csv file

Source: Own illustration

Appendix C **Supplementary descriptive statistics***Sample characteristics*

Table C-1 presents the sample characteristics regarding attitudes, perception and knowledge for each subsample (valuation method) and the overall sample. The overview illustrates the homogeneity between the subsamples with respect to initial attitudes, perception and knowledge which is a prerequisite for the method comparison.

Table C-1 Sample characteristics: Attitudes, perception and knowledge

	CV (n=48)	PE (n=46)	PM (n=47)	Overall (n=141)
pref_env				
0	42 (87.5%)	39 (84.8%)	42 (89.4%)	123 (87.2%)
1	6 (12.5%)	7 (15.2%)	5 (10.6%)	18 (12.8%)
pref_animal				
0	45 (93.8%)	43 (93.5%)	43 (91.5%)	131 (92.9%)
1	3 (6.2%)	3 (6.5%)	4 (8.5%)	10 (7.1%)
know				
Mean (SD)	3.67 (2.15)	4.26 (1.91)	3.49 (2.15)	3.80 (2.08)
Median [Min, Max]	3.50 [0.00, 9.00]	4.00 [1.00, 8.00]	3.00 [0.00, 9.00]	4.00 [0.00, 9.00]
att_sc_1				
Mean (SD)	4.75 (0.601)	4.61 (0.649)	4.62 (0.990)	4.66 (0.764)
Median [Min, Max]	5.00 [2.00, 5.00]	5.00 [3.00, 5.00]	5.00 [0.00, 5.00]	5.00 [0.00, 5.00]
att_sc_2				
Mean (SD)	1.67 (1.14)	1.65 (0.994)	1.45 (0.855)	1.59 (1.00)
Median [Min, Max]	1.00 [0.00, 5.00]	1.00 [1.00, 5.00]	1.00 [1.00, 4.00]	1.00 [0.00, 5.00]
att_sc_3				
Mean (SD)	2.06 (0.885)	2.00 (0.869)	2.02 (1.01)	2.03 (0.918)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [0.00, 4.00]	2.00 [1.00, 5.00]	2.00 [0.00, 5.00]
att_sc_4				
Mean (SD)	3.85 (1.18)	4.28 (0.655)	4.09 (0.803)	4.07 (0.923)
Median [Min, Max]	4.00 [0.00, 5.00]	4.00 [3.00, 5.00]	4.00 [2.00, 5.00]	4.00 [0.00, 5.00]
att_sc_5				
Mean (SD)	4.46 (1.07)	4.59 (0.858)	4.49 (0.882)	4.51 (0.938)
Median [Min, Max]	5.00 [0.00, 5.00]	5.00 [0.00, 5.00]	5.00 [1.00, 5.00]	5.00 [0.00, 5.00]
att_sc_6				
Mean (SD)	4.56 (0.681)	4.61 (0.682)	4.45 (0.928)	4.54 (0.770)
Median [Min, Max]	5.00 [2.00, 5.00]	5.00 [2.00, 5.00]	5.00 [0.00, 5.00]	5.00 [0.00, 5.00]
att_w_1				
Mean (SD)	1.27 (0.644)	1.28 (0.688)	1.72 (1.12)	1.43 (0.864)
Median [Min, Max]	1.00 [0.00, 4.00]	1.00 [0.00, 3.00]	1.00 [0.00, 5.00]	1.00 [0.00, 5.00]
att_w_2				
Mean (SD)	4.35 (1.06)	4.39 (1.00)	4.32 (1.07)	4.35 (1.04)
Median [Min, Max]	5.00 [0.00, 5.00]	5.00 [0.00, 5.00]	5.00 [0.00, 5.00]	5.00 [0.00, 5.00]
att_w_3				
Mean (SD)	1.42 (0.710)	1.54 (0.887)	1.30 (0.587)	1.42 (0.738)
Median [Min, Max]	1.00 [0.00, 4.00]	1.00 [1.00, 5.00]	1.00 [0.00, 3.00]	1.00 [0.00, 5.00]

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Table C-1 (continued)

	CV (n=48)	PE (n=46)	PM (n=47)	Overall (n=141)
att_w_4				
Mean (SD)	2.27 (1.81)	3.00 (1.51)	2.70 (1.65)	2.65 (1.68)
Median [Min, Max]	3.00 [0.00, 5.00]	3.00 [0.00, 5.00]	3.00 [0.00, 5.00]	3.00 [0.00, 5.00]
att_w_5				
Mean (SD)	1.88 (1.18)	1.98 (1.39)	1.77 (1.20)	1.87 (1.25)
Median [Min, Max]	2.00 [0.00, 4.00]	2.00 [0.00, 5.00]	1.00 [0.00, 5.00]	2.00 [0.00, 5.00]
att_w_6				
Mean (SD)	1.67 (0.753)	1.91 (0.985)	1.74 (0.871)	1.77 (0.873)
Median [Min, Max]	2.00 [1.00, 4.00]	2.00 [1.00, 5.00]	2.00 [0.00, 4.00]	2.00 [0.00, 5.00]
att_w_7				
Mean (SD)	4.79 (0.410)	4.67 (0.920)	4.70 (0.507)	4.72 (0.645)
Median [Min, Max]	5.00 [4.00, 5.00]	5.00 [0.00, 5.00]	5.00 [3.00, 5.00]	5.00 [0.00, 5.00]
att_w_8				
Mean (SD)	1.56 (1.20)	1.74 (1.31)	1.70 (1.35)	1.67 (1.28)
Median [Min, Max]	2.00 [0.00, 4.00]	1.50 [0.00, 5.00]	2.00 [0.00, 5.00]	2.00 [0.00, 5.00]
nimby				
0	2 (4.2%)	6 (13.0%)	2 (4.3%)	10 (7.1%)
1	34 (70.8%)	36 (78.3%)	37 (78.7%)	107 (75.9%)
2	12 (25.0%)	4 (8.7%)	8 (17.0%)	24 (17.0%)

Source: Own illustration

Table C-2 presents an overview about participants' self-reported subjective sense of connectedness to nature (INS) and society (ICS) as well as the number of activities pursued in nature on a regular basis within the last twelve months. Responses are reported for the subsamples (CV, PE and PM) and for the overall sample. *Before* refers to the first elicitation round and *after* to the second elicitation round. Again, the matter of interest was the subsamples' homogeneity.

Table C-2 Sample characteristics: Connectedness and ES usage

	CV (n=48)	PE (n=46)	PM (n=47)	Overall (n=141)
INS_before				
Mean (SD)	4.52 (1.30)	4.46 (1.19)	4.40 (1.15)	4.46 (1.21)
Median [Min, Max]	4.00 [2.00, 7.00]	4.00 [2.00, 7.00]	4.00 [2.00, 7.00]	4.00 [2.00, 7.00]
INS_after				
Mean (SD)	4.60 (1.40)	4.50 (1.19)	4.40 (1.23)	4.50 (1.27)
Median [Min, Max]	5.00 [1.00, 7.00]	5.00 [1.00, 7.00]	4.00 [2.00, 7.00]	4.00 [1.00, 7.00]
ICS_before				
Mean (SD)	4.02 (1.42)	3.87 (1.41)	3.74 (1.31)	3.88 (1.38)
Median [Min, Max]	4.00 [1.00, 7.00]	4.00 [1.00, 7.00]	4.00 [1.00, 6.00]	4.00 [1.00, 7.00]
ICS_after				
Mean (SD)	3.90 (1.48)	3.83 (1.37)	3.79 (1.27)	3.84 (1.37)
Median [Min, Max]	4.00 [1.00, 7.00]	4.00 [1.00, 7.00]	4.00 [1.00, 6.00]	4.00 [1.00, 7.00]
activities				
Mean (SD)	3.52 (1.86)	3.98 (1.69)	3.66 (1.48)	3.72 (1.68)
Median [Min, Max]	3.50 [0.00, 9.00]	4.00 [0.00, 8.00]	4.00 [0.00, 7.00]	4.00 [0.00, 9.00]

Source: Own illustration

Appendix D **Supplementary regression results**

Bootstrapped regression models

Table D-1 shows the bootstrapped results for the between-group design (model 1). The table contains: The *Predictors*; *Original Estimate*; bootstrap estimates of bias (*Bias*) – difference between average bootstrapped estimate and original estimate; bootstrapped SEs (*Bootstr. SE*); median of bootstrapped values (*Bootstr. Median*); bootstrapped 95% CIs (*Bootstr. 95% CI*); total variance explained (σ^2); and variance explained by group-specific random effects ($\sigma^2_{id_group}$).

Table D-1 Results bootstrapping model 1

<i>Predictors</i>	Bootstrapped model 1				
	<i>Original Estimate</i>	<i>Bias</i>	<i>Bootstr. SE</i>	<i>Bootstr. Median</i>	<i>Bootstr. 95% CI</i>
(Intercept)	0.77	-0.006	1.36	0.78	-1.88 – 3.45
PE	0.25	0.002	0.33	0.26	-0.39 – 0.89
PM	-0.04	0.002	0.33	-0.04	-0.69 – 0.62
stage	0.11	0.002	0.15	0.11	-0.19 – 0.4
pref_env	-0.12	-0.002	0.28	-0.13	-0.66 – 0.42
pref_animal	0.53	0.000	0.33	0.52	-0.11 – 1.18
know	0.00	0.001	0.05	0.00	-0.09 – 0.09
att_sc_1	-0.10	-0.001	0.12	-0.10	-0.35 – 0.14
att_sc_2	-0.11	0.001	0.09	-0.11	-0.29 – 0.06
att_sc_3	0.01	-0.001	0.11	0.01	-0.2 – 0.22
att_sc_4	-0.11	0.002	0.11	-0.11	-0.33 – 0.11
att_sc_5	0.01	0.000	0.11	0.01	-0.21 – 0.23
att_sc_6	0.27	0.000	0.14	0.27	0 – 0.55
att_w_1	-0.11	0.000	0.09	-0.11	-0.29 – 0.07
att_w_2	-0.05	0.000	0.09	-0.05	-0.22 – 0.11
att_w_3	-0.32	-0.002	0.12	-0.32	-0.55 – -0.08
att_w_4	0.06	0.000	0.06	0.06	-0.05 – 0.17
att_w_5	0.14	0.000	0.07	0.14	0.01 – 0.28
att_w_6	-0.28	0.001	0.12	-0.28	-0.51 – -0.05
att_w_7	0.08	0.001	0.15	0.09	-0.22 – 0.39
att_w_8	0.11	0.000	0.07	0.11	-0.02 – 0.24
nimby - no	1.25	-0.002	0.35	1.25	0.56 – 1.94
nimby - maybe	0.46	0.002	0.39	0.46	-0.31 – 1.2
INS	0.17	0.000	0.08	0.17	0.02 – 0.32
ICS	-0.04	0.000	0.06	-0.04	-0.17 – 0.08
activities	-0.03	0.000	0.06	-0.03	-0.14 – 0.08
age	0.12	0.002	0.20	0.12	-0.27 – 0.5
male	0.11	-0.001	0.20	0.11	-0.29 – 0.5
diverse	-1.20	-0.001	0.66	-1.20	-2.48 – 0.1
income	-0.11	0.002	0.13	-0.11	-0.38 – 0.15
edu	-0.02	-0.001	0.10	-0.02	-0.22 – 0.19
urban.residence	0.72	0.000	0.41	0.72	-0.08 – 1.5
urban.origin	0.00	-0.002	0.18	0.00	-0.35 – 0.35
member	-0.18	-0.001	0.20	-0.19	-0.59 – 0.21
donation	0.69	0.000	0.21	0.69	0.28 – 1.1
hunter	-0.72	-0.002	0.40	-0.72	-1.49 – 0.07
dog	0.73	0.003	0.23	0.73	0.28 – 1.18
farmer	-0.40	0.001	0.21	-0.40	-0.8 – 0
Random Effects					
σ^2	1.03	-0.009	0.06	1.02	
$\sigma^2_{id_group}$	0.40	0.038	0.15	0.45	

Number of bootstrap replications B = 10000

Source: Own illustration

Table D-2 shows the bootstrapped results for the within-group design (model 2). The table contains: *Predictors*; The *Original Estimate*; bootstrap estimates of bias (*Bias*) – difference between bootstrapped average estimate and original estimate; bootstrapped SEs (*Bootstr. SE*) – bootstrap replicates’ standard deviations; median of bootstrapped values (*Bootstr. Median*); and bootstrapped 95% CIs (*Bootstr. 95% CI*); total variance explained (σ^2), variance explained by group-specific random effects ($\sigma^2_{id_group}$) and individual-specific random effects ($\sigma^2_{id:id_group}$).

Table D-2 Results bootstrapping model 2

<i>Predictors</i>	<i>Original Estimate</i>	Bootstrapped model 2			
		<i>Bias</i>	<i>Bootstr. SE</i>	<i>Bootstr. Median</i>	<i>Bootstr. 95% CI</i>
(Intercept)	0.90	0.020	2.25	0.91	-3.51 – 5.22
PM	-0.31	-0.002	0.33	-0.31	-0.96 – 0.32
stage	-0.04	0.000	0.09	-0.04	-0.22 – 0.13
PM:stage	0.30	0.000	0.13	0.30	0.05 – 0.54
pref_env	-0.15	0.001	0.46	-0.15	-1.07 – 0.74
pref_animal	0.73	0.000	0.56	0.73	-0.39 – 1.83
know	0.00	0.000	0.08	0.00	-0.16 – 0.15
att_sc_1	-0.18	-0.001	0.21	-0.18	-0.59 – 0.24
att_sc_2	-0.15	-0.002	0.17	-0.15	-0.47 – 0.18
att_sc_3	-0.16	-0.003	0.18	-0.16	-0.51 – 0.2
att_sc_4	0.04	0.000	0.21	0.04	-0.38 – 0.45
att_sc_5	-0.03	-0.001	0.24	-0.03	-0.49 – 0.44
att_sc_6	0.32	-0.004	0.25	0.31	-0.17 – 0.8
att_w_1	-0.17	-0.001	0.15	-0.17	-0.46 – 0.13
att_w_2	0.06	0.001	0.16	0.06	-0.25 – 0.37
att_w_3	-0.40	0.001	0.19	-0.39	-0.77 – 0
att_w_4	0.07	-0.002	0.10	0.07	-0.13 – 0.27
att_w_5	0.21	0.001	0.11	0.21	-0.01 – 0.43
att_w_6	-0.17	0.002	0.19	-0.17	-0.55 – 0.21
att_w_7	-0.11	0.001	0.25	-0.11	-0.6 – 0.38
att_w_8	0.11	-0.001	0.11	0.10	-0.11 – 0.32
nimby - no	1.40	0.003	0.59	1.41	0.21 – 2.57
nimby - maybe	0.72	0.000	0.64	0.71	-0.55 – 1.96
INS	-0.01	0.000	0.08	-0.01	-0.17 – 0.15
ICS	0.08	-0.001	0.07	0.08	-0.06 – 0.22
activities	0.08	0.001	0.11	0.08	-0.14 – 0.3
age	0.36	0.005	0.32	0.37	-0.28 – 0.99
male	0.13	-0.001	0.36	0.13	-0.56 – 0.83
diverse	-1.07	-0.001	1.01	-1.06	-3.06 – 0.99
income	0.07	-0.003	0.24	0.07	-0.4 – 0.56
edu	-0.07	0.002	0.18	-0.07	-0.43 – 0.28
urban.residence	0.59	-0.001	0.68	0.58	-0.75 – 1.92
urban.origin	-0.08	0.002	0.33	-0.08	-0.72 – 0.55
member	-0.29	-0.005	0.35	-0.30	-0.97 – 0.41
donation	0.74	-0.005	0.37	0.74	0.04 – 1.46
hunter	-0.51	0.006	0.75	-0.49	-1.99 – 0.97
dog	0.70	-0.001	0.41	0.70	-0.11 – 1.52
farmer	-0.32	-0.006	0.34	-0.33	-0.98 – 0.37
Random Effects					
σ^2	0.43	-0.032	0.07	0.39	
$\sigma^2_{id:id_group}$	1.05	0.116	0.14	1.16	
$\sigma^2_{id_group}$	0.16	0.021	0.21	0.09	

Number of bootstrap replications B = 10000

Source: Own illustration

Regression tables

Table D-3 presents the regression results of the between-group design reduced to socio-demographic predictors. The first column reports the predictor variables (*Predictors*), followed by the estimated coefficients (*Coef.*), associated standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and back-transformed estimated coefficients (*back-transf. coef.*) representing the proportional change (%) in WTP for each coefficient, all other things being equal. The bottom part of the table summarises measures related to the random effects: the total variance explained by the model (σ^2), the variance explained by the random effects ($\sigma^2_{id_group}$), the ICC, the number of groups (N_{id_group}), the number of overall *observations*, and the marginal R^2 (R_m^2) and conditional R^2 (R_c^2).

Table D-3 WTP robust mixed effects model regression results: between-group design reduced to socio-demographic predictors

Robust model 1 socio						
<i>Predictors</i>	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	3.34	0.60	2.17 – 4.51	5.61	<0.001***	2721.9
PE	0.03	0.32	-0.60 – 0.66	0.10	0.920	3.0
PM	-0.33	0.33	-0.97 – 0.32	-0.99	0.333	-28.1
stage	0.10	0.18	-0.25 – 0.45	0.56	0.578	10.5
age	0.32	0.20	-0.06 – 0.71	1.64	0.103	37.7
male	-0.26	0.20	-0.65 – 0.13	-1.32	0.190	-22.9
diverse	-0.66	0.69	-2.02 – 0.70	-0.95	0.343	-48.3
income	-0.29	0.14	-0.56 – -0.02	-2.07	0.039*	-25.2
edu	-0.03	0.10	-0.24 – 0.17	-0.31	0.756	-3.0
urban.residence	0.10	0.41	-0.70 – 0.90	0.25	0.805	10.5
urban.origin	-0.15	0.18	-0.50 – 0.21	-0.81	0.420	-13.9
member	-0.11	0.22	-0.54 – 0.32	-0.52	0.606	-10.4
donation	0.90	0.21	0.48 – 1.32	4.23	<0.001***	146.0
hunter	-1.30	0.40	-2.09 – -0.50	-3.20	0.002**	-72.7
dog	0.62	0.24	0.15 – 1.10	2.59	0.010**	85.9
farmer	-0.33	0.22	-0.75 – 0.10	-1.50	0.134	-28.1
Random Effects						
σ^2	1.4					
$\sigma^2_{id_group}$	0.12					
ICC	0.08					
N_{id_group}	18					
Observations	234					
R_m^2 / R_c^2	0.164 / 0.231					

. $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Table D-4 presents the results of the between-group design reduced to attitudinal, perceptual, connectedness, use and knowledge predictors. The table presents from left to right: predictor variables (*Predictors*), estimated coefficients (*Coef.*), standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and back-transformed estimated coefficients (*back-transf. coef.*). The table's bottom part summarises: the total variance explained (σ^2), the variance explained by random effects ($\sigma^2_{id_group}$), ICC, number of groups (N_{id_group}), number of overall observations, marginal R² (R_m^2), and conditional R² (R_c^2).

Table D-4 WTP robust mixed effects model regression results: between-group design reduced to attitudinal, perceptual, connectedness, use and knowledge predictors

Robust model 1 attitudes						
<i>Predictors</i>	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	0.57	1.04	-1.47 – 2.60	0.55	0.585	76.8
PE	0.16	0.27	-0.37 – 0.68	0.58	0.571	17.4
PM	0.15	0.27	-0.37 – 0.68	0.58	0.570	16.2
stage	0.10	0.15	-0.19 – 0.39	0.66	0.510	10.5
pref_env	-0.24	0.24	-0.71 – 0.23	-1.00	0.318	-21.3
pref_animal	0.49	0.29	-0.08 – 1.05	1.69	0.093	63.2
know	0.01	0.04	-0.07 – 0.08	0.18	0.855	1.0
att_sc_1	-0.02	0.11	-0.24 – 0.21	-0.15	0.883	-2.0
att_sc_2	-0.08	0.08	-0.24 – 0.07	-1.03	0.303	-7.7
att_sc_3	-0.03	0.10	-0.21 – 0.16	-0.27	0.785	-3.0
att_sc_4	-0.03	0.10	-0.23 – 0.17	-0.28	0.781	-3.0
att_sc_5	0.04	0.10	-0.17 – 0.24	0.36	0.720	4.1
att_sc_6	0.13	0.13	-0.12 – 0.38	1.04	0.301	13.9
att_w_1	-0.20	0.09	-0.37 – -0.03	-2.28	0.023*	-18.1
att_w_2	-0.07	0.08	-0.23 – 0.08	-0.91	0.361	-6.8
att_w_3	-0.31	0.11	-0.53 – -0.09	-2.76	0.006**	-26.7
att_w_4	0.13	0.05	0.03 – 0.23	2.58	0.011*	13.9
att_w_5	0.11	0.06	-0.01 – 0.23	1.80	0.073	11.6
att_w_6	-0.12	0.10	-0.32 – 0.07	-1.21	0.226	-11.3
att_w_7	0.12	0.13	-0.14 – 0.38	0.89	0.376	12.7
att_w_8	0.07	0.06	-0.05 – 0.18	1.10	0.275	7.3
nimby - no	1.68	0.33	1.04 – 2.33	5.14	<0.001***	436.6
nimby - maybe	0.92	0.36	0.21 – 1.63	2.53	0.012*	150.9
INS	0.13	0.07	-0.00 – 0.26	1.90	0.059	13.9
ICS	-0.04	0.06	-0.15 – 0.08	-0.61	0.540	-3.9
activities	0.04	0.05	-0.06 – 0.14	0.81	0.422	4.1
Random Effects						
σ^2	0.99					
$\sigma^2_{id_group}$	0.07					
ICC	0.07					
N_{id_group}	18					
Observations	234					
R_m^2 / R_c^2	0.414 / 0.455					

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Table D-5 presents the results of the stepwise regression based on the between-group design. The first column reports the predictor variables (*Predictors*), followed by the estimated coefficients (*Coef.*), associated standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and back-transformed estimated coefficients (*back-transf. coef.*) representing the proportional change (%) in WTP for each coefficient, all other things being equal. The bottom part of the table summarises measures related to the random effects: the total variance explained by the model (σ^2), the variance explained by the random effects ($\sigma^2_{id_group}$), the *ICC*, the number of groups (N_{id_group}), the number of overall *observations*, and the marginal R^2 (R_m^2) and conditional R^2 (R_c^2).

Table D-5 WTP stepwise regression results: between-group design

Stepwise model 1						
<i>Predictors</i>	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	0.35	0.89	-1.39 – 2.09	0.39	0.697	41.9
pref_animal	0.66	0.28	0.10 – 1.21	2.32	0.021*	93.5
att_sc_6	0.22	0.10	0.03 – 0.41	2.32	0.021*	24.6
att_w_3	-0.34	0.10	-0.55 – -0.13	-3.24	0.001**	-28.8
att_w_5	0.15	0.06	0.04 – 0.27	2.60	0.010**	16.2
att_w_6	-0.28	0.09	-0.46 – -0.10	-2.99	0.003**	-24.4
nimby - no	1.12	0.31	0.51 – 1.74	3.57	<0.001***	206.5
nimby - maybe	0.37	0.34	-0.30 – 1.05	1.08	0.283	44.8
INS	0.13	0.06	0.01 – 0.25	2.18	0.030*	13.9
urban.residence	0.71	0.36	-0.00 – 1.42	1.95	0.053·	103.4
donation	0.54	0.16	0.24 – 0.85	3.50	0.001***	71.6
hunter	-0.76	0.35	-1.44 – -0.08	-2.19	0.030*	-53.2
dog	0.77	0.19	0.40 – 1.14	4.06	<0.001***	116.0
farmer	-0.44	0.19	-0.81 – -0.08	-2.40	0.017*	-35.6
Random Effects						
σ^2	1.03					
$\sigma^2_{id_group}$	0.14					
ICC	0.12					
N_{id_group}	18					
Observations	234					
R_m^2 / R_c^2	0.411 / 0.480					

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Table D-6 presents the regression results of the within-group design reduced to socio-demographic predictors. The first column reports predictor variables (*Predictors*), followed by estimated coefficients (*Coef.*), standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and back-transformed estimated coefficients (*back-transf. coef.*). The table's bottom summarises: total variance explained by the model (σ^2), variance explained by individual-specific random effects ($\sigma^2_{id:id_group}$) and group-specific random effects ($\sigma^2_{id_group}$), overall *ICC* and group-specific *ICC* (ICC_{id_group}), number of groups (N_{id_group}), number of individuals (N_{id}), number of *observations*, marginal R^2 (R_m^2), and conditional R^2 (R_c^2).

Table D-6 WTP robust mixed effects model regression results: within-group design reduced to socio-demographic predictors

Robust model 2 socio						
<i>Predictors</i>	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	3.85	0.83	2.23 – 5.47	4.66	<0.001***	4599.3
PM	-0.37	0.27	-0.90 – 0.17	-1.35	0.209	-30.9
stage	-0.02	0.01	-0.05 – 0.01	-1.54	0.127	-2.0
PM:stage	0.06	0.02	0.03 – 0.10	3.35	0.001**	6.2
age	0.47	0.28	-0.08 – 1.03	1.67	0.099·	60.0
male	-0.48	0.31	-1.08 – 0.13	-1.54	0.127	-38.1
diverse	-0.95	0.93	-2.77 – 0.87	-1.02	0.309	-61.3
income	-0.26	0.21	-0.67 – 0.14	-1.28	0.205	-22.9
edu	-0.09	0.16	-0.40 – 0.22	-0.59	0.559	-8.6
urban.residence	-0.23	0.58	-1.37 – 0.91	-0.39	0.696	-20.5
urban.origin	-0.18	0.28	-0.73 – 0.37	-0.63	0.529	-16.5
member	-0.28	0.32	-0.92 – 0.35	-0.87	0.385	-24.4
donation	1.03	0.31	0.42 – 1.63	3.33	0.001**	180.1
hunter	-1.68	0.61	-2.86 – -0.49	-2.77	0.007**	-81.4
dog	0.77	0.37	0.06 – 1.49	2.11	0.038*	116.0
farmer	0.03	0.33	-0.61 – 0.68	0.11	0.916	3.0
Random Effects						
σ^2	0					
$\sigma^2_{id:id_group}$	1.28					
$\sigma^2_{id_group}$	0					
ICC	1					
ICC_{id_group}	0					
N_{id}	93					
N_{id_group}	12					
Observations	186					
R_m^2 / R_c^2	0.233 / 0.998					

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Appendix D - Supplementary regression results

Table D-7 presents the regression results of the within-group design reduced to attitudinal, perceptual, connectedness, use and knowledge predictors. The table presents from left to right: variables (*Predictors*), estimated coefficients (*Coef.*), standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and back-transformed coefficients (*back-transf. coef.*). The table's bottom summarises: total variance explained (σ^2), variance explained by individual-specific random effects ($\sigma^2_{id:id_group}$) and group-specific random effects ($\sigma^2_{id_group}$), overall *ICC* and group-specific *ICC* (ICC_{id_group}), number of groups (N_{id_group}), number of individuals (N_{id}), number of *observations*, marginal R^2 (R_m^2), and conditional R^2 (R_c^2).

Table D-7 WTP robust mixed effects model regression results: within-group design reduced to attitudinal, perceptual, connectedness, use and knowledge predictors

<i>Predictors</i>	Robust model 2 attitudes					
	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	0.63	1.42	-2.16 – 3.42	0.44	0.662	87.8
PM	-0.01	0.22	-0.43 – 0.42	-0.03	0.977	-1.0
stage	-0.02	0.02	-0.06 – 0.01	-1.45	0.152	-2.0
PM:stage	0.07	0.02	0.03 – 0.12	3.22	0.002**	7.3
pref_env	-0.32	0.32	-0.94 – 0.31	-0.99	0.323	-27.4
pref_animal	0.43	0.41	-0.36 – 1.23	1.07	0.289	53.7
know	0.03	0.05	-0.08 – 0.13	0.51	0.614	3.0
att_sc_1	0.02	0.16	-0.29 – 0.34	0.15	0.880	2.0
att_sc_2	-0.15	0.13	-0.40 – 0.10	-1.20	0.233	-13.9
att_sc_3	-0.07	0.14	-0.34 – 0.20	-0.53	0.596	-6.8
att_sc_4	-0.08	0.16	-0.38 – 0.23	-0.49	0.628	-7.7
att_sc_5	-0.02	0.19	-0.38 – 0.35	-0.08	0.935	-2.0
att_sc_6	0.16	0.18	-0.21 – 0.52	0.85	0.398	17.4
att_w_1	-0.23	0.12	-0.47 – 0.00	-1.95	0.055	-20.5
att_w_2	0.04	0.13	-0.20 – 0.29	0.34	0.738	4.1
att_w_3	-0.33	0.16	-0.64 – -0.02	-2.11	0.038*	-28.1
att_w_4	0.10	0.07	-0.05 – 0.24	1.30	0.198	10.5
att_w_5	0.09	0.08	-0.07 – 0.25	1.11	0.273	9.4
att_w_6	-0.01	0.14	-0.29 – 0.27	-0.08	0.937	-1.0
att_w_7	0.06	0.18	-0.28 – 0.41	0.36	0.724	6.2
att_w_8	0.10	0.09	-0.06 – 0.27	1.20	0.233	10.5
nimby - no	1.90	0.47	0.98 – 2.81	4.05	<0.001***	568.6
nimby - maybe	1.13	0.52	0.11 – 2.14	2.17	0.034*	209.6
INS	0.00	0.02	-0.03 – 0.04	0.26	0.793	0.0
ICS	0.03	0.02	-0.01 – 0.06	1.61	0.108	3.0
activities	0.12	0.07	-0.02 – 0.27	1.65	0.103	12.7
Random Effects						
σ^2	0.01					
$\sigma^2_{id:id_group}$	0.82					
$\sigma^2_{id_group}$	0					
ICC	0.99					
ICC_{id_group}	0					
N_{id}	93					
N_{id_group}	12					
Observations	186					
R_m^2 / R_c^2	0.480 / 0.996					

· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Table D-8 presents the results of the stepwise regression based on the within-group design. The first column reports predictor variables (*Predictors*), followed by estimated coefficients (*Coef.*), standard errors (*SE*), 95% confidence intervals (*95% CI*), t-statistics (*t*), p-values (*p*) and back-transformed estimated coefficients (*back-transf. coef.*). The table's bottom summarises: total variance explained by the model (σ^2), variance explained by individual-specific random effects ($\sigma^2_{id:id_group}$) and group-specific random effects ($\sigma^2_{id_group}$), overall *ICC* and group-specific *ICC* (ICC_{id_group}), number of groups (N_{id_group}), number of individuals (N_{id}), number of *observations*, marginal R^2 (R_m^2), and conditional R^2 (R_c^2).

Table D-8 WTP stepwise regression results: within-group design

Stepwise model 2						
<i>Predictors</i>	<i>Coef.</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>	<i>p</i>	<i>Back-transf. coef.</i>
(Intercept)	1.04	0.88	-0.69 – 2.77	1.17	0.244	182.9
PM	-0.26	0.24	-0.73 – 0.21	-1.10	0.276	-22.9
stage	-0.04	0.09	-0.22 – 0.13	-0.49	0.627	-3.9
PM:stage	0.30	0.13	0.06 – 0.55	2.42	0.017*	35.0
att_sc_6	0.26	0.14	-0.02 – 0.54	1.85	0.068	29.7
att_w_1	-0.21	0.12	-0.44 – 0.03	-1.72	0.089	-18.9
att_w_3	-0.43	0.16	-0.74 – -0.12	-2.70	0.009**	-34.9
att_w_5	0.22	0.09	0.05 – 0.39	2.49	0.015*	24.6
nimby - no	1.28	0.41	0.47 – 2.08	3.10	0.003**	259.7
nimby - maybe	0.73	0.50	-0.24 – 1.71	1.47	0.144	107.5
donation	0.73	0.22	0.29 – 1.17	3.25	0.002**	107.5
dog	0.66	0.27	0.12 – 1.19	2.39	0.019*	93.5
Random Effects						
σ^2	0.18					
$\sigma^2_{id:id_group}$	0.97					
ICC	0.84					
N_{id}	93					
N_{id_group}	12					
Observations	186					
R_m^2 / R_c^2	0.399 / 0.904					

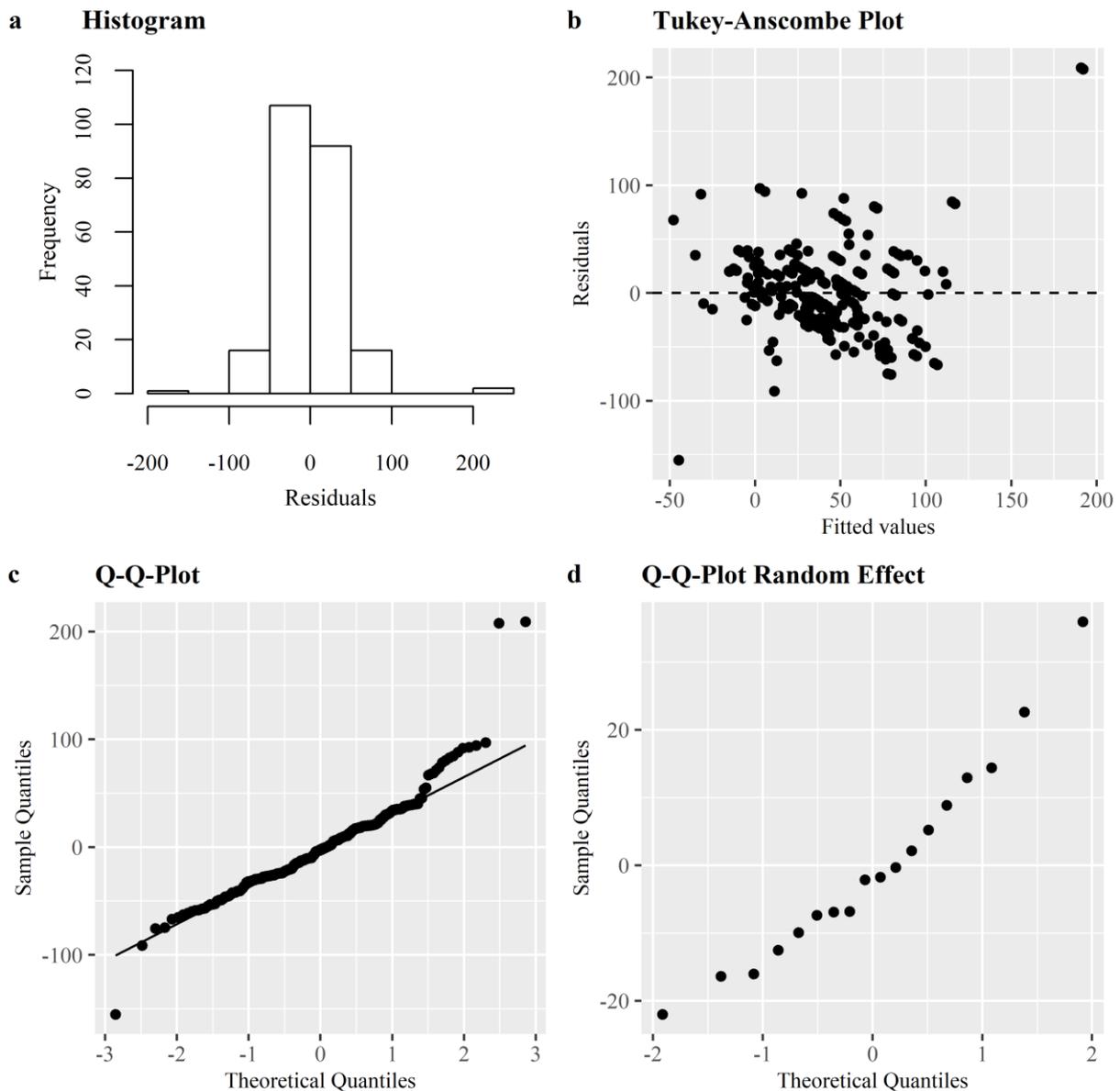
· $p < 0.1$ * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Source: Own illustration

Appendix E **Supplementary residual plots**

The residual plots in Figure B-1 suggest deviations from normality (panel *a* and panel *c*) as well as existence of heteroscedasticity (panel *b*). This is also confirmed by the results of the Shapiro-Wilk normality test ($W = 0.926$; $p\text{-value} < 0.001$) and Levene's test ($F = 2.386$; $p\text{-value} = 0.002$). The normile quantile plotted against the random effect quantile in panel *d* does not raise concerns about normality of random effects.

Figure E-1 Residual plots of unrestricted and untransformed mixed effects model: between-group design



Source: Own illustration

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