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Doctoral thesis

**Public and Scientific Opinion on Climate Policy,
Economic Growth and the Environment**

by

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Public and Scientific Opinion on Climate Policy, Economic Growth and the Environment

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Summary

The main aim of this thesis is to investigate public and scientific opinion on climate policy, economic growth and the environment. This is elaborated in four original studies. A first study aims to explain why people support or reject climate policies. Drawing on a large body of empirical and experimental research, the various factors are organized in three broad categories: (1) climate change perception and related social-psychological factors; (2) perception of climate policy and its design; and (3) contextual factors. A second study reports the results of an original questionnaire survey in Spain regarding public views on economic growth, the environment and prosperity. It identifies various dimensions of attitudes towards growth, and examines how these are related to socio-demographic, knowledge and ideological characteristics. A third study provides further insight into public opinion on economic growth and the environment, this time by adopting an international perspective. It gathers and analyzes a large amount and wide variety of survey data from numerous countries and years. A key finding is that most people see economic growth and environmental protection as compatible. A fourth and final study focuses on the scientific debate about economic growth and the environment. It reports the results of an original international questionnaire survey among researchers from a range of backgrounds, including various economic sub-disciplines, ecological economics, environmental social sciences, and natural sciences. It finds considerable variation of views across research fields, as well as a consistent influence of political ideology. A final chapter offers general conclusions and suggestions for future research.

Resumen

El objetivo principal de esta tesis es investigar la opinión pública y científica sobre políticas climáticas, crecimiento económico y medio ambiente. Esto se desarrolla en cuatro estudios originales. Un primer estudio tiene como objetivo explicar por qué las personas apoyan o rechazan las políticas climáticas. Sobre la base de un gran cuerpo de investigación empírica y experimental, los diversos factores se organizan en tres grandes categorías: (1) percepción del cambio climático y factores psicosociales relacionados con el mismo; (2) percepción de la política climática y su diseño; y (3) factores contextuales. Un segundo estudio presenta los resultados de una encuesta realizada en España, creada para recopilar información sobre opinión pública en relación al crecimiento económico, el medio ambiente y la prosperidad. En él se identifican diversas dimensiones de las actitudes relativas al crecimiento, y se examina cómo éstas se articulan con factores socio-demográficos, de conocimiento e ideológicos. Un tercer estudio adopta una perspectiva internacional de la opinión pública sobre el crecimiento económico y el medio ambiente. Se recogen y analizan una gran cantidad y amplia variedad de datos, aportados por encuestas de numerosos países, en diferentes años. Un hallazgo clave es que la mayoría de las personas ven el crecimiento económico y la protección del medio ambiente como compatibles. Un cuarto y último estudio se centra en el debate científico sobre crecimiento económico y medio ambiente. Se informa de los resultados de una encuesta internacional, de creación propia, que se realizó a investigadoras e investigadores de disciplinas tan diversas como la economía ecológica, las ciencias socio-ambientales y naturales, así como varias sub-disciplinas económicas. Se ha encontrado una variación considerable de puntos de vista a través de campos de investigación, así como una influencia constante de la ideología política. Un capítulo final presenta las conclusiones generales y sugerencias para futuras investigaciones.

Chapter 1

Introduction

1.1 Background and motivation

Human societies have to respect various planetary boundaries in order to avoid destabilizing the Earth system (Rockström et al., 2009; Steffen et al., 2015). The thresholds of two boundaries – namely for climate change and biodiversity – have already been crossed beyond what is considered safe. The vast majority of climate scientists agree that global climate change is happening and significantly human-caused (Doran and Zimmerman, 2009; Verheggen et al., 2014; Cook et al., 2016). Similarly, the community of conservation scientists is unanimous in their view that a serious loss of biodiversity is likely to happen in the coming decades to centuries (Rudd, 2011). Failing to realize a global sustainability transition will have negative consequences for economic production, human health and social welfare.

While there is a broad consensus on the environmental problems, the same cannot be said for the solutions. For example, policy analysts have termed climate change as a “super-wicked” problem due to it having several unique characteristics, such as the lack of time, irrational discounting of the future, a weak or non-existent central authority, and the fact that those who cause the problem also have to solve it (Levin et al., 2012). Adding to the complexity is that climate change involves an interplay of economic, social, psychological, cultural and political dimensions (Hulme, 2009). Hence, it is no surprise that there is a wide variety of proposals to make production and consumption more sustainable (Geels et al., 2015). Some believe that technological advances on their own will do the trick. This is questionable for various reasons, among others, as innovation and adoption of the cleanest technologies is rather slow (Negro et al., 2012). Therefore, most analysts propose that public

policies, notably economic incentives, are required at national and international levels to assure that relevant decisions by investors, producers and consumers are altered in the direction of sustainability. Research shows that the majority of environmental and climate economists is in favor of market-based instruments such as carbon trading or taxation (Howard and Sylvan, 2015).

Some researchers take the more radical position that a shift in societal values and socio-economic systems is needed. One main idea here is to question the objective of endless economic growth, especially in rich and industrialized countries. This draws on a long-standing debate about economic growth and the environment. Already many decades ago, eminent scholars such as John Stuart Mill and John Maynard Keynes expressed their doubts about the notion of an ever-expanding economy (Schmelzer, 2015). But it was mainly in the 1960s and 1970s, in the wake of the rising environmental movement, that economic growth came under fierce criticism (Mishan, 1967; Nordhaus and Tobin, 1972; Hirsch, 1976; Scitovsky, 1976; Daly, 1977). In particular, the “The Limits to Growth” report to the Club of Rome (Meadows et al., 1972) received enormous academic and public attention. This debate waned somewhat in the 1980s and 1990s, but reemerged in recent years. For example, a search in Google Scholar shows that the book “Prosperity without Growth” (Jackson, 2011) has been cited over 2,000 times in the academic literature in the five years since its publication. Discussions about this topic also increasingly enter the policy arena of some countries, as is exemplified by an all-party parliamentary group on the limits to growth in the UK in 2016, and an “Enquete commission” titled “Growth, Prosperity and Quality of Life” in Germany between 2011 and 2013.

A main reason for the renewed debate is the unprecedented challenge posed by climate change. To achieve a stabilization of global warming below 2 or even 1.5°C until 2100, the global economy has to decouple CO₂ emissions at a considerably faster rate than observed during the past decades (Victor, 2010a; Schneider et al. 2010; Jackson, 2011; Antal and van

den Bergh, 2014). This causes various experts to be skeptical about continued economic growth under climate goals. Nevertheless, mainstream economists largely remain optimistic. To illustrate, a recent report by the New Climate Economy (2014) asserts that “countries at all levels of income now have the opportunity to build lasting economic growth at the same time as reducing the immense risks of climate”.

Economic growth is questioned on the basis of not only environmental problems but also social-psychological considerations. There is much evidence that economic growth does no longer contribute to improving life satisfaction or other proxies of social welfare in rich countries (e.g., Easterlin et al., 2010), even though debate on this topic lingers on (e.g., Stevenson and Wolfers, 2008). Some scholars therefore argue it is “time to leave GDP behind” (Costanza et al., 2014).

Those in favor of abandoning the strong commitment to economic growth often highlight the challenge of getting these messages across to a wider audience. Herman Daly, one of the pioneers on thinking beyond growth, recently noted the following in this regard (Daly, 2015):

“It is one thing to suggest a general outline of policies, but it is something else entirely to say how we will secure the will, strength, and clarity of purpose to carry out these policies—especially when we have treated growth as the *summum bonum* for the past century.”

Before being able to “secure the will”, it is useful, if not necessary, to have a good understanding of public opinion towards policies, economic growth and the environment. This is a main motivation for writing this thesis.

There is an extensive literature on people’s environmental attitudes and behaviors. In a review of this research, Gifford et al. (2011) pointed out that much attention is given to the study of behaviors that have a relatively low environmental impact, such as recycling. Gifford et al. ask for re-directing research attention to those behaviors with higher potential

environmental impacts, such as (inter-)national carbon pricing. This includes examining the appeal of policies as well as under what conditions individuals accept or reject environmental policies, which in turn can help to improve communication by governments and advocacy groups about such policies.

Some environmental psychologists claim that the existing literature does not sufficiently consider the socio-economic context in which environmental attitudes and behaviors emerge (Uzzell and Rätzl, 2009; Gifford, 2014; Capstick et al., 2015). There is little previous work considering an important aspect of this context, namely the quest for economic growth. It is precisely at this point where it seems fruitful to integrate the literature on environmental attitudes with insights from ecological economics and related fields, which argue for abandoning the unconditional commitment to economic growth. This is a further motivation of this thesis.

By giving importance to public opinion, one assumes that the latter plays a significant role in actual policy decisions. Indeed, both theoretical and empirical evidence suggest that public opinion influences environmental and other policy decisions in democratic societies (Tjernström and Tietenberg, 2008; Hughes and Urpelainen, 2015; Vandeweerd et al., 2016; see also Burke, 2012). However, there are obviously numerous other factors that feed into policy making and implementation. One of them is the opinions of scientists regarding a certain issue. Given the apparent disagreement on economic growth and the environment among academic researchers, it is equally valuable to inquire which specific questions in the economic growth debate elicit most controversy across research fields, as well to understand the underlying reasons for this. While there are studies about scientific opinion on a number of issues, so far this type of research has not been done on economic growth and the environment.

1.2 Aims and structure of the thesis

In line with the previous remarks, the overarching aim of this thesis is to investigate both public and scientific opinion on climate policy, economic growth and the environment. The major research questions of this dissertation are:

- How does the general public view various aspects of the relationship between economic growth, the environment and prosperity?
- Which factors explain variation in public attitudes towards climate policy, economic growth and the environment?
- How do scientists view the relationship between economic growth and the environment?
- Which factors explain variation in scientists' views on economic growth and the environment?

The remainder of the thesis consists of five chapters whose specific aims are as follows.

Chapter 2 is motivated by the fact that a lack of public support is a barrier to the implementation of effective climate policies. The chapter examines a range of factors influencing public attitudes towards climate policy. This is done through a systematic literature review, which is the first of its kind on this topic. The various factors influencing policy support are divided into three categories: (1) social-psychological factors and climate change perception, (2) the perception of climate policy and its design; and (3) contextual factors. I discuss the findings and propose future research directions.

Chapter 3 examines attitudes towards economic growth and environmental protection. Prior opinion surveys have typically framed this relationship in a simple dichotomous pro-growth/environment format. Here I examine public beliefs and attitudes about a considerably wider range of aspects of the growth debate. To this end, I conducted an online questionnaire

survey including a country-wide, representative sample of 1,008 Spanish citizens. A range of questions related to economic growth were posed, such as whether growth is necessary for improving life satisfaction or whether the economy can grow endlessly. Through various techniques of statistical analysis, I examine how support for or disagreement with different questions and statements on growth are related to each other, as well as how they are influenced by socio-demographic, knowledge and ideology/values variables. In addition, I investigate whether and to what extent specific Spanish economic conditions in the recent past influence the outcomes.

Chapter 4 investigates international public opinion on economic growth, the environment and prosperity. For this purpose, I gathered and analyzed a large amount of survey data. The combined sample of this study includes over half a million respondents from representative surveys conducted in more than 50 countries in the last three decades. First, I examine whether people view economic growth and environmental protection as compatible or not. Assuming that there is a conflict between the two objectives, I study what people have prioritized in the recent past. Furthermore, we investigate public understanding of key concepts such as “economic growth”, “the environment” and the “GDP growth rate”. Finally, we assess how people evaluate economic growth in a broader context of social welfare, and whether they believe that economic growth will continue in the future.

Chapter 5 focuses on the academic debate on economic growth versus the environment, which has been going on for many decades now. Between March and May 2015, I conducted an online survey of researchers’ views on various aspects of this debate. These include, among others, the favored GDP growth rate, the compatibility of global GDP growth with the 2°C climate policy target, the timing and factors of (never-)ending growth, a favored growth-environment strategy, and various questions on the link between growth, employment and prosperity. The 814 respondents have a wide range of backgrounds, including economics broadly, growth theory specifically, environmental economics, ecological economics,

environmental social sciences, and natural (environmental) sciences. The two main aims are: (1) to provide an overview of agreements and disagreements in researchers' views across (sub-)disciplines and broader research fields, and (2) to understand why opinions differ. For this reason, various statistical analyses are undertaken.

Chapter 6 summarizes the insights from the chapters, draws general conclusions, and indicates what are seen to be promising directions for further research.

Chapter 2

What explains public support for climate policies? A review of empirical and experimental studies¹

2.1 Introduction

Environmentally significant behavior can be classified into four types (Stern, 2000): environmental activism (e.g., participation in social movements), nonactivist behaviors in the public sphere (e.g., accept or support public policies), private sphere environmentalism (e.g., actions in the household), and other environmentally significant behaviors (e.g., actions in the workplace). Here it is the second category – non-activist behavior in the public sphere – that is central to this article. This may include, for example, stating approval to environmental policies and the willingness to incur subsequent financial costs, such as paying higher prices or taxes, or behavioral costs, such as effort or inconvenience.

This review article aims to shed light on the question of why people support or oppose public policies in the context of climate change mitigation. In the last ten to fifteen years, a substantial body of empirical literature has emerged that approaches the subject from different angles. Yet, to our knowledge, there is no study summarizing these cross-disciplinary findings. This is what we attempt to do here.

Understanding public support for climate policies is important for several reasons. In general, public opinion is a key determinant of policy change in democratic countries (Page and Shapiro, 1983; Burstein, 2003). More specifically, when comparing countries, citizens' concern about climate change is associated with lower greenhouse gas emissions, suggesting that public attitudes translate into policy action (Tjernström and Tietenberg, 2008). Others have identified the lack of broad public support as a major barrier to realizing a transition to a

¹ This chapter has already been published in *Climate Policy* (Drews and van den Bergh, 2015).

low-carbon economy (Geels, 2013; Wiseman et al., 2013). Knowledge about public attitudes further helps to anticipate public responses in a later stage of the policy cycle, which can contribute to the design and implementation of effective policies.

For the purposes of this chapter, we searched the Web of Science using combinations of “climate change” and “global warming” with the following keywords: “public support”, “policy support”, “public acceptance”, “policy acceptance”, “public acceptability”, “policy preferences”, “public preferences”, “policy preferences”, “public attitudes”, and “policy attitudes”. We retrieved 355 papers and decided to include or exclude these on the basis of the criteria described below.

The major part of the identified studies uses the concept of attitude which is “a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor” (Eagly and Chaiken, 1993). We further included some economic studies that report a willingness-to-pay (WTP) value.² There is evidence to suggest that economic preferences expressed as WTP and psychological attitudes have much in common (Kahneman et al., 2000; Ryan and Spash, 2011). Studies reporting a WTP can make a meaningful addition to the findings in the psychological literature, because they provide clear information on the costs of policy, which is often missing in other studies on public opinion. To limit the scope of the investigation, we do not consider typical socio-demographic factors such as income, age, or gender. This review further excludes studies that focus solely on renewable or other energy technologies (e.g., CCS, nuclear, fracking), often without an explicit climate change or climate policy context.³ Neither do we cover general studies on public support for environmental protection (e.g., Inglehart, 1995). More specifically, the empirical and experimental studies reviewed here examine attitudes and preferences regarding various

² Due to space limits in the published article, we do not offer a comprehensive coverage of the existing research on WTP for climate policy. Note further that a few partial reviews, restricted to a limited set of factors, are already available (Johnson and Nemet, 2010, unpublished); Diederich and Goeschl, 2013; and Alló and Loureiro, 2014).

³ See, for example, Huijts et al. (2012) for a review on psychological factors influencing acceptance of energy technologies.

policies by using a range of methods and measures. Using the search criteria as just outlined, we ended up with 46 articles from the search in *Web of Science*. These were then checked for relevant backward and forward citations, which led to a further inclusion of 49 papers.

The remainder of the chapter is organized as follows. Section 2.2 addresses the public perception of climate change and related social-psychological variables, including beliefs, knowledge, emotions, values and worldviews. Section 2.3 examines perceptions of climate policy and its attributes, such as benefits, costs, effectiveness, fairness and potential revenues. Section 2.4 highlights contextual factors of policy support, such as social trust, norms and participation, economic and political aspects, geography and weather, media coverage, and framing. Section 2.5 discusses the main findings, draws conclusions and offers suggestions for future research.

2.2 Social-psychological factors and climate change perception

Much has been written about the public perception of, and disagreement on, climate change (Hulme, 2009). It involves a complex interplay of forces. The purpose of this section is not to review climate change perception, but to briefly highlight those constructs which seem to have a particular relevance for policy preferences.

2.2.1 General personal orientations

Before discussing variables that specifically relate to climate change, we consider people's more general orientations toward life, such as political ideology, values, worldviews and religiosity. Left-wing political orientation relates to more favorable attitudes towards climate policies in Switzerland (Tobler et al., 2012) and Sweden (Harring and Jagers, 2013; Hammar and Jagers, 2007). Left and green political ideology clearly were associated with favorable votes in referenda on energy taxes in Switzerland (Thalmann, 2004; Bornstein and Lanz, 2008). Evidence from the US, which includes some large-scale surveys, reveals that

Democratic party affiliation and left-wing political orientation are strongly associated with more policy support (e.g., Leiserowitz, 2006; McCright, 2008; McCright et al., 2013; Zhao et al., 2011; Park and Vedlitz, 2013), even if a few studies (with notably smaller samples) report insignificant effects for these variables (Shwom et al. 2010; Attari et al., 2009). In addition, WTP for climate change mitigation is found to be higher for Democrats than for Republicans (Kotchen et al. 2013).

It should be noted, though, that political orientation may not directly influence policy support but rather via factors like values and worldviews (e.g., Dietz et al., 2007). Research from the US, drawing on the cultural theory of risk, finds that egalitarian worldviews strongly predict support for costly climate policies, while individualistic and hierarchical values are associated with opposition to climate policy (Leiserowitz, 2006; Smith and Leiserowitz, 2013b).

Research shows that values matter in understanding policy support, with environmental and self-transcendent values (e.g., social justice) likely affecting public acceptance of policies more strongly than so-called self-enhancement values (e.g., wealth) are affecting public opposition (Nilsson et al., 2004; Nilsson and Biel, 2008; Harring and Jagers, 2013). Another widely used scale in social psychology is the so-called ‘New Environmental Paradigm’, which measures general beliefs about the human-nature relationship. Much evidence suggests that this scale is positively correlated with the degree of support for climate policy in the US and other countries (Dietz et al., 2007; Shwom et al., 2010; Attari et al., 2009; Harring and Jagers, 2013; Lubell et al., 2007). The value-belief-norm (VBN) theory of environmentalism developed by Stern et al. (1999) combines personal values, general environmental beliefs and personal norms in a causal chain to explain pro-environmental behavior. This model has been shown to predict public acceptability for a number of policies aimed at reducing CO₂ emissions (e.g., Steg et al., 2005).

A different value-based explanation is Inglehart's (1995) often cited 'Postmaterialist values thesis'. As basic needs are increasingly met with rising income in industrialized countries, societies are said to experience a shift of values from material towards more abstract ones like quality of life or environmental protection. However, the limited empirical evidence for the effect of post-materialist values on public support for climate policy does not support the hypothesis (Dietz et al., 2007). Religiosity involves another belief system that could be relevant but has been scarcely studied in relation to policy support. One exception is a recent paper by Smith and Leiserowitz (2013a), who find that American evangelicals are less likely to support climate policies than non-evangelicals. Another paper finds that US adherents of "Christian end-times theology" express lower support for government action in general (Barker and Bearce, 2013).

2.2.2 Climate change perception

There are several key beliefs about the phenomenon of climate change that matter for public support. First and foremost, there is the belief that climate change is happening, which has been shown to be a determinant of favorable policy attitudes (Sibley and Kurz, 2013). In addition, this belief and the certainty about it came out as strong explanatory factors of WTP for climate policy in countries such as the US, China and Sweden (Kotchen et al., 2013; Carlsson et al., 2012). Apart from that, human responsibility for climate change in a general sense (Krosnick et al., 2006) as well as a feeling of personal responsibility (Brouwer et al., 2008) have been found to favorably influence policy attitudes. The attribution to natural or human causation of climate change, however, may vary depending on whether one perceives one's own or another country as more responsible (Jang, 2013). Next, there is the belief in the negative consequences of climate change. This is measured as concern or risk perception for

oneself and society at large,⁴ which is undoubtedly a crucial factor in explaining public support (O'Connor et al., 1999; McCright, 2008; Zahran et al., 2006; DeBono et al., 2012) as well as WTP for policies (Brouwer et al., 2008; Viscusi and Zeckhauser, 2006; Hersch and Viscusi, 2006). On the other side of the coin, climate change skepticism with regard to these different facets of climate change perception – e.g., the existence, human contribution, degree and timing of risks – has become a research topic of growing interest. Skepticism can account for some of the observed public resistance to climate policies in the US (Leiserowitz, 2006). As of now, this type of skepticism may still be more pronounced in the US; Akter et al. (2012) finds little skepticism in Australia about climate change in general, but much skepticism about successful mitigation, which negatively influenced policy support.

Whether individuals hold such beliefs with certainty depends a lot on their knowledge about climate change (Krosnick et al., 2006). It has been pointed out that it is necessary to distinguish between a person's self-reported and objectively assessed knowledge about climate change (Stoutenborough and Vedlitz, 2013). Many studies (e.g., Bord et al., 2000, Zahran et al. 2006, Park and Vedlitz 2013, Adaman et al., 2011) find higher assessed knowledge to be correlated with greater policy support, while McCright (2008) observes no link between higher self-reported knowledge and policy support. However, when personal knowledge is insufficient, people may rely on heuristics: for instance, perceived scientific disagreement on climate change may weaken various beliefs about climate change and consequently support for climate policy (Ding et al., 2011; McCright et al., 2013).

Going beyond these rather cognitive explanations, some researchers stress the role of experience-based perception. In a US study, Leiserowitz (2006) illustrated that policy preferences are partly explained by negative imagery and affect, that is, “a person's good or bad, positive or negative feelings about specific objects, ideas or images” (p. 48), in this case

⁴ Note that a considerable amount of literature studies environmental concern and risk perception independently of policy attitudes.

about climate change. In a more recent and extended study, Smith and Leiserowitz (2013b) find that discrete emotions explained up to 50% of the variance in their model of policy preferences: worry, which is not to be confused with fear, turned out to be the most significant negative emotion, while interest and hope emerged as the most significant positive emotions. Recent evidence for Sweden underpins the importance of worry in predicting policy support (Sundblad et al., 2014).

Finally, some approaches explain policy support by integrating many of the above mentioned variables. One of these is the risk information seeking and processing (RISP) model. This involves components such as environmental values, knowledge, need for information, negative affect and subjective informational norms. It suggests that systematic and effortful information processing regarding climate change predicts policy support, whereas heuristic and automatic processing do not (Yang et al., 2014). Another line of research from the US and Australia has intended to identify different segments of people based on a set of similar characteristics regarding beliefs, behaviors, preferences, etc.: the “alarmed”, “concerned”, “cautious”, “disengaged”, “doubtful”, and “dismissive” (Maibach et al., 2011; Morrison et al., 2013). Not too surprisingly, policy support is found to be the highest for the “alarmed” and the lowest for the “dismissive”.

2.3 Perception of climate policy and its design

When it comes to public perception, uncertainty about the solutions to climate change might actually be greater and more problematic than uncertainty about the characteristics of climate change itself (Patt and Weber, 2013). There are various policy instruments, such as information provision, economic incentives, and command-and-control, which can evoke specific public responses. We here aim to provide insights into how public attitudes are affected by objective and perceived characteristics of policy instruments.

2.3.1 Pull versus push measures

One way of characterizing various types of policies is in terms of their (perceived) degree of coercion. That is, policies can be differentiated by rather coercive ‘push’ measures (e.g., regulations, taxes), and less or noncoercive ‘pull’ measures (e.g., subsidies, moral suasion), which either aim to discourage or encourage certain behaviors (Steg et al., 2006). Overall, it seems reasonable to suggest that people prefer noncoercive climate policies over more coercive policies. The preference for noncoercive policies may be explained by the lower perceived financial and behavioral costs to the individual. This builds on the so-called ‘low-cost hypothesis’, which predicts that environmental concern translates into low-cost pro-environmental behaviors, but only to a smaller extent into high-cost behaviors (Diekmann and Preisendörfer, 2003). A case in point is a Swiss study which found that people approved climate policies such as various subsidies (for sustainable buildings, electricity generation from renewable energies, technology research, and alternative heating systems) or expansion of public transportation. To a significantly lesser degree they supported two types of CO₂ taxation (Tobler et al., 2012). Moreover, it should be noted that there is an interplay between a policy’s level of coerciveness and its targeted behavior: coercive measures do not appear attractive in general, but acceptance is even lower if the policy targets a high-cost behavior such as driving compared to a low-cost behavior such as recycling (de Groot and Schuitema, 2012).

In a similar vein, a US survey experiment investigated policy preferences with respect to transport and energy (Attari et al., 2009). As for transport behavior, study participants preferred voluntary changes, followed by soft regulations (e.g., economic incentives or changes in default options) and, lastly, hard regulations (e.g., bans). Regarding green energy use, voluntary changes and soft regulations were equally preferred over hard regulations. The majority of people opposed to hard regulations stated the perceived loss of “personal freedom” and the “need for choice” as the main reasons for their preferences (see also Cherry

et al., 2012). Costly policies might be perceived as more acceptable if alternatives to the targeted behaviors are offered. For example, improved public transport can reduce some public opposition to gas taxes (Kallbekken and Aasen, 2010).

The insight that ‘hard’ regulations are always the least favored is not clear-cut. Kotchen et al. (2013), for example, find practically no difference in WTP for emission reduction between the instruments “cap-and-trade” “carbon tax” and (hard) “GHG regulations”. In a qualitative study, Fischer et al. (2011) explore ‘folk psychology’ to further understand how the way laypersons conceptualize human behavior affects their views of different measures of climate and energy policy. By and large, people revealed images of human beings as inherently selfish, ruled by habit and comfort, myopic, and motivated mainly by money. Interviewees then used these mental constructs of other people as arguments working in favor of top-down governmental policies such as regulations, increased prices or educational campaigns to stimulate pro-environmental behavior. Simply relying on voluntary behavioral changes was widely regarded as insufficient.

2.3.2 Perceived benefits and effectiveness of policy

People wonder whether a policy can reach its desired goals. For instance, Kallbekken and Sælen (2011) show that individuals in their Norwegian sample were more likely to support a fuel tax if they believed the tax was going to reduce driving and exert a positive effect on climate change (see also Schuitema et al., 2010). Other studies, from various countries, find a similarly important role of perceived “climate benefits” in explaining support for particular policies (Tobler et al. 2012; Lam, 2014; Brouwer et al., 2008).

A related aspect is that perceived effectiveness can quickly change once people start to experience the effects of a policy. Useful lessons can be drawn from the field of

transportation.⁵ One major reason why past referenda on congestion charges in the UK have failed to win a majority of votes was that people were uncertain about the effectiveness of the proposals (Hensher and Li, 2013). Or take the congestion charge in Stockholm: Eliasson and Jonsson (2011) conclude that, besides environmental concern, the perceived effectiveness of the charge played the most decisive role in its acceptance. Initially, less than 30% of the population supported the charge, whereas the number rose to about 70% after implementation. Thus, it is important to distinguish between pre- and post implementation phase and to acknowledge the role of adaptation to policies. This also suggests that a gradual implementation and policy experimentation may build more public support.

Nevertheless, it is not entirely clear how people arrive at their judgments of policy effectiveness. Bostrom et al. (2012) conduct an international survey of public support for general environmental, carbon and geoengineering policies. Overall, general ‘cheap’ environmental policies were favored over costly carbon policies, while geoengineering proposals received the least support. Perceived effectiveness best predicted people’s policy choices. In other words, someone who had a preference for an environmental policy like reforestation also perceived this policy as more effective to tackle climate change than a carbon tax or a geoengineering measure. Aside from (incorrect) beliefs about the causes of climate change, one of the explanations the authors give is that ‘wishful thinking’ may be at work: when an individual refuses to face the unpleasant reality that some, more effective policies have higher financial or behavioral costs than others, s/he may change beliefs about the policy’s effectiveness (see also Rosentrater et al., 2012). Perceived effectiveness might explain some of the variance in support for push and pull measures, with the former being seen as rather ineffective, and the latter being perceived as rather effective (Eriksson et al., 2008), regardless of whether this is really the case. Finally, it should be noted that perceived

⁵ Note that a number of studies in the field of transportation have dealt with the question of policy acceptability. We do not provide a comprehensive overview of these studies here, mainly because transport constitutes only one out of many areas of climate policy.

environmental effectiveness is not always associated with policy support. People's ethical concerns, here in particular a deontological orientation, can cause public resistance to certain policies such as a cap-and-trade program, despite its perceived benefits (Sacchi et al., 2014).

2.3.3 Perceived costs of policy

As already suggested above, it is evident that the costs of policies influence public preferences. Several aspects matter here: the actual versus perceived costs, the distributive fairness, and the use of revenues in the case of revenue-generating policies. Some studies investigating public opinion on climate policies do not explicitly state the personal costs of a policy, which may result in a bias toward overly favorable responses. Therefore, it makes sense to distinguish between studies that present concrete estimations of personal costs due to policy implementation, and other studies that only communicate possible uncertain, or no cost increases at all. Generally speaking, policies implying more direct monetary costs (e.g., raising electricity prices) tend to be less supported (e.g., Lam, 2014). Not surprisingly, when different levels of monthly financial costs of policy are explicitly described, public support for domestic (Brannlund and Persson, 2012) as well as global climate policy (Bechtel and Scheve, 2013) goes down for higher levels of costs. Note further that in some surveys, people may overestimate the costs of taxes and underestimate the 'hidden' costs of alternative policies, such as subsidies or investments in public transport (Jagers and Hammar, 2009). All this is not to say, however, that people do not want to incur any costs. On the contrary, research using the WTP approach indicates a substantial WTP for climate policies. For example, Krosnick and MacInnis (2013) estimate WTP by the American public for an emission reduction of more than 80% by 2050 that corresponds with actual cost calculations of the US Environmental Protection Agency.

Shwom et al. (2010) explore US public support for national climate policies. After voting for specific policies, people were asked to give reasons for their decisions. The authors

identified four rationales from the statements: economic, political, technological and moral. 58% of respondents mentioned costs in general, to themselves or their family as the reason for their decision, in either direction. Going somewhat beyond personal financial concerns, a common belief and public narrative is that environmental and climate policies will have adverse effects on the economy and employment. Research shows that people use this rationale when considering climate policy (Shwom et al., 2010) and that it predicts lower policy support (O'Connor et al., 2002), although the overall effect on policy support is suggested to be moderate.

Personal costs are surely important, but depending on the (study) context, other considerations matter: Kallbekken and Sælen (2011) demonstrate in a Norwegian study that the consequences of a fuel tax to oneself – in terms of reduced income or less mobility – has little explanatory power relative to other factors like perceived effectiveness and distributional concerns. It is the latter aspect that we turn to now.

2.3.4 Perceived fairness of policy

The distribution of costs from climate policy is a contested issue, regardless of whether it relates to domestic or international climate policy. Concerning domestic climate policy, evidence from different countries suggests that climate policy receives more support if the distribution of costs is progressive, or in other words, if richer members of society pay a larger share and potential revenues are redistributed to poorer or more vulnerable members of society (Carson et al., 2010; Brannlund and Persson, 2012; Dreyer and Walker, 2013).

A Swedish study by Hammar and Jagers (2007) examined how public attitudes towards fuel taxation are related with three fairness principles: 'equity' (who emits most, should reduce most), 'equality' (everyone reduces equally) and 'need' (the more one needs to emit, the less one should reduce). In general, individuals' support for the fairness principles 'equality' and 'need' was found to have a strongly positive impact on tax support. The authors

further distinguished between frequent and non-frequent car users: the ‘equity’ principle predicted support only for non-frequent car users, while the ‘need’ principle predicted support only for car users; the ‘equality’ principle was associated with support in both groups (see also Jagers and Hammar, 2009).

The distribution of costs is a crucial concern in international climate policy. A qualitative study in Canada explored justice perceptions of laypersons in the context of international climate change mitigation and adaptation actions (Klinsky et al., 2012). Participants mentioned a range of justice arguments in assigning a countries’ responsibility for mitigation, with the most frequent ones being: causality of emissions, ability and need, equal burden, and merit/deservingness. Similarly, Gampfer (2014) shows experimentally the relevance of fairness principles such ability-to-pay, vulnerability, and historical responsibility for burden sharing preferences. Furthermore, Bechtel and Scheve (2013) investigate public support for a global climate agreement by conducting a choice experiment with subjects from the US, UK, Germany and France. This demonstrates that a highly skewed distribution of costs, in which only rich countries pay, significantly decreases support compared to other distributive principles. There is further evidence for the US and Canada which indicates that stated WTP values are higher when the costs of mitigation are shared internationally (Lee and Cameron, 2008; Cai et al., 2010).

Policy support also depends on the stakeholder or agent to whom people assign responsibility to act: government, industry, energy producers, consumers, taxpayers, etc. WTP for climate change mitigation can decrease if general taxpayers are assigned great responsibility, while it can increase if industry and energy users are targeted (Cai et al., 2010). The focus here and in the literature is on distributional fairness, but it should be mentioned that other types of fairness (e.g., procedural) can have an effect on policy support (e.g., Kim et al., 2013).

2.3.5 Perceived use of revenues

As for taxation as an instrument of climate policy, it appears to be crucial for policy support how revenues are managed. For example, a choice experiment for the UK finds that acceptability of a carbon tax can vary between 68% and 48% depending on whether revenues are earmarked for specific purposes or go directly to the general tax budget (Bristow et al., 2010).⁶ In a study for Canada, Hsu et al. (2008) explore several factors of policy design that may explain Canadian citizens' resistance to higher gasoline taxation. Revenue recycling, that is, channeling the tax proceeds back to taxpayers, made a marked difference: both suggestions – reducing VAT or income tax – increased policy support, with a stronger effect for the latter option. Additionally, earmarking tax revenues for environmental purposes, such as financing technological research, elicited more favorable attitudes towards gas taxation. In a similar vein, Sælen and Kallbekken (2011) show in a choice experiment that a majority of Norwegians would support a rise in fossil fuel taxes if revenues are earmarked for environmental purposes, whereas without earmarking a majority prefers a decrease of such taxes. Kallbekken and Aasen (2010) use a focus group to study preferences of Norwegian citizens towards environmental taxation. They find rather low opposition to environmental taxes as well as strong preferences to earmark revenues for environmental projects. While the majority of participants generally understood the mechanism of how environmental taxes are supposed to influence behavior, they still asked for more information to further their knowledge. Moreover, people were skeptical towards the idea of shifting taxation from incomes to environmental externalities, which is known as the ecological tax reform.

In 2006, the journal *Energy Policy* published a special issue on social and political responses to the ecological tax reform (Dresner et al., 2006). In short, people demonstrated relatively low awareness of this policy in general, modest understanding of revenue recycling,

⁶ Note that the welfare theory of optimal externality policy in environmental economics shows that environmental tax revenues should not be earmarked or serve to raise additional tax revenues but be recycled neutrally to tax payers (Baumol, 1988).

the incentive mechanism of the tax, and the double-dividend argument. Other issues arose, such as a lack of trust in government, the low visibility of benefits, the need for better communication of the policy, and concerns about the level and regressivity of taxation. The green tax reform also constituted one of the proposals in the aforementioned Swiss referendum, but it was criticized for being unfair as it would have only rewarded people active in the labor market (Thalmann, 2004). Recent US opinion polls show that a (non-negligible) minority of 43-45% of citizens supports a revenue-neutral carbon tax (Leiserowitz et al., 2013). Given that one third of respondents chose “don’t know” as their answer, we can safely surmise that opinions on this issue may easily change. A different, comparative public opinion study from the US and Canada shows that most people would like the revenues of carbon pricing policies to be spent on R&D for renewable energy (43% of Americans and 51% of Canadians), followed by a smaller share of people preferring tax rebates, deficit reductions or payroll tax cuts (Lachapelle et al., 2012).

2.4 Contextual factors

This section highlights a host of social, economic, institutional and communicative factors, which go beyond the individual level and the question of policy design, and shape public attitudes and policy preferences.

2.4.1 Social trust, norms and participation

Several studies have looked at the role of trust, which is often seen as a key element of social capital, in explaining policy support. Trust may be further distinguished into trust in government and politicians, science, industry, non-governmental groups, and generally other people. There is considerable evidence to suggest that policy support requires trust in government and politicians, as exemplified by the case of carbon taxation in Sweden and Norway (Hammar and Jagers, 2006; Kallbekken and Sælen, 2011; Harring and Jagers, 2013).

Trust in government also matters for public approval of various other climate policies in the US (Zahran et al., 2006; O'Connor et al., 1999). In a US study by Dietz et al. (2007), trust in environmental scientists and environmental organizations are positively and trust in industry is negatively associated with greater policy support. A lack of trust in the institutional body – whether a national or international one – that is supposed to implement climate policy has been reported to be negatively related to WTP values for emission reduction in Turkey (Adaman et al., 2011). In addition, some researchers have examined the influence of social norms on public support (de Groot and Schuitema, 2012; Adaman et al., 2011). For example, an experiment by Bolsen et al. (2013) shows how support for a carbon tax falls when people receive information that only a minority of other citizens support the proposed tax. However, social norms might play a more important role in engagement in environmental activism or other pro-environmental behaviors than in policy support (Lubell et al., 2007).

Creating more participatory policy processes and civic-mindedness might build public support (Stoll-Kleemann et al., 2001). For example, Bernauer and Gampfer (2013) explore how public support is affected by civil society involvement in the making of global climate policy. Conducting three survey experiments, they note that people favor the presence of civil society actors in international climate negotiations, and that including or excluding these actors from national delegations may increase or decrease public support, respectively. A study by Lo et al. (2013) investigates the effect of public deliberation on preferences regarding national climate policy in Australia. Besides generally promoting a consensus, a majority of participants favored a carbon tax after deliberation. Deliberation provides insights into public preferences by allowing people to consider a greater number of motives for their stated policy preferences (Dietz et al., 2009).

2.4.2 Economic and political aspects

It is obvious that economic and political aspects can affect public attitudes towards climate policy. The evidence, however, is scarce if we look at policy support in the narrower sense as defined in this paper. A recent US study finds that public support for climate policy has decreased considerably between 2007 and 2013 which indicates the impact of the economic downturn on public opinion starting in 2008 (Stoutenborough et al., 2014). On the other hand, poll data from the midst of the economic recession in 2010 demonstrates that only 20% of Americans thought that taking action on climate change would “hurt the economy” (Krosnick and MacInnis, 2013). Given the importance of these questions, one can consider the evidence for concern about environmental problems and policy in general. Broadly speaking, this research shows for various countries that current economic conditions associated with higher economic growth and employment tend to be linked with higher environmental concern and support for environmental protection (Halbheer et al., 2006; Scruggs and Benegal, 2012), whereas the effect of national GDP per capita remains unclear (Gelissen, 2007; Franzen and Vogl, 2013). Since 2009, high-ranking Republican politicians have increasingly communicated messages advocating climate change denial, and US survey data suggests a marked decline of policy support among self-identified Republicans in the following years (McCright et al., 2013b). Related to this, the success of past environmental ballots in Switzerland depended significantly on whether political parties and associations expressed support for the respective policy proposal (Stadelmann-Steffen, 2011).

2.4.3 Geography and weather

The experience of recent extreme weather events such as droughts and heat waves – likely mediated via media exposure and increased issue importance – has been shown to immediately affect attitudes by increasing stated support for environmental legislation (Owen

et al. 2012).⁷ The role of geography and the experience with climate change-related weather events may be important for two reasons. First, they represent a window of opportunity for public debate. Second, an increasing number of experienced events is likely to translate into more policy support. One may also speculate that those who are geographically more exposed to climate hazards are more likely to support policies. Park and Vedlitz (2013) find no evidence for this hypothesis in a US study among people living near the coast and in other areas prone to floods, storms and droughts compared with those living in less exposed areas. Other lines of research explore the influence of emphasizing the geographical patterns of climate change impacts. Results from these studies are anything but conclusive. Some scholars suggest that a local/regional and hence more personal framing of climate change impacts tends to yield higher WTP values (Longo et al., 2012), others find slightly stronger effects for national climate impacts (Yarnal et al., 2003), while again others find no differences in policy preferences between paying attention to either local or national impacts (Shwom et al. 2008).

2.4.4 Media coverage and framing

Many of the previous remarks hint at the idea that the media coverage at least indirectly affect policy preferences. For instance, research from Sweden found that public attitudes towards CO₂ taxation became more favorable after the release of Al Gore's documentary "An Inconvenient Truth" and the publication of the "Stern Review" (Löfgren and Nordblom, 2010). A study from Australia finds media exposure to be a significant factor in explaining policy support (Akter and Bennett, 2011), while a different Australian study indicates that for a subgroup of less climate-engaged people, policy support might have decreased after intensive exposure to media coverage (Morrison and Hatfield-Dodds, 2011). In the US, there

⁷ A recent review of climate change perceptions over time (not specifically on policy attitudes) identifies a significant role of temperature anomalies and discrete weather events, though it remains unclear how long-lasting such changes in perception are (Capstick et al., 2015).

was seemingly little change in policy preferences after early public debates in 1997 surrounding the Kyoto treaty (Krosnick et al., 2000). More recent controversies such as the so-called “Climategate” might have increased public opposition to some climate policies (Stoutenborough et al., 2014). Another US study finds that citizens who pay a lot of attention to political news express less policy support, while those who rather tend to follow scientific and environmental news are more in favor of climate policies (Zhao et al., 2011).

One might conclude from the above that perhaps even more important than mere media exposure is the content of communications and campaigns, that is, its messages and framings (Lakoff, 2010). While framing research on climate change abounds, only a few studies have used policy preferences or attitudes as the dependent variable or tried to frame climate policies differently. One example of the latter is a study for the UK by Lockwood (2011). He found that expansion of renewable energy – framed as a strategy for reducing energy independence – garnered significantly more support from study participants than when it was framed as an economic opportunity or a way to tackle climate change. An Australian study indicates that framing action on climate change in terms of creating societal well-being and progress may elicit more support – particularly from climate change skeptics – compared to highlighting the risks of climate change (Bain et al., 2012).

Sometimes only a single word suffices to activate frames. An experimental study by Hardisty et al. (2009) shows that self-identified Republicans preferred to pay more for an identical environmental charge when it was labeled as a ‘carbon offset’ than when it was labeled as a ‘carbon tax’. No such differences were found for self-identified Democrats. This finding is not only related to the above mentioned importance of trust in governments, but also to the well-established idea of ‘tax aversion’. Other studies suggest a similar negative effect of the tax label on policy support and WTP (Kallbekken et al., 2011; Brannlund and Persson, 2012). However, a similar US experiment shows no differences in public support for gas taxation when climate change mitigation was either framed as leading to “higher prices”

or to “higher taxes” (Villar and Krosnick, 2011), while a UK experiment finds somewhat more support for “carbon” rather than “energy” taxation (Parag et al., 2011). Other research suggests that framing climate change as a public health issue may lead to more favorable policy attitudes (Petrovic et al., 2014), although this effect may be moderated by political orientation according to Hart and Nisbet (2012). Results of a study by Hart (2011) suggest to frame climate change impacts in thematic instead of episodic terms.

2.5 Synthesis and conclusions

2.5.1 Factors affecting policy support

Table 2.1 provides a summary of the major factors influencing policy support that we have identified in our review of the literature. In view of the scope of our review and the wide variety of factors, it is useful to qualify the findings and put them into perspective. Comparing results across different fields of research is difficult and one must be careful about drawing overly general conclusions. We also want to highlight opportunities for synthesizing the findings, and mention some caveats of this study. After this we will be able to offer suggestions for policy and future research.

Drawing on different literatures brings along the obvious advantage of obtaining a broad understanding of the research topic. But it is also true that different disciplines use distinct concepts, terminology and levels of analysis. While some research areas primarily focus on personal characteristics, others stress the importance of wider social, economic, institutional or contextual forces. This offers partly contrasting and partly complementary insights.

Table 2.1. A summary of the main factors identified in past research as influencing public support for climate policies

<i>General categories</i>	<i>Factors</i>	<i>Main findings and effects on policy support</i>
<i>Social-Psychological factors and climate change perception</i>	Political orientation	Left-wing orientation (+), right-wing orientation (-)
	Worldviews	Egalitarianism (+), Individualism (-), hierarchism (-)
	Religiosity	Beliefs in “Christian end-times theology” (-), evangelical beliefs (-),
	Personal values	Self-enhancement (-), self-transcendence (+), environmental values (+)
	General environmental beliefs	Endorsement of the New Environmental Paradigm (+)
	Beliefs about climate change	Existence (+), human causation (+)
	Risk perception	Beliefs in present/soon and severe impacts, at personal and societal level (+)
	Knowledge	Assessed climate change knowledge (+), self-rated knowledge (0)
	Information seeking and processing	Effortful and systematic (+)
	Affect and emotions	Negative affect and imagery (+); emotions such as worry (+), interest (+), hope (+), fear (-)
<i>Perception of climate policy and its design</i>	Pull versus push measures	Pull measures (e.g., subsidies) tend to be favored over push measures (e.g., restrictions, taxes)
	Perceived policy effectiveness and benefits	Policy is perceived as effective and beneficial in addressing climate change (+)
	Policy costs	Higher personal economic costs (-)
	Perceived fairness of policy	Progressive distribution of policy costs (+)
	Use of revenues	Recycling and earmarking of policy revenues (+)
<i>Contextual factors</i>	Trust	Trust in key actors (e.g., government/politicians, scientists) (+)
	Social norms	Perceived policy support by others (+)
	Participation/de liberation	Civil society involvement and public deliberation (+)
	Economic and political aspects	Economic downturn (-), contrary discourses on climate change by political elites (-)
	Geography and weather	Experience of extreme weather (+), geographical exposure (0)
	Media coverage and framing	Media matters, though a direction of influence depends much on content and frequency; Diverse set of framings are proposed, e.g., framing of climate change as a public health issue (+)

Note: (+) indicates a positive effect on policy support, (-) indicates a negative effect, (0) indicates no effect.

The reviewed studies use a variety of measures of policy attitudes. Some studies use indexes of ‘policy support’ consisting of up to ten or more policies, whereas others use single-item measures (e.g., a gasoline tax). Some focus on national policy measures, while others study international agreements. As a result, a direct comparison of findings is often complicated so that conclusions regarding ‘policy support’ or attitudes towards climate policy are to be treated with caution.

The previously described factors obviously cannot be considered in total isolation as factors are connected and may interact in various ways. For example, some social-psychological factors (e.g., worldviews and values) may underlie others (like political orientation). Perceived policy effectiveness may be moderated by levels of education and knowledge. Another type of interaction is between individual-level and contextual factors. For instance, media coverage of climate change influences policy support, but it probably does so indirectly by shaping individual beliefs and knowledge about climate change itself. Such effects should be taken into account, but disentangling all of them is beyond the scope of this review.

With this caution in place, we feel confident to offer some lessons learned. First, among the explanatory factors related to social psychology and climate change perception, left-wing and green political orientation can be considered as a strong positive influence on policy support. Self-transcending and environmental values tend to be associated with stronger policy support, as do egalitarian worldviews. The reverse is observed for self-enhancing values as well as hierarchical and individualistic worldviews. Policy support is stronger when people hold certain key beliefs about climate change (e.g., that it is real, human caused, and harmful). Objectively assessed knowledge about climate change that people possess may be one of the most robust predictors of favorable attitudes. Emotions, such as worry, interest and hope may further strengthen policy support. Second, with regard to policy characteristics and associated beliefs, pull measures tend to garner more support than (more coercive) push

measures. The more individuals perceive policies as effective, the more they support them, whether or not these perceptions are ‘objectively’ true. Higher financial costs and behavioral efforts associated with policy result in lower public support. Fairness principles in the distribution of the policy burden are clearly relevant, and redistribution of policy-generated revenues (e.g., from carbon taxation) can substantially increase support. Third, we examined several contextual factors. Trust in societal actors, like politicians and scientists, has a positive effect on policy support. Certain social norms as well as forms of public participation and deliberation may strengthen policy support. Policy preferences are further affected by the economic situation of a country. Geography in terms of vulnerability and exposure to climate change impacts and the experience of extreme weather events may influence public attitude, though the evidence covered here is mixed. Finally, the media can shape public attitudes, notably through the framing of messages.

2.5.2 Implications for policy and practice

We briefly discuss a number of policy implications. To start with, it is important to acknowledge the role of different ideologies, values and worldviews in determining policy attitudes. However, these factors are generally hard to change, and communication efforts to bridge such differences are challenging (e.g., Corner et al., 2014). It might be easier to increase concrete knowledge about climate change or to alter related beliefs. To achieve this, tailoring messages, targeting specific population segments, and using trusted information sources and channels can be useful. Nevertheless, while much attention has been given to skepticism about (or denial of) of climate change, a majority of people in most countries actually tends to believe in its existence as well as human causation of it. Further communication of climate change is certainly needed, but it may be worthwhile to focus more on strategies and solutions for the problem. This can foster public beliefs that climate change

can be solved, which in turn would increase perceived importance of the problem (Patt and Weber, 2013). A general suggestion for policy-makers is then to study how policy characteristics are perceived by the general public (similarly as done in Section 2.3). For example, a relatively clear message emerging from the results is the need to correct misperceptions regarding the effectiveness of policies, especially those with high (perceived) financial and behavioral costs. Moreover, information provision could improve public understanding of the main purpose of environmental taxes, which is to influence behavior and not to raise revenues. Beyond mere communication about policies and strategies, governments might perform policy experiments through trial runs in order to change individuals' beliefs about a policy's effectiveness, benefits and costs through lived experience.

Policies are implemented by governments, who need the trust of their citizens. Two possible ways to increase trust might be promoting transparency of the policy process and encouraging greater involvement of civil society. An implication of the research on framing effects is that it may be worthwhile to reframe certain policies like a carbon tax, for example as an offset or a charge, since the 'tax' label evokes negative affective reactions which cause unfavorable attitudes. Given the importance of social norms, it may further help to raise awareness that, according to recent poll data (Amdur et al. 2014), a significant number of people already are in favor of stringent climate policies. Finally, timing matters as well for communication and policy. Governments and practitioners could take advantage of so-called 'teachable moments' or 'policy windows of opportunity' when issue salience is high due to weather events or media coverage (Hart and Leiserowitz, 2009).

2.5.3 Future research

We end with a few suggestions for future research. A key question left unanswered in this paper concerns the relative importance of each of the factors. Future work could try to disentangle effects and measure their relative strength by use of quantitative meta-analysis.

This might include socio-economic factors which were omitted here for reasons of space. Next, there seems to be broad skepticism about whether and how climate change can be mitigated (see also Capstick and Pidgeon, 2013, on "response skepticism"). To this end, research might dive deeper into explaining how people make sense of different policies, its effectiveness as well as other attributes. For example, there is little understanding of how people see the effectiveness of policies related to the international dimension of climate change, collective efforts, and indirect system-wide effects, such as carbon leakage, energy/carbon rebound, and oil market responses (green paradox). Furthermore, instead of soliciting opinions on single policies, research may benefit from examining public support for more complex policy packages like combinations of carbon taxation and renewable R&D subsidies, or shifting taxes from labor to environment, as these are stressed by many policy experts as necessary to make a transition to a low-carbon economy. A particularly puzzling question may receive attention in this context, namely why a revenue-neutral environmental/carbon tax reform receives relatively little support in politics and society thus far. Research could also study a wider array of policies that can address climate change, such as the introduction of alternative well-being indicators, working time reduction, restrictions on certain types of advertising, and measures to discourage conspicuous consumption. Given that the majority of studies covered here are empirical, future research may use more experiments to better identify the causal relation between factors and policy support. A final remark concerns the geographical scope, namely that the bulk of the reviewed research focuses on public opinion in North America, Australia and Europe. Little is known about countries in other geographical areas and hence cultural contexts.

Chapter 3

Public views on economic growth, the environment and prosperity:

Results of a questionnaire survey⁸

3.1 Introduction

There is a long-standing and recently revived academic and public debate about economic growth and its relationship to environmental quality and prosperity. It gained momentum during the 1960s and 1970s (Mishan, 1967; Nordhaus and Tobin 1972; Daly, 1973; Easterlin 1974; Hirsch, 1976; Scitovsky, 1976; Sen, 1976 and Huetting, 1980), reaching a wide audience through the publication of the “The Limits to Growth” report by Meadows et al. (1972). For various reasons, this debate waned somewhat after a while (Buttel et al., 1990). Following the recent global economic crisis and the challenges posed by climate change, biodiversity loss and other global environmental changes, economic growth has become again a contested issue (e.g., Turner, 2008; Victor, 2010a; Schneider et al., 2010; Jackson, 2011; Antal and van den Bergh, 2014; Costanza et al., 2014; Anderson, 2015). Even certain influential mainstream economists express skepticism about continued growth: some argue that the times of high economic growth in rich countries like the US are over (Gordon, 2012; 2014), others lament the “GDP fetishism” (Stiglitz 2009), while again others ask whether it is time to reconsider the “growth imperative” (Rogoff, 2012).

These questions also attract considerable public attention. For example, the book “Prosperity Without Growth” by Tim Jackson (2011) was featured in various media around the world. A BBC article (2014) recently opened with: “Poor GDP. Everyone seems to be rounding on the once highly regarded measure.” Paul Krugman, public intellectual and Nobel prize winner in Economics, has twice already devoted attention to questions of growth and the environment in his NYT column (New York Times, 2014a/b). Of course, the general narrative

⁸ This chapter has already been published in *Global Environmental Change* (Drews and van den Bergh, 2016).

about growth remains positive and optimistic. Witness the recent report “Better Growth – Better Climate” (New Climate Economy, 2014) and the push for “green growth” by the World Bank (2012) and the OECD (2015a).

These examples indicate that economic growth and its relationship to environmental sustainability is an increasingly important public issue. If perpetual economic growth is indeed environmentally unsustainable, then it seems reasonable to study public attitudes towards the dominant paradigm, and seek public support for strategies that go beyond it. However, public opinion is an element that is surprisingly missing in the newly emerging research on these topics. Although one can find a few survey questions on this issue scattered in the literature, these are rather ambiguous, and do not represent the relevant debate very well, as will be shown in a brief review below. In addition, there is a great deal of empirical research on environmental attitudes, but these studies are mostly carried out without considering the wider socioeconomic context (Uzzell and Rätzzel, 2009; Gifford, 2014; Capstick et al., 2015), let alone specific questions relating to economic growth.

This paper offers a more complete study of public views on the debate about economic growth and the environment. It reports the results of a representative survey from Spain specifically designed for this purpose. In the past, Spain has experienced high economic growth rates, followed by a deep economic crisis, and more recently a mild economic improvement. The four main aims of this study are as follows. First, we examine an array of attitudes towards economic growth and its underlying structure using statistical factor analysis. A second aim is to examine public preferences regarding economic growth and the environment by using a novel measure that captures four different positions. These preferences are then compared with the previously identified attitudes, and with an arguably related measure: namely, what people view as a desirable rate of GDP growth in rich industrialized countries. Third, we investigate public beliefs about a core element of the growth debate: namely, whether it is possible to grow indefinitely in rich countries. We also

assess the reasons that individuals indicate for economic growth to end or not. Fourth, we study how beliefs and attitudes are related to each other, and how they vary across individual characteristics, such as sociodemographic, social-psychological and other factors.

3.2 A brief review of past studies

Past empirical research has examined what and how the general public thinks about economic issues (e.g., Walstad, 1997; Caplan, 2002; Blinder and Krueger, 2004). However, little is known about people's views on economic growth specifically. The few available studies, such as Christandl and Fetchenhauer's (2009) work on public understanding of GDP growth, neglect questions associated with environmental sustainability and prosperity.

We are aware of only two older studies for the USA that examined public views in a broader and more critical way (Buttel and Flinn, 1976; Czarnecki et al., 1980). However, not only was this research undertaken more than three decades ago, but also it does not cover many issues that are being discussed in the current debate. Nevertheless, since then, these studies and the general limits-to-growth debate have probably helped questions on the relationship between economic growth and the environment to be included in several longitudinal opinion polls. For instance, a Gallup poll conducted in the US since 1984 includes one question that asks people whether their opinion is closer to one of the following two statements: "Protection of the environment should be given priority, even at the risk of curbing economic growth *or* economic growth should be given priority, even if the environment suffers to some extent?" (Gallup, 2014). In addition, a large-scale international project like the European and World Values Survey (World Values Survey, 2015), which is conducted in more than 80 countries, contains a similar question, which asks respondents to choose between the statements: (a) "Protecting the environment should be given priority, even

if it causes slower economic growth and some loss of jobs.”, or (b) “Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent.”

There are several problems, however, with the format and wording of both survey questions cited above. First of all, the adopted dichotomous choice is misleading, because as we will see later, one can think of more than just two positions in the growth-environment debate (Mooij and Bergh, 2002). It is also unclear what is meant, or what people understand, by “curbing” or “slower” economic growth. Both terms suggest that growth, even though (s)lower, can continue and go together with environmental protection. Finally, the question from the World Values survey includes the phrases “creating jobs” and “some loss of jobs”. Since (un)employment is a very salient public issue, this wording may further obscure the responses to this question, as one cannot distinguish between people cognitively focusing more on “jobs” or on “economic growth” in arriving at their answers. Dunlap and York (2008) have also noted the ambiguity of this survey question.

To our knowledge, only Kaplowitz et al. (2013) go beyond the typical question format and offered a third option: namely, an equal prioritization of economic growth and environmental sustainability. They found that the majority of respondents opted for this middle option. But also this study remains somewhat limited, as it otherwise adopts the same response options and wording as in the WVS. More generally, Leiserowitz et al. (2005) note the lack of research trying to “identify public attitudes or preferences for particular levels or end-states of economic development (for example, infinite growth versus steady-state economies).” We can conclude that past research has not offered a very complete and balanced study of public views about economic growth and the environment. It is, therefore, useful and timely to study public attitudes and beliefs in a more comprehensive way, which is what we set out to do in the remainder of the paper.

3.3 Method

3.3.1 Survey sample and procedure

The questionnaire was developed early in 2014 over a period of half a year and refined iteratively after various researchers and laypeople provided feedback on subsequent versions. The data was collected in July 2014 through a web-based questionnaire by the professional survey company “Netquest” (for additional information on the panel, see: <http://www.netquest.com/en/panel/sample-calculator/statistical-calculators.html>). The survey had 1,008 respondents which were obtained using a stratified random sampling technique. The average survey completion time was 19 minutes. Respondents were encouraged to participate in the survey by giving them a gift voucher. Comparison of the survey data with census data from the Spanish National Institute of Statistics (www.ine.es), as well as with data on household income for Spain from the OECD (www.oecd.org) shows that the survey is representative of the Spanish population in terms of age, geographical regions, gender, educational attainment, and median household income. Descriptive statistics are presented in the block of sociodemographic variables of Table 3.1.

3.3.2 Dependent variables

We formulated 22 items aimed at covering the main aspects of the economic growth debate. They are largely derived from the literature on economic growth as referred to earlier in Sections 3.1 and 3.2. An introductory sentence in the questionnaire emphasized that all statements applied generally to rich industrialized countries. Participants could respond on 7-point Likert scales, ranging from strongly disagree to strongly agree. The set of questions included both positive and negative formulations associated with economic growth.

Next, we elicited the respondents’ beliefs about when they think economic growth in rich industrialized countries may come to an end. The six available answer categories ranged from

“in less than 10 years” to “never”. As a follow-up question, those respondents who believed that the economy may stop growing at some point were asked to give one main and several additional reasons for why growth may end. A list of reasons was provided, accompanied by an open-response field to enter further reasons. Aside from standard reasons as featured in the classic limits to growth debate (e.g., the scarcity of material and energy resources, environmental problems), the list was supplemented by reasons of a social and economic nature. These are loosely based on Gordon’s (2012) set of “headwinds” for US economic growth (e.g., slowdown of technological advances). In the same way, those respondents who answered that growth may “never” end were directed to a different set of reasons to justify their beliefs.

We further asked participants which position concerning the relationship between economic growth and the environment they favor. To go beyond the typical dichotomous choice format of growth-versus-environment as discussed in Section 3.2 (e.g., the World Values Survey), we offered four positions motivated by the following considerations. The first position clearly prioritizes economic growth, as it has been shown that some people express climate change skepticism (e.g., Whitmarsh, 2011; McCright and Dunlap, 2011), or even a general environmental skepticism (Zhou, 2015). The second position relates to the narrative of “sustainable” or “green growth”, representing the belief that economic growth and environmental sustainability are compatible. This has been advocated in academic and policy circles (e.g., Bowen and Fankhauser, 2011; OECD 2015a). The third position is based on the argument that economic growth should be ignored and not serve as an aim in public policy, hence making it easier to combine environmental and welfare goals (van den Bergh, 2011; and see also Jakob and Edenhofer, 2014). The fourth position reflects the assertion that economic growth should be stopped and even reversed to achieve environmental sustainability (Schneider et al., 2010; Kallis, 2011). It should be noted that there are various interpretations of “degrowth” (van den Bergh, 2011). The wording used in our questionnaire

closely follows Schneider et al. (2010). Hereafter we use the following labels to refer to the four positions: *growth-at-all-costs*; *green growth*; *agrowth*; and *degrowth*. Note that in the questionnaire itself no such labels were used to describe the four positions. The exact wording of each position is presented in Appendix A3.1.

Related to the previous item, we additionally measured public attitudes toward economic growth by asking respondents “What rate of economic growth should the government of a rich industrialized country aim for?”. Here they could enter a round number between -7% and 7%.

3.3.2 Independent variables

To examine individual-level variation in public views concerning economic growth and the environment, we focus on three sets of explanatory variables: (i) knowledge about the economy and the environment; (ii) ideology and personal values; and (iii) socio-demographic variables. In addition, two variables are used to control for possible influences of the economic crisis. Table 3.1 provides the descriptive statistics and the coding for each of the variables we employ in the analyses.

Six questions were designed to obtain a picture of people’s knowledge about the GDP. Most of these questions were based on often-voiced criticisms regarding the estimation of the GDP metric. Examples of these criticisms are the lack of accounting for environmental damages and the depletion of natural resources, or social (e.g., income inequality) costs (e.g., van den Bergh, 2009; Kubiszewski et al., 2013). Response options ranged from “definitely false”, “probably false”, “probably true” to “definitely true”, and included a “don’t know” option. All questions and the descriptive statistics are displayed in Appendix A3.1. On the basis of the responses, we constructed a GDP knowledge index for each respondent: namely, by counting the number of correct (“definitely” false/true) answers to the six questions. This results in a mean score of 1.32 (SD = 1.33) on scale from 0 to 6 correct answers. Cronbach’s

alpha test of internal consistency is 0.56, a value that has been regarded as acceptable in past research for tests of economic knowledge with similar numbers of items (e.g., Walstad and Rebeck, 2002; Walstad et al., 2010). The resulting GDP knowledge scale is used in subsequent analyses reported below. It should be noted that we do not use both “definitely” and “probably” false/true responses to count correct answers, because it results in a significantly lower Cronbach’s alpha (0.43).

Table 3.1. Overview and descriptive statistics of the independent variables

Variables	Description	Mean (SD) or %
<i>Socio-demographic</i>		
Gender	Dummy: 1 (female)	50.7%
Age	18 to 64 years	40.14 (12.57)
Household income	1 (≤ 1000 €) to 5 (≥ 3000 €)	2.88 (1.34)
Educational attainment	1 (primary education) to 4 (postgraduate degree)	2.60 (0.76)
Employed	Dummy: 1 (yes)	62.1%
<i>Knowledge</i>		
GDP knowledge	Index of six questions (see Table A1 in Appendix A3.1), 0 (0 correct answers) to 6 (6 correct answers)	1.32 (1.33)
Self-rated knowledge about the economy	1 (not at all informed) to 7 (very well informed)	4.52 (1.29)
Self-rated knowledge about the environment	1 (not at all informed) to 7 (very well informed)	4.35 (1.29)
<i>Personal values, and political and religious ideology</i>		
Religiosity	1 (not religious) to 5 (very religious)	2.09 (1.16)
Political orientation	1 (left-wing) to 9 (right-wing)	3.98 (1.99)
Self-enhancement values (power, achievement, hedonism)	0 (the value is opposed to my principles) to 8 (the value is of supreme importance as a guiding principle in my life)	3.42 (1.73)
Self-transcendence values (universalism, benevolence)	0 (opposed to my principles) to 8 (supreme importance as a guiding principle in my life)	5.98 (1.61)
Conservation values (tradition, conformity, security)	0 (opposed to my principles) to 8 (supreme importance as a guiding principle in my life)	5.19 (1.67)
Environmental values (respect for the Earth, environmental protection)	0 (opposed to my principles) to 8 (supreme importance as a guiding principle in my life)	6.03 (1.67)
<i>Economic crisis in Spain</i>		
Personal impact crisis	1 (strongly disagree) to 7 (strongly agree)	5.70 (1.42)
Crisis influenced response	1 (strongly disagree) to 7 (strongly agree)	5.37 (1.39)

In addition to the index of assessed GDP knowledge, two further single items measured self-reported knowledge about the environment (e.g., McCright and Dunlap, 2011; Whitmarsh, 2011) and the economy (e.g., Blinder and Krueger, 2004; Wobker et al., 2014).

Having measures of both assessed and self-reported knowledge is useful, since prior research has sometimes found weak relationships between the two concepts (Stoutenborough and Vedlitz, 2013; Wobker et al., 2014).

Two single items are used to measure the effects of political orientation and religiosity, respectively. Note that we did not ask for a specific religious affiliation, given that Roman Catholicism is by far the largest religious community in Spain (CIS, 2014). Having religious faith has been shown to be related to both economic and environmental attitudes. For example, Guiso et al. (2003) find that religious beliefs are associated with economic attitudes which are “conducive to higher per capita income and growth”. As regards the environment, empirical research remains inconclusive about the direction of the relationship between (Christian) religiosity and environmental concern and behavior (Gifford and Nilsson, 2014). Political orientation has been shown to influence both economic opinions (e.g., Blinder and Krueger, 2004) and environmental opinions (e.g., McCright and Dunlap, 2011).

Next, we measured respondents’ personal values. Schwartz (1992) developed a theory of basic human values which include Power, Achievement, Hedonism, Stimulation, Self-direction, Universalism, Benevolence, Tradition, Conformity and Security (see also, Schwartz 2012). We used a short version of the Schwartz value survey comprising 10 items. The reliability and validity of this version has been generally demonstrated by Lindeman and Verkasalo (2005), and it has been used in other research on environmental issues (e.g., Poortinga et al., 2011). The 9-point response scale for each single item ranged from 0 (“the value is opposed to my principles”) to 8 (“the value is of supreme importance as a guiding principle in my life”). In addition, we used two items measuring environmental values adapted from past research (Groot and Steg, 2008). Five higher-order value types were constructed by averaging the associated single items. Four of the constructed scales had a good reliability (according to Cronbach’s alpha): self-enhancement (power, achievement, hedonism; 0.75); self-transcendence (universalism, benevolence; 0.82); conservation values

(tradition, conformity, security; 0.80); and environmental values (respect for the Earth, environmental protection; 0.92). The fifth value scale, openness to change (stimulation, self-direction; 0.58), had a comparatively lower reliability. Because of this, and to circumvent problems of multicollinearity that we encountered, we excluded this variable in subsequent regression analyses.

Finally, two variables are used to control for a possible influence of the Spanish economic crisis on the survey results. The first question asked respondents to indicate if the recent economic crisis has affected them personally. The second question asked respondents at the end of the questionnaire to consider whether the economic situation in Spain influenced their responses. The motivation for including both questions is that all survey questions related to growth referred to “rich and industrialized countries” in general and therefore not explicitly to Spain.

3.4 Results and discussion

3.4.1 Structure of attitudes towards economic growth

We begin by analyzing an array of 22 attitude statements regarding economic growth. A factor analysis with principal component extraction was conducted to identify interpretable clusters of variables. This aims to explore an underlying structure of attitudes. Table 3.2 reports the item wordings and the item loadings within the pattern matrix resulting from the factor analysis (see further descriptions in the note at the bottom of the Table). In addition, Table 3.3 shows the associated descriptive statistics of the single items. We chose oblique (direct oblimin) rotation for the principal component extraction, as relationships between factors were assumed. Following this procedure, we obtain six separate factors which together explain 57% of the variance. Bartlett’s test of sphericity is highly significant ($p < 0.001$), while the KMO measure of sampling adequacy is very good (0.836).

Table 3.2. Factor analysis examining the structure of attitudes towards economic growth

Item	Item wording	Factor loadings					
		1	2	3	4	5	6
Job creation	Economic growth is necessary to create jobs.	0.845	0.038	-0.078	0.161	-0.054	0.039
Life satisfaction	Continued economic growth is essential for improving people's life satisfaction.	0.811	0.031	0.006	0.083	-0.029	0.028
Health and pension	Economic growth is necessary to finance public health and pension systems.	0.784	-0.021	0.069	-0.004	0.112	0.078
Stability	Without economic growth the economy will become less stable.	0.745	0.011	0.086	-0.001	0.078	0.021
Environmental protection	Economic growth is necessary to finance environmental protection.	0.638	0.041	0.294	-0.039	0.15	-0.088
Full employment	Full employment can be achieved without economic growth.	-0.626	0.2	0.197	0.076	0.134	0.207
Prosperity	Economic growth is the best indicator of prosperity.	0.499	0.143	0.147	-0.196	-0.275	0.283
Good life	A 'good life' without economic growth is possible.	-0.493	0.169	0.159	0.269	0.179	-0.036
Climate limit	Climate change and other environmental problems will sooner or later result in an end to economic growth.	-0.041	0.777	-0.136	-0.051	0.07	-0.034
Resource limit	Limited availability of natural resources (e.g. oil, gas) will sooner or later result in an end to economic growth.	0.203	0.708	-0.161	0.186	-0.353	-0.166
Energy rebound	Energy savings due to technological advances are partly undone by further economic growth.	-0.059	0.621	0.094	0.03	-0.062	0.155
Environmental damage	Economic growth always harms the environment.	-0.078	0.563	0.083	-0.006	0.195	0.018
Development space	In view of limited natural resources, rich countries may have to give up their economic growth to assure that all poor people in the world can reach a fair standard of living.	-0.016	0.477	0.109	0.075	0.345	-0.132
Techno-fix	Technology can solve all environmental problems associated with economic growth.	0.055	-0.111	0.688	0.125	0.145	-0.176
Recovery	Future economic growth will recover and again be as high as in the past.	-0.002	-0.031	0.647	0.159	-0.375	0.07
Post-materialism	Economic growth raises incomes which in turn make people care more about the environment.	0.158	0.162	0.582	-0.295	0.042	0.133
Excessive news attention	The news media pay too much attention to GDP and its growth.	0.117	0.035	0.107	0.726	-0.07	0.047
Excessive political attention	Politicians are too concerned about economic growth.	-0.254	0.075	0.125	0.654	-0.139	0.074
Income inequality	Making the income distribution more equal should get a higher priority than economic growth.	0.132	0.119	-0.196	0.547	0.258	0.097
GDP skepticism	The GDP measures everything except that which makes life worthwhile.	0.004	0.292	-0.019	-0.008	0.609	0.18
Flawed welfare measure	The GDP is a flawed measure of social welfare.	-0.002	-0.102	-0.051	0.474	0.495	-0.101
Governmental control	Economic growth can be controlled by the government.	0.038	-0.105	-0.095	0.143	0.087	0.89
<i>Cronbach's a</i>		0.849	0.667	0.446	0.531	0.413	-

Notes: Factors within the table correspond to groupings of items that reflect the underlying structure across the whole set of items. Items with a high, absolute value of the loading (above 0.4 shown in bold) are strongly associated with a factor, as opposed to those with lower absolute value loadings. Positive and negative loadings reflect positive and negative associations, respectively. The proposed factor structure is highlighted in grey.

Table 3.3 Descriptive statistics (%) for attitudes towards economic growth

Item	strongly disagree	disagree	somewhat disagree	undecided	somewhat agree	agree	strongly agree
Job creation	1.6	4.1	3.4	11.0	16.0	35.1	28.9
Life satisfaction	2.0	5.6	6.5	14.8	21.2	34.9	15.0
Health and pension	2.2	5.3	6.8	18.2	23.5	27.8	16.3
Stability	2.0	6.3	7.1	22.3	27.9	27.1	7.2
Environmental protection	4.6	11.0	9.5	24.2	25.1	18.3	7.3
Full employment	14.6	26.2	16.5	21.9	11.2	6.4	3.2
Prosperity	7.1	12.3	14.6	25.6	23.1	12.9	4.4
Good life	8.6	17.3	13.8	21.2	19.6	13.7	5.8
Climate limit	2.7	13.0	14.2	30.3	22.5	11.6	5.8
Resource limit	4.9	12.4	9.7	24.4	21.2	19.6	7.7
Energy rebound	2.6	12.1	12.1	41.8	20.1	8.9	2.4
Environmental damage	4.1	16.8	18.3	27.3	20.5	9.2	3.9
Development space	4.6	11.4	9.6	31.3	19.5	14.3	9.3
Techno-fix	6.6	17.3	16.3	27.0	19.0	9.6	4.2
Recovery	9.9	20.0	18.7	25.4	15.7	8.1	2.2
Post-materialism	8.4	20.4	16.1	30.9	15.0	6.6	2.6
Excessive news attention	3.1	6.3	8.3	35.0	20.6	18.8	7.8
Excessive political attention	10.1	11.4	10.2	20.4	16.2	19.9	11.7
Income inequality	1.1	3.6	5.9	13.4	21.1	31.4	23.5
GDP skepticism	4.4	11.7	8.1	30.7	20.0	16.1	9.0
Flawed welfare measure	3.3	6.9	9.4	28.9	20.8	18.6	12.1
Governmental control	4.5	7.1	10.6	24.7	23.2	20.0	9.8

The items contributing to each factor are added together so as to create factor scores for each respondent. We describe, label, and interpret the results of the analysis as follows.

Factor 1: Prosperity with growth. This factor consists of eight items. The four highest-loading items generally convey beliefs that economic growth delivers, or is even a prerequisite for, jobs, happiness, public services, and economic stability. As can be seen in Table 3.3, the most widespread belief (80%) relates to the positive link between growth and employment (see also item 6 “full employment”). This is consistent with prior findings in economic psychology of lay people’s understanding of the economy (Leiser and Aroch, 2009; Dixon et al., 2014). One item captures the belief that growth is necessary for environmental protection, yet only 51% agree with this. The two final items concern the link of growth with prosperity and the “good life”. They are more contested, as is indicated by only 40% agreement. It can be concluded that moving from more to less concrete topics (e.g., from jobs to the ‘good life’) is associated with a lower loading on the factor. The internal consistency of this factor is high (Cronbach’s alpha = 0.85). In sum, people scoring high on this factor believe that growth is important and necessary to assure general prosperity.

Factor 2: Environmental limits to growth. The two highest-loading items both relate to a possible end of economic growth due to climate change or the limited availability of natural resources. Two additional items express the belief in the negative effects of continued economic growth on net energy conservation and the environment in general. The item with the lowest loading captures whether rich countries may have to give up their economic growth so that poorer countries have enough environmental and resource space to develop. The factor has an acceptable internal consistency (Cronbach's alpha = 0.67). Taken together, respondents scoring high on this factor see environmental and resource limits to growth.

Factor 3: General optimism. This factor comprises three rather distinct items which at first sight seem to have little in common. However, each reflects some type of optimism: a techno-fix optimism regarding solutions to the environmental problems associated with growth; optimism that growth will positively affect people's concern and care for the environment; and optimism about growth recovering at previous rates in the future. Overall, this optimism is shared by somewhat less than one-third of the respondents.

Factor 4: Wrong priority. The fourth factor includes three items that primarily reflect a critical stance towards the excessive societal importance placed on economic growth. This is expressed by two statements saying that both media and politicians give too much attention to economic growth. An alternative priority is reducing income inequality, which a large majority (76%) sees as more important than pursuing economic growth (item 3 of this factor).

Factor 5: Overrated GDP. The two items loading on this factor both capture the idea that the measure of economic growth – the GDP – is an inappropriate indicator of social welfare. Note that the second item of this factor also loads fairly high on factor 4, thus representing the only item with a cross-loading above 0.4. Overall, the view that the GDP measure is overrated is shared by approximately half of the respondents.

Factor 6: Governmental control. This is a single item that does not load on any other factor. It relates to the question of whether or not economic growth can be controlled by the

government. More than half of the respondents think that the government can considerably influence economic growth.

In the further analyses, we will only draw on three of the identified factors with multiple items: namely, *prosperity with growth*; *environmental limits to growth*; and *wrong priority*. This is because these three factors have a Cronbach's alpha reliability value above 0.5, which can be considered acceptable in exploratory research (Nunnally, 1978). The remaining single items of the other three factors are partially included in the analysis where it is deemed useful.

As a next step, we conduct a correlation analysis to examine how factors are related to each other. Perhaps the most noteworthy result is that there is essentially no relationship ($r = -0.07$) between the two factors *prosperity with growth* and *environmental limits to growth*. This indicates that attitudes regarding *prosperity with growth* are independent of those attitudes associated with the *environmental limits to growth*, suggesting that respondents in the total sample view the prosperity aspects of growth independently of the environmental aspects of growth. In other words, admitting the environmental limits and problems of growth is not associated with less belief that growth is prosperity. However, it makes sense to study sub-samples in order to understand growth-environment views better, a point to which we return later.

We continue with several linear regression analyses for the three relevant factors in order to understand which individual characteristics may explain attitudes. The results are shown in Table 3.4. The factor *prosperity with growth* is significantly positively associated with conservation values, religiosity, higher self-rated knowledge about the economy, higher household income, and older age. Right-wing political orientation is only a marginally significant predictor. A stronger perception of *environmental limits to growth* is significantly associated with left-of-centre political orientation, higher self-rated knowledge about the environment, and older age. Female gender is marginally significant, while personal values play no significant role. The factor *wrong priority* is significantly negatively associated

with conservation and self-enhancement values. Political left-wing orientation also increases the view that excessive attention is given to economic growth, as do higher educational attainment and male gender. Somewhat to our surprise, the GDP knowledge index does not predict any of the factors.

The effects of gender across the three factors are interesting: women appear to be more pro-growth in general but they are also more concerned about the adverse environmental dimension of growth. On the one hand, this might be explained by women's generally higher environmental concern (e.g., Davidson and Freudenburg, 1996), and, on the other, by a stronger perceived benefit of, and empowerment due to, economic growth (Kabeer and Natali, 2013).

Both control variables related to the economic crisis have no significant associations to the three factors, with one exception: respondents who thought that their responses have been influenced by the economic situation in Spain score significantly higher on the factor *prosperity with growth*. This might suggest that the crisis has slightly increased certain pro-growth attitudes in the sense that growth is seen as more necessary to achieve prosperity. But this effect is fairly small.

Although not the main objective of this study, we examined several possible interaction effects between knowledge/education and ideology/values, as has been done in prior research on environmental attitudes (Hamilton, 2011; McCright, 2011; Zhou, 2015). To this end, we ran the same regressions as before, but introduced a multiplicative interaction term using centered variables (results not shown here). Perhaps most interestingly, for the factor *prosperity with growth* we find that educational attainment interacts with political orientation and religiosity. The interaction term between education and political orientation is positive and significant (Beta = 0.08, $p < 0.05$), suggesting that with higher levels of education the effect of political orientation on *prosperity with growth* becomes stronger. That is, individuals who are both more educated and right-wing oriented believe more strongly in *prosperity with*

growth, while those who are highly educated and left-wing oriented reject more strongly *prosperity with growth*. The coefficients of the interaction terms between political orientation and the other knowledge variables are also positive (though mostly non-significant), thus indicating the same effects. In addition, we similarly observe that religiosity and conservation values interact with education and knowledge. For example, very religious people with high educational attainment most strongly endorse *prosperity with growth*, while highly educated non-religious people most strongly reject this view (Beta = 0.07, p = 0.07).

Table 3.4. OLS regression analyses of three factors of attitudes towards economic growth

	Factor: <i>Prosperity with growth</i>			Factor: <i>Environmental limits to growth</i>			Factor: <i>Wrong priority</i>		
	B	SE	Beta	B	SE	Beta	B	SE	Beta
Female	.117	.072	.058	.134*	.080	.065	-.239***	.076	-.117
Age	.015***	.003	.182	.008**	.004	.102	.005	.003	.058
Income	.067**	.030	.089	-.023	.033	-.030	.002	.031	.002
Education	-.037	.049	-.028	-.045	.055	-.034	.153***	.052	.114
Employed	.023	.076	.011	.107	.084	.050	.034	.080	.016
GDP knowledge	-.006	.029	-.008	-.048	.032	-.060	-.016	.030	-.020
Economic knowledge	.118***	.032	.148	-.053	.036	-.065	.052	.034	.065
Environmental knowledge	-.077**	.033	-.097	.130***	.037	.162	.027	.035	.034
Religiosity	.097***	.034	.111	-.027	.038	-.030	-.062*	.036	-.070
Political orientation	.036*	.020	.071	-.068***	.022	-.134	-.051**	.021	-.101
Self-enhancement values	.080***	.022	.137	.022	.024	.037	-.041*	.023	-.068
Self-transcendence values	-.057*	.031	-.089	.011	.034	.018	.142***	.033	.220
Conservation values	.155***	.028	.250	.011	.031	.017	-.096***	.030	-.153
Environmental values	.005	.033	.009	.053	.036	.083	.041	.035	.065
Personal impact crisis	.043	.026	.061	.004	.029	.005	-.020	.028	-.028
Crisis influenced response	.080***	.026	.109	-.025	.029	-.034	.005	.027	.007
<i>R-square</i>	.211			.07			.141		

Notes: * p < 0.1; ** p < 0.05; *** p < 0.01. B = unstandardized regression coefficient. SE = standard error. Beta = standardized regression coefficient.

On the whole, these findings may be in accordance with the literature on ideologically motivated cognition (e.g., Kahan, 2013), suggesting that high levels of knowledge and education drives information processing in line with one's ideological commitments.

3.4.2 Favored GDP growth rate and growth-environment position

After analyzing the variety of attitude statements, we now investigate two more concrete questions that tap into the desirability of growth. To start with, we asked respondents to

indicate what rate of economic growth the governments of rich industrialized countries should aim for. The median response was 4%. As noted in the method section, it was explicitly stated in the question that positive as well as negative rates could be entered. Taken at face value, this result suggests that economic growth remains strongly desirable. Further breaking down the results shows that: less than 1% of respondents favored a negative growth rate; 4.1% chose a zero growth rate; and 5% opted for a 1% growth rate. The rest of the participants indicated a preferred growth rate of at least 2%, with about half of all people favoring very high growth rates between 4% and 7%. Note that these are relatively far removed from what OECD countries have achieved on average in the past decade (OECD, 2015b).

The second question was to choose one of four different positions regarding economic growth and the environment, as we discussed earlier in the method section. Less than 4% of participants favored the position that we labeled as *growth-at-all-costs*, 59% supported *green growth*, 21% favored *agrowth*, and 15% preferred what we termed *degrowth*.

How do our results compare with those from the standard survey question on economic growth and the environment in the World Values Survey? In the sixth wave conducted in 2011 in Spain (World Values Survey, 2015), 35% of Spaniards preferred that “protecting the environment should be given priority”, and 58% “economic growth and job creation should be given priority”. Only about 1% gave a different answer, while 5% didn’t know. At first glance, one might think that these results are fairly consistent with ours. Then again, 59% of our respondents do not “prioritize” economic growth per se, but instead they favor it because they believe it can be made compatible with environmental sustainability. This is in line with findings of a US study (Kaplowitz et al., 2013), in which a majority prefers a middle option that is added to the dichotomous choice between growth and the environment. It is, of course, possible that picking such a win-win option simply reflects minimizing cognitive dissonance, that is, avoiding a cognitively and emotionally uncomfortable trade-off (Kunda, 1990; Tetlock, 2000). Furthermore, about one-fifth of our respondents think that economic growth

should not be given any attention at all – neither in a positive nor in a negative sense – as they favor “ignoring” it. What is more, 15% of our respondents support “stopping” the pursuit of economic growth, which is a much clearer and stronger statement than “giving priority to the environment”, as the latter may mean “slower” but continued economic growth. It is also noteworthy that very few respondents (4%) favor a position that clearly prioritizes economic growth no matter what.

At this point one might wonder how the responses to the two previous single questions regarding the GDP growth rate and the growth-environment position correspond to each other. To investigate this, we performed a cross-tabulation. That is, we calculated the average preferred GDP growth rate for the people who supported any of the four positions. This is represented in Figure 3.1. People who favored *growth-at-all-costs* had the highest preferred economic growth rate (mean = 4.82), followed by those supporting *green growth* (m = 4.07). These results and the downward trend seem plausible. More surprisingly, the findings further show that the preferred GDP growth rates for both the third (*agrowth*) and the fourth position (*degrowth*) are lower, as expected, but still positive and rather high (m = 3.31 and m = 3.32, respectively).

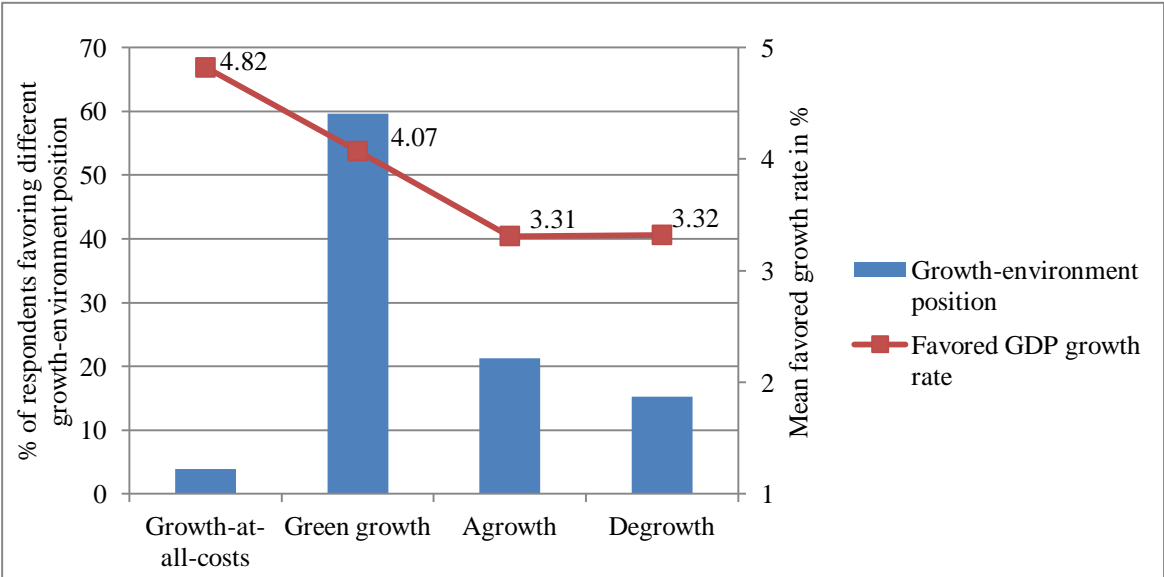


Figure 3.1. Combination of favored growth-environment position with favored GDP growth rate

A one-way ANOVA test ($F = 15.62$; $p < 0.001$) shows that the differences between the preferred GDP growth rates for the subgroups are statistically significant, except between *agrowth* and *degrowth* (according to Bonferroni post hoc tests).

The next aim is to bring together the present results with the factors and single items analyzed in the previous subsection. For the supporters of each growth-environment position, we calculated the means of factor scores for the three reliable factors, as well as for the remaining single items (see Table 3.5). To check statistical differences, we again used one-way Anova and Bonferroni post hoc tests. The results show that both *agrowth* and *degrowth* supporters score significantly lower on the factor *prosperity with growth* compared with *growth-at-all-costs* and *green growth* supporters. As to the factor *environmental limits to growth*, the main insight here is that both *agrowth* and *degrowth* supporters score higher on this factor compared with the other two groups. There are some notable differences for the factor *wrong priority*: *agrowth* has the highest score which is consistent with its underlying idea. The difference is significant with respect to both *growth-at-all-costs* and *green growth*, and comes close ($p = 0.106$) to being significant at the 10 percent level even for *degrowth*. There are no statistically significant differences for two single items: namely, *techno-fix* and *governmental control*. The item *recovery* shows the only significant difference between *green growth* and *degrowth*, with the latter group scoring lower. Although mean scores for the item *postmaterialism* monotonically decrease from *growth-at-all-costs* to *degrowth*, the results are not statistically significant.

Two items related to the GDP remain: both *agrowth* and *degrowth* show significantly more agreement with *GDP skepticism* than *green growth* and *growth-at-all-costs*. *Agrowth*, followed by *degrowth*, is associated with the highest score on the item *flawed welfare measure*, but only *agrowth* is significantly different from both *green growth* and *growth-at-all-costs*.

Table 3.5. Comparison of means of attitude factors and single items, by growth-environment position

	Prosperity with growth	Environmental limits to growth	Wrong priority	Techno-fix	Postmaterialism	Recovery	GDP skepticism	Flawed welfare measure	Governmental control
Growth-at-all-costs	-0.05 (0.97)	0.08 (1.01)	-0.26 (1.06)	3.9 (1.54)	3.92 (1.24)	3.67 (1.28)	3.82 (1.3)	3.64 (1.53)	4.51 (1.34)
Green growth	0.33 (0.8)	-0.14 (0.98)	-0.13 (0.92)	3.81 (1.54)	3.62 (1.44)	3.62 (1.54)	4.12 (1.56)	4.49 (1.44)	4.53 (1.56)
Agrowth	-0.5 (1.06)	0.18 (0.97)	0.35 (1.08)	3.73 (1.5)	3.39 (1.47)	3.41 (1.48)	4.7 (1.52)	5.01 (1.53)	4.51 (1.49)
Degrowth	-0.57 (1.07)	0.28 (1.04)	0.1 (1.06)	3.83 (1.61)	3.31 (1.63)	3.09 (1.48)	4.88 (1.56)	4.75 (1.7)	4.64 (1.7)
<i>F ratio</i>	67.39***	10.32***	14.33**	0.21	3.54**	5.47***	15.96***	12.22***	0.24

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard deviations in parentheses.

To assess the relationships between the independent variables and the responses to the preferred growth-environment positions and the GDP growth rate, we ran multinomial regression analyses for the former, and OLS regression analyses for the latter (Table 3.6). It should be noted that the variable for the “growth-at-all-costs” position only includes 39 observations. This may reduce statistical power. For completeness, however, we decided to include this variable.

The four models again include the different sets of independent variables. The “green growth” view serves as the reference category in the multinomial logistic regression. The model for the growth-at-all-costs position indicates that respondents with less educational attainment and higher levels of self-enhancement values were more likely to support this view. In addition, those who saw themselves as less personally affected by the crisis were more likely to choose growth-at-all-costs. This might reflect a small number of observations in the latter group. It may also be that those less affected by the crisis are more committed to growth in order to avoid being affected in the future. One can only speculate as to the right reason, as there is no additional evidence to settle this point. Supporters of both agrowth and degrowth were more likely to have weaker conservation values. Degrowth seems to be more strongly driven by environmental motivations, as is indicated by the statistically significant effect of environmental values.

Regarding the preferred GDP growth rate, the results show that conservation values are again a strong positive predictor. Furthermore, the fact that both higher levels of education and GDP knowledge are significantly negatively associated with the preferred growth rate indicates a lack of understanding of economic growth as one explanation for the high preferred rates. This is broadly in line with experimental evidence demonstrating that laypeople find it very difficult to make sense of GDP growth rates (Christandl and Fetchenhauer, 2009).

Table 3.6. Multinomial logistic regression of growth-environment position and OLS regression of favored GDP growth rate

	Growth-at-all-costs		Agrowth		Degrowth		Favored growth rate		
	B	SE	B	SE	B	SE	B	SE	Beta
Female	.032	.369	-.235	.176	.042	.202	.598***	.143	.162
Age	-.006	.016	-.008	.008	-.003	.009	.002	.006	.011
Income	-.128	.161	-.155**	.078	-.071	.089	-.046	.059	-.033
Education	-1.004***	.291	-.045	.119	-.161	.138	-.189*	.097	-.078
Employed	.189	.380	-.233	.178	-.016	.205	-.051	.149	-.013
GDP knowledge	.052	.148	.000	.070	.047	.078	-.121**	.056	-.086
Economic knowledge	.222	.166	-.157*	.082	-.204**	.092	.042	.064	.029
Environmental knowledge	-.188	.166	.353***	.085	.143	.096	.018	.065	.013
Religiosity	-.050	.158	-.083	.084	-.125	.099	.131*	.068	.082
Political orientation	.107	.097	-.108**	.053	-.096	.062	-.012	.039	-.013
Self-enhancement values	.293**	.117	-.097*	.054	-.122**	.061	.099**	.043	.092
Self-transcendence values	-.205	.155	.085	.080	.011	.092	-.136**	.061	-.116
Conservation values	.050	.178	-.232***	.068	-.294***	.074	.183***	.055	.161
Environmental values	-.055	.168	-.031	.080	.305***	.097	-.012	.065	-.011
Personal impact crisis	-.398***	.113	-.027	.067	-.111	.073	.055	.052	.042
Crisis influenced response	-.068	.131	.079	.066	-.035	.070	-.038	.051	-.029
<i>Nagelkerke R-square</i>	0.19						0.09		

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. B = unstandardized regression coefficient; SE = standard error; reference group = green growth; Beta = standardized regression coefficient. "Green growth" is the reference group in the multinomial regression. For the OLS regression, we recoded three cases of the dependent variable: -7 and -3 were recoded as -1, which helped to improve statistical tests for normality. Because using the original variables household income and political orientation in the multinomial regression had a considerable number of missing values ($n = 317$), we recoded the latter using the median values.

Before closing this subsection, we want to provide some additional interpretations of the seemingly conflicting result that one-third of the respondents reject further pursuit of economic growth to achieve environmental sustainability, while most people also want high GDP growth rates. One may view this finding as an indication that many people have inconsistent attitudes (Converse, 1964). However, other explanations are possible. First of all,

it is well known that question wording effects occur in opinion studies (Schuldt et al., 2015). It should be noted that the preferred GDP growth rates were elicited for economic growth in general. Especially respondents with a lower understanding might use a simple cognitive shortcut which equates economic growth with economic improvement. This may be supported by the earlier reported regression results which indicated the links between low GDP knowledge and educational levels, and high favored growth rates. The environment is at most implicitly taken into account when answering this question. On the contrary, when asked to opt for a more explicitly formulated position on the growth-environment relationship, environmental (un)sustainability moves more strongly to the forefront of conscious consideration in answering this question. Therefore, it may not be completely irreconcilable that some respondents then choose an option other than further pursuing economic growth, even if they have previously favored a positive growth rate.

Another wording effect might have occurred regarding the *degrowth* position. It seems plausible that this response option may have been understood rather in a frame of ‘less consumption’. For example, recent public opinion studies from the US show that between 70%–88% of Americans support initiatives to reduce consumption (Markowitz and Bowerman, 2012; Bowerman, 2014). Some of our respondents may have focused especially on the question wording “reduce consumption and production”, and considered less that this option may imply zero or negative GDP growth.

In addition, it makes sense to further place our findings in the context of research in cognitive and social psychology. This suggests that human reasoning is largely unconscious and metaphorical (Meier et al., 2012; Landau et al., 2010). Embodied cognition represents the idea that human thinking is grounded in and strongly influenced by bodily experience. Experiments show that people rate objects along a vertical axis, on which “up” stands for good and “down” for bad (Meier and Robinson, 2004). So, an understanding of abstract concepts like GDP growth may unconsciously occur by drawing on these metaphors. A

growing economy, perhaps with a mental image of a growing GDP graph, is unconsciously considered as something good. Discussing such insights of cognitive science in relation to economic and ecological issues, Hukkinen (2012) suggested that “upward growth fires in our minds the neural connections of “more”, “control”, and “happy””. In turn, choosing a zero or even negative GDP growth rate is intuitively unappealing. Our results may indeed reflect this.

3.4.3 Beliefs about when and why economic growth may come to an end

Apart from questions about the desirability of economic growth, a similarly relevant issue of the debate is whether endless economic growth is possible or not. Figure 3.2 displays results for the question of when people think economic growth in rich industrialized countries may come to end. As can be seen, public beliefs range from very pessimistic to very optimistic. A considerable number of people (44%) believe that economic growth may stop within the next 25 years. One-fifth foresees an end within the next 25 to 100 years. While very few people think economic growth will come to an end somewhere beyond 100 years, almost 30% of respondents believe it may be never-ending.

We are not aware of empirical studies which examine the same question. More generally, it is possible that individuals’ future expectations draw strongly on their present situation (e.g., Gilbert et al., 2002). Given that at the time of conducting the survey, Spanish citizens were still feeling the effects of the economic crisis, it is possible that this contextual factor has influenced responses to this particular survey question.

One may additionally compare our results with those coming from related survey measures of individuals’ economic expectations. When doing this, our findings generally concur with evidence indicating that on macroeconomic issues (e.g., inflation, unemployment), the general public tends to be more pessimistic than what actually observed trends suggest (Dua and Smyth, 1993) or what certain economic experts predict (Blendon et al., 1997; Caplan, 2002). In particular, an international poll conducted in 2014 found that 62%

of Spaniards think that children growing up today will be financially worse off than their parents (PEW, 2014).

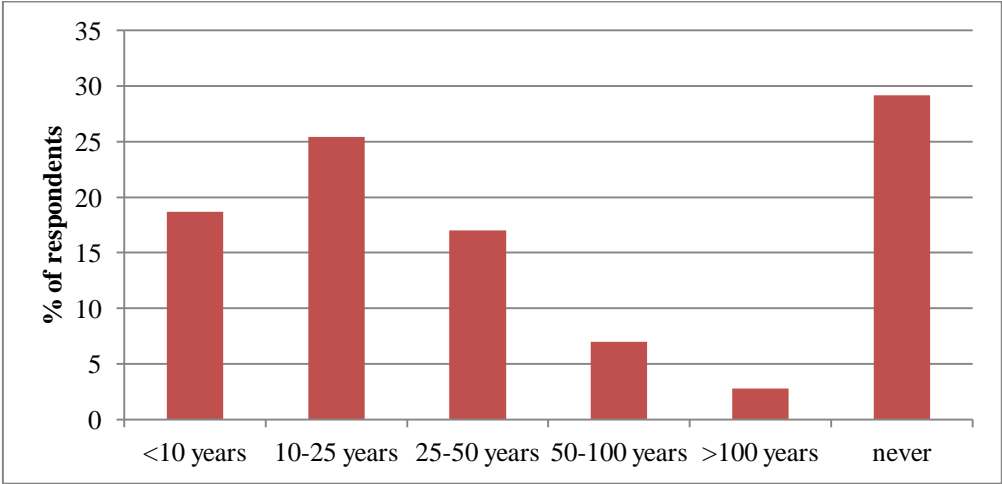


Figure 3.2. Beliefs about the timing of an end to economic growth in rich countries

We now try to shed some light on the main reasons people indicate for why economic growth may end or not. The blue bars in Figures 3.3 and 3.4 show the results for the two relevant groups: namely, those who believe in an end to economic growth, and those who don't. Starting with the pessimists, about 30% of the respondents saw “growing income inequality” as the main reason for an end, followed by “high public debt” with 23%, and “aging population” with 12%. When considered separately, reasons related to scarcity of energy and material resources, and environmental problems do not appear important. But together they account for 24%, making the environment-energy-resources nexus the second most frequent reason. This is broadly consistent with earlier results from subsection 3.4.1 (items “climate limit” and “resource limit”). Some 5% of the participants used the open-response field to state other reasons. The most frequent ones can be categorized as follows: some mix of all provided reasons (n = 7); corruption (n = 6); socio-economic changes at the global level (n = 5); and war/conflict (n = 4).

We also asked respondents to indicate additional reasons for an end to economic growth. Looking at the results displayed by the red bars in Figure 3.3, the ranking of the most frequent

reasons largely remains the same. Only “aging population” goes up significantly to 30%. Similarly, “scarcity of energy supply” (25%), “scarcity of mineral resources” (23%), and “environmental problems” (21%) are all regarded as important additional reasons, which together make up 69%.

Overall, socioeconomic reasons were chosen more often than environmental or resource reasons. The fact that income inequality was regarded as the most important reason makes sense in view of studies on lay understanding of macroeconomic causation (Leiser and Aroch, 2009). These suggest that lay people may use a simple cognitive shortcut to understand macroeconomic causation: they evaluate a certain economic variable A as positive (negative). If this variable A increases, it will then have a corresponding positive (negative) effect on a variable B. Taking into account that Spain is one of the countries with the most unequal income distribution in the EU-28 (European Commission, 2015), inequality is likely to appear as both a salient and negative issue in responses to the questionnaire.

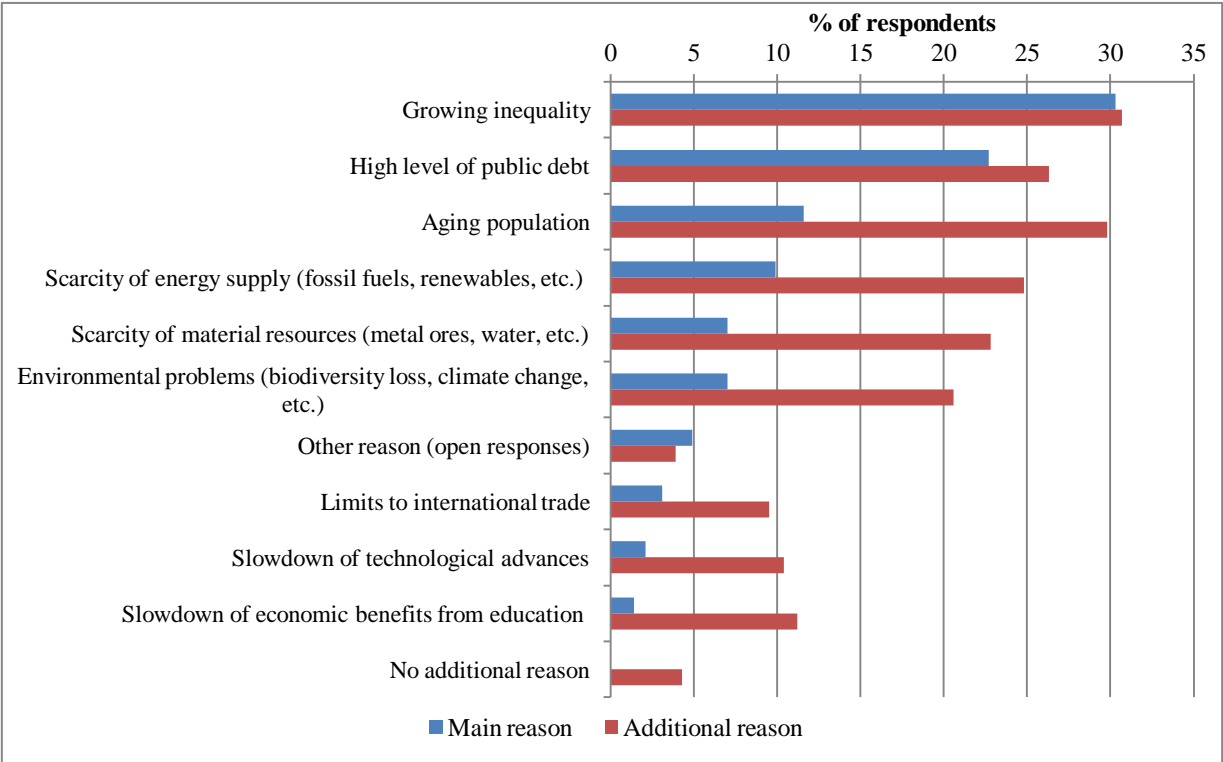


Figure 3.3. Indicated reasons for a possible end to economic growth
Note: Because up to three additional reasons could be selected, the percentages shown by the red bars add up to more than 100%.

These factors might explain why so many people made the causal connection between income inequality and a potential end of economic growth. The same logic might apply to the reason “public debt”.

Those respondents who believed that economic growth will be never-ending were asked to indicate main and additional reasons as well (see Figure 3.4). The results show that the most frequently indicated main reasons were related to confidence in technological progress (28%), and the economic benefits associated with increases in knowledge (26%). This was closely followed by the belief that renewable energy can replace all fossil energy sources (23%). Skepticism about environmental problems was hardly mentioned as a reason for endless growth, and neither was a belief in the abundance of fossil fuels. When respondents were asked for additional reasons, technological progress was deemed even more important.

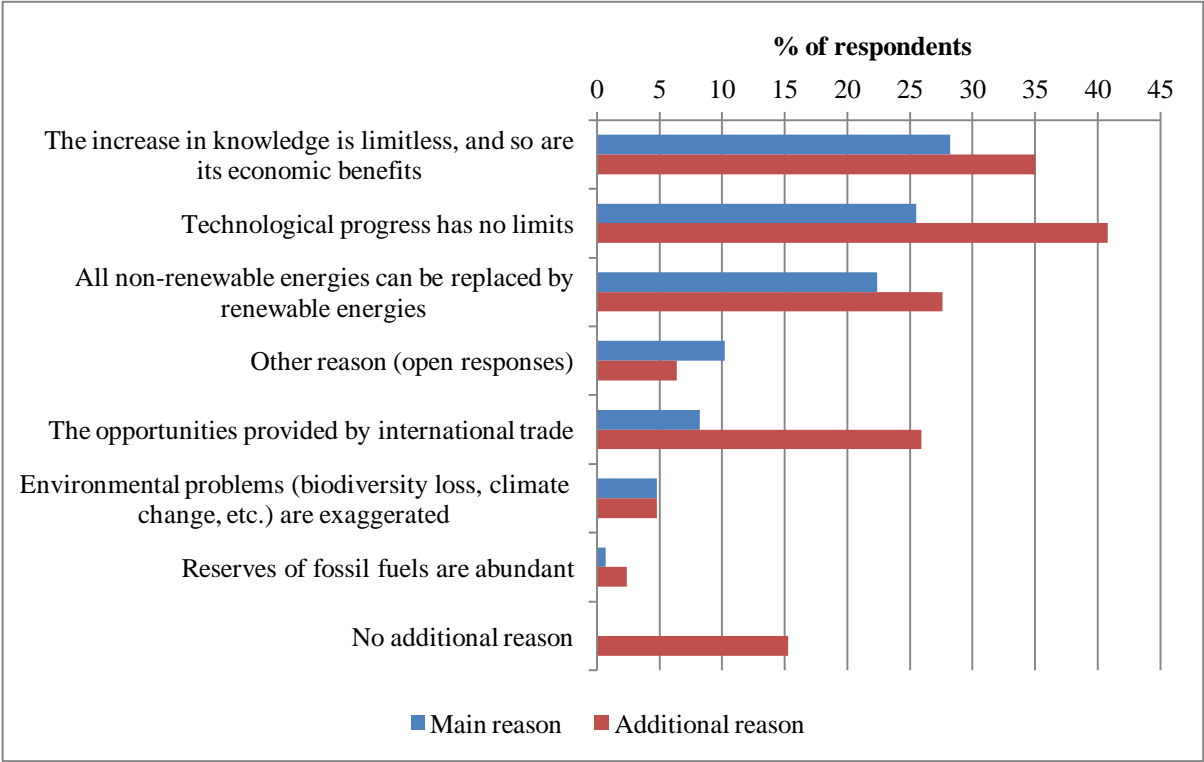


Figure 3.4. Indicated reasons for possibly endless economic growth
Note: Because up to three additional reasons could be selected, the percentages shown by the red bars add up to more than 100%.

Moreover, the opportunities for international trade made a significant jump and were now selected by a quarter of the participants. The only noteworthy other explanation which emerged from people's statements in the open-response field was related to human nature: namely, the theme of "greed" (n = 4). In sum, these findings suggest that the belief in never-ending economic growth is strongly associated with optimism about technological and human ingenuity (Dunlap and Catton, 1994).

Next, we illuminate why people (do not) believe in an end of economic growth by examining associations with the other attitudes towards growth, as well as with the independent variables. The responses to the question measuring the belief about when economic growth may end were transformed from a 6-point into a dichotomous scale. In this way, we distinguish between pessimistic respondents who believe in an end of economic growth (coded 1) and optimists who do not (coded 0), as was done in the previous analysis of indicated reasons.

First, we compare the means of the three attitude factors and the six single items for the two groups of pessimistic and pessimistic respondents (Table 3.7). Independent t-tests were performed to check statistical differences. An important finding is that people who believe in an end to growth acknowledge more strongly the *environmental limits to growth* and believe less in *prosperity with growth*. In other words, the latter may imply that more strongly equating economic growth with general prosperity is associated with rejecting the possibility of an end to growth. This is also consistent with the findings that the optimists consider growth less as a *wrong priority*, and show less *GDP skepticism*. Not surprisingly, belief in never-ending growth is also significantly associated with optimistic expectations about a *recovery* of growth in the future. Taken together, these results indicate a largely coherent pattern in attitudes and beliefs about growth. People who believe in the possibility of never-ending growth also express more desirability for growth.

Table 3.7. Comparison of means of attitude factors and single items, by beliefs about end of economic growth

	Prosperity with growth	Environmental limits to growth	Wrong priority	Techno-fix	Recovery	Postmaterialism	GDP skepticism	Flawed welfare measure	Governmental control
Endless growth	0.2 (0.95)	-0.41 (0.99)	-0.11 (0.89)	3.84 (1.57)	3.76 (1.55)	3.62 (1.5)	4.06 (1.64)	4.51 (1.53)	4.62 (1.53)
End of growth	-0.08 (1.01)	0.17 (0.95)	0.04 (1.04)	3.79 (1.52)	3.39 (1.49)	3.5 (1.46)	4.46 (1.53)	4.65 (1.53)	4.51 (1.56)
<i>t-test statistic</i>	0.43***	1.03***	10.55**	0.53	0.23**	0.08	0.21***	0.00	0.42

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard deviations in parentheses.

While these differences are statistically significant, it should be noted that the magnitudes of these differences are not large.

Finally, we performed a logistic regression analysis for the dichotomous variable measuring belief in an end to growth (Table 3.8). The model again includes the sets of independent variables. The results show only two statistically significant associations: older and more religious people are more likely to believe that economic growth will never come to an end.

Table 3.8. Multivariate logistic regression of belief in an end of economic growth

	B	SE
Female	.026	.153
Age	-.014**	.007
Income	-.111	.068
Education	-.081	.103
Employed	-.040	.158
GDP knowledge	-.108*	.059
Economic knowledge	.067	.069
Environmental knowledge	.111	.072
Religiosity	-.198***	.069
Political orientation	-.056	.044
Self-enhancement values	.058	.046
Self-transcendence values	.083	.066
Conservation values	-.062	.061
Environmental values	-.042	.069
Personal impact crisis	.006	.055
Crisis influenced response	-.019	.055
<i>Nagelkerke R-square</i>	0.07	

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. B = unstandardized regression coefficient. SE = standard error. Because using the original variables household income and political orientation had a considerable number of missing values ($n = 317$), we recoded the latter using the median values.

The latter result is broadly in line with prior research showing that Christian religiosity is associated with attitudes and institutions conducive to economic growth (Guiso et al., 2003). Recent findings also show that religious people were more optimistic that the economy will recover from the crisis (Leiser et al., 2010).

3.5 Conclusions

The purpose of this article has been to examine public views on economic growth, the environment, and prosperity by using a questionnaire survey. Several interesting findings emerged from this work. Most importantly, public views on economic growth are not simply divided into two consistent and coherent pro- and anti-growth camps. Instead, the attitudes and beliefs measured here vary in intensity and with the specific facets of the economic growth debate. Out of a range of statements, we identified six different dimensions of attitudes towards growth: *prosperity with growth*; *environmental limits to growth*; *wrong priority*; *general optimism*; *overrated GDP*; and *governmental control*.

We further investigated public views specifically regarding the growth-environment relationship by using a novel measure that offered four options: *growth-at-all-costs*; *green growth*; *agrowth*; and *degrowth*. While the majority favors continuing with (green) growth, though not at all costs, more than one-third supports ignoring or stopping economic growth. Associating these views with the earlier identified factors and attitudes yielded largely consistent results: both *agrowth* and *degrowth* supporters believe less in the idea of *prosperity with growth*. A notable difference between the two positions was that *agrowth* support is more strongly linked to the idea that growth is a *wrong priority*, while *degrowth* supporters expressed slightly more agreement with *environmental limits to growth*.

We further find that about two-thirds of our respondents believe that economic growth in rich countries may stop at some point in the future, while one-third believe it will be never-ending. Socioeconomic reasons (e.g., inequality) are somewhat more important than

environmental ones (e.g., energy scarcity) to justify beliefs in an end of growth. Strong confidence in technology and human ingenuity are the main reasons indicated by growth optimists.

It is possible to draw some general conclusions regarding the determinants of public beliefs and attitudes. We found that self-enhancement values were related to various pro-growth views. This makes sense, because such values are positively associated with materialistic values, which in turn can be seen as an endorsement of economic growth at the individual level (Hurst et al., 2013). Conservation values also played an important, if not *the* most important, role in explaining different pro-growth views. Together with the significant effects of religiosity and right-wing political orientation, these effects may be in line with system-justification theory (Jost et al., 2008; Jost et al., 2014). This suggests that people are (often unconsciously) motivated to bolster, defend, and justify the status quo – that is, the prevailing social, economic, and political systems. Economic growth is undoubtedly an essential part of this broader system.

Religiosity has already been associated with attitudes that foster growth in previous studies (Guiso et al. 2004). The result that religiosity is predictive of a *prosperity with growth* view is interesting in light of Pope Francis's (2015) recent Encyclical *Laudato Si*, as it argues for strong climate action and a reconsideration of the dominant economic model, including the idea of continued economic growth. Our findings suggest it targets a group that is relatively supportive of growth, namely religious people.

The different measures of knowledge are weakly significant factors underlying public views in this study. The GDP knowledge index is only significantly associated with the favored GDP rate, where more knowledge predicts a lower rate. Higher self-reported knowledge about the economy is related to a stronger belief in *prosperity with growth*, and tends to make a person favor the green growth position. It may be that more knowledgeable people have sought out more relevant information in the past. Given that media coverage

about growth remains predominantly positive, it would explain why people with a better understanding of the economy tend to be rather pro-growth. Self-reported environmental knowledge, on the other hand, is associated with more belief in *environmental limits to growth*, and with supporting the *agrowth* and (to a lesser extent) the *degrowth* position. Finally, it is noteworthy that, while factors such as ideology and knowledge have independent effects, they also interact with each other. Especially it appears that high levels of education and knowledge, on the one hand, and political right-wing, religious and conservation orientations, on the other, synergistically reinforce different pro-growth views.

Compared to previous research, the general value of this study is that it provides a more nuanced picture of public opinion on the relationships between economic growth, the environment and prosperity. This can help inform both economic and environmental policy making. In addition, our study findings may provide insights to all those who – for environmental or other considerations – propose and communicate a shift away from the growth paradigm. With this goal of change in mind, one may find grounds for both hope and despair when looking at the study results. The most widespread belief about economic growth seems to be that it is needed to create jobs. Finding solutions for unemployment independent of growth seems a worthwhile goal, though recent research has shown this to be very difficult (Antal, 2014). Our data further suggest that alternative welfare indicators might receive substantial public support (leaving technical issues aside for the moment). Given that the majority of people believe anyway that growth may come to an end, one could highlight this point as a motivation to build alternative strategies.

Considering the exploratory nature of our investigation, we hope that this research will stimulate further studies on public attitudes towards economic growth and possible alternatives. At a minimum, we would encourage that future research and large-scale opinion polls include and test single questions on growth and the environment with different wordings (e.g., avoiding the word “jobs”) and formats (e.g., providing more options). In addition,

studies on public support for environmental policies might benefit from taking into account the effects on economic growth and how this matters in the formation of attitudes.

Finally, it is worth mentioning again that our study relied on a sample from Spain, which has experienced a severe economic recession and a mild return of growth. This might have influenced responses to some specific survey questions. On the other hand, two variables that potentially capture effects of the crisis were either non-significantly or only weakly related to attitudes about growth. The same holds for the variable ‘employment’. Overall, the effect of the crisis on our results seems small. Other factors showed stronger and more consistent associations. Moreover, environmental and economic attitudes are shaped by a wide range of factors (e.g., Gifford and Nilsson 2014; Leiser and Krill 2016), which is however beyond the scope of this study. All the same, it would be useful to carry out similar surveys as well as longitudinal research in countries that had different economic growth experiences in recent times.

Appendix A3.1

Survey questions used in this study

Dependent variables

1. Here is a list of statements about the GDP, economic growth, and social and environmental issues. All statements refer generally to rich industrialized countries (EU countries, US, Canada etc.) except when stated otherwise. Please tell us your opinion about each statement. (for statements and response options, see Table 3.2 and 3.3)

2. Which rate of economic growth should the government of a rich industrialized country aim for? *You can enter a value between -7% and 7%.*

3. Roughly speaking, when do you think economic growth in rich industrialized countries will come to an end? (for response options, see Figure 3.2)

4a. [For those who have chosen another option than “never” in Q3] What do you think would be the main reason for economic growth in rich industrialized countries coming to an end? (1 response possible; for response options, see Figure 3.3)

Do you think there are other reasons for why economic growth in rich industrialized countries may come to an end? (maximum 3 responses possible)

4b. [For those who have chosen “never” in Q3] What do you think would be the main reason for economic growth in rich industrialized countries never coming to an end? (1 response possible; for response options, see Figure 3.4)

Do you think there are other reasons for why economic growth in rich industrialized countries may never come to an end? (maximum 3 responses possible)

5. Here are four positions on the relation between economic growth and the environment. Which of them comes closest to your own opinion?

Position	Public policy should...
1	... further pursue economic growth in spite of its environmental impacts.
2	... further pursue economic growth. There are many ways to make economic growth compatible with environmental sustainability.

3	... ignore economic growth as a policy aim, that is, be completely neutral about growth. This will amplify the policy spectrum to combine well-being and environmental sustainability goals.
4	... stop pursuing economic growth. Production and consumption need to be reduced in an equitable way to achieve environmental sustainability.

Independent variables

(response options are shown in Table 3.1)

6. In general, how informed do you consider yourself to be about the following issues?

- Economic issues

- The environment

7. What is your highest completed level of education?

8. Are you currently employed?

9. Please consider the income of all household members. What is your household's approximate total net income per month?

10. Which values are important for you as guiding principles in your life and which are less important? Try to differentiate your responses as much as possible by using all scores.

Power (social power, authority and wealth, preserving public image)
Achievement (success, capability, ambition, influence on people and events)
Hedonism (gratification of desires, enjoyment in life, self-indulgence)
Stimulation (daring, a varied and challenging life, an exciting life)
Self-direction (creativity, freedom, curiosity, independence, choosing one's own goals)
Universalism (broad-mindedness, social justice, a world at peace, equality)
Benevolence (helpfulness, honesty, forgiveness, loyalty, responsibility)
Tradition (respect for tradition, humbleness, accepting one's portion in life, devotion, modesty)
Conformism (obedience, honoring parents and elders, self-discipline, politeness)
Security (national security, family security, social order, cleanliness, reciprocation of favors)
Respecting the earth (respecting rights of other species, being in harmony with other species)
Protecting the environment (minimizing pollution and waste, using natural resources with care)

11. In politics people sometimes talk of “left” and “right”. Where would you place yourself on this scale, where 1 means the left and 9 means the right?

12. How religious would you say you are?

13. Economic growth is measured by a change in the gross domestic product (GDP). Here is a list of statements about the GDP. For each one, please indicate whether you think the following statements are true or false. (for response options, see Table A3.1 below)

Table A3.1. Distribution of frequencies for questions measuring GDP knowledge (in%)

Statement	Def. false	Prob. false	Prob. true	Def. true	Don't know
The GDP is the sum of all profits made by domestic companies.	24,4	17,8	29,8	11,6	16,5
Cleaning up an oil spill increases the GDP.	40,7	24,1	12,3	4,1	18,8
A rise in the GDP per capita can go along with more wage inequality.	8,3	16,1	37,5	20,5	17,6
Military expenditures are part of the estimation of the GDP.	9,3	17,3	31	18,1	24,4
The GDP takes into account the depletion of natural resources like oil and minerals.	21,2	26,4	21,4	6,6	24,3
Unpaid work in the household is part of the estimation of the GDP.	43,4	25,5	10,9	5,5	14,8

Note: grey shading indicates the percentage of correct answers.

14. Could you please indicate your opinion to the following statements?

- The recent economic crisis in Spain has affected me personally.

- My responses to this questionnaire have been influenced by the current economic situation in Spain.

Chapter 4

Public opinion on economic growth, the environment and prosperity:

Insights from international survey data

4.1 Introduction

The debate on the relationship between economic growth, environmental sustainability and prosperity has a long history (Mishan, 1967; Meadows et al., 1972; Daly, 1977). In recent years, growth has been questioned again from various perspectives (e.g., Victor, 2010a; Schneider et al., 2010; Jackson, 2011; Costanza et al., 2014). In particular, environmental goals like keeping global warming below the 2°C threshold seem very difficult to achieve with continued economic growth (Anderson, 2015; Antal and van den Bergh, 2016). It is also argued that economic growth is no longer linked to proxies of social welfare, such as life satisfaction (Easterlin et al., 2010). Nonetheless, economic growth remains a central objective of governments in countries around the world. To address environmental challenges and respond to criticism, international organizations such as the OECD and the World Bank promote so-called “green growth”.

A number of issues in this debate have received considerable media attention. To give some examples: The book “Prosperity without Growth” by Tim Jackson (2011) was featured in various media around the world. Nobel laureate economist Paul Krugman discussed economic growth and environmental protection twice on his New York Times blog in a single year (2014a,b), in essence defending the mainstream notion that the two objectives are compatible. Another recent article in the New York Times opened with the question, “Can people have a good life without economic growth?” (New York Times, 2014c).

Despite the importance of these debates, there is limited and fragmented research on how the general public views the relationships between economic growth, the environment and

prosperity. Here we present a comprehensive overview of international public opinion on several aspects of the economic growth debate. We combine data from many different sources, which have not been analyzed collectively so far. This includes results from well-known longitudinal and multinational survey projects (e.g., the World Values Survey, International Social Survey Programme, Eurobarometer), as well as several recent studies and polls, some of which have not yet been discussed in the academic literature. In total, we draw on survey data conducted in more than 50 countries over the past 30 years.

The focus is on data from rich, industrialized countries, as it is here where economic growth is primarily questioned. This is supplemented by some data from middle-income countries so as to arrive at a more complete picture across different countries. The study fills a gap in the literature because previous research that summarized public opinion on different environmental problems (Dunlap and Scarce, 1991; Dunlap, 1998; Brewer, 2004; Lorenzoni and Pidgeon, 2006; Nisbet and Myers, 2007; Brechin and Bhandari, 2011; Stoutenborough et al., 2014; Capstick et al., 2015) paid little attention to the specific issue of economic growth and the environment.

We intend to answer the following specific research questions. Do people view economic growth and the environment as compatible or not (subsection 4.3.1)? Supposing a conflict between economic growth and environmental protection, which objective have people prioritized over the past 40 years (subsection 4.3.2)? How does the general public understand key concepts such as “economic growth”, “the environment” and the “GDP growth rate” (subsection 4.3.3)? How does the public evaluate economic growth in a broader context of social welfare, and what are their expectations about future economic growth (subsection 4.3.4). Subsequently, we interpret the findings, give attention to the role of question wording and format, and suggest some avenues for future research. Finally, we draw conclusions.

4.2 Data sources

This section describes how we collected the data. The following selection criteria were employed to include survey data. First, question wordings had to refer to “economic growth” or the “GDP”. Studies that referred to “the economy” or similarly vague terms were excluded. Second, we judged survey questions relevant if they covered aspects of the broader economic growth debate as described in the introduction. Third, we intended to cover mainly nationally representative samples (typically $N \sim 1000$) of the general population. A few exceptions were made to the last criterion in order to include some survey results which meaningfully complement the national samples. Note that we will explicitly mention these few additional data sources whenever relevant in the presentation of the results below.

Data sources were found through using the following procedure. We started by identifying large multinational survey projects that have questions on economic growth and the environment at several points in time. These are the International Social Survey Programme (ISSP), the World Values Survey (WVS), the Eurobarometer (EB), surveys by the PEW institute and by Gallup.⁹ Next, to make the data collection systematic, we consulted the Scopus database of peer-reviewed literature in January 2016. Using the terms “economic growth” and “environment” together with “attitudes” or “opinion” or “views” or “beliefs”, we searched in all English-language abstracts, keywords and titles of the literature. The resulting documents were screened for their relevance to this study by reading the article titles and abstracts. Three studies were found to be relevant. Finally, several additional studies and polls were included which the authors knew from previously conducted research.

All in all, our coverage of survey data on this topic is comprehensive though perhaps not exhaustive.¹⁰ For example, we do not consider the literature on the New Environmental Paradigm (NEP) (Dunlap and Van Liere, 1978). While the old NEP scale includes items

⁹ Details about, and references to, each data source are provided below in the presentation of the results.

¹⁰ In principle, the search could be expanded, for example, to other languages or databases. This was not possible here due to time constraints.

mentioning the term “economic growth”, this is not the case for the revised version (Dunlap et al., 2000).

4.3 Findings

4.3.1 Economic growth and environmental protection: compatible or not?

The first research question is whether people see the relationship between environmental protection and economic growth as compatible or contradictory. We start by analyzing two survey questions from the ISSP (2010), a survey executed in more than 30 countries between 2010 and 2011. The first question asks survey participants to rate on a 5-point Likert scale whether they agree or disagree with the statement, “In order to protect the environment [COUNTRY] needs economic growth.” The second statement reads: “Economic growth always harms the environment.” These two statements can be considered contradictory, so agreement with one should imply disagreement with the other. Looking at the responses to both questions can be considered an examination of implicit beliefs about the compatibility of economic growth and environmental protection.

Based on the responses to the two statements, we created four groups representing different views on the relationship between economic growth and the environment. Table 4.1 explains the grouping, while Figure 4.1 shows results for the individual countries. Almost 40% in the whole sample and between 12 - 62% of respondents in individual countries agreed with both statements, or agreed with one and neither agreed nor disagreed with the other. These responses are classified as *seemingly inconsistent views* (see dark blue columns in Figure 4.1).¹¹ Next, people who disagreed with the first statement but agreed with the second likely deem economic growth and environmental protection *incompatible* (on average 9%, see

¹¹ We use the term “seemingly” because there may be situations where both statements can be considered consistent. For example, one may agree that growth has on average negative environmental effects, while simultaneously agreeing that politically it is very difficult to implement strict environmental regulations when growth is low or negative (e.g., Franzen and Vogl, 2013). However, we think that agreeing to both statements in most cases displays inconsistent attitudes.

red columns). People who did not agree with the first statement and neither agreed nor disagreed with the second were regarded to have *undecided views* (14%, see light blue columns). And finally, those who disagreed with the second statement, regardless of their response to the first one, likely believe that economic growth and environmental protection are *compatible* (41%, see green columns).¹² Furthermore, it is striking that almost the same percentage distributions for the four groups appeared in the first survey, even though it was taken about 20 years ago (ISSP, 1993).

In addition to the classifications, we conducted a correlation analysis for the whole sample. This shows that responses to the two statements are very weakly negatively correlated ($r = -0.065, p < 0.01$), which provides further evidence that views on the relationship differ widely and lack of consistency.

Table 4.1. Categorization of views based on responses to two statements from the ISSP, 2010

		“Economic growth always harms the environment.”				
		Str. agree	Agree	Neither/nor	Disagree	Str. disagree
“In order to protect the environment [Country) needs economic growth.”	Str. agree	<i>Seemingly inconsistent views</i>			Economic growth and environmental protection are <i>compatible</i> (“yes” in Figure 4.1)	
	Agree					
	Neither/nor					
	Disagree	Economic growth and environmental protection are <i>incompatible</i> (“no” in Figure 4.1)		<i>Undecided views</i>		
	Str. disagree					

¹² We consider disagreement with the statement that growth is harmful as a general indication of the view that growth and environment are compatible – independent of responses to the second statement. If the latter would be taken into account, it would be possible to further distinguish strong and weak views of compatibility. To keep things simple, we avoid this finer classification here.

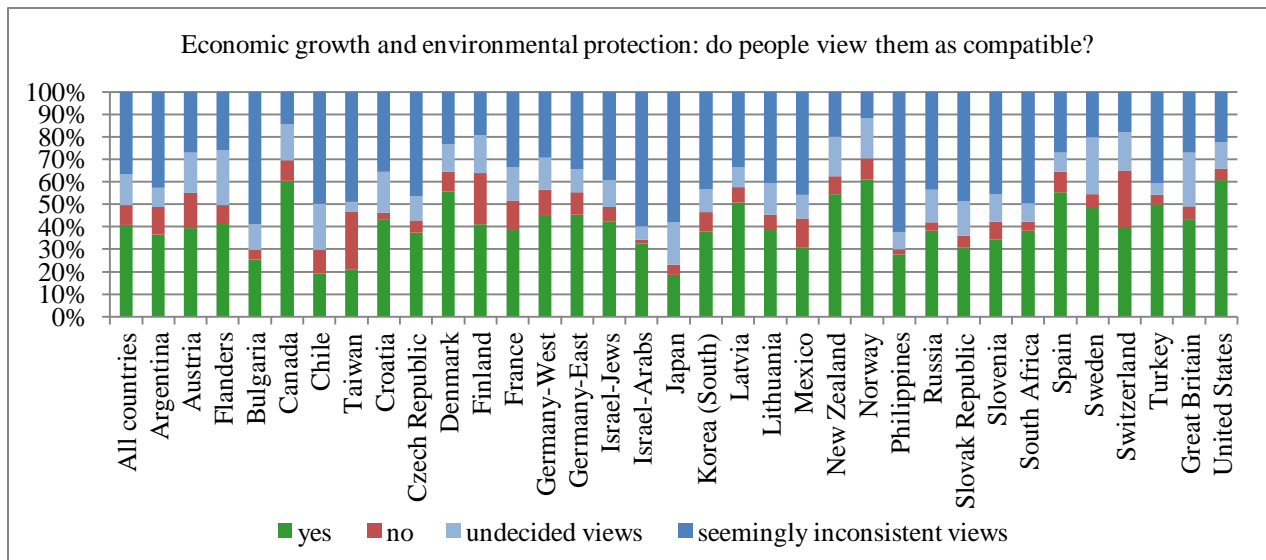


Figure 4.1 Combination of responses to two contrary statements about the relation between economic growth and the environment ($N = 45,199$).

Source: ISSP (2010).

Next, we consider a Eurobarometer poll from 2009. Using so-called split samples, respondents were divided into two groups, with each receiving one of the following two statements: “The protection of the environment can boost economic growth in the European Union” (Split A) and “Protecting the environment is an obstacle to economic growth in the European Union” (Split B). In the total EU27 sample, 66% and 26% agreed, respectively. Figure 4.2 shows that in every EU country the majority of people believe that environmental protection is conducive to economic growth. The statement of Split A was repeated in more recent Eurobarometer polls, which show even higher agreement: 77% in 2011 and 74% in 2014 (Eurobarometer 75.2 and 81.3).

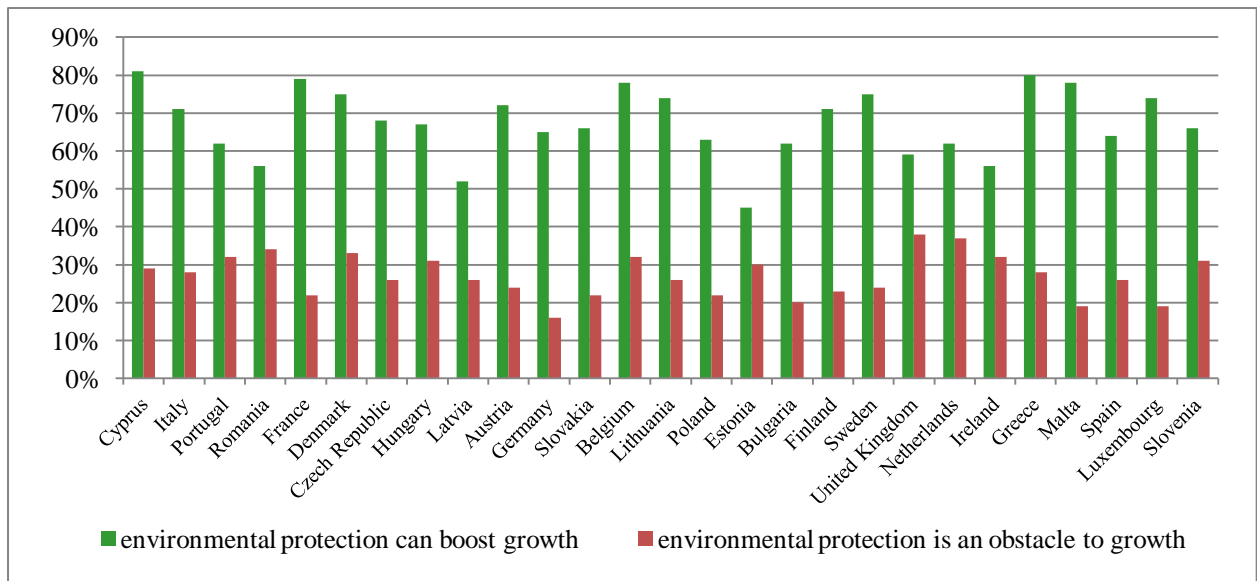


Figure 4.2. European citizens’ beliefs on whether environmental protection can boost or is an obstacle to economic growth. ($N = 30,232$).

Source: Eurobarometer (2009, wave 72.1).

Next, Figure 4.3 presents the results of another recent survey from 2014, which asked Americans explicitly about the effects of environmental protection (Leiserowitz et al. 2012, 2015). It provided three response options: environmental protection “improves economic growth and creates new jobs” (60%), it “reduces growth and costs jobs” (15%), or it “has no effect on growth or jobs” (22%). A comparison with earlier results shows that the view of compatibility has slightly increased since 2010. In addition, the advocacy group “Earthjustice” (2015) conducted a large poll among the Latino population of the US ($N = 1,200$), using a similar wording as the previously described polls by Leiserowitz et al. They found almost identical results compared to the general population: the majority of respondents (59%) believed that “if the country enacted stronger environmental laws”, it would “improve economic growth and create jobs”. The same type of question was also part of a survey in India in 2012 ($N = 3,806$). About one-third of the respondents believed in the positive effects of environmental protection – considerably less than in the US. A further 31% believed in negative effects, 16% in no effects at all, and 18% did not know.

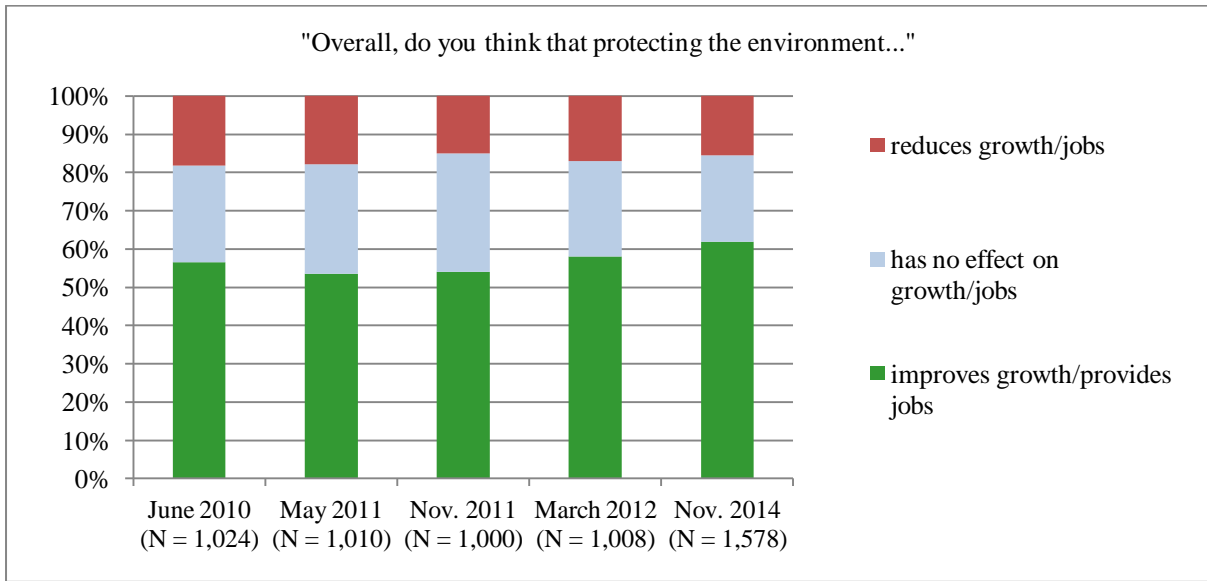


Figure 4.3. Perceptions of Americans about the effects of environmental protection on economic growth/jobs.

Source: Leiserowitz et al. (2012, 2015).

Overall, the results indicate that a majority views economic growth and environmental protection as compatible rather than mutually exclusive, when asked explicitly about it. Nevertheless, there is a large share of seemingly inconsistent answers when attitudes are examined implicitly, as was done with the two ISSP statements.

4.3.2 Economic growth versus environmental protection: what have people prioritized over time?

Survey questions on economic growth and environmental protection have been traditionally framed as a dichotomous choice between the two objectives (Buttel and Flinn, 1976; Czarnecki et al., 1980). Accordingly, we aim to understand which objective people prioritize when survey questions pose a conflict between the two. To this end, we start by comparing time-series data from various international data sources. To allow comparative analysis of changes over time, we restrict the analysis to countries for which we have data from at least

two sources for at least two points in time. We first examine the extent to which people prioritize either economic growth or environmental protection in recent years. For this we draw on data from four multinational surveys, which are described in Table 4.2. The related Figure 4.4 depicts percentage distributions of environmental (in green) and economic (red) preferences for 21 countries based on surveys conducted between 2010-2012 (exceptional years are noted in the Figure caption).

Table 4.2. Original questions from four surveys on prioritization of economic growth and environmental protection

Reference	Original wording	Response format
PEW, 2010	Please tell me whether you completely agree, mostly agree, mostly disagree or completely disagree with the following statements... "Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs."	Completely agree; mostly agree; mostly disagree; completely disagree; don't know; refused
World Values Survey, 2010	Here are two statements people sometimes make when discussing the environment and economic growth. Which of them comes closer to your own point of view? "Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs OR Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent"	Forced choice; other answer; don't know
Eurobarometer, 2003, 2006, 2012	Two split samples (respondents only read one statement). Split A: Economic growth must be a priority for (OUR COUNTRY), even if it affects the environment. Split B: Protecting the environment should be a priority for (OUR COUNTRY), even if it affects economic growth.	Totally agree; tend to agree; tend to disagree; totally disagree; don't know
Gallup, 2012 and 2014	With which one of these statements about the environment and the economy do you most agree? Protection of the environment should be given priority, even at the risk of curbing economic growth OR economic growth should be given priority, even if the environment suffers to some extent?	Forced choice; don't know; equal prioritization only counted if respondent "volunteers" this response

Figure 4.4 clearly shows that the environment is most often prioritized over economic growth, i.e. green markers are above red ones. The average agreement to the PEW statement "protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs" is 66% in the 19 countries of our sample, ranging from 42% in Jordan to 86% in India. In the WVS, 47% of all respondents chose the pro-environmental option (same statement as in the PEW) and 42% the pro-growth option. In the Eurobarometer

survey, 71% favored the environment, while 48% preferred economic growth. In the 5 countries covered by Gallup using similar statements, 57% favored the environment while 27% were pro-growth. In 12 out of 21 countries, majorities consistently favor the environment. There are six countries with mixed results (Japan, Lebanon, Netherlands, Poland, Spain, and the USA) and three countries where pro-growth sentiments are stronger (Egypt, Jordan, Pakistan).

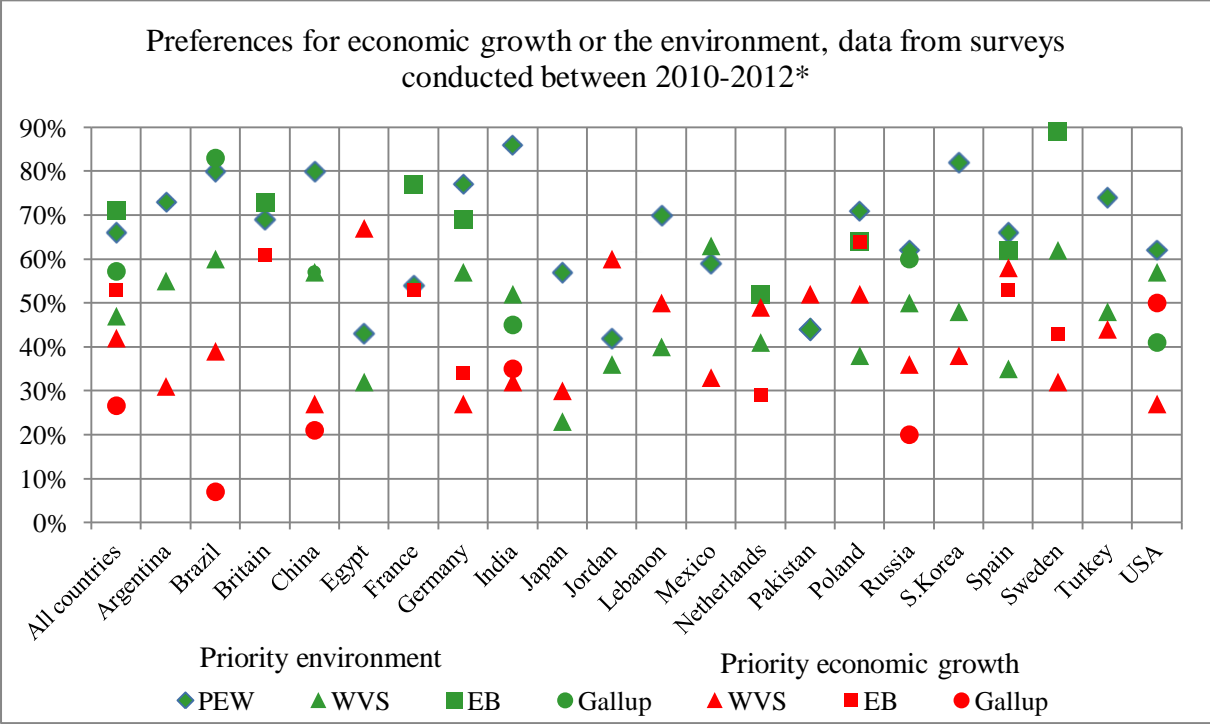


Figure 4.4. Cross-national comparison of prioritization of economic growth and environmental protection for 21 countries. Shades of green indicate pro-environment preferences, shades of red indicate pro-growth preferences.

Sources: the World Values Survey (2010), PEW (2010), the Eurobarometer (2012), and Gallup (2012, 2014). All surveys conducted between 2010-2012 (*exceptions for the WVS: Argentina 2013, Brazil 2014, Germany 2014, Jordan 2013). Corresponding question wordings are in Table 4.2.

The results of Gallup and WVS are fairly similar for most countries, with the USA being a notable exception. The data from the EB, which use split samples, shows that preferences can add up to more than 100%, suggesting again that attitudes can be somewhat inconsistent. It is also noteworthy that pro-environmental attitudes measured by the PEW survey typically trump all other pro-environmental preferences.

Next, we look briefly at trends for the same group of countries (see Figure 4.5). We consider data from the PEW and WVS and compare two time periods: for the PEW we compare 2010 with 2007 and 2002. Two similar periods are used from the WVS: the sixth wave (2010-2014) is compared against the fifth (2005-2007) and fourth wave (2000-2003). On average, prioritization of the environment in the PEW survey has declined over time by 3.5% compared to 2007 and 8% compared to 2002 in those countries for which data is available. In the WVS, prioritization of the environment has slightly fallen by 2% in 2010 compared to the preceding fifth wave, though it is up by 5% compared to the earlier fourth wave. However, more people also prioritize economic growth in the most recent wave compared to the two prior waves. The Eurobarometer indicates almost no changes on average for the prioritization of environmental protection. However, somewhat more people prioritize economic growth: in 2012, preferences are 10% up compared to 2003, and 13% up compared to 2006. Overall, preferences for economic growth have increased more than preferences for environmental protection have decreased.

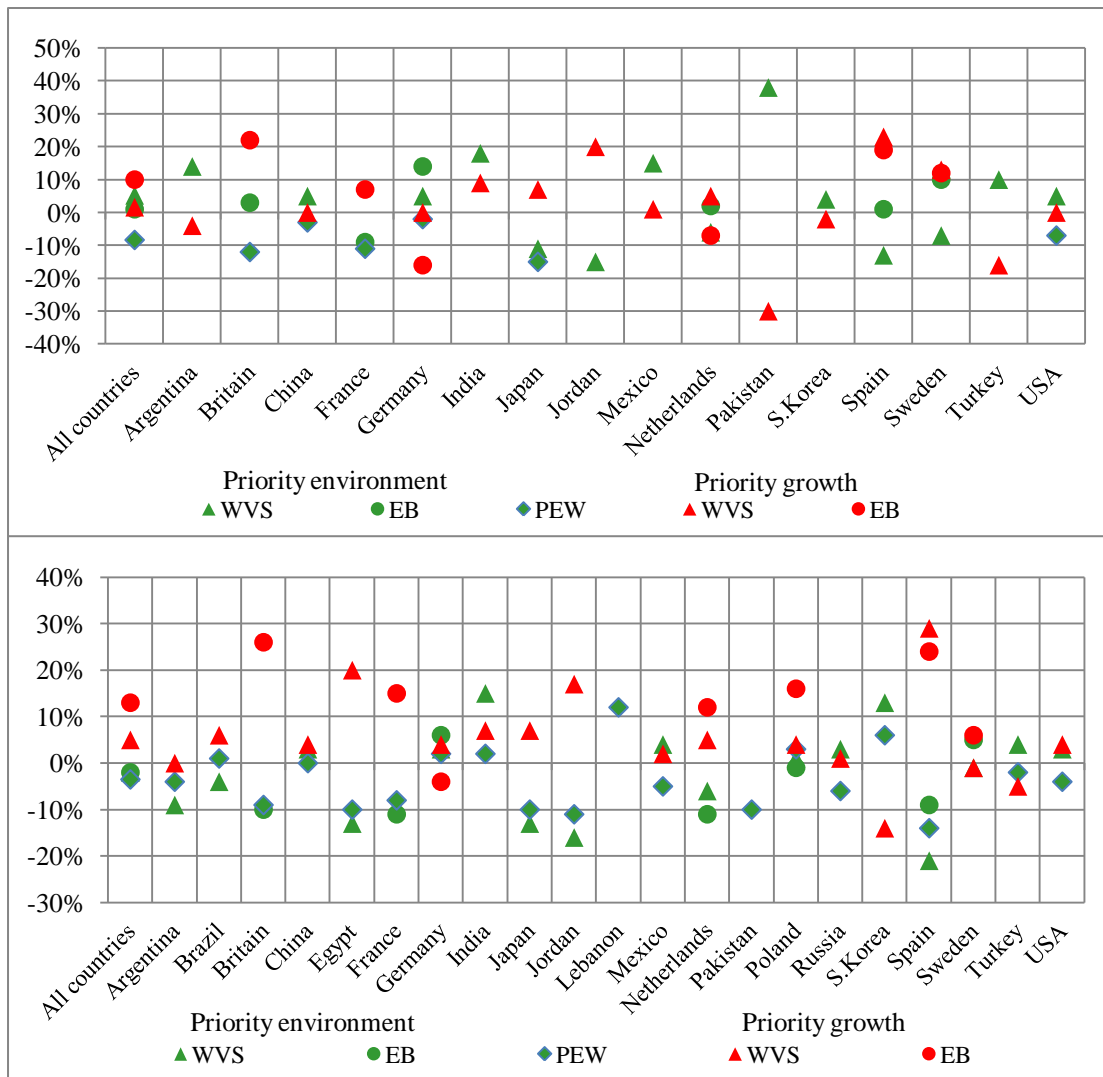


Figure 4.5. Changes in preferences over two periods of time. Top graph: WVS 4.wave (2000-2004) - 6.wave (2010-2013) | EB 2003-2012 | PEW 2002-2010. Bottom graph: WVS 5.wave (2005-2008) - 6. wave | EB 2006-2012 | PEW 2007-2010.

Next, we look at a different type of question as used in the European Parliament Election Survey from 2014 (see Figure 4.6). Here respondents could answer on a scale from 0 (prioritizing environmental protection) to 10 (prioritizing economic growth). This offers insights into how many people hold extreme attitudes, understood as the share of people responding at the end points of the scale (i.e., 0 and 10). Data from the overall sample of EU28 citizens ($N = 30,064$) shows that 48% leaned toward prioritizing environmental protection, 18% toward prioritizing economic growth, whereas 25% picked the middle option

on this response scale. More interestingly, almost 15% opted for the extreme pro-environmental option, while only 5% did so for the extreme pro-growth options.

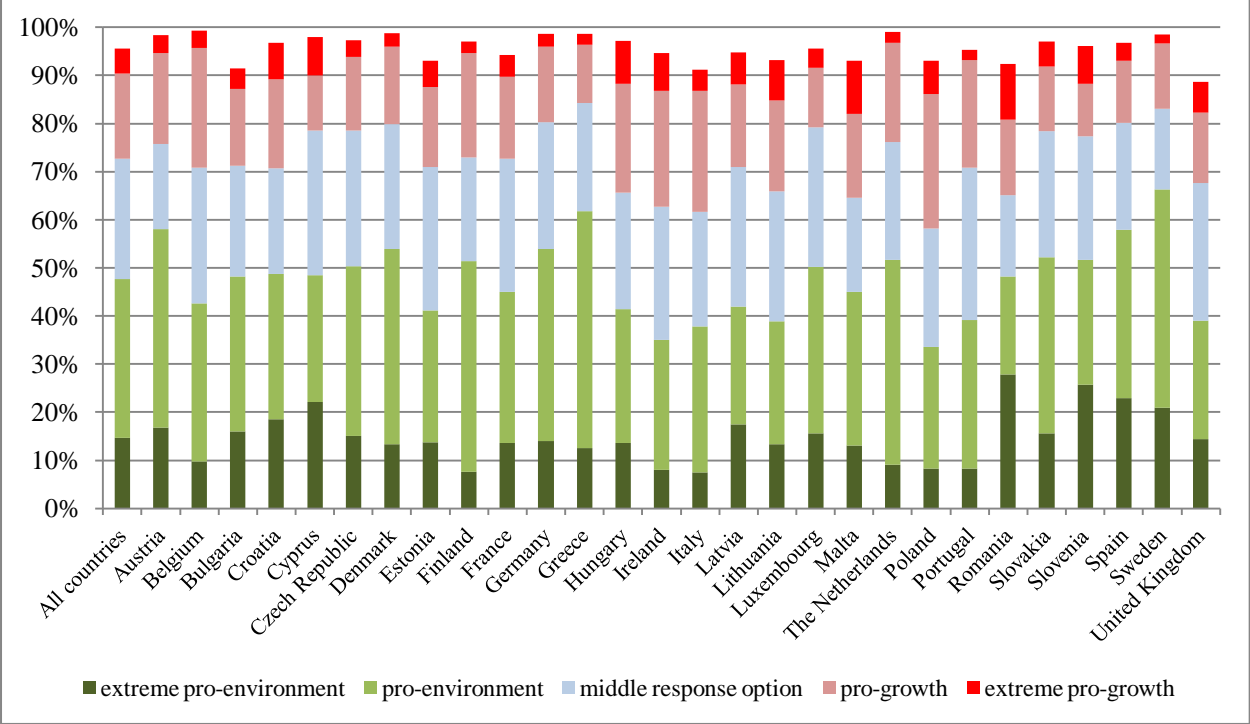


Figure 4.6. Prioritization of economic growth or environmental protection. (N = 30,064).

Source: European Parliament Election Study (Schmitt et al., 2015).

We continue by discussing a few studies from individual countries. The polls from the Yale Program on Climate Change Communication, which were already mentioned in relation to the issue of compatibility, also included a question on prioritization. It reads: “When there is a conflict between environmental protection and economic growth, which do you think is more important?” Between 2010 and 2012, the share of Americans who favored “prioritizing environmental protection, even if it reduces economic growth” was relatively stable between 62% and 65%.

Another US survey by Kaplowitz et al. (2013) modified the standard question on the growth versus environment preference by offering a third response option, namely an equal prioritization of both objectives. In one survey treatment, they gave respondents the standard

dichotomous choice format, which asked them to prioritize either “environmental protection” (73.5%) or “economic growth and creating jobs” (23.5%). In a second treatment, they included a middle option to prioritize “both” (economic growth and the environment), which was favored by the majority of respondents (60%). This is a considerable shift in the distribution of preferences compared to the treatment without the “both” response option. It is in line with the fact that many people do not see economic growth and environmental protection as contradictory as shown in subsection 4.3.1. The frequency of choosing the middle response option was considerably higher than in the European Parliament Election Study (Fig. 4.6) which had a finer scale. It should be noted that while the size of the sample in Kaplowitz et al. was large ($N = 2,429$), the study was not representative, since it only included university members (students, teachers/researchers, staff).

Lastly, we consider a study from Sweden which asked 3,297 citizens in 2005 whether they think it is a good or bad idea “to work towards an environmentally friendly society even if it means low or no economic growth” Jagers (2009). This survey question is distinct from the previous ones, as it explicitly mentions “no growth” in its wording. Implications of this are discussed in Section 4.4.4. The results show that 44% think the proposition as a fairly or very good idea, while 23% think it is a fairly or very bad idea.

4.3.3 Public understanding of key concepts

This section will shed light on how the public understands and thinks about key aspects of the growth-environment debate. To better interpret the previously shown trends in attitudes, it helps to know what people actually have in mind when they think about “economic growth” and “the environment”. The method of eliciting free associations is useful to this. However, while there are several studies inquiring people’s thoughts about climate change (e.g., Whitmarsh, 2009; Schuldt et al., 2015), very little is known about their associations to economic growth and the environment.

One exception is a study by Mohai et al. (2010). They asked American and Chinese citizens about the first ideas coming to their mind when they heard the terms “economic growth” and “the environment”. Table 4.3 lists the main findings. Fairly similar categories of associations emerged in both countries, but with different frequencies. For example, economic growth was associated with “improvements in standard of living” by 61% of Chinese respondents, but only 32% of American respondents. In contrast, “jobs/employment” occurred more frequently in responses by Americans (24%) than by Chinese (2%). With regard to “the environment”, people in both samples often mentioned topics such as “Nature/natural environment”, “everything/living space/the Earth”, and “air/water/natural resources”. Relatively few respondents mentioned associations about “pollution/contamination”.

Table 4.3. Free associations to “economic growth” and “the environment” by Americans ($N = 339$) and Chinese ($N = 662$) respondents

	USA (Detroit)	China (Beijing)
	%	%
<i>Categories of associations to “economic growth”</i>		
Increases in nation's production, GNP, economic strength	18	18.9
Jobs/employment	23.6	2.1
Improvement in standard of living	31.9	67.1
Economic stability	8.9	2.9
Improvements in public welfare	8.7	0.6
Negative outcomes (e.g., on environment)	5.7	7.7
Other	23	6.3
<i>Categories of associations to “the environment”</i>		
Everything/living space/the earth	28.4	20.4
Nature/natural environment	30.8	44.7
Air, water, natural resources	47.1	30.7
Pollution/contamination	20.4	8.5
Land/open space	13	-
Other	20.8	30.1

Source: adapted from Mohai et al. 2010.

The authors further scrutinized whether free associations were related to responses to the typical dichotomous choice question. For example, they found that those prioritizing the environment were more likely to associate economic growth with negative outcomes such as pollution. In contrast, those prioritizing economic growth were more likely to mention

increases in production, GDP and economic strength (Chinese respondents) and jobs/employment (American respondents). It should finally be noted that this study uses samples that were representative of Metropolitan areas (Detroit and Beijing) rather than of the countries as a whole.

Whereas free associations might be conceived as a kind of “everyday knowledge”, it is also useful to examine conceptual and statistical knowledge about economic growth. A study on economic knowledge by Walstad (1997) asked a sample of Americans the following multiple-choice question: “Economic growth is measured by a change in which of the following?”. Out of four available response options, the “Gross Domestic Product” was correctly identified by 40% of the respondents.¹³ Another dimension of knowledge concerns the rate of GDP growth. A Eurobarometer poll from 2015 asked respondents whether they know the GDP growth rate in the previous year of their respective country. Only 6% of the respondents gave a correct answer, that is, in the range defined by $-/+ 20\%$ of the actually realized GDP growth rate. Approximately one-third of respondents did not provide a response. Moreover, of those respondents who did give an answer, on average the growth rate was more frequently substantially overestimated rather than underestimated as shown in Figure 4.7.

¹³ The other three response options were: “The money supply”, “The Producer Price Index” and “The balance of payments”.

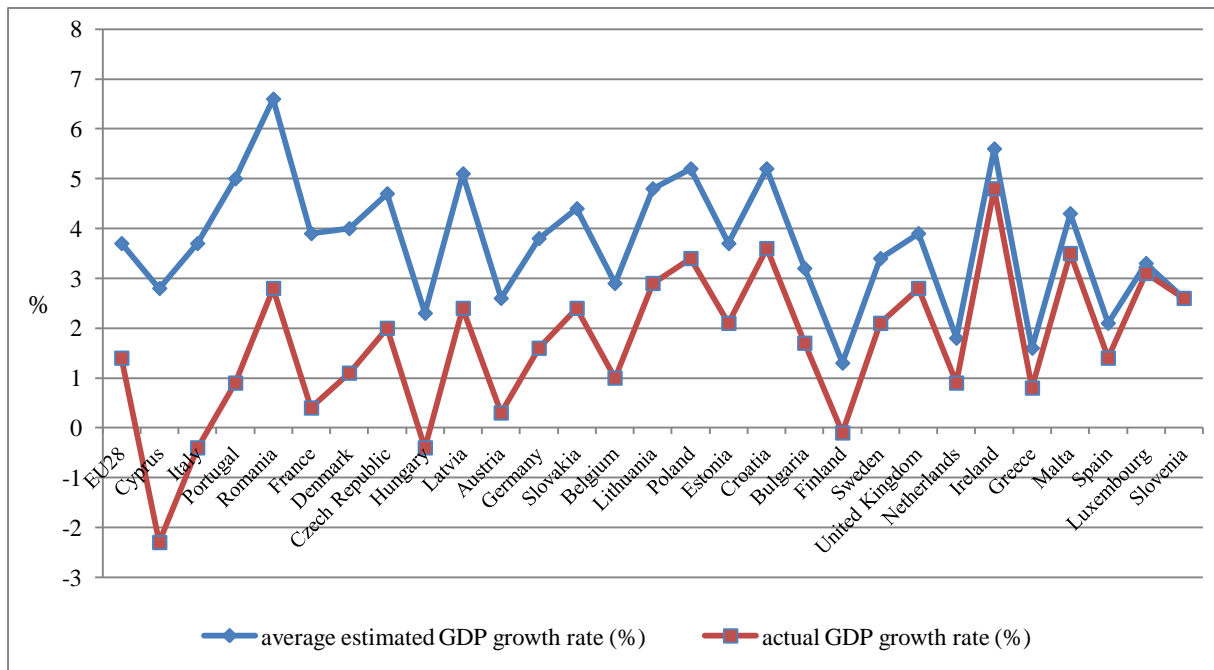


Figure 4.7. Comparison of estimated and actual GDP growth rates in EU-28 countries for 2014. Countries are ordered from large to small differences between the two values. ($N = 27,758$).

Source: Eurobarometer (2015, wave 83.3).

Related to knowledge about the actual growth rate, Christandl and Fetchenhauer, (2009) investigated public understanding of the dynamics of economic growth, in particular how people assessed the effect of exponential growth. In several experiments, participants were given slight variations of the following main question: “What is the overall rise in national income within the next 25 years if the economy grows with an annual rate of 5%?”. Only 10-15% provided an accurate estimate, counted as 50% less to 100% more than the true value (239%). Of the others, a majority underestimated rather than overestimated the effect of economic growth in the long-run. Note that this study from Germany is not representative, as it involved students from business, economics, and other fields. Given that even students in business/economics gave mostly incorrect answers to this arguably difficult question, it is unlikely that average estimates by the general public are more accurate.

4.3.4 Attitudes towards economic growth in a broader context

In this final subsection, we examine public views on aspects of the economic growth debate that go beyond the relationship to the environment. We start with a recent survey from Austria in 2014 which asked its respondents how they thought economic growth affects a wide range of societal goals (see Figure 4.8). At least two major insights can be derived. First, more than 80% of Austrians think that economic growth has a positive effect on maintaining living conditions, jobs and social peace. All of these may be regarded as factors contributing to societal stability. In contrast, the most widespread skepticism about economic growth is associated with the effect on “a fair distribution of income and wealth”, which 43% consider as negative, and only 26% as positive.

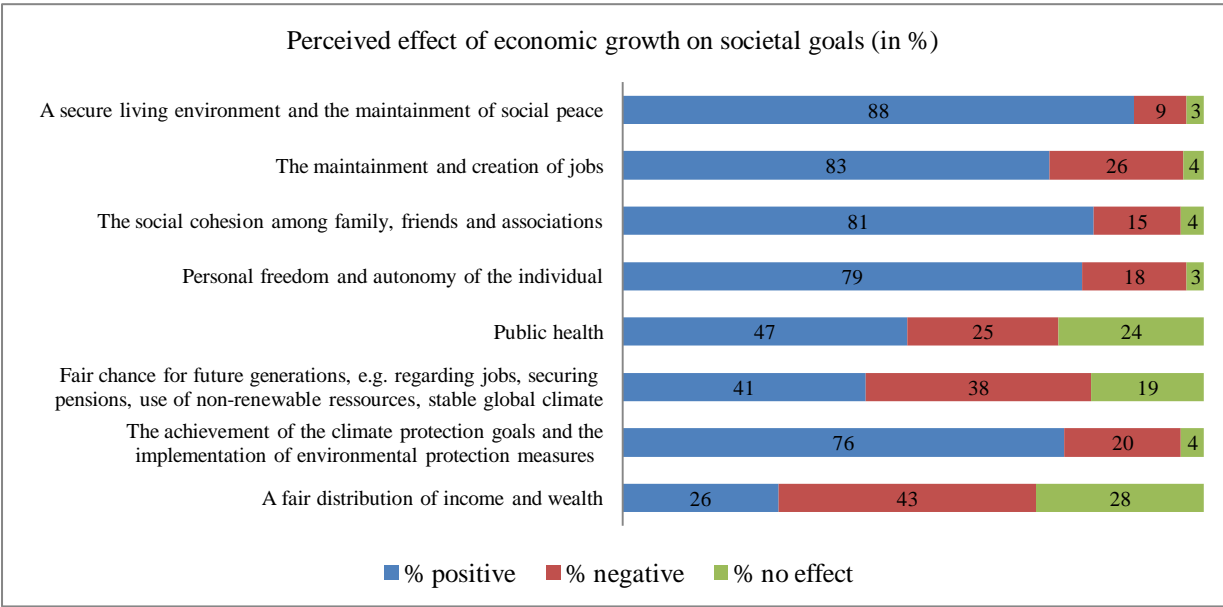


Figure 4.8. The question asked, “How does economic growth affect the following societal goals in Austria?”. (N = 500). Conducted in 2014. Source: www.wachstumimwandel.at (2015).

Next, we explore how people see the relationship between economic growth and well-being. Figure 4.9 shows results from identical polls in Germany and Austria from 2010 and 2012. They show some seemingly paradoxical results: while large majorities in both countries

view economic growth as important or very important for their country’s quality of life, majorities of people also believe that further economic growth does not enhance their personal quality of life. Broadly consistent with these findings are those of two other surveys from Germany. The first indicates that 59% of respondents agree that “without further economic growth we cannot maintain our living standards” (UBA, 2015). The second shows consistently for several years in the period 2006 - 2013 that large majorities of Germans (60-80%) did not perceive to benefit personally from economic growth in their country (Infratest Dimap, 2011, 2013). In the last survey from 2013, participants were additionally asked why they perceived no benefit from growth. The answers ordered from the most to least frequent were: “incomes/pensions rises too little” (34%), “rising prices” (30%), “most corporate profits go to the rich” (22%), and “politics is generally unsocial” (12%).

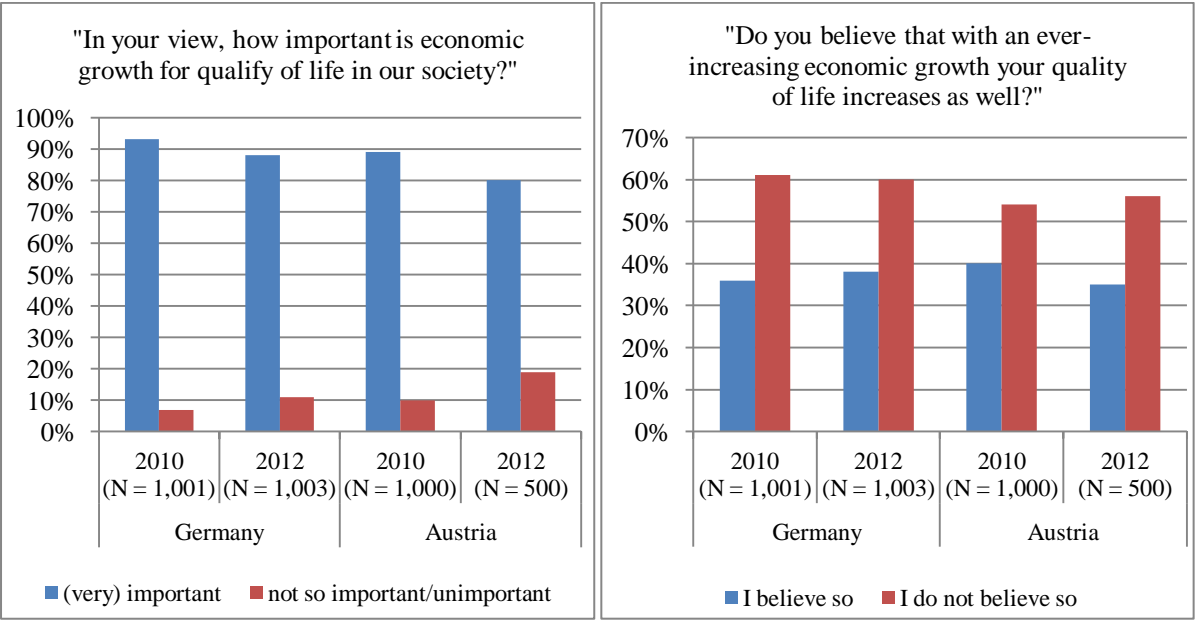


Figure 4.9. Perceived importance of economic growth for societal and personal quality of life.

Source: Bertelsmann Stiftung (2012)

There is a growing literature about the excessive attention given to the GDP in public policy, as well as about alternative indicators of welfare (van den Bergh, 2009; Stiglitz, 2009; Costanza et al., 2014). Survey results from Germany show that a significant majority of

people seem to be in favor of the introduction of an alternative welfare indicator which in the survey was called “Gross national happiness”. This finding is in line with the results of a Special Eurobarometer poll from 2011 and 2014. Here people were asked on which criteria progress should be based. One of four available answers was “mainly economic criteria such as the GDP”, which in 2014 was chosen by only 14% of Europeans, while 59% preferred an equal prioritization of economic, social and environmental criteria.

Another contextual consideration of economic growth is to look how it relates to attitudes towards consumption. Bowerman (2014) used focus groups and quantitative surveys to study consumption attitudes. A total of 24 participants were divided in two groups based on their response to the dichotomous choice question on priority for economic growth or environmental protection. Both groups had positive attitudes towards reducing consumption, albeit with different motivations. In addition, a sample of 300 respondents from the same study was asked to choose from two statements, which read as follows: (a) “We’ll be better off by consuming less and living more simply”, and (b) “We need to get the economy growing by consuming more goods and services”. 65% favored the first, 27% the second statement.

Finally, we investigate public beliefs about future economic growth. The results of several survey questions from different countries are summarized in Table 4.4. A poll from Japan finds that only about 30% of the population thinks that economic growth can continue to increase in the future, while most people are uncertain. At least partly this uncertainty might be caused by the ambiguous question wording, since it asks people to think about future economic growth of both Japan and “the world”. Next, a recent study from Austria shows that respondents are evenly split over whether the Austrian economy “can grow considerably in the next years”. In the same year, a survey from Germany finds that many people seem to be skeptical, not specifically about the potential of future GDP growth, but rather about the future of the growth-based economy in general. This might be one way of understanding for

72% agreement with the statement “When I see that our economy is growing year after year, I ask myself: For how long is this going to go well?”. Another EU-wide poll asked citizens in 2011, when they believed economic growth to return. The vast majority was pessimistic and expected this to take many years.

Table 4.4. Public beliefs about the future of economic growth

Source	Question wording	Responses (in %)					
UBA (German Federal Environmental Agency) (2015); <i>N</i> = 2,117; conducted in 2014 in Germany	Please tell us whether you completely, somewhat, rather not, or not at all agree with the following statements. “When I see that our economy is growing year after year, I ask myself: For how long is this going to go well?”	Somewhat agree	37	Completely agree	35		
www.wachstumimwandel.at (2015); <i>N</i> = 500; conducted in 2014 in Austria	“Do you think it is realistic that Austria's economy is growing considerably once again in the next years?”	Yes	51	No	47		
IHES, 2011; <i>N</i> = 500; conducted in 2011 in Japan	“Do you think world GDP and Japan's GDP can continue increasing?”	Yes	30	No	26	Uncertain	44
Eurobarometer (2011, wave 76.1), <i>N</i> = 26,856; conducted in 2011 in EU-27 countries	“When it comes to a return to growth in (OUR COUNTRY), which one of the following opinions is closest to your own?”	Already returning/in the coming months	17.5	Return in the coming years	39	Crisis going to last for many years	43.5

4.4 Discussion

Several points are worth considering when interpreting attitudes towards economic growth and the environment. The first concerns the role of question wording, which generally matters in the study of public opinion (e.g., Lodge and Taber, 2013), as well as specifically for environmental attitudes. For example, distinct public reactions have been identified to the terms “climate change” and “global warming” (e.g., Whitmarsh 2009, Schuldt et al., 2015).

More robust conclusions about public attitudes towards economic growth and the environment can be drawn if one is aware of how their relationship is exactly formulated in opinion studies, and what possible consequences this have.

To begin with, it is important to bear in mind that the pro-environmental options in questions about prioritizations (e.g., in the WVS) are phrased in a way that does not necessarily imply giving up the objective of economic growth. Instead, options typically include phrases like “slower economic growth” or “curbing economic growth”. In a review of the literature, Leiserowitz et al. (2005) called attention for identifying “public attitudes or preferences for particular levels or end-states of economic development (for example, infinite growth versus steady-state economies).” The fact that many people prioritize the environment over economic growth should not be interpreted as if all of those respondents are in favor of abandoning the commitment to economic growth. The study by Jagers (2009) may illustrate this point. As shown before, only 44% of Swedes find it a good idea to work “to work towards an environmentally friendly society even if it means *low or no* economic growth” (italics original), while 23% were against the proposition and 33% were neutral. In the same year, 63% of respondents prioritized environmental protection over economic growth in the WVS, 88% in the EB one year later, and again 88% two years later in the PEW survey (note that there was no neutral response option in these surveys). It seems plausible that the lower level of support for the pro-environmental statement is at least partly due to the more explicit wording. Future research should try to examine attitudes beyond growth in a more explicit way.

Furthermore, people tend to overestimate recent GDP growth rates which may have implications for how they prioritize both objectives. Think of the statement “protecting the environment even if this causes slower economic growth”. People may simply reduce an estimated high rate of economic growth to a somewhat lower (but still positive and not too low) when prioritizing environmental protection.

Besides question wording, another important consideration is the response format of questions. If one compares responses for questions using a dichotomous choice format and those using a Likert agreement scale, one can observe significant differences in pro-environmental priorities. An extreme example is the year 2010 in the US, when Gallup found 37% prioritizing the environment in a dichotomous choice, while PEW reported 77% agreement with the pro-environmental statement on the basis of a Likert scale – a gap of 40%. Differences between the widely discussed Gallup results and those of the PEW are on average almost 20%, which is considerable. Comparing results from PEW with the dichotomous choice question of the WVS that used the exact same pro-environmental statement (Table 4.2), differences are equally impressive (Figure 4.4). The most likely reason for this is the so-called acquiescence bias, which is the tendency of people to agree rather than disagree to a certain statement (Krosnick, 1999). All this indicates the importance of question wording and format when contemplating survey results on economic growth and the environment.

Another point worth noting is that choosing to prioritize the environment in the above survey questions – whether via choice or agreement – does not signal any immediate personal cost. This might explain a sometimes high share of the pro-environmental preferences. Previous research has shown that when the personal costs of holding a pro-environmental attitude increase or are made more explicit, support tends to go down (e.g., Diekmann and Preisendörfer, 2003).

It was found that many people view economic growth and environmental protection as compatible. A possible answer at the individual level may result from the theory of motivated reasoning. That is, those who do not hold either strong pro- or anti-growth views may be motivated to support the desired conclusion that both economic and environmental objectives can be achieved. According to motivated reasoning theory (Kunda, 1990), they will thus seek evidence to support this conclusion. Most of the standard survey questions offer this kind of “evidence” in the sense that a clear trade-off is avoided in the question wording. At the

institutional level, it seems plausible that media coverage and elite opinion play an important role (Harring et al., 2011). For example, there is preliminary evidence to suggest that recent social media discussions on the relationship between economic growth and the environment have become more positive (New Climate Economy, 2015). This is consistent with the findings of this paper that the favorable opinion about the compatibility of economic growth and the environment has slightly gone up in recent years.

With respect to prioritization of economic growth or environmental protection, our data shows on average fairly stable trends of public attitudes over the past 15 years. Overall, prioritization of the environment has gone down, but this decrease is typically less than 10%. There are still many countries in which majorities prioritize environmental protection. The most notable changes are more recent, which suggests an influence of the economic recession. For example, pro-growth attitudes have gone up much more strongly in Spain, which has experienced a very severe economic recession. In general, this is in line with previous research that examined the influence of the economic recession on environmental/climate attitudes through the use of inferential statistics (Brulle et al., 2012; Shum, 2012; Scruggs and Benegal, 2012; Conroy and Emerson, 2014). However, these studies do not use dependent variables that specifically capture the relationship between economic growth and the environment. An exception is Scruggs and Benegal (2012) who find that the national unemployment rate in the US is inversely related to prioritizing environmental protection over economic growth. It should be noted, however, that the authors of this particular study use data from Gallup poll, which has the strongest shifts in public opinion among all the American data sources, as we have shown.

A surprising finding is that most people in rich countries like Germany do not think that growth is important for their quality of life, nor do they perceive personal benefits from economic growth in general. Rises in household incomes are perhaps the most direct benefits that people can think of. As has been observed in many industrialized countries, increases in

median real incomes have been very low in the last two decades (e.g., Gordon, 2012; Gordon, 2014). In addition, very few people saw a positive effect of economic growth on income distribution in the Austrian poll.

Despite the lack of perceived personal benefits, most people continue to witness societal benefits from economic growth, which suggests ambivalent attitudes. What might explain this paradoxical finding? The 2014 poll from Austria showed that most people associate economic growth with positive effects on maintaining standards of living, “social peace”, and employment. A scenario of zero (or even negative) economic growth may thus be associated with losing such societal benefits. In other words, a widespread public perception may be that economic or societal stability is threatened in low/negative growth scenarios by unemployment and other problems. This is arguably seen as a social and not a personal issue, as it mostly affects others.

There is another puzzling question arising from the results. On the one hand, people appear to be skeptical whether economic growth can continue strongly in the future, or more generally whether a growth-based economy can be sustained. This may be explained by a general economic pessimism in rich countries. For example, a poll from 2014 shows that on average 65% of the population in various advanced countries believe their children will be financially worse off than their parents (PEW, 2014). On the other hand, most people are optimistic that growth and the environment can be combined. So, both optimism and pessimism are present when thinking about economic growth. It is possible that these findings simply represent different dimensions of attitudes towards growth, that is, people consider these questions largely independent of each other.

There are various avenues for future research. For example, qualitative research methods could help us to understand what people actually think about when they read phrases such as “environmental protection”, “slower economic growth” and “the environment suffers to some extent”, all of which are used in standard opinion polls. Future studies may investigate

whether people still prioritize environmental protection if future personal income would stop increasing or even fall. Finally, it was beyond the scope of this article to examine factors underlying these views, but it represents an important task for further research.

4.5 Conclusions

Over the last few years a considerable literature has emerged that has synthesized public opinion on various environmental issues. This study adds to this by zooming in on the relationship between economic growth, the environment, and prosperity. We focused on public attitudes in rich, industrialized countries, while providing some additional insights for middle-income countries. We find that many people tend to view economic growth and environmental protection as compatible rather than contradictory. However, some evidence suggests that large portions of the population in all countries are undecided or have seemingly inconsistent attitudes on this question. When pressed to choose between the two objectives, people more often than not prioritize the environment. This may be uplifting news for advocates of environmental protection and an economy beyond growth. However, we gave several reasons why the latter finding should be interpreted with caution. Most notably, these include the role of question wording and format, which can lead to significantly different responses. Moreover, many people have a limited factual knowledge about concepts and actual patterns of economic growth, while few people seem to associate it immediately to environmental problems. A further puzzling finding is that at least in rich countries, many people perceive societal but no personal benefits from further economic growth.

While debate on economic growth and the environment has intensified in recent years, this does not seem to have affected public opinion very much. Preferences for prioritizing environmental protection over economic growth are relatively stable. If one looks carefully, it appears that there is slightly less priority for environmental protection than a decade ago, while recently a higher percentage of respondents' belief in the compatibility of the two

objectives. In light of a lack of in-depth studies on this topic, research should further explore the revealed attitudes, longitudinal trends and underlying factors, for which it can learn much from the established literature on public opinion about climate change.

Chapter 5

Scientists' views on economic growth and the environment: The role of research fields, expertise, and ideology

5.1 Introduction

The old debate about economic growth and the environment has recently been revived. A general skepticism about the idea of an ever-growing economy was already expressed a long time ago by such eminent scholars as John Stuart Mill (1848) and John Maynard Keynes (1930). The particular focus on the environmental aspects of growth essentially emerged in the 1960's (e.g., Mishan, 1967) and received considerable attention in the 1970s, notably through the publication of the "The Limits to Growth" report by Meadows et al. (1972).¹⁴ For various reasons, these discussions eventually waned somewhat (Buttel et al., 1990). However, following the recent global economic crisis and the challenges posed by climate change, biodiversity loss and other global environmental changes, economic growth has become again a contested issue (Turner, 2008; Victor, 2010a; Schneider et al., 2010; Jackson, 2011; Daly, 2013; Antal and van den Bergh, 2014; Costanza et al., 2014). Even certain influential mainstream economists express particular forms of skepticism about economic growth: some argue that the times of high economic growth in rich countries like the US are over (Gordon, 2012; Gordon, 2014), others point out a "GDP fetishism" (Stiglitz, 2009), while again others ask whether it is time to reconsider the "growth imperative" (Rogoff, 2012).

Due to the complex nature of the growth-versus-environment debate, several research fields are involved in the analysis. Among these, ecological economics is probably most actively engaged in growth criticism (see the review by Victor, 2010b). Regarding climate science, it has been claimed that many of its researchers tacitly agree that "climate change

¹⁴ For additional relevant literature published around that time, see, Nordhaus and Tobin, 1972; Daly, 1973, Easterlin, 1974; Hirsch, 1976; Scitovsky, 1976; Sen, 1976; and Hueting, 1980.

commitments are incompatible with short- to medium-term economic growth” (Anderson and Bows, 2012). In mainstream (environmental) economics, these messages seem to go either mainly unnoticed, or the Environmental Kuznets curve is referred to, which suggests a positive relationship between economic growth and environmental quality above a certain threshold of GDP per capita (Grossman and Krueger, 1994; see also the review by Stern, 2004). Influential global reports such as “Better Growth, Better Climate” (New Climate Economy, 2014) convey outright optimism with respect to combining growth and reducing the risks of climate change (see also Hatfield-Dodds et al., 2015).

The main purpose of this chapter is to improve our understanding of the described controversy. We examine various aspects of the debate using a questionnaire survey that was specifically designed to this end. We follow the approach proposed by Javeline and Shufeldt (2014) who have recently called attention to the role of “scientific opinion” in policy making. They argued that scientific opinion can be measured by systematic surveys employing similar quality standards as public opinion surveys. While a few quantitative and qualitative studies have touched on several questions about growth and the environment (Berg and Hukkinen, 2011; Spash and Ryan, 2012; van Dalen and Koedijk, 2013; Howard and Sylvan, 2015), so far there is no comprehensive quantitative survey on this issue. In contrast, considerable research of scientific opinion is available on somewhat related topics, including climate change (Doran and Zimmerman, 2009; Rosenberg et al., 2010; Verheggen et al., 2014; Carlton et al., 2015) biodiversity (Rudd, 2011; Javeline et al., 2013; Hagerman and Satterfield, 2013), climate economics (Nordhaus, 1994), and other general economic issues (Fuchs et al., 1998).

This chapter has two main research aims. The first is to examine which issues in the economic growth debate indicate most agreement or disagreement across the range of researchers. In view of previous literature, a central hypothesis of this study is that specific, different views can be linked to each research field. The second aim is to investigate which factors apart from disciplinary differences explain variation in researchers’ views about

growth and the environment. Prior studies demonstrate that scientific opinion, just like public opinion, are influenced by a range of factors (e.g., Carlton et al., 2015; Randazzo and Haidt, 2015). Here we examine statistically how variables capturing expertise, political orientation, country of origin and several other factors are related to the researchers' views. In addition, we explore which reasons researchers give to explain disagreement on growth and the environment.

5.2 Method

5.2.1 Selection of respondents

To select relevant scientists and obtain their contact information, we used 'Scopus' as it is the largest global database of peer-reviewed literature. Moreover, it was convenient as it provided the email addresses of corresponding authors of documents resulting from search activities.

There were two main stages in the selection. In the first, we tried to assure that our sample included an adequate number of researchers with relevant expertise on the issue. To this end, we identified articles in whose titles both "economic growth" and various environmental terms ("environment", "climate", "emissions", "sustainability", etc.) appeared.¹⁵ This search was conducted for the period 2005-2014, resulting in 697 documents (i.e., corresponding authors). Additionally, we searched in article keywords with the same combinations of search terms as for the article titles. This step resulted in 3425 additional researchers.¹⁶ We checked all resulting documents for their relevance by screening the article title and, where necessary, the abstract, removing the irrelevant documents.¹⁷ This process resulted in 2369 unique names.

¹⁵ For several search terms, we used an asterisk at the end of the word to include variations (e.g., "environment*", which delivered results including both "environment" and "environmental").

¹⁶ Reproducibility of the sampling frame is limited: performing a search with the exact same keywords and algorithms at a later date will not deliver the exact same results, as Scopus continuously updates its database by including both recent and old publications.

¹⁷ This means we excluded articles if they combined, for example, "economic growth" and "*sustainable management of debt*", or "*human resources*".

The second stage of selection involved collecting names of researchers who may not have published with a focus on the growth-environment relationship, but whose knowledge and opinions are nevertheless relevant to the growth debate. To this end, we chose a number of important scientific journals in economics and environmental science, mainly based on their impact factor or scientific prestige. We drew random samples of authors who contributed to these journals. An obvious first choice was the *Journal of Economic Growth*: we invited all authors who published in this journal in the past ten years (2005-2014) and for who contact information was available. This resulted in 238 names. Next, we collected 3160 email addresses of authors from five prestigious, general economics journals – sometimes called the “Top 5” (Card and DellaVigna, 2013): *American Economic Review*, *Econometrica*, *Journal of Political Economy*, *Quarterly Journal of Economics*, and *The Review of Economic Studies*. This resulted in 1582 names after duplicates were removed.

The last part of the second search stage was to collect names of authors who published in a number of journals with an environmental focus. Here we used the period 2009-2014, because the volume of relevant published articles is much higher in these environmental journals. First, we collected 471 authors from two journals on environmental economics (*Journal of Environmental Economics and Management* and *Environmental and Resource Economics*) and another 500 randomly from *Ecological Economics*. Furthermore, 486 authors were added from the journal with the highest impact factor in the environmental social sciences: *Global Environmental Change*. Environmental scientists were randomly selected from several important journals: *Environmental Science and Technology* (500), *Journal of Climate* (500), and *Frontiers in Ecology and the Environment* (261). Finally, 320 authors were drawn from the multidisciplinary journal *Nature Climate Change*. In total, our sampling frame included 7434 authors (2369 first phase, 5065 second phase).

5.2.2 Survey implementation

An email invitation to participate anonymously in the survey was sent on 24 March 2015 to the individuals of the sampling frame described above. A unique identifier was used to avoid duplicate responses. Approximately 850 email addresses were invalid, meaning that the survey could not be delivered to the respective researchers. A small professional incentive was offered by giving respondents the option to be added to an email list which would inform them about potential survey results, ensuring that anonymity would be maintained. About 20% of all survey respondents used this option. On April 7 and 28 we sent out reminder emails to those individuals who had not yet responded. The survey was closed on 10 May. After accounting for invalid email addresses, the survey had a response rate of 12% ($N = 814$). This may seem comparatively low, but it is understandable for two reasons. First, considering our sampling strategy (Section 5.2.1), we likely invited many researchers whose main research focus or interest is not economic growth. Second, surveys in general suffer recently from declining response rates, and web surveys in particular have significantly lower response rates than other survey modes (Fan and Yan, 2010; Keusch, 2015).

5.2.3 Survey questions and sample characteristics

The survey questions intended to cover main aspects of the economic growth debate. To motivate researchers from various disciplines to provide their opinions, we used non-technical question wordings and response options. The survey was kept short to an approximate completion time of ten minutes.

There were two main sections. The first comprised more than 20 questions on economic growth and the environment. The participants could give additional comments following each question. We will draw on these comments only where notable patterns emerged, or where comments clearly help to qualify the responses. Analyzing all of them would go beyond the scope of this paper.

The second survey section included items that we expected to influence researchers' views on economic growth and the environment. We asked for the respondents' research focus (see Section 5.2.4 for how respondents were categorized into research fields), publication record (i.e., total number of peer-reviewed publications, on growth in general, and specifically on growth and the environment), formal education, professional affiliation, country of origin, age, gender, and political orientation. All exact question wordings can be found in the supporting material. Table 5.1 provides a summary of the key characteristics of the survey respondents.

Table 5.1. Key characteristics of the survey respondents ($N = 814$)

Variable	<i>n</i>	Variable	<i>n</i>	Variable	<i>n</i>
Age		Research field		Political ideology	
<30 years	29	GrowEc	34	Very left	61
30-39	263	GrowEnv	31	Left	260
40-49	239	OthEc	75	Slightly left	230
50-59	142	EnvEc	228	Center	121
≥60	105	EcoEc	131	Slightly right	59
Gender		EnvSoc	156	Right	34
female	193	EnvSci	159	Very right	4
male	609	# publications grow/env		Don't know	34
Education		0	288		
PhD	714	1-3	224		
Other	100	4-10	208		
Professional affiliation		11-29	57		
Academia	655	≥30	37		
Government	54	# publications growth			
Private	40	0	522		
Other	63	1-3	117		
Income of country of origin ^a		4-9	67		
High	669	10-19	35		
Middle/low	102	≥20	26		

Notes: ^aWe use the classification of The World Bank for high and middle/low income countries: <http://data.worldbank.org/about/country-and-lending-groups>. The research fields are described in subsection 5.2.4. Not all numbers add up to $N = 814$ due to missing data.

5.2.4 Categorization of respondents into research fields

The survey provided the respondents the option to indicate up to two main research areas. Based on these self-reports, we categorized the respondents into various groups of research fields (descriptive statistics are shown in Table 5.1). The procedure for this categorization is explained as follows (summarized in Table 5.2).

A first group comprises economists who described their main research areas as “growth theory” and/or “empirical analysis of growth”, and who did not select an environmental research area as a possible second option. In other words, this group is supposed to represent economists who focus purely on economic growth (hereafter simply called *GrowEc*). In addition, this group was cross-checked with responses to the questions on the number of publications (growth/environment, growth in general). A few respondents ($n = 6$) who were initially in this group had more publications on growth and environment than on growth in general. Among these, those who had selected theoretical or empirical analysis of growth as their primary area, combined with an environmental (or energy) field, were moved to the second group (*GrowEnv*). A third group includes other economists, such as macroeconomists or development economists, whose research areas include neither economic growth nor environment or energy (*OthEc*). A fourth group represents environmental & resource economics, that is, all respondents who selected this research area except those who had growth or ecological economics as the second choice (*EnvEc*). Accordingly, ecological economics is the fifth group (*EcoEc*). This also includes 36 respondents who chose both environmental & resource economics and ecological economics as their research areas.¹⁸ A sixth group consists of other environmental social scientists (e.g., environmental sociologists, psychologists), who were not classified into any of the prior groups (*EnvSoc*). Finally, a seventh group encompasses environmental scientists, that is, respondents from the natural or environmental sciences, who did not belong to any of the previously mentioned social sciences (*EnvSci*). Finally, note that hereafter we will use the term “research fields” to refer to these seven groups, as they involve (sub-)disciplines of economics as well as broader areas of research, like ecological economics, and even sets of distinct disciplines, like environmental social sciences.

¹⁸ This decision was motivated by an initial analysis of the survey data which shows that there were no statistically significant differences between (almost all) responses by the groups of ecological economists and those selecting both environmental & resource and ecological economics as their research areas.

Table 5.2. Categorization of respondents into research fields

Research field	Abbreviation	Combinations of fields
Growth economists with non-environmental focus	<i>GrowEc</i>	“Empirical analysis of growth” and “growth theory” together or as single choice, possibly combined with another non-environmental research area.
Growth economists with environmental focus	<i>GrowEnv</i>	“Empirical analysis of growth” or “growth theory” combined with another environmental or energy research area.
Other economists with non-environmental focus	<i>OthEc</i>	All other economic fields (e.g., “public economics” and/or “development economics”); without environmental research area.
Environmental & resource economists	<i>EnvEc</i>	“Environmental & resource economics”, possibly combined with another environmental or energy research area, except “ecological economics”.
Ecological economists	<i>EcoEc</i>	“Ecological economics”, possibly combined with another environmental or energy research area.
Other environmental social scientists	<i>EnvSoc</i>	All other environmental social sciences, such as “environmental politics”, “environmental psychology” or “environmental sociology”.
Environmental scientists	<i>EnvSci</i>	“Atmospheric sciences”, “ecology”, “biology”, “geosciences”, “chemistry” or “physics”; not combined with any social sciences.

5.2.5 Data analysis

Most questions were in a closed format. The responses were analyzed using different statistical techniques. In each subsection, we present the descriptive results for the total sample as well as for the research fields. This is followed by regression analyses using all independent variables expected to influence views on growth. Note that in the analysis we added missing responses to the responses labeled as “no opinion”.

One survey question was designed in an open-ended format, namely regarding the reasons for disagreement on growth and environment. The provided answers were coded systematically involving the authors as well as two independent coders. An initial coding scheme was established by the first author after examining 20% of the responses. This initial

scheme was discussed with the second author and subsequently modified. Two research assistants were trained in the use of the final scheme and eventually coded all responses independently. Percentage agreement between the three coders (the first author and the two assistants) was 58 %. All remaining disagreements were resolved in a subsequent discussion among the three coders.

Relatively few respondents (always less than 25%) used the option to provide additional comments. The first author analyzed and coded all answers in order to look for important emerging themes. The use of three coders was avoided here for two reasons: a) a detailed analysis of all comments is not a main research aim; b) time and resource constraints.

5.3 Findings

5.3.1 Responses to diverse statements about economic growth

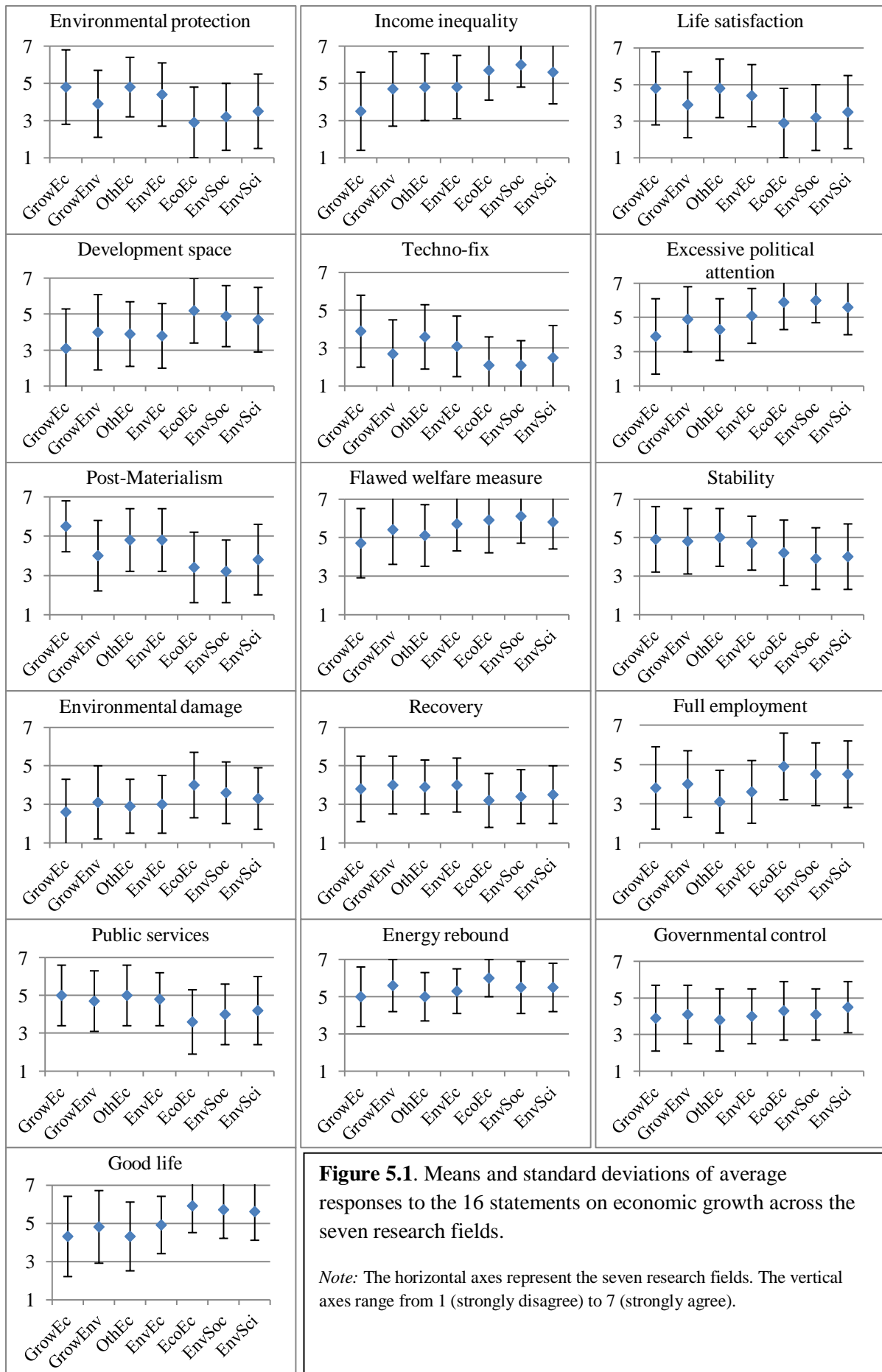
We begin by analyzing a series of 16 statements on economic growth to which the participants responded. Response options for all questions were provided on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Table 5.3 reports the original statements and the percentage distribution of responses for the total sample. The accompanying Figure 5.1 shows the means and standard deviations of average responses by respondents in each of the seven research fields. In the following we will illustrate the main results and insights.

The overall results show a wide distribution of views on all the 16 statements (Table 5.3). For example, the sample is almost equally divided on whether growth is necessary to improve life satisfaction (statement 3 in both tables), or whether people care more about the environment when their incomes rise (statement 7). In contrast, most agreement (~80%) is found for the propositions that the GDP is a seriously flawed welfare indicator (statement 8), and that growth generates energy rebound (statement 14).

Table 5.3. Percentage distribution of responses to 16 statements on economic growth

	Abbreviation	Original statement	Strongly disagree	Disagree	Some-what disagree	Neither/nor	Some-what agree	Agree	Strongly agree	No opinion
1	Environmental protection	Economic growth is necessary to finance environmental protection.	12.2	22.0	13.1	7.9	17.6	16.8	9.0	1.5
2	Income inequality	Making the income distribution more equal should get a higher priority than economic growth.	3.1	6.6	10.1	9.0	15.1	22.9	32.2	1.1
3	Life satisfaction	Continued economic growth is essential for improving people's life satisfaction.	12.8	21.0	15.2	8.0	15.6	18.4	7.6	1.4
4	Development space	In view of limited natural resources, rich countries may have to give up their economic growth to assure that all poor people in the world can reach a fair standard of living.	5.9	15.5	14.1	10.3	19.3	16.8	16.7	1.4
5	Techno-fix	Technology can solve all environmental problems associated with economic growth.	29.4	27.3	15.8	5.9	13.1	4.5	2.8	1.1
6	Excessive political attention	Politicians are overly concerned about economic growth.	3.1	7.1	6.4	8.7	14.1	28.0	31.1	1.5
7	Post-Materialism	Economic growth raises incomes which in turn make people care more about the environment.	10.6	14.7	13.0	10.6	24.6	19.0	6.4	1.1
8	Flawed welfare measure	The GDP is a flawed measure of social welfare.	1.6	4.1	6.1	6.3	15.1	24.9	40.2	1.7
9	Stability	Without economic growth the economy will become less stable.	3.1	14.7	13.3	15.6	22.4	22.0	6.8	2.2
10	Environmental damage	Economic growth always harms the environment.	10.9	29.0	22.1	7.6	18.4	8.6	2.6	.7
11	Recovery	Future economic growth will recover and again be as high as in the past.	5.5	18.6	19.3	24.9	13.0	11.1	1.4	6.3
12	Full employment	Full employment can be achieved without economic growth.	6.1	17.2	15.1	12.0	18.6	21.0	6.0	3.9
13	Public services	Economic growth is necessary to finance public services like health and pensions.	3.7	14.4	15.6	13.3	21.7	20.9	8.6	1.8
14	Energy rebound	Energy savings due to technological advances are partly undone by further economic growth.	.9	2.6	5.0	8.6	25.2	33.0	20.9	3.8
15	Governmental control	Economic growth can be controlled by the government.	3.4	15.4	15.7	13.9	31.2	14.5	3.3	2.6
16	Good life	A 'good life' without economic growth is possible.	2.9	5.2	9.1	8.7	16.2	30.3	25.3	2.2

Notes: The following sentence introduced the series of statements in the questionnaire: "Here is a list of statements about the GDP, economic (GDP) growth, and social and environmental issues. All statements refer generally to rich industrialized countries (Canada, European countries, Japan, USA, etc.) and global environmental problems (biodiversity loss, climate change, etc.), except when stated otherwise. Please try to give us your opinion about each statement even if you are not completely sure."



A key insight from the disaggregated results is that for all 16 questions there are statistically significant differences in mean values between the seven research fields (using one-way ANOVA tests). To examine exactly which research fields differ in their views, we conducted Bonferroni post-hoc tests. Overall, the results show that for most statements the differences have similar patterns: On the one hand, *GrowEc*, *OthEc*, and *EnvEc* tended to give similar answers. On the other, responses of *EcoEc*, *EnvSoc* and *EnvSci* were much alike. *GrowEnv* is positioned somewhat in between these two main camps, depending on the specific statements. As to the concrete research fields, *EcoEc* is the group with mean values at one end of the spectrum for most statements, while *GrowEc* represented the group that most often was at the other end of the spectrum of views.

To examine which factors may be related to the distinct views, we ran multivariate OLS regression analyses for each of the 16 statements. Table 5.4 presents a summary of the results, indicating whether an independent variable has a statistically significant positive or negative effect on the dependent variable (detailed regression results are available upon request). The results substantiate the prior findings regarding the existence of two main camps of research fields with distinct views in our sample. There are some interesting exceptions to these patterns. For two questions we find very small differences between research fields, namely regarding the flaws in GDP as a welfare measure (statement 8), and the possibility of governmental control of growth (statement 15). Furthermore, *OthEc* tends to be more optimistic about techno-fixes than *EnvEc* (statement 5).

The most noteworthy finding concerning the additional independent variables is that political orientation is statistically significant for all 16 statements. Moreover, its standardized regression coefficients are typically the highest of all variables. In other words, this indicates that views on economic growth are strongly affected by political ideology. The results for the first variable of expertise, the number of publications on growth and environment, generally show no significant relationships with the expressed views on growth. The second variable,

number of publications on growth in general, shows that occasionally more expertise is related to more favorable views regarding the link between growth and prosperity (e.g., statement 13 on public services).

Table 5.4. Summary of multiple regression results for the 16 statements

	1. Environmental protection	2. Income inequality	3. Life satisfaction	4. Development space	5. Techno-fix	6. Excessive political attention	7. Post-materialism	8. Flawed welfare measure	9. Stability	10. Environmental damage	11. Recovery	12. Full employment	13. Public services	14. Energy rebound	15. Governmental control	16. Good life
<i>GrowEc</i>						(-)	(-)									
<i>GrowEnv</i>							-									
<i>OthEc</i>				+	-		-				(-)		(-)			
<i>EcoEc</i>	-	+	-	+	-	+	-		(-)	+	-	+	-	+		+
<i>EnvSoc</i>	-	+	-	+	-	+	-		-	+	-	+	-			+
<i>EnvSci</i>	-	+	-	+	-	+	-		-	+	-	+	-	+		+
# publicat. growth/env		(+)														
# publicat. growth	+		(+)			+	(-)					+				
Phd							(+)									
Political orientation	+	-	+	-	+	-	+	-	+	-	+	-	+	-	-	-
Poor/middle income country	+	+	+				(-)		(+)		(-)	+				-
Age					-											
Male gender		-	+			+		+								
Gov. affiliation			(+)				(-)									
Private affiliation				(-)		-										
<i>Adj. R²</i>	20.4	26.1	23.4	14.6	19.4	19.8	26.4	10.9	7.7	9	7.6	18.9	19.8	8.1	0.3	17.1
<i>N</i>	802	805	803	803	805	802	805	800	796	808	763	782	799	783	793	796

Note: + indicates a significant positive effect at $p < 0.05$. - significant negative effect at $p < 0.05$. (+/-) significant at $p < 0.1$.

Finally, we make several observations based on the optional comments related to these 16 survey questions. Most comments concerned the general nature of the statements. About 5% of the comments can be considered as general reflections on the relationship between growth and the environment (e.g., respondents stating that there is no conflict). Some respondents

criticized the lack of definition and/or context of economic growth (i.e., growth in rich or poor countries). However, we regard such criticism as invalid because the introductory text of the first survey section clearly stated that the questions refer to “GDP” growth, “rich industrialized” countries, and “global” environmental problems (see also the footnote of Table 5.3).¹⁹ As to the specific survey questions: since none of the 16 statements was commented on by more than 2% of the respondents, we do not further consider these comments here.

5.3.2 Favored GDP growth rate

The next question on the desirability of economic growth asked respondents which rate of GDP growth the governments of rich countries should aim for in the next decade. Figure 5.2 presents a comparison of median and mean values of the favored growth rate across the seven research fields.

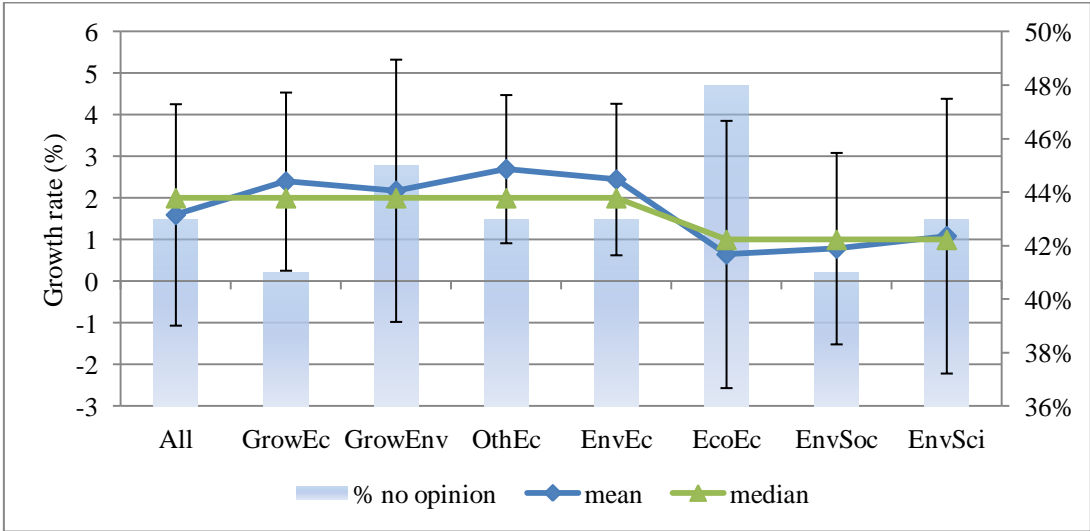


Figure 5.2. Mean and median of favored GDP growth rate (left vertical axis), by research field.

Note: Original question wording: “Which average annual rate of economic growth should governments of rich industrialized countries aim for in the next decade?” Blue bars denote the percentage of responses indicating no opinion (right vertical axis).

¹⁹ Similar comments about the supposed lack of defining “economic growth” were occasionally made with regard to subsequent questions. In view of the rebuttal presented in the main text, we do not pay further attention to this issue.

The overall results show that 4.5% of the respondents favored a negative growth rate, 9.3% a zero growth rate, 10.4% a 1% growth rate, 25.8% a 2-3% growth rate, and 6.5% a growth rate of more than 3%. The median preferred growth rate was 2%.

There is some diversity of views between the seven groups as shown by Figure 5.2, revealing similar patterns compared to the previously analyzed attitude statements. In general, *GrowEc*, *GrowEnv*, *OthEc*, and *EnvEc* have fairly similar preferences, namely a median GDP growth rate of 2%. On the other hand, *EcoEc*, *EnvSoc* and *EnvSci* have median favored growth rates of 1%. We performed a Kruskal-Wallis test which shows that group differences are statistically significant ($p < 0.01$). Pairwise comparisons between research fields using Wilcoxon rank sum tests indicate that *GrowEc*, *OthEc* and *EnvEc* are significantly different from *EcoEc*, *EnvSoc* and *EnvSci* ($p < 0.05$, BH adjustment), with the exception of the comparison between *GrowEc* and *EnvSci* ($p = 0.1$). *GrowEnv* is not significantly different from any other field. However, considering the mean values and standard deviations suggests that (a) the differences between groups may be larger than what the median values indicate, and (b) that within-group variation is considerable, especially for *GrowEnv*, *EcoEc* and *EnvSci*.

An additional important finding is that 353 respondents (43%) did not state a favored growth rate (see the light blue bars in Figure 5.2). This may appear high, but is consistent with non-responses found in other studies of scientific opinion (e.g., Fuchs et al., 1998). Non-response is roughly the same across the research fields, as can be seen in Figure 5.2. This indicates high uncertainty in the responses to this question. What may explain this high percentage of non-response? The optional comments provided for this question give us some insight into this. An often mentioned comment is that governments should not aim for any specific growth target, either because growth is not a desirable end itself, because it is plainly undesirable, or because the government has no control over it anyway.

We recoded responses to this question into three categories and conducted a multinomial logistic regression comparing those who favored a positive growth rate (the reference category) with those who preferred a zero or negative growth rate, and those who had no opinion (Table 5.5). The results show that *EcoEc*, *EnvSoc* and *EnvSci* are significantly more likely to prefer a zero or negative growth rate than *EnvEc* (the reference group). Respondents with a political left-wing orientation are significantly more likely to favor a zero or negative growth rate, but also to have no opinion on this question.

Table 5.5. Multinomial logistic regression analyses of preferred growth rates

Variable	zero/negative growth			no opinion		
	B	p	Exp(B)	B	p	Exp(B)
Intercept	.034	.966		.207	.720	
<i>GrowEc</i>	.724	.435	2.063	-.269	.588	.764
<i>GrowEnv</i>	.994	.262	2.702	.419	.369	1.520
<i>OthEc</i>	-.290	.725	.748	-.106	.731	.899
<i>EcoEc</i>	1.683	.000	5.381	.461	.076	1.586
<i>EnvSoc</i>	2.208	.000	9.099	.327	.210	1.387
<i>EnvSci</i>	1.917	.000	6.798	.479	.056	1.615
# publicat. growth/env.	.000	.998	1.000	-.001	.875	.999
# publicat. growth	-.008	.793	.992	-.010	.557	.990
Phd	-.421	.247	.656	-.006	.982	.994
Political orientation	-.484	.000	.617	-.156	.024	.855
Low/middle income country	-.676	.141	.509	-.393	.139	.675
Age	-.002	.833	.998	.009	.224	1.009
Male gender	-.327	.256	.721	-.143	.504	.867
Governm. affiliation	-.546	.282	.579	-.871	.015	.419
Private affiliation	.674	.216	1.962	.554	.180	1.740
<i>Nagelkerke R²</i>	17.8					
<i>N</i>	701					

Note: The reference category of the dependent variable is the preference for “positive growth”.

5.3.3 When and why economic growth may end or not

Now we examine answers to the question of when economic growth in rich countries may or may not come to a permanent end. Many respondents (43%) believed that this will be the case sooner or later. Fewer respondents (33%) thought that this will never happen, while 24% had no opinion. The median response of the 621 researchers who expressed an opinion was “in more than 100 years”.

The disaggregated responses, as shown in Figure 5.3, are in line with expectations about differences between research fields. Median responses suggest that *GrowEc*, *OthEc* and *EnvEc* are the most convinced that growth will “never” end. The median response by *GrowEnv* is “in more than 100 years” and therefore differs slightly from the aforementioned groups of economists. The remaining groups of research fields are less convinced. The nearest end of economic growth is expected by *EcoEc* and *EnvSci*, with a median response of “25-50 years”, while for *EnvSoc* it is “50-100 years”.

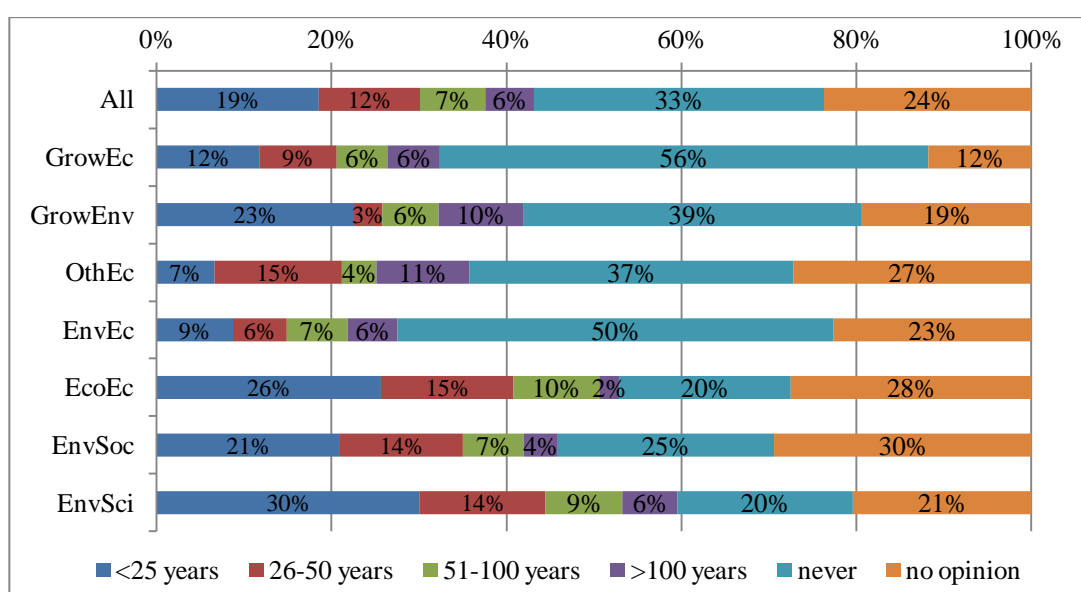


Figure 5.3. Beliefs about the timing of an end to growth, by research field.

Note: Original question wording: “Roughly speaking, when do you think economic growth in rich industrialized countries will permanently come to an end?” Response options: 1=in less than 10 years; 2= in 10-25 years; 3=25-50 years; 4=50-100 years; 5=more than 100 years; 6=never. Response options 1 and 2 are integrated here to improve clarity of the presentation..

According to a Kruskal-Wallis test, medians across the fields are significantly different from one another ($p < 0.01$). Subsequent Wilcoxon rank sum tests show that *GrowEc*, *OthEc* and *EnvEc* are all significantly different from *EcoEc*, *EnvSoc* and *EnvSci* ($p < 0.05$).

Table 5.6 presents the results of a multinomial logistic regression analysis. It shows that *OthEc*, *EcoEc*, *EnvSoc* and *EnvSci* are all significantly more likely to believe in an end to economic growth than *EnvEc* (the reference group). This belief is also more likely held by researchers with a higher number of publications on growth and the environment, those with

left political orientation or female gender. The second category of the dependent variable used in the regression model is “no opinion”. The results show that the same variables as before predict a more likely association with having no opinion on this question. In addition, we find that respondents are more likely to have no opinion when they: (a) have fewer publications on growth in general, (b) have a PhD, and (c) are not affiliated with the government.

Table 5.6. Multinomial logistic regression analysis of “belief in end of growth” and “no opinion”

Variable	Belief growth will end			No opinion		
	B	p	Exp(B)	B	p	Exp(B)
Intercept	1.388	.031		1.283	.079	
<i>GrowEc</i>	.748	.165	2.113	.220	.768	1.246
<i>GrowEnv</i>	.813	.119	2.254	.542	.383	1.719
<i>OthEc</i>	.877	.017	2.405	1.040	.007	2.830
<i>EcoEc</i>	1.590	.000	4.904	.995	.004	2.705
<i>EnvSoc</i>	1.201	.000	3.325	.814	.010	2.258
<i>EnvSci</i>	1.945	.000	6.995	.752	.031	2.122
# publicat. growth/env.	.025	.016	1.025	.022	.047	1.023
# publicat. growth	-.020	.275	.980	-.054	.059	.948
Phd	.259	.383	1.296	.939	.016	2.558
Political orientation	-.383	.000	.682	-.416	.000	.660
Low/middle income country	.034	.908	1.035	-.392	.299	.676
Age	-.010	.233	.990	-.012	.207	.988
Male gender	-.466	.061	.627	-.721	.008	.486
Governm. affiliation	.389	.335	1.475	.807	.059	2.242
Private affiliation	-.077	.867	.925	.679	.147	1.973
<i>Nagelkerke R²</i>	21.7					
<i>N</i>	701					

Note: reference category is the belief that growth will “never” end

We make some observations related the optional comments by the respondents. Some 3% of respondents mentioned they found it difficult, if not impossible, to make a long-term prediction as asked in this question. Others mentioned that the possibility of endless growth depends on issues such as technological progress, rates of dematerialization, and how growth is measured. In general, each of these and other reasons was mentioned by no more than 2% of respondents.

Next, we elicited views on various factors that may contribute to either an end or a continuation of economic growth. Those respondents who indicated in the preceding question

that growth will end were presented with a different set of factors than those who indicated a belief in never-ending growth or who had no opinion.

Figure 5.4 shows the factors contributing to an end of economic growth. Overall, “environmental problems” is mentioned most often as a “very important” factor (53%), followed by scarcity of “energy resources”, “material resources”, and “growing inequality”. Differences across the research fields are very small (see Table 1 in Appendix A5.2). This is probably due to the survey design, which (dichotomously) separated respondents based on their beliefs about whether growth will never end or not.

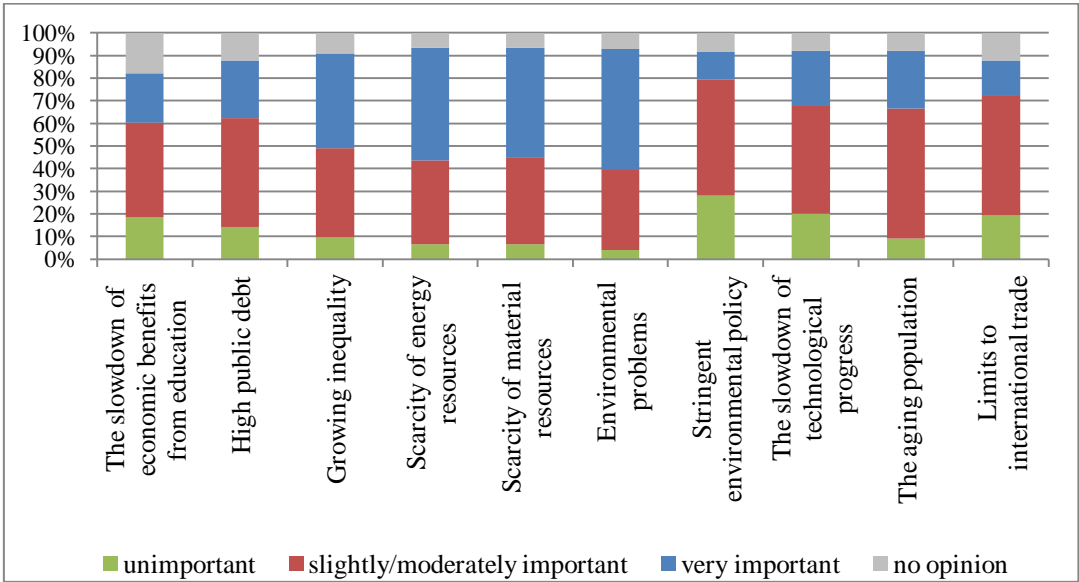


Figure 5.4. Importance of factors contributing to end of growth, for subsample of respondents ($n = 544$) who previously did not indicate that growth may be never-ending.

Note: Original question wording: “How important do you consider the following factors as contributing to a permanent end of economic growth in rich countries?”

Figure 5.5 reports the results for the factors that contribute to never-ending growth. Overall, the statement “the increase in knowledge is boundless” was indicated most frequently as a “very important” factor, followed by the conceptually similar factors “technological change has no limits” and “all non-renewable energy resources can be replaced by renewable ones”. At least moderate importance was given to the “opportunities that international trade

affords”. This pattern holds generally for the research fields as well (Table 2 in Appendix A5.2).

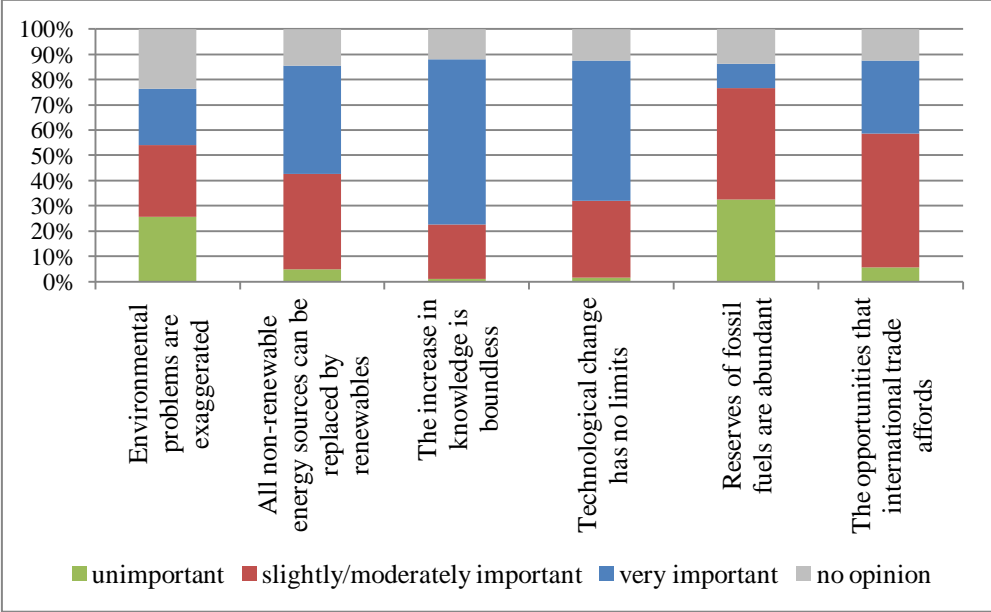


Figure 5.5. Importance of factors contributing to never-ending growth, for subsample of respondents ($n = 270$) who previously indicated that growth may be never-ending.

Note: “How important do you consider the following factors as contributing to a permanent end of economic growth in rich countries?”

The finding that environmental problems are considered as the most important factor seems to be broadly consistent with a study by Howard and Sylvan (2015) who find that most of their surveyed economists think that climate change will negatively affect future economic growth.

5.3.4 Compatibility of growth with 2° C climate policy target

We continue by reporting the results for a question regarding growth and climate policy, namely whether global GDP growth can be made compatible with the internationally agreed 2° C target. The responses to this question are summarized in Figure 5.6. First of all, the responses of the total sample indicate a somewhat lower variation of views compared to the previous questions. 61% of the respondents judged the compatibility as unlikely or very

unlikely, 14.1% think there is about an even chance, and 18.7% estimated it as likely or very likely. The median answer is “unlikely”. Non-response was relatively low to this question (6.3%). These results suggest that the respondents are generally quite pessimistic. The only two research fields that are slightly more optimistic were *GrowEc* and *OthEc* which both had a median response of 2.5, that is, between “unlikely” and “about an even chance” (Figure 5.6). A Kruskal-Wallis test indicates that the group medians are significantly different from one another ($p < 0.01$). Subsequent Wilcoxon rank sum tests show that *GrowEc*, *OthEc* and *EnvEc* are all significantly different from *EcoEc*, *EnvSoc* and *EnvSci* ($p < 0.05$).

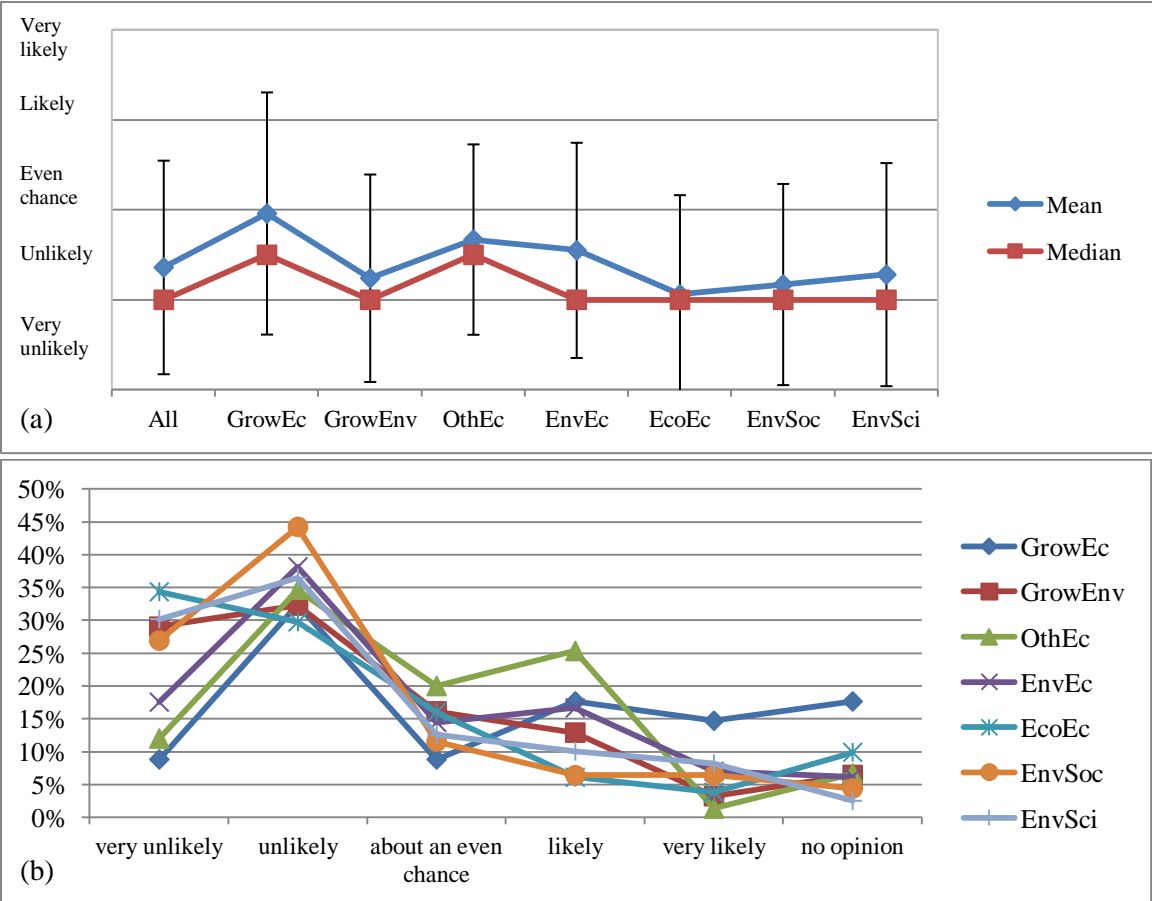


Figure 5.6. Likelihood of combining global GDP growth and the 2° C climate target, by research field. Figure 5.6a shows mean (SD) and median responses. Figure 5.6b shows percentage distributions.

Note: Original question wording: “Globally, greenhouse gas emissions per unit of GDP were reduced by less than 1.5% per year in the period 1970–2013. Studies indicate that to have a fair chance of staying below 2°C warming by the end of the century, at least a 4.4% emissions reduction is required per year until 2050. This assumes that per capita GDP growth continues at an average 1.5% annual rate. All other things being equal, how likely do you think it is that this GDP growth goal and the 4.4% emission reduction goal can be combined?”

Table 5.7 presents the results of a multiple regression analysis showing that researchers who self-identified as *EcoEc*, *EnvSoc* and *GrowEnv* are all significantly associated with seeing the compatibility of global GDP growth and reaching the 2°C climate policy target as more unlikely ($p < 0.1$ in the case of *GrowEnv*). Right-wing political orientation and low/middle income country of origin are related to more pessimistic views. Neither expertise nor any other variable has a significant influence on the responses to this question.

Table 5.7. OLS regression analysis predicting likelihood of combining the goal of growth and the 2°C climate target

	B	Std. error	Beta	p
Constant	1.760	.291		.000
<i>GrowEc</i>	.293	.264	.049	.268
<i>GrowEnv</i>	-.451	.260	-.069	.083
<i>OthEc</i>	.047	.172	.011	.787
<i>EcoEc</i>	-.390	.140	-.122	.005
<i>EnvSoc</i>	-.379	.132	-.130	.004
<i>EnvSci</i>	-.214	.129	-.074	.097
# publicat. growth/env.	.001	.004	.012	.779
# publicat. growth	-.001	.009	-.003	.953
Phd	.024	.140	.006	.867
Political orientation	.141	.036	.152	.000
Low/middle income country	.514	.139	.145	.000
Age	.005	.004	.051	.208
Male gender	.027	.110	.010	.807
Government. affiliation	-.066	.173	-.014	.704
Private affiliation	-.112	.202	-.021	.579
<i>Adj. R</i> ²	7.2			
<i>N</i>	718			

5.3.5 Favored growth-environment strategy

Next, we analyze responses to a general question about which growth-environment strategy the governments of rich countries should pursue. The overall distribution of responses, shown in Figure 5.7, looks as follows: less than 1% favored pursuing growth despite its environmental impacts (“growth-at-all-costs”), 42% favored to pursue economic growth as it can be made compatible with environmental sustainability (“green growth”, e.g., Bowen and

Fankhauser, 2011), 31% supported a strategy of ignoring economic growth as a policy aim (“agrowth”, e.g., van den Bergh, 2011), and 17% preferred stopping economic growth altogether (“degrowth”, e.g., Kallis, 2011).²⁰ Moreover, 8% of the respondents preferred another strategy which they could specify in an open-response field. An analysis of these answers shows that the most frequent theme ($n = 21$) can be considered as slightly modified versions of the “green growth” strategy. A few more answers are very similar to either “agrowth” or “degrowth”. Additional distinct opinions were that the government should have no welfare goals or should not interfere with markets.

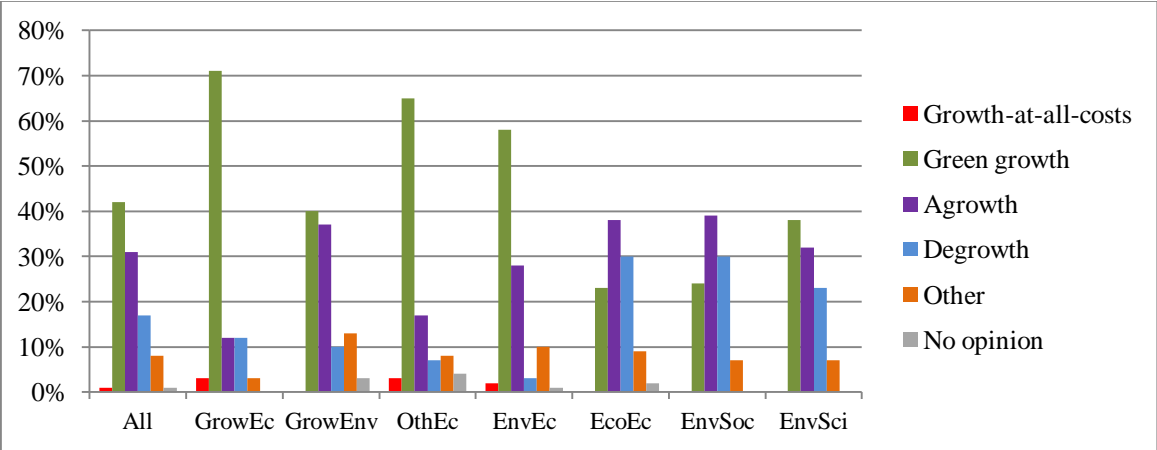


Figure 5.7. Favored growth-environment strategy in rich countries, by research field

Note: Original question wording: “Here are several positions on the relation between economic growth and the environment. Which of them is closest to your own opinion? Public policy in rich industrialized countries should ... (1) further pursue economic growth in spite of its environmental impacts. (2) further pursue economic growth. There are many ways to make economic growth compatible with environmental sustainability. (3) ignore economic growth as a policy aim, that is, be completely neutral about growth. This will amplify the policy spectrum to combine well-being and environmental sustainability goals. (4) stop pursuing economic growth. Production and consumption need to be downscaled in an equitable way to achieve environmental sustainability. (5) other (please specify).

We find similar patterns as before in the disaggregated results. *GrowEc*, *OthEc*, and *EnvEc* are the most committed to a pro-growth view, as the majority of respondents in each of these research fields chose “green growth” as their preferred option. For all other fields the preferences for the different strategies are more evenly distributed. We conducted Chi-square

²⁰ Note that these labels (“growth-at-all-costs” etc.) are only used here but were not presented as such in the questionnaire.

and post-hoc tests for multiple comparisons of preferences. *Grow*, *OthEc*, *EnvEc* were more likely to favor “green growth” than *EcoEc*, *EnvSoc* and *EnvSci* ($p < 0.05$). Responses by *GrowEnv* were not significantly different from those of any other group, which shows again the middle position of this group.

Table 5.8 reports the results of a multinomial logistic regression analysis. Using “green growth” as the reference category, it shows that *EcoEc*, *EnvSoc*, and left-wing political orientation are significantly more likely to be associated with favoring “agrowth” as well as “degrowth”. In addition, *GrowEc*, *GrowEnv*, *EnvSci* are more likely to favor “degrowth”. At first sight, this result appears surprising. However, it should be considered that *EnvEc* serves as the reference group, which had the lowest percentage of preference for “degrowth” as shown in Figure 5.7.

Table 5.8. Multinomial regression analysis comparing preferences for three growth-environment strategies, with “green growth” as reference category

Variable	Agrowth			Degrowth		
	B	p	Exp(B)	B	p	Exp(B)
Intercept	1.513	.022		-.623	.521	
<i>GrowEc</i>	-2.056	.056	.128	2.756	.003	15.735
<i>GrowEnv</i>	.952	.077	2.592	2.298	.027	9.953
<i>OthEc</i>	-.612	.118	.542	1.285	.112	3.613
<i>EcoEc</i>	1.152	.000	3.164	3.632	.000	37.798
<i>EnvSoc</i>	.946	.001	2.576	3.616	.000	37.192
<i>EnvSci</i>	.467	.088	1.596	2.986	.000	19.811
# publicat. growth/env.	-.006	.567	.994	-.006	.662	.994
# publicat. growth	-.035	.171	.966	-.062	.095	.940
Phd	-.463	.179	.630	-.193	.652	.824
Political orientation	-.337	.000	.714	-.872	.000	.418
Low/middle income country	-1.048	.002	.351	-.143	.723	.867
Age	-.011	.236	.989	.013	.262	1.013
Male gender	.063	.798	1.065	-.368	.218	.692
Governm. affiliation	-.505	.167	.603	-.636	.238	.529
Private affiliation	-.549	.224	.578	-.426	.454	.653
Nagelkerke R^2	36.2					
<i>N</i>	639					

Furthermore, researchers from high income countries are more likely to favor “agrowth” than those from low and middle income countries. We also find that researchers with more

publications on growth in general are significantly less likely (though only at $p < 0.1$) to be associated with “agrowth” or “degrowth”.

We conducted another multinomial logistic regression using the 16 statements of Section 5.3.1 as independent variables (Table 5.9). This aims to understand which specific views on growth underlie a favored growth-environment strategy. The results show that those preferring either “agrowth” or “degrowth” are more likely to be associated with disagreement to the ideas that growth is necessary for improving happiness and for maintaining public services, and with agreement to the idea that full employment can be achieved without growth. There are also differences between the two strategies. Those who favor “agrowth” are significantly more likely to disagree that growth is necessary for environmental protection, and more likely to agree that politicians are overly concerned about growth.

Table 5.9. Multinomial logistic regression for growth-environment strategy, using the 16 statements about growth as predictors

Variable	Agrowth			Degrowth		
	B	p	Exp(B)	B	p	Exp(B)
Intercept	-.295	.817		-6.760	.005	
Environmental protection	-.295	.002	.744	-.240	.133	.787
Income inequality	.089	.333	1.093	.276	.068	1.317
Life satisfaction	-.272	.006	.762	-.595	.000	.552
Development space	.125	.158	1.133	.444	.001	1.559
Techno-fix	.031	.749	1.031	-.215	.181	.807
Excessive political attention	.243	.016	1.275	.203	.203	1.225
Post-Materialism	-.085	.376	.919	-.189	.160	.828
Flawed welfare measure	-.010	.917	.990	.205	.192	1.228
Stability	-.141	.191	.869	-.057	.685	.945
Environmental damage	.180	.074	1.198	.648	.000	1.912
Recovery	-.121	.217	.886	.065	.643	1.067
Full employment	.253	.010	1.287	.457	.003	1.579
Public services	-.321	.003	.725	-.577	.000	.561
Energy rebound	.203	.094	1.226	.217	.261	1.242
Governmental control	-.105	.265	.900	.077	.561	1.080
Good life	.156	.210	1.169	.069	.738	1.071
<i>Nagelkerke R²</i>	70.2					
<i>N</i>	609					

In contrast, favoring “degrowth” is associated with a concern about development space for poorer countries, with a priority for reducing inequality, and with believing in environmental harm from growth.

Finally, it makes sense to examine how the growth-environment strategy corresponds to the preferences regarding the GDP growth rate. To this end, we performed a cross-tabulation. That is, we calculated the average preferred GDP growth rate for the people who supported any of the five growth-environment response options. This is shown in Figure 5.8. The few people who favored “growth-at-all-costs” had the highest preferred economic growth rate (median = 2.5%), followed by those supporting “green growth” (median = 2%). The findings further show that the third option (“agrowth”) was associated with a median GDP growth rate of 1%, while the fourth one (“degrowth”) with 0% rate. In addition, note that “agrowth” supporters are the group that most often did not state a favored GDP rate among the four presented options (which is consistent with its basic motivation). The fifth option (*other*) has a median of 2%, which is consistent with the impression that many respondents here are close to the *green growth* position.

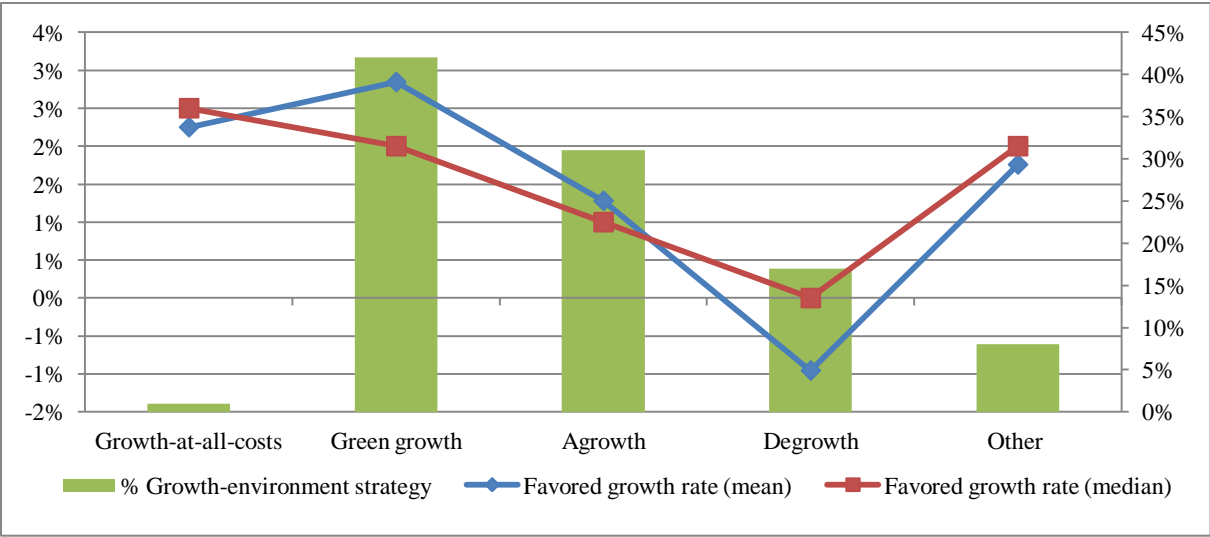


Figure 5.8. Combination of responses to favored growth-environment strategy (associated with the right vertical axis) with mean and median of preferred growth rates for each strategy (left vertical axis).

According to a Kruskal-Wallis test, the differences in median growth rates across the groups are statistically significant ($p < 0.01$). Post-hoc tests show that the decreasing growth rates favored by supporters of “green growth”, “agrowth” and “degrowth” (the three main groups of interest) are significantly different from each other ($p < 0.01$).

3.6 Why researchers disagree

A final question was posed to gain insight into the sources of disagreement among researchers on growth and the environment. Most of the respondents (70%, $n = 573$) provided at least one reason. Using the coding procedure as described in the methods section (2.5), we developed 21 categories. These are classified into four broad themes: (1) disciplines and theories, (2) knowledge and understanding, (3) ideology and worldviews, and (4) miscellaneous reasons. Table 5.10 shows the results of these categorized reasons.

The first theme (“disciplines”) includes three categories. The most important one covers terms like “disciplines” or “research areas”, suggesting that different disciplines almost necessarily seem to imply different perspectives. This was mentioned by 15% of those respondents who gave at least one reason. It is supported by the many differences reported in this paper between the seven research fields from Table 5.2. The second category is called “theories, assumptions and schools of thought” (9%). It includes mentions of the words of the title, as well as other phrases such as frameworks, paradigms and approaches. It is worth noting that these reasons and statements were generic, i.e. respondents did not refer here to any specific theories etc. The third category, stated by 7% of the respondents, contains explicit or implicit criticisms of one specific discipline, namely (mainstream) economics. Common examples include phrases like “dominance of neoclassical economics”, “economic is not a hard science”, and others with similar meanings.

Table 5.10. Suggested reasons for disagreement on growth and the environment

Themes	Categories	Frequency
Disciplines	Disciplines and research foci	15%
	Theories, assumptions and schools of thought	9%
	Implicit and explicit criticisms of economics/economists	7%
Knowledge and understanding	Knowledge and its limits	10%
	Understanding of economic growth	10%
	Understanding of economics	6%
	Understanding of environment	11%
	Understanding of relationship between growth and the environment	3%
	Complexity and uncertainty	6%
	Lack of familiarity with alternatives	2%
Ideology	Ideology, values, worldviews	31%
	Growthism	4%
	Environmentalism	2%
Miscellaneous	Technology	6%
	Time horizons	4%
	Psychological factors	7%
	Country	5%
	Cultural background	6%
	Interests and power	8%
	Markets, policy and governance	4%
Other	4%	

Notes: Original question wording: “As the final question of part I, we would like to ask you why researchers’ views on economic growth and the environment differ. Please state briefly a main reason.” Percentages add up to more than 100% because some respondents provided more than one reason.

The second theme is called “knowledge and understanding”. Its first category (“knowledge and its limits”) mainly covers single terms such as “ignorance”, “knowledge”, and “understanding” (9%). In addition, respondents gave more detailed explanations, such as academic overspecialization and the lack of a “well-informed overview of the big picture”. Most of these phrases and explanations were kept rather general. In contrast, the next four knowledge-related categories are more specific. They refer to different understandings of (1) economic growth, (2) economics or the economy, (3) the environment, and (4) the relationship between growth and the environment. It is worth noting that the tone of the provided responses differs considerably among these four categories. For example, while some respondents pointed out differences of knowledge or understandings in a neutral way,

other responses can easily interpreted as dismissive remarks about the lack of knowledge by those with dissenting views. In addition, some respondents acknowledged the lack of understanding of other disciplines, as can be seen in the following statement: “Lack of understanding of either the concepts of economic growth (for non-economists) or of the functioning of the environment (for many economists)”.

The third theme is called “ideology”. It includes a general category “ideology, values and worldviews”, which has the highest frequency of occurrence among all categories (31%). Here, respondents tended to mention (political) ideology, values, worldviews, beliefs and related ideas in more general way. Two specific and opposing ideologies were categorized in addition to the general category. They are labeled “environmentalism” and “growthism”. The first refers to the valuation of and concern for the environment. The second includes statements which express a strong commitment to economic growth, that is, growth for growth’s sake.

The fourth theme (“miscellaneous”) contains a diverse set of reasons. An important category of reasons is “technology”. It includes phrases ranging from more neutral ones (e.g., “understanding of technology”) to more ideological ones (e.g., “faith in technology”). So, it partly overlaps with the categories “ideology” and “understanding”. Another category is about different views on the role of “markets, policy and governance”. The category “time horizons” involves mentions of differences in historical and future perspectives. Two further categories relate to the context in which researchers work. One is the country. That is, different views may emerge depending on whether researchers come from developed or developing countries. Our previous statistical analyses lend some support to this claim. Other contextual factors mentioned are culture, socialization and upbringing. A further category is called “interests and power”. A frequently mentioned example is that research funding may depend on a country’s economic growth. Finally, the category “psychological factors”

encompasses an array of factors and issues, such as “fear of change”, “emotions”, “lack of empathy”, “personality”, “optimism/pessimism”, and so on.

Overall, the presented variety of reasons both enriches our understanding and shows the complexity of the controversy over growth and the environment. It should be noted that there are obviously relationships between these reasons. For example, some respondents stated that different disciplines have different ideologies, which shows the possible relation between the first and third themes.

5.4 Discussion

Several key findings emerge from this study. Overall, there is substantial diversity of opinion related to almost every posed survey question. To give examples: The sample was almost equally divided on whether growth is necessary to improve life satisfaction in rich countries. Some 14% of respondents favored a zero (or even negative) GDP growth rate as a policy objective, while the remaining ones about equally either supported positive GDP growth rates or had no specific opinion. Slightly more respondents believe that economic growth in rich countries will sooner or later come to an end rather than it being never-ending. Considering different growth-environment strategies for public policy, 42% favored continuing to pursue growth as it is compatible with environmental goals (“green growth”), 31% preferred ignoring growth as a policy objective (“agrowth”), and 17% favored stopping growth altogether (“degrowth”).

An issue where more agreement exists concerns the low likelihood of reconciling global GDP growth with the 2°C climate policy target. This is largely consistent with the claims that many climate scientists tacitly view climate and GDP growth goals as incompatible (Anderson and Bows, 2012). It is also in line with other analyses of green growth and climate change (Jackson, 2011; Antal and van den Bergh, 2014). Furthermore, it suggests that

researchers are more skeptical about growth in the context of solving a concrete, challenging problem like climate change than when considering ‘the environment’ in general.

Disciplinary background is a key explanation for disagreement. There are two main groups of disciplines in our survey with broadly similar views: on the one hand, growth economists, other economists, and environmental and resource economists; on the other, ecological economists, environmental social scientists, and environmental scientists. Given that ecological economics has traditionally taken a more critical perspective on economic growth (e.g., Victor, 2010a; Daly 2013), the differences with environmental & resource economics are not surprising. Our results are also consistent with the differences found in earlier surveys using smaller samples (Spash and Ryan, 2012). The group that is probably the most intensively involved in the central theme – growth economists focusing on environmental issues – is positioned somewhat between these two camps with regard to many questions. The most plausible explanation is that this group includes researchers from mainstream economics as well as heterodox fields like ecological economics.

The survey results generally suggest that expertise – operationalized here as publication record – is related to views on growth only in a few cases. First, a higher number of publications on growth in general are associated with slightly more favorable views on the link between growth and prosperity. Second, more publications on growth and the environment are associated with more skepticism that endless growth is possible. On the whole, however, expertise explains only very little of the variation in views. The reason for this may be that expertise probably interacts with theory, school of thought and ideology. Moreover, it is important to bear in mind that our survey measure (i.e., number of peer-reviewed publications on growth-and-environment) is of course only one facet of expertise (see e.g., Burgman et al., 2011).

We find that political ideology best and most consistently explains variation in researchers’ views. It was significantly associated with the responses to every survey question

on growth, even after controlling for other variables such as research fields. The latter point is important to consider, because one might think that some fields (e.g., ecological economics) are somewhat more left-of-centre than others (e.g., mainstream economics). This suggests that the debate about growth and the environment is strongly ideologically charged, which goes beyond ideologies related to disciplines. This finding is in line with many respondents mentioning ideology, values, beliefs and worldviews as main reasons for disagreement in views.

Some economists may argue that the survey questions are mixing “positive” and “normative” propositions. However, while theoretical arguments against the fact-value dichotomy have been made for a long time (e.g., Myrdal, 1953), there is now ample empirical research on opinions of economists showing that this line is blurry, to say the least (Randazzo and Haidt, 2015; Mayer, 2001; Fuchs, 1998). Of course, also many environmental scientists believe that values cannot be entirely separated from ‘positive’ features of basic and applied research (Reiners et al., 2013). This and the many mentions of other psychological factors resonate with recent calls for keeping various types of biases in mind when interpreting scientific evidence (Baddeley, 2015; see also Nuzzo, 2015).

In addition to ideology and related notions, further insights can be derived from the reasons that researcher provided to explain disagreement. For example, it may appear self-evident, but given that many researchers mentioned different “understandings”, “definitions” and “meanings” related to growth and the environment, it is possible that some researchers are talking past each other. This suggests the need for more and improved multidisciplinary communication or even research on growth and environment, involving economists, engineers and environmental or climate scientists.

A couple of potential caveats are worth noting. The usual disclaimer applies regarding the correlational nature of the data. That is, we cannot prove causal relationships between the variables. Finally, it is possible that our study has a self-selection bias. Many researchers may

have used the survey to express their discontent with the deep commitment towards growth in mainstream economics. Therefore, (average) results for the total sample should be taken perhaps with a grain of salt, while the diversity of results by groups reflects a more accurate picture of views in the wider community.

5.5 Conclusions

The purpose of this chapter was to shed new light on the old debate about economic (GDP) growth and the environment. Using a questionnaire survey of 814 scientists, we showed how opinions on main aspects of the debate are distributed across various research fields, and examined how these views are related to expertise, political ideology and other factors.

Overall, views on both the desirability and possibility of endless economic growth are divided across research fields, notably between mainstream growth, general and environmental economics on the one hand, and ecological economics, environmental social sciences, and natural sciences on the other. Those having a stronger research focus or more publications on growth and the environment are somewhat less convinced of the possibility of endless growth. In general, however, greater expertise does not point strongly to one or another perspective.

In contrast, political ideology plays the most consistent and important role in shaping opinions in the debate on growth and environment, even after taking into account disciplinary and other variations. We further find that ideology and related notions, such as values and worldviews, are the most frequently mentioned reasons to explain disagreement on growth and environment. This and the wide range of other stated reasons – complexity, psychology, power, to name a few – suggest that disagreement on growth and the environment is about much more than mere facts.

Future research may test more nuanced measures of ideology and values than the left-right political scale used here. It can try to examine what, if anything, could be done about the

role of political ideology in the growth debate. Can its influence be minimized, and if so, how? Further studies should be undertaken with different samples and perhaps on more concrete problems like climate change.

Appendix A5.1

Survey items (whose wording is not described in detail in the main text)

What is the highest level of education that you have obtained?

Bachelor's degree Master's degree PhD

Other (please specify)

10. Please choose the option that best describes with what type of organization are you employed by or engaged with:

- Academia (faculty, research associates, post-docs)
- Academia (student)
- Government
- Non-governmental organization
- Other (please specify)

11. Please select your primary area(s) of expertise. Please select two at most.

Empirical analysis of economic growth	Ecological economics	Atmospheric sciences
Growth theory	Energy studies	Biology
Development economics	Environmental and resource economics	Chemistry
Economics of technological innovation	Environmental engineering (incl. Industrial ecology)	Geosciences
Macroeconomics (not specifically growth)	Environmental politics	Physics
Public economics	Environmental sociology	Ecology
Financial economics	Geography	Other research (please specify)
Business economics and finance		Other research area (please specify)

12a. Approximately how many peer-reviewed articles have you published (as author or co-author) in academic journals?

12b. How many of your published articles mainly focus on economic growth and environmental and/or energy issues?

12c. How many of your published articles focus on economic growth without covering environmental and/or energy issues?

13. What is your sex? Male Female Other

14. What is your age?

15. What is your country of citizenship?

16. In politics people sometimes talk of “left” and “right” (or “liberal” and “conservative” in the US). Where would you place yourself on the following scale?

Very left left slightly left center slightly right
 right very right I don't know

Appendix A5.2

Additional results factors end of growth

Table 1. Importance of factors contributing to end of growth, by research field

Factor	GrowEc	GrowEnv	OthEc	EnvEc	EcoEc	EnvSoc	EnvSci
Slowdown economic benefits from education	3.00	2.76	2.85	2.92	2.34	2.51	2.47
High public debt	2.57	2.41	2.75	2.53	2.71	2.86	2.90
Growing inequality	3.21	3.06	3.13	3.08	2.91	3.28	3.14
Scarcity of energy resources (fossil fuels, renewables, etc)	3.57	3.17	3.14	3.04	3.41	3.34	3.32
Scarcity of material resources (metal ores, water, etc)	3.36	3.00	3.16	3.10	3.30	3.41	3.27
Environmental problems (biodiversity loss, climate change, etc)	3.57	3.11	3.24	3.25	3.37	3.54	3.42
Stringent environmental policy	2.50	2.00	2.50	1.90	2.34	2.24	2.20
Slowdown of technological advances	3.07	3.24	2.93	2.97	2.46	2.30	2.50
Aging population	3.14	2.63	2.82	2.88	2.63	2.81	2.97
Limits to international trade	2.86	2.25	2.60	2.33	2.46	2.29	2.52
<i>n</i>	15	19	47	114	105	117	129

Note: Shown are means based on a scale from 1 (unimportant) to 4 (very important)

Table 2. Importance of factors contributing to never-ending growth, by research field

Factor	GrowEc	GrowEnv	OthEc	EnvEc	EcoEc	EnvSoc	EnvSci
Environmental problems (biodiversity loss, climate change, etc) are exaggerated	2.69	2.42	2.42	2.21	2.58	3.03	2.63
Reserves of fossil fuels are abundant	2.35	2.00	2.00	1.92	2.36	2.15	2.13
All non-renewable energy sources can be replaced by renewable ones	3.53	2.84	2.84	3.16	3.67	3.38	3.60
Increase in knowledge is boundless	3.94	3.64	3.64	3.63	3.57	3.57	3.80
Technological progress has no limits	3.59	3.61	3.61	3.53	3.65	3.50	3.50
Opportunities in international trade	2.59	2.85	2.85	2.96	2.64	3.29	3.30
<i>n</i>	19	12	28	114	26	39	32

Note: Shown are means based on a scale from 1 (unimportant) to 4 (very important)

Chapter 6

Conclusions

The main aim of this thesis was to improve our understanding of public and scientific opinion on climate policy, economic growth and the environment. Particular attention was given to identify what people think about various aspects of the relationship between economic growth, the environment and prosperity. In addition, the thesis attempted to explore which factors underlie attitudes towards climate policy and economic growth. In addition to public opinion, this thesis examined scientists' views in the growth-versus-environment debate, as well as which factors explain variation in their views. In this final chapter I will summarize the main findings and draw implications for research and policy.

6.1 Summary of main findings

Chapter 2 examined why citizens support or reject climate policies. Given that research on this topic is quickly expanding, it is difficult for academics and practitioners to keep pace. The chapter represents the first study that provides a review of this literature. The examination of empirical and experimental research revealed various factors influencing policy attitudes, which were divided into three general categories: (1) climate change perception and associated social-psychological factors, such as the positive influences of left-wing political orientation, egalitarian worldviews, environmental and self-transcendent values, knowledge, risk perception, or emotions like interest and hope; (2) the perception of climate policy and its design, which includes, among others, the preference of pull over push measures, perceived (in)effectiveness of policy particular instruments, the personal costs associated with instruments, the effect of perceived fairness of instruments, and the recycling of any revenues to poor households; (3) contextual factors, such as the influence of social trust, norms and

participation, the role of wider economic, political and geographical aspects, and the effects of specific media events and communications.

Chapter 3 examined public attitudes on and beliefs about economic growth, the environment and prosperity. Prior opinion surveys typically offered a simple dichotomous choice between growth and environmental protection. This study extends previous work by examining public views on a wider range of aspects of the growth debate. I conducted an online questionnaire survey including a country-wide, representative sample of 1008 Spanish citizens. Using factor analysis, I identified six distinct dimensions of public attitudes, referred to as: *prosperity with growth*; *environmental limits to growth*; *general optimism*; *wrong priority*; *overrated GDP*; and *governmental control*. Furthermore, it was found that most respondents favor GDP growth rates of more than 3%. A majority views growth and environmental sustainability as compatible (*green growth*), while about one-third prefers either ignoring growth as a policy aim (*agrowth*), or stopping growth altogether (*degrowth*). Only very few people want unconditional growth (*growth-at-all-costs*). About one-third of the respondents believe that growth may be never-ending. I examined how support for, and disagreement with, the various statements on growth relate to each other, as well as how they are influenced by socio-demographic, knowledge and ideology/values variables. So-called conservation values like tradition emerged as the most consistent predictor of various favorable attitudes towards growth. Overall, the findings can inform public debates about the growth paradigm and its potential alternatives by providing a more nuanced understanding of public opinion. A number of directions for future research were suggested, including modifying poll questions on growth and environment through offering a more diverse set of response options.

Chapter 4 derived further insights into public opinion about economic growth, the environment and prosperity. This was done by compiling a large set of existing survey data from multiple studies, countries and years, which permitted an innovative integrated analysis.

The main findings of the study are: (1) 60-85% of respondents in the EU and the USA see economic growth and the environment as compatible when explicitly asked about it; (2) When people have to choose, environmental protection is prioritized in the majority of studied countries, which moreover seems to be a relatively stable attitude over time; (3) The public has a limited factual knowledge of key data, such as past, realized GDP growth rates, or the consequences of exponential growth on future income; (4) People tend to see societal rather than personal benefits from economic growth; (5) They are fairly pessimistic about the future of economic growth. The comparison of different studies indicates that different question wordings and formats can considerably influence the results. Overall, the article contributes to an improved understanding of public attitudes on the relationship between economic growth and the environment.

Chapter 5 zoomed in on the long-standing academic debate about economic growth versus the environment. To investigate scientific opinion on various aspects of this debate, I conducted the first web-based questionnaire survey among researchers on this topic. The 814 respondents have a wide range of backgrounds, including growth theory, general economics, environmental economics, ecological economics, environmental social sciences, and natural sciences. The survey results indicated a wide variety of opinion on almost every posed question. Furthermore, it seems that researchers are more skeptical about growth in the context of a concrete problem like the compatibility with the 2°C climate target than when considering environmental problems more generally. The results indicate polarization of views among mainstream economists on the one hand, and ecological economists, environmental social and natural scientists on the other. Moreover, many respondents suggested ideology, values and worldviews as important reasons for general disagreement. This finding is supported by the statistical analysis, which shows that researchers' political orientation consistently and strongly correlates with all expressed views on growth. Expertise played a negligible role in explaining researchers' views.

Some general conclusions beyond the individual chapters are worth noting. Taking a quick glance at the results of both original surveys on economic growth and the environment reveals that public opinion about the desirability of economic growth is closer to the mainstream view in economics, as expressed for example in the favored growth-environment strategy. At the same time, public views and those of ecological economists and environmental scientists are similar on certain questions, such as regarding the doubt about the possibility of never-ending growth. In addition, the growth paradigm seems to be generally questioned more on social than on environmental grounds.

An important insight from the two original surveys on economic growth and the chapter on climate policy is that both public and scientific opinion is significantly associated with political ideology and various types of value orientations. This is consistent with a recent large meta-analysis of climate change opinions which showed that the effect of ideologies, values and worldviews trump those of every other influencing variables (e.g., knowledge) (Hornsey et al., 2016). In general, this suggests that questions surrounding climate change and the contested relationship between economic growth and the environment are of a scientific as well as cultural nature.

6.2 Implications for research and policy

Future research on climate policy attitudes (*chapter 2*) could integrate insights about attitudes towards economic growth (*chapter 3 and 4*). Specifically, two questions may be examined more thoroughly: First, how do climate policy attitudes vary for people who have either favorable or unfavorable views about economic growth? Second, do preferences regarding climate policy depend on whether a person believes that the policy has positive or negative effects on economic growth?

As for public views on economic growth, the results of *chapters 3 and 4* indicated several forms of seemingly inconsistent, ambivalent or even paradoxical attitudes towards economic growth, the environment and prosperity. It clearly deserves further research attention to disentangle these attitudes in order to arrive at a better understanding of them. In addition, it was found that many people in numerous countries both favor deemphasizing economic growth and are pessimistic that growth will continue in the future. This raises the question what kind of future people desire? It seems that little work has been done to examine this. An example in this direction is a questionnaire survey in Australia, which is being conducted at the time of finishing this thesis. In this survey, Australian citizens were invited to provide their views on how they want their country to develop until 2050 (<http://www.anuscenarioplanning.com>; see also Costanza et al., 2015). Future research along these lines could also investigate how alternatives to growth can be framed in a more appealing way (Drews and Antal, 2016).

As already alluded to above, a challenge for future research is to systematically compare public and scientific opinion on economic growth and the environment. For example, it is well-known that climate change beliefs differ considerably between the general public and scientists in some countries (e.g., PEW, 2012). The data collected in this thesis would allow for similar comparisons. A logical extension of this work on public and scientific opinion would be to carry out surveys including other actors of the democratic process, such as politicians and policymakers, and representatives of non-governmental organizations, media and industry. Such work should particularly aim to explore the underlying factors shaping the optimistic view of green growth, as well as how individuals may react to information that challenges the possibility of a win-win situation.

It is worth remembering that this thesis relied on survey techniques. In recent years, new methods have emerged to study public attitudes and sentiments. These draw on large-scale unsolicited expressions of opinion in the internet, notably in channels such blogs, newspaper

article comments, and Twitter feeds (Malcevski et al., 2012). As questions of economic growth and the environment have been discussed online on numerous occasions, there is plenty of material suitable for in-depth analysis.

A number of policy implications can be derived from this thesis. First, the identified factors affecting attitudes towards climate policy include perceptions about climate change, policy and its attributes, all of which are amenable to intervention. The acquired insights can thus assist in improving policy design and communication with the overarching objective to garner more public support for effective climate policy. Next, it is clear that the vast majority of the general public rejects an unconditional pursuit of economic growth. Many people in various countries give priority to the environment over growth. Nevertheless, any strategy aiming to go beyond growth must consider and guarantee social and economic stability, given that the latter are strongly associated with growth in the public's mind. Public communication about growth and its potential alternatives should consider that people's interpretations of and thoughts about growth are very diverse. For example, public views on environmental aspects of growth seem to be largely independent from views regarding aspects of prosperity, while most people do not immediately associate "economic growth" with environmental pressures. Finally, the results show that researchers from fields such as ecological economics and environmental sciences in majority reject a green growth strategy. This should be a call for policy-makers to question whether economic growth and environmental sustainability can be made compatible, as well as to stimulate further interdisciplinary research on this topic.

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