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Social Well-Being Within Planetary Boundaries: the Precautionary Post-Growth Approach

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Social Well-Being Within Planetary Boundaries: the Precautionary Post-Growth Approach

Partial Report for the "Approaches to Resource Conservation in the Context of Post-Growth Concepts" project

by

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The present discussion paper is partial report for the “Approaches to Resource Conservation in the Context of Post-Growth Concepts” project (research code 3715 311040).

Kurzbeschreibung: Gesellschaftliches Wohlergehen innerhalb planetarer Grenzen: Der Ansatz einer vorsorgeorientierten Postwachstumsposition

Im Mittelpunkt dieses Diskussionspapiers steht die Frage, welche Rolle die Wirtschaftsleistung und ihre künftige Entwicklung in einem wohlhabenden Land wie Deutschland bei der Einhaltung planetarer Grenzen spielt. Wir möchten zum Verständnis dieser relevanten Kontroverse beitragen, indem wir in diese Debatte systematisierend einführen, Analysen zu zahlreichen Aspekten vorlegen, offene Fragen aufzeigen und politische Handlungsorientierungen ableiten. Durch die Darstellung, Analyse und erste Bewertung von zentralen Argumenten und Schlussfolgerungen der Postwachstumsliteratur leistet das Diskussionspapier einen Beitrag dazu, diesen bisher vor allem in Wissenschaft und Zivilgesellschaft geführten Diskurs für ein breiteres Publikum zugänglich zu machen.

Innerhalb des Diskurses gibt es zwei besonders prominente und eindeutig antagonistische Positionen, deren politische Konsequenzen einander widersprechen: Green Growth und Degrowth. Unsere Analysen zeigen, dass beide Positionen auf Kernannahmen beruhen, die sich wissenschaftlich nicht hinreichend begründen bzw. belegen lassen. Keine dieser Positionen sollte daher für sich beanspruchen, als alleinige Strategie für umweltpolitisches Handeln dienen zu können. Daher schlagen wir eine dritte Position vor und stellen sie mit diesem Papier zur Diskussion: die „vorsorgeorientierte Postwachstumsposition“. Diese Auffassung hat aus unserer Sicht das Potenzial, einen neuen Konsens in der Nachhaltigkeitsdebatte zu bilden. Das Diskussionspapier lotet aus, welche Potenziale zur gesellschaftlichen Orientierung und welche Wissensbedarfe damit verbunden sind.

Auf Grundlage einer Analyse verschiedener Positionen (Kapitel 2) präsentiert dieser Beitrag eine ausführliche Übersicht über die Ursachen von Wirtschaftswachstum und identifiziert gesellschaftliche Bereiche, deren Funktion von diesem Wirtschaftswachstum abhängen könnte (Kapitel 3). Darauf aufbauend wird die Möglichkeit diskutiert, ob Wirtschaftssysteme durch verschiedene Reformvorschläge so gestaltet werden könnten, dass sie weniger von permanentem Wirtschaftswachstum abhängig wären (Kapitel 4). Schließlich skizzieren wir handlungsleitende Elemente unseres Vorschlags einer „vorsorgeorientierten Postwachstumsposition“ (Kapitel 5).

Wir hoffen, mit diesem Diskussionspapier einen Impuls zur gesellschaftlichen Debatte über Ausgestaltung und Instrumentierung von Transformationspfaden für „gesellschaftliches Wohlergehen innerhalb planetarer Grenzen“ zu geben, der einen neuen Diskussions- und Forschungsprozess anregt und strukturiert. Die vorsorgeorientierte Postwachstumsposition bietet eine Diskursplattform für weiter zu entwickelnde Handlungsstrategien, die dem Ausmaß der Herausforderung gerecht werden, welche die Einhaltung der planetaren Grenzen darstellt.

Bei dem vorliegenden Diskussionspapier handelt es sich um die Übersetzung des Berichts, der unter dem Titel „Gesellschaftliches Wohlbefinden innerhalb planetarer Grenzen – Der Ansatz einer vorsorgeorientierten Postwachstumsposition“ erschienen ist (UBA Texte 89/2018). Dieser Bericht ist im Rahmen des Projektes „Ansätze zur Ressourcenschonung im Kontext von Postwachstumskonzepten“ (Forschungskennzahl 3715 311040) erstellt worden. Der Endbericht des Projektes ist im Frühjahr 2020 erschienen (UBA Texte 98/2020).

Eine Zusammenfassung dieses Berichts, die englische Übersetzung dieser Zusammenfassung und der Endbericht sind als Download hier verfügbar:
http://www.umweltbundesamt.de/publikationen

Brief description: Social well-being within planetary boundaries: The precautionary post-growth approach

This discussion paper focuses on the role of economic performance and its future development in wealthy countries such as Germany with respect to compliance with planetary boundaries. To improve our understanding of this controversial topic, we introduce the debate in a systematic way, presenting analyses on numerous aspects, pointing out open questions and finally deriving guidelines and options for political action. The presentation, analysis and initial assessment of key arguments and conclusions represent our contribution to making the post-growth discourse – which so far has been conducted primarily in the realms of academia and civil society – accessible to a wider audience.

There are two particularly prominent and clearly antagonistic positions within the discourse whose political consequences are fully contradictory: green growth and degrowth. Our analyses show that both positions are based on core assumptions that cannot be adequately substantiated scientifically and thus cannot claim to serve as the sole strategy for environmental policy action. We therefore propose a third position and put it up for discussion with this paper: precautionary post-growth. From our point of view, this approach has the potential to create a new consensus in the sustainability debate. The discussion paper explores the potential for societal orientation and need for knowledge associated with this position.

On the basis of an analysis of the various current positions (chapter 2), this paper presents a detailed overview of the causes of economic growth and identifies those areas of society whose functioning could be dependent on economic growth (chapter 3). We then discuss the possibility that economic systems can be shaped by various reform proposals in such a way that they would be less dependent on permanent economic growth (chapter 4). Finally, we outline the guiding elements of our proposal for such a precautionary post-growth approach (chapter 5).

With this discussion paper, we hope to provide an impulse for the societal debate on the design and instrumentation of transformation paths for social well-being within planetary boundaries. Our aim is to stimulate and structure discussion and research processes. The precautionary post-growth approach offers a platform for discussing strategies, whose implementation has yet to be worked out in all details, to meet the challenge of respecting planetary boundaries.

This discussion paper is a translated version of the partial report „Gesellschaftliches Wohlbefinden innerhalb planetarer Grenzen – Der Ansatz einer vorsorgeorientierten Postwachstumsposition “of the project “Approaches to Resource Conservation in the Context of Post-Growth Concepts” (Project No. (FKZ) 3715 311040). The complete final report of the project has been published in spring 2020 in German only (UBA Texte 98/2020).

An English executive summary of this discusson paper and the final report (in German only) are available as a download here: http://www.umweltbundesamt.de/publikationen

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1 Introduction

Global environmental policy challenges become apparent when planetary boundaries are crossed. Environmental and sustainability policy has not succeeded in achieving a sufficiently strong reduction of the environmental pressures up to this point. In addition, the impact of efficiency and consistency strategies is reduced by rebound effects. Against this backdrop, the question arises as to whether extensive changes within economic and social institutions, as well as to the way of life and economy, would not be necessary in early-industrialised countries in order to comply with ecological boundaries. Proposals for these types of radical transformation have been articulated more and more within the discourses on post-growth and degrowth in recent years. The starting point is the lack of belief that ecological objectives can be achieved if the economies of prosperous countries continue to grow. Proponents of degrowth and post-growth ideas are accordingly seeking approaches that can reduce – and, ideally, completely override – economic and social institutions' dependence on growth.

This discussion paper[1] analyses implications for the economy of an early-industrialised, prosperous country which might result from the double requirement of, on the one hand, ensuring a sufficient contribution to complying with the planetary boundaries and, on the other hand, of not causing damage to the fundamental principles of social justice. The paper focuses in particular on the question raised within the degrowth and post-growth discourse regarding the role played by economic output and its development in an early-industrialised country like Germany in terms of the objective of complying with planetary boundaries.

One objective of this paper is to contribute to the understanding of where the current points of contention over the role of economic growth in achieving environmental policy objectives come from, and: to critically analyse the assumptions behind them. We also explore which knowledge requirements stem from these points of contention and their critical analyses, and which courses of policy action can be derived from them.

In the first section (**Chapter 2**) we will develop a systematisation of the approaches within the public discourse on the role of economic output in achieving environmental policy objectives. Within this debate the concepts of "degrowth", "green growth", "post-growth", "a-growth", "green economy" and "steady-state economy" are mostly not strictly differentiated. There are, however, two especially prominent and unequivocally antagonistic approaches within the discourse whose policy implications contradict each other: **degrowth** and **green growth.** We will identify the core assumptions of these two approaches and analyse the quality of their justification. Based on the critical review of the main claims of degrowth and green growth, we develop a third analytical approach that we term the "**precautionary post-growth approach**".

In **Chapter 3** of the discussion paper we will turn to the **status quo of modern societies dependent on economic growth.** Two fundamental questions are addressed within the degrowth and post-growth discourses – on the one hand regarding the "causes" of growth; on the other hand regarding its "necessity". In the terminology of the degrowth and post-growth literature, the causes and triggers of growth dynamics are described as "**growth drivers**" (Chapter 3.1), while the question of the "necessity" of growth is examined in the discussion on "**growth-dependent areas**" (Chapter 3.2). In **Chapter 3.1** we will identify the elements which

[1] We would like to thank our project advisory board and our clients for the many fruitful discussions and for the feedback on the draft versions of our text. Our thanks also go to all our colleagues and, in particular, to our student assistants and interns for their valuable contributions. We would like especially to thank Kirsten Dohmwirth, Lea Kliem, Lisa Storcks, Laura Theuer, Charlotte von Möllendorf (all IÖW) and Evert Reins (RWI).

The analysis of the literature was completed in May 2017. Various potentially relevant specialist articles have since been published that we were not able to include in the present discussion paper. We are not aware of any more recent papers that would substantially contradict our analyses.

are considered as drivers of economic growth within the degrowth literature. Taking a selection of these elements, we will describe in greater detail how the respective mechanisms should function according to the degrowth literature and review them in light of the current state of research in economics and social sciences. In **Chapter 3.2** we will address growth-dependent areas. After a brief literature review of the areas that are considered to be growth-dependent within the degrowth and post-growth discourse, we will focus on two areas that are considered to be of high societal relevance: employment and the social security system (with an emphasis on German pension and healthcare provision). We will explain how the growth dependency is justified in these particular cases.

In **Chapter 4** we will discuss measures and **instruments** that, from the perspective of the literature we have studied, may contribute to bringing about a post-growth society. Along the same lines as the analyses in Chapter 3, we will focus on the areas of employment (**Chapter 4.2**) and social security systems (here: pension and healthcare provision, **Chapter 4.3**). We will discuss instruments from the post-growth discourse that are targeted at making these areas (more) independent from growth. With reference to social security systems, it is also argued within mainstream economics that the German pension and health insurance systems are in need of reform (albeit for reasons other than those included in the post-growth discourse). We will also present reform proposals discussed there and examine whether they could contribute to greater independence from growth. In addition to specific reform approaches, i.e. directed at parts of the social security system, we will also analyse overarching policy proposals (e.g. the unconditional basic income) that have the capacity to affect both the social security systems and the employment sector.

Key findings, notes on interpreting the results, as well as further reflections on the questions addressed in the discussion paper are set out in **Chapter 5**.

Through the presentation, analysis and initial evaluation of the main arguments and conclusions, we will attempt to make the post-growth discourse, which has to date primarily taken place in civil society and parts of academia, available to a broader readership interested in the realisation of sustainable development and related transformation issues. In terms of content, the paper takes up the work of the German Enquete-Commission on "Growth, Prosperity and Quality of Life – Paths to Sustainable Economic Activity and Social Progress in the Social Market Economy" (2010–2013) [Enquete-Kommission "Wachstum, Wohlstand, Lebensqualität – Wege zu nachhaltigem Wirtschaften und gesellschaftlichem Fortschritt in der Sozialen Marktwirtschaft"], a political body appointed by the German parliament. The results from this discussion paper can likewise form the basis for the development of scenarios and, where applicable, specific policy proposals for the transformation towards a sustainable society that is not (as heavily) reliant on economic growth. Equally, we want to contribute to connecting the hitherto mostly disparate threads of the debate on "degrowth", "green growth" and "post-growth" and, above all, to exploring the extent to which common (partial) strategies can be developed.

Background to the Project

In the "*Approaches to Resource Conservation in the Context of Post-Growth Concepts*" research project (research code 3715 311040), which is funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the German Environment Agency (UBA), the overall focus is on the extent to which post-growth concepts can contribute to an absolute reduction in resource consumption. The approaches and instruments within the post-growth literature are compared with those opinions and measures that are represented within the pro-growth discourse on "green growth". Proposals for shaping a sustainable society that, where possible, is less heavily reliant on economic growth, are to be worked out in the

project on this basis. The analysis of the literature was completed in May 2017. Numerous academic papers have since been published on the topic that this discussion paper explores. We were unable to systematically evaluate this literature for the present discussion paper and could therefore not include it in our analysis. The authors are not aware of any recent papers that would fundamentally contradict the core statements in this paper.

2 Positions and Strategies

In this chapter we will address the question of the role played by economic output in an early-industrialised, wealthy country such as Germany, focusing on the objective of compliance with planetary environmental boundaries. Firstly (Chapter 2.1), we will explain the relevance of the debate about the significance of economic output in socio-ecological transformation and differentiate between three fundamental approaches within this debate: degrowth, green growth and post-growth. We will then explain these three approaches in more detail. The chapters on degrowth (2.2) and green growth (2.3) are similarly structured: first of all, we will outline the respective approach (Chapters 2.2.1 and 2.3.1); secondly, we will present the various arguments put forward in the degrowth and green growth literature for the respective approach, without evaluating them at this point (Chapters 2.2.2 and 2.3.2); thirdly, we will set out our objections to the arguments presented (Chapters 2.2.3 and 2.3.3). Based on the critique of green growth and degrowth, we will analytically develop a third approach: post-growth. We will present this approach in Chapter 2.4. In Chapter 2.5 (Preliminary Conclusions) we will summarise the discussion of these approaches.

2.1 Background to the Transformation Debate

With their current lifestyles and economic behaviour, people alive today are interfering in various ecosystems so deeply and comprehensively that drastic and irreversible damage to future generations and other creatures must be expected. In this respect, the increase in the concentration of greenhouse gases in the atmosphere is just one example of a particularly prominent anthropogenic interference in ecosystems (Bindoff et al. 2013: 869). Scientists have pointed out that humanity has already plunged other fundamental earth system processes into a state of criticality never seaen before in the epoch of the Holocene, which has been particularly favourable to the development of human civilisation. For example, global quantities of phosphorus and nitrogen seeping into soils and watercourses have exceeded critical limits, as has the rate at which natural species are dying out (Rockström et al. 2009a/b, Steffen et al. 2015). Early-industrialised, wealthy countries are responsible for a disproportionate number of these pressures on natural systems (with regard to greenhouse gas emissions, cf. Caney 2009: 126). In order to comply with the fundamental and widely acknowledged principles of intergenerational and global justice, therefore, wealthy countries in particular must reduce their interference in the respective ecosystems to a considerable extent. They should contribute the share of global obligtaions to compliance with planetary boundaries that reflects their responsibility and enables all people, across the globe, to utilise the ecosystems in such a way that they can attain a good life.[2] On the political level in Germany, there is cross-party consensus on the claim that the ecological limits should be permanently respected.

Although there is consensus on the fundamental target, controversies have arisen on the question of how exactly to achieve this target, controversies on both a scientific and a political level. On the one hand, there is no agreement on the question of what kind of contribution a national state can, and should, make to mitigating global ecological challenges[3] (cf. Enquete-

[2] This claim has been justified by moral philosophers on the basis of different moral theories, particularly with respect to one planetary boundary – greenhouse gas emissions (cf. e.g. Gardiner 2011, Moellendorf 2014, Shue 2014, Broome 2012). It is also possible to argue for other planetary boundaries on a similar basis.

[3] With regard to ecological impacts, such as GHG emissions, it of course does not matter where exactly these are avoided. If we consider, however, the extent of the reductions required over the coming years and decades, as well as the financial and technological prerequisites of the individual countries, it is obvious that wealthy and industrial countries bear a particular responsibility and must take a leading role. On the other hand, economic efficiency arguments make the case that ecological impacts should be avoided (initially) to a considerable extent where these can be achieved with the lowest possible (marginal) costs (i.e. in newly industrialised and developing countries), offset by appropriate technological exports and transfer payments from wealthy countries. However, the global distribution of GHG emissions and their consumption-based attributions make clear that, despite

Bericht, Enquete-Kommission 2013: 477-521). On the other hand – and related to the first question –, there is much contention around the issue of how the economic behaviour of an early-industrialised country should be transformed so that it can contribute adequately to the protection of planetary boundaries without violating at least the basic principles of social justice. This includes, for example, maintaining quality of life at a minimum level (e.g. operationalised in O'Neill et al. 2018) and protecting human rights.[4]

In much of the literature, it is an undisputed fact that in order to meet ecological targets, it is mainly the economies of early-industrialised countries that must be comprehensively transformed (e.g. Jacobs and Mazzucato 2016, WBGU 2011). Especially with regard to climate targets, there must be a much greater reduction in greenhouse gas emissions if we are to meet the targets that have been agreed upon on the policy level (limiting global warming to 1.5 to 2 °C). There is an ex post accounting relationship between the level of greenhouse gas emissions and economic output, and this is expressed in the so-called IPAT identity[5] (Ehrlich and Holdren 1972):

Amount of GHG emissions (I) = size of population (P) * economic output (GDP) per capita (A) * amount of GHG emissions per GDP (T)

A corresponding ex post relationship between the rates of growth (g) of these quantities can also be derived from this (cf. Hepburn and Bowen 2013):[6]

g(GHG emissions) = g(population) + g(GDP/capita) + g(GHG intensity)

This identity is not based on any causal relationships, it rather merely expresses a mathematical relationship between politically relevant quantities. Still, it illustrates, in terms of a thought

technological exports and transfer payments, substantial GHG reductions "at home" in industrial countries will still be necessary. In the case of regional environmental boundaries of potential global significance – e.g. nitrogen emissions or the loss of biodiversity –, direct national responsibility is in any case a given.

[4] Even the uncontroversial target of meeting at least certain minimum standards of social equity during the socio-ecological transformation throws up important challenges for the fundamental approach we discuss, as we will subsequently demonstrate. When considering the minimum requirements of social equity in this report, however, we do not commit to the view that the concepts of social equity that go beyond this (e.g. egalitarian approaches such as Rawls 1971 or even Cohen 2008) are not justifiable in the case of a socio-ecological transformation. This is actually the subject of a dispute (one that has yet to play out): To which moral standards (quality of life, human rights, capabilities for attaining fundamental values) and on what level should all people (and, as the case may be, some animals) be entitled? Which inequities in the distribution of levels of quality of life are legitimate? The further questions of which principles of social equity should be preserved are irrelevant to the differences between the fundamental approaches discussed in this text.

[5] Here, *I* stands for *impact*, *P* for *population*, *A* for (material) *affluence* and *T* for *technology*. The IPAT equation is often used as an accounting identity in this simple formulation using aggregated concepts for *A* and *T*; here too, it is used to illustrate the scope of the challenge of a further decoupling. However, the IPAT identity is not suitable as an analytical tool for indicating effective starting points for policy on this highly aggregated level. In particular, economic output is very heterogeneous with regard to the greenhouse gas intensity of different products and processes. These analyses, which take heterogeneity into consideration, must therefore necessarily leave the aggregation level of the IPAT identity; see Dietz and Rosa (1994) for more detail on this.

[6] However, McNicoll (2014: 297), among others, points out that this transformation of the IPAT equation does not allow any proportionate or causal attribution of emissions increase to the three rates of change: size of population, GDP per capita and GHG intensity. For this, *P*, *A* and *T* would have to be independent from one another, which is not the case (cf. York et al. 2003: 352). For analytical purposes, the IPAT equation must be translated into a version that is also called the STIRPAT equation (for *ST*ochastic *I*mpacts by *R*egression on *P*opulation, *A*ffluence and *T*echnology) (cf. York et al. 2003: 353): $I = a P^b A^c T^d \varepsilon$. The parameters *b*, *c* and *d* of this model indicate the respective elasticities, i.e. e.g. in the case of *c,* by how many percentage points the impact *I* would change if, ceteris paribus, the material affluence *A* were to increase by 1%. In the original IPAT model it is assumed that all elasticities are identical and each has the value one, i.e. that there is a strictly proportionate correlation. This implicit assumption does not, however, stand up to empirical verification (cf. Cole und Lucchesi 2014, Magee et al. 2016 as well as Magee and Devezas 2017). Decoupling cannot even be diagnosed for those technologies with the highest rates of progress. The qualitative illustration regarding the scope of the challenge conveyed by the thought experiments in this section has been – at least until now – supported by sufficiently complex empirical analyses.

experiment – similar to Jackson (2009: 54)[7] –, how the growth rates of these quantities would have to develop in future in various scenarios if particular climate targets are to be met.

In 2013, humans emitted 48 Gt CO_2e (WRI 2017). Rogelj et al. (2015) have analysed scenarios of future GHG emissions in which both climate targets (limitation of global warming to 1.5 and 2 °C) are achievable. According to their analysis, global GHG emissions must be reduced to a value between 4 and 19 Gt CO_2e in the year 2050 if we are to achieve the target of 1.5 °C, and to a value of between 9 and 26 Gt CO_2e if we are to meet the target of 2 °C[8].

If we conduct an initial thought experiment for the year 2050, assuming a constant growth in the global population of 0.7% per year[9] and, at the same time, a constant economic growth of 2% per year, then there needs to be a drastic reduction in the GHG intensity of economic output if we are to stay within a GHG emissions budget that is compatible with the climate targets.

Table 1: Annual rates by which GHG intensities would have to be reduced in order to meet the target values by the year 2050, assuming future population and economic growth.

Climate targets	GHG emissions in 2050 (global) in Gt CO_2e/year		Annual rate of change in GHG emissions 2013–2050	g (Population)	g (GDP/ capita)	Annual rate of change in GHG intensity
1.5 °C	min	4	-6.5%	0.7%	2%	-9.2%
	median	13	-3.5%			-6.2%
	max	19	-2.5%			-5.2%
2 °C	min	9	-4.4%			-7.1%
	median	20	-2.3%			-5%
	max	26	-1.6%			-4.3%

Source: Own calculation based on literature as outlined in footnote 10, IÖW

The values for the required reduction in GHG intensity in the last column in Table 1[10] reflect the extent to which the qualitative nature of the national product in terms of its GHG intensity must be transformed by the interplay between technical progress and parallel changes in behaviour. If, for the purposes of illustration, we assume a constant rate of improvement, GHG intensity would have to decrease annually by 9%. Thus far, however, there has only been an annual reduction in GHG intensity of around 1% globally.

[7] In the revised version of the report, "Limits to Growth" (Jackson 2017), the IPAT calculations are adapted to the objective of reducing GHG emissions in such a way that the 1.5 °C target can be achieved (p. 96 ff.). Here, Jackson's results are similar to the calculations below.

[8] However, in the scenarios analysed, it is suggested that after 2050, GHG emissions will be reduced further and negative emissions will be achieved, i.e. CO_2 will be withdrawn from the atmosphere. Even without this assumption, emissions would have to be reduced significantly further by 2050.

[9] This would mean a global population of approximately 9 billion by 2050, which is consistent with current projections.

[10] Sources: Values for the required GHG emissions by 2050 are taken from Regelij et al. 2015, Tables 1 and 2 in the Supplementary Materials; the rest of the data consists of the results of our own calculations using the IPAT identity. The values given for GHG emissions for 2050 that will meet both climate targets only serve as a point of orientation, i.e. they represent the approximate values down to which GHG emissions would have to be reduced. Regelij et al. (2015) have analysed so-called "probable" scenarios, i.e. scenarios where the probability of meeting the climate targets is higher than 66%. If, based on moral considerations of decision-making under risk, we require climate policy to be based on scenarios that have an even higher probability of occurrence, the available GHG budgets decrease significantly. The exact value of the available budgets is not, however, the subject of this text, and the aforementioned data already illustrates the scope of the challenge.

In a second thought experiment we assume an annual reduction in GHG intensity of 2% across the whole period. Although this corresponds to double the rate of reduction observed thus far, it is well behind the required 9%. The penultimate column in Table 2 shows the consequences for the development of economic output per capita that would be associated with this pathway.

Table 2: Scenarios for the development of economic output, assuming GHG intensity decreases by 2%.

Climate targets	GHG emissions in 2050 (global) in Gt CO_2e/year		Annual rate of change in GHG emissions 2013–2050	g (Population)	g (GDP/ capita)	Annual rate of change in GHG intensity
1.5 °C	min	4	-6.5%	0.7%	-5.2%	2%
	median	13	-3.5%		-2.2%	
	max	19	-2.5%		-1.2%	
2 °C	min	9	-4.4%		-3.1%	
	median	20	-2.3%		-1%	
	max	26	-1,6%		-0,3%	

Source: Own calculation, IÖW

Table 2 shows that in a scenario in which there is insufficient decarbonisation within the economies, and within which GHG intensity decreases annually by 2%, global economic output would have to decrease by 5% annually if we were to meet the climate target of 1.5 °C. A further thought experiment illustrates the drastic implications: if global GDP was to decline annually between 2013 and 2050 at a rate of 5%, GDP in 2050 would only amount to 15% of global GDP in 2013.

The scope of the challenge is similar if we focus on Germany. In order to contribute adequately to limiting global warming to 1.5 to 2 °C, a national economy such as Germany's would have to almost completely decarbonise by the year 2050.[11] Let us assume that the target for GHG emissions in Germany is a reduction of 95% by 2050 in comparison with the year 1990. Table 3 depicts how GDP or GHG intensity would each have to develop annually in both polar extreme scenarios in order to reduce GHG emissions by 95% by 2050 in comparison with 1990.

[11] This requirement can be substantiated as follows: If we assume that in 2050 the global population will total approx. 9 billion, the global emissions compatible with the climate target of 1.5 °C (cf. the data in Tables 1 and 2) imply that by 2050 emissions may be permitted up to, on average, between 0.4 and 2.1 t per capita per year. Thus, in the case of an equal global distribution of emissions per capita, Germany too should be emitting between 0.4 and 2.1 t GHG per capita per year by 2050. In 2016, however, Germany emitted around 11 t GHG per capita (cf. the figures in Table 3). The upshot is that in Germany emissions per capita must be reduced by between 80 and 96% to be consistent with the 1.5 °C target.

Table 3: Development of GDP and GHG intensity in both polar extremes in order to meet the target.

GHG emissions in 1990	2050 target: reduction by 95%	GHG emissions in 2016	Required rate of reduction 2017–2050	Resultant rates for the future development of GDP and GHG intensity (assuming population in Germany remains constant)
1251 Mt/year	63 Mt/year	906 Mt/year	-7.6%	If GDP growth rate is **1%**, required reduction in GHG intensity is **8.6%** annually.
				If annual reduction in GHG intensity is **2%**, required GDP growth rate is -**5.6%**.

Source: Own calculation, IÖW

Due to the high level of aggregation in the IPAT identity and the fact that it merely represents accounting relationships, it can only serve to illustrate the environmental challenge. In particular, the IPAT calculations alone do not allow us to determine the plausibility of achieving high rates of reduction in GHG intensity. Neither do the IPAT calculations reveal what annual GDP reductions of 5% would actually mean (would all sectors shrink, or only GHG-intensive sectors?). In order to answer these questions, we must address the causal relationship between economic growth and GHG emissions.

In the context of these accounting relationships between climate targets, economic growth and GHG intensity within national economies, two approaches to economic policy have emerged. They differ in their answers to the question of whether or not it is possible and socially desirable to meet the ecological targets while maintaining economic output.

One answer to this question – advocated from within the **"degrowth"** approach – suggests that the ecological targets can only be met if wealthy economies reduce their economic output (degrowth proponents refer to the "selective downscaling of man-made capital and of the institutions" (Asara et al. 2015: 377) or to "society with a smaller metabolism" (Kallis 2014: 4). Here, the reduction in GDP is not an end in itself, and neither should it be undertaken purely for ecological reasons. It is rather the case that degrowth proponents advocate the realisation of a society in which many things will be different (Asara et al. 2015: 377) to how they have been thus far in wealthy societies: differently structured relationships, different gender roles, different division of time between paid work and leisure (according to Kallis 2014: 4). In particular, this would involve shifting numerous economic activities currently undertaken in markets beyond established markets, or rather performing them in markets with a fundamentally different structure. A society such as this would also adhere to principles of social equity, despite its reduced economic output.[12]

An opposite answer is derived from the **"green growth"** approach. Its proponents doubt that in wealthy countries, fundamental principles of social justice can be preserved without further economic growth. Yet, they do accept the overall need for wealthy economies to undergo a

[12] Within the degrowth movement, the aim is not only to achieve the two basic objectives of socio-ecological transformation (compliance with planetary boundaries whilst preserving social equity). Its proponents also argue for changes to the social order in wealthy countries that go beyond this in further respects: e.g. increased democratisation of company structures but also of political processes (increased citizen participation), increased equality in income distribution and gender equity, an increase in quality of life by strengthening social communities (for an overview cf. the degrowth anthology by d'Alisa et al. 2016 as well as Chapter 2.2: Characterising the Degrowth Approach). In this text we will limit ourselves to presenting the socio-ecologically motivated demands of the degrowth movement.

fundamental transformation in order to meet ecological targets (cf. e.g. Jacobs and Mazzucato 2016, Rockström et al. 2017, Hallegatte et al. 2011). However, they believe the transformation of economic systems should take a different direction: market principles need to be changed in order to remove those negative externalities that are currently impacting the welfare of people living in poor countries, and will continue to do so. In particular, they argue that we need to induce, via market mechanisms, technological progress and behavioural changes, for the interplay between these would bring about the required reductions in GHG intensity. According to this view, a long-term side-effect of such a transformation would be not less but more economic growth, even in wealthy countries.

As their respective names suggest, these two approaches can be characterised and differentiated by the role that will be played, or rather should be played, by economic growth in achieving socio-ecological transformation in wealthy countries. We will differentiate and define the approaches in more detail below, employing two criteria – first, the suggested relationship between economic output and resource consumption, and second, the assumed relationship between economic output and social well-being:

Regarding the relationship between economic output and resource consumption respectively environmental pressures:

- Degrowth: Proponents of this approach argue that resource consumption, or environmental pressures, can only be sufficiently reduced in wealthy countries if economic growth in these countries is adequately reduced. This approach therefore implies an inextricably positive and causal relationship between economic output and resource consumption (environmental pressures).
- Green Growth: Proponents of this approach reject the idea that there is an inextricably positive and causal relationship between economic output and resource consumption respectively environmental pressures. By contrast, they believe that implementing a "green growth" pathway may even effect a negative correlation between these quantities: if we are to reduce resource consumption in wealthy countries, we need technical innovations. If we introduce these innovations and adapt them for the (global) markets, we induce economic growth once again.

Regarding the relationship between economic output and social well-being:

- Degrowth: Proponents of this approach argue that social well-being in wealthy countries may continue to increase or remain constant, even if there is a decrease in economic output, measured in GDP per capita. According to the degrowth approach, therefore, economic output measured in this way is not a necessary component of social well-being. Some degrowth proponents even regard further economic growth in wealthy countries as undesirable and detrimental to social well-being. They argue that increased economic output has been a causal factor in numerous social developments that have reduced quality of life. These include social acceleration trends, the increase in alienated labour, the decrease in meaningful activities, and the loss of a sense of community (cf. e.g. Paech 2012, Latouche 2015, d'Alisa 2016).
- Green Growth: Proponents of this approach question whether it is possible to maintain the standard of social well-being that has been achieved in wealthy countries if GDP per capita either does not continue to increase or if it substantially decreases. According to this approach, there is a very close correlation between economic output, measured in GDP per capita, and social well-being: GDP per capita is a reliable, albeit not a comprehensive, indicator for social well-being.

These two approaches, however, make it possible to analytically differentiate a third approach. We will call this the **"precautionary post-growth approach".** Proponents of this approach accept the fundamental goals of the transformation discourse, i.e. reducing environmental pressures to a level compatible with the planetary boundaries and maintaining a good quality of life (at a level to be specified by public discourses). In contrast to the degrowth approach, they do not accept the claim that a reduction in GDP per capita is a necessary side-effect of a successful socio-ecological transformation. In contrast to the green growth approach, however, they also reject the claim that compliance with the planetary environmental boundaries is definitely compatible with further economic growth.

Proponents of post-growth remain agnostic with regard to the disagreements between the degrowth and green growth approaches on aforementioned relationships

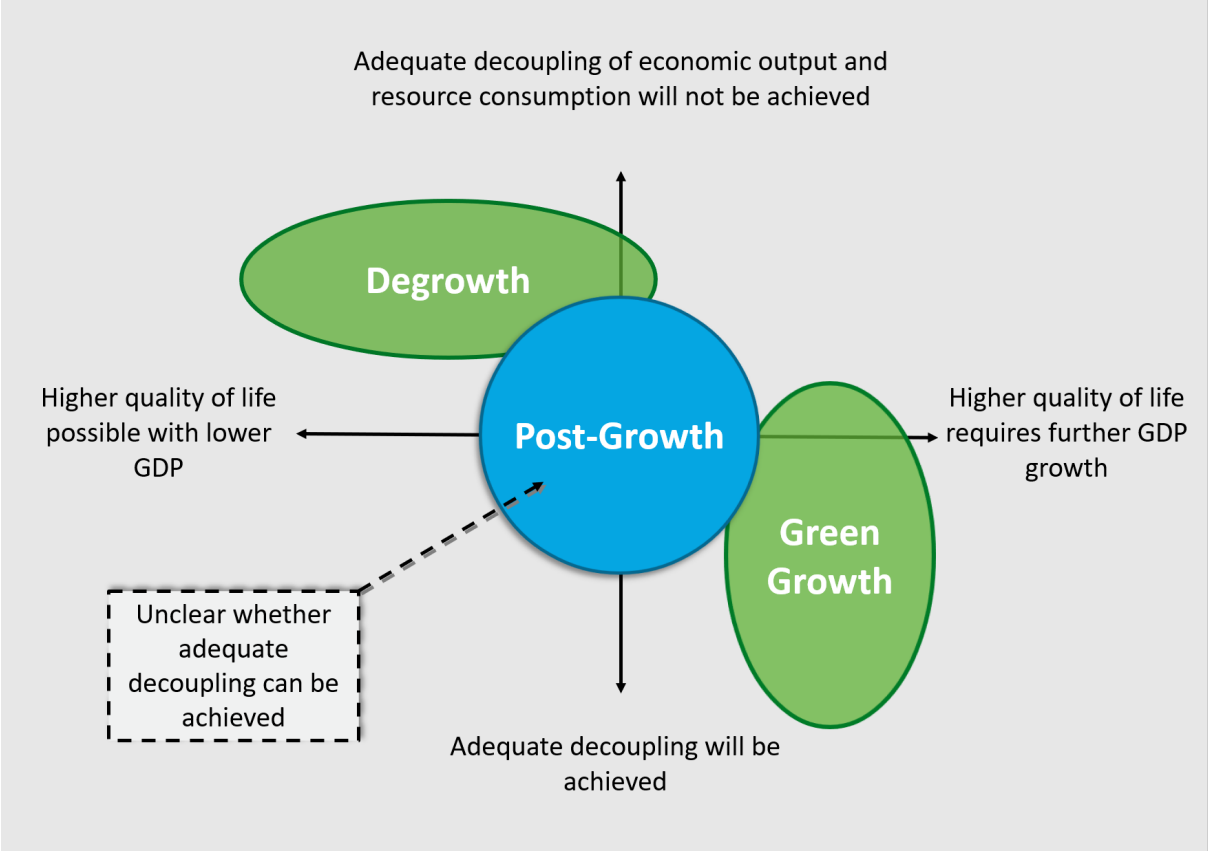
- Economic output and environmental pressures: Proponents of post-growth approaches believe the relationship between resource consumption, environmental pressures and economic output has not been understood well enough to be able to make reliable prognoses about how GDP will develop if the ecological targets are met. In wealthy countries it may either decrease or increase. However, they consider a scenario in which total economic output decreases due to the pursuit of ecological targetsa serious possibility.
- Economic output and quality of life: Proponents of post-growth approaches see no direct, linear correlation between the amount of GDP and social well-being. The correlation is also dependent, in particular, on the concept of social well-being. In this context, proponents of post-growth do not regard GDP per capita as an adequate proxy for social well-being; instead, they advocate an extended measurement and diagnostics of well-being.

These perspectives on the two relationships are advocated under different names by many authors within the discourse on socio-ecological transformations: **new economics of prosperity** (Jackson 2009), **post-growth society** (Seidl and Zahrnt 2010), **a-growth** (van den Bergh 2011). However, even the ideas on welfare diagnostics presented by Jakob and Edenhofer (2014) are compatible with the two claims of the post-growth approach specified here. Nonetheless, the post-growth approach has substantial and politically challenging implications: if, in our pursuit of ecological targets, we reduce GDP on a permanent basis, there would be, ceteris paribus, severe social disadvantages within the existing economy. This scenario (reductions in GDP induced by ecologically motivated reforms) is a serious possibility. Therefore, we should transform economic institutions as far as possible in such a way that they are able to function adequately if there is a decrease in GDP. It is in this sense that our approach claims to be "precautionary". This transformation of social institutions, which involves liberating them from their dependence on growth, is a political challenge to which Seidl and Zahrnt (2010) have explicitly drawn attention in the anthology "Postwachstumsgesellschaft" ("post-growth society"). Therefore, we have adopted the name "post-growth" for the approach we have analytically differentiated here.

In Figure 1 we illustrate the differences between these three approaches.

With regards to its justification, however, the post-growth approach specified here is dependent on the debate between the degrowth and green growth approaches in the following respect: it is only possible to rationally advocate the post-growth approach if neither the degrowth nor the green growth approach can be reasonably justified. If, on the other hand, it could be shown that one of the approaches, either degrowth or green growth, is reasonably justified, a commitment to an agnostic position would be disingenuous.

Figure 1: Overview of the approaches



Source: own illustration, IÖW (Institute for Ecological Economy Research)

Below, we will examine the two approaches of degrowth and green growth to see if their central claims can be plausibly justified in the light of the current state of academic research.

2.2 Degrowth

This chapter discusses the degrowth approach as follows: firstly (Chapter 2.2.1), we will present an overview of the different degrowth perspectives. To do this, we will outline the various strands and associated claims of the degrowth approach, providing an overview without any ciritical assessment. Secondly (Chapter 2.2.2), we will concentrate on the ecologically motivated aspect of the degrowth discourse and present in more detail the arguments brought forward in support of the core claims of the degrowth approach. The aim of this section is to provide an outline; this does not imply that we support the arguments. Thirdly (Chapter 2.2.3), we will enter into critical debate with the arguments we have set out.

2.2.1 Characterising the Approach

Proponents of the degrowth approach believe that if we are to meet our ecological targets and comply with the planetary boundaries, the economic order of early-industrialised wealthy countries must be fundamentally transformed. Apart from the reduction in material throughput, the aim behind this transformation of wealthy societies is to establish a different institutional order, one that is best characterised as a solidarity economy (Ronge 2016). Degrowth proponents regard common property (commons) and its associated economic activities (sharing) and organisational forms (collectives) as an institutional lynchpin in this kind of economy (Kallis et al. 2015: chapter 2). From the perspective of degrowth, such a transformation

would have an effect on the future development of GDP per capita in wealthy countries. According to some of its proponents, GDP per capita in wealthy countries would substantially decrease as a result of socio-ecological transformation (e.g. Asara et al. 2015: 377, Kallis et al. 2015); other proponents believe that as part of the degrowth transformation, GDP per capita should be reduced in a controlled way (Schneider 2010: 512, Demaria et al. 2013: 209), without decreasing quality of life and without giving rise to social inequities.

This strategy is advocated from within several civil society currents. Demaria et al. (2013) and Muraca (2013) have suggested that all these currents could be subsumed under the concept of the "degrowth movement". However, it is not only actors within the degrowth movement who advocate the strategy of transformation according to which GDP per capita would decrease (or the strategy of a controlled reduction in GDP). Other social actors share this opinion (e.g. Miegel 2010) without being an accepted part of the degrowth movement (cf. Muraca 2014). For this reason, we will not limit our account purely to the degrowth movement in its narrower sense.

Proponents of the degrowth approach derive the demand for a fundamental transformation of the established economic systems of wealthy countries from two basic normative principles – social justice and enabling the good life. They argue that existing economic systems constitute a causal factor in the violation of these basic requirements. Within the discourse, individual authors foreground different aspects which, from their point of view, give rise to injustices or impede the quality of life. Many authors see the **environmental pressures** resulting from economic behaviour and lifestyles in wealthy countries – in particular the level of resource throughput – as intergenerationally and globally unjust because these ecological impacts make compliance with the planetary boundaries impossible (e.g. Martínez-Alier et al. 2010, Miegel 2010, Kallis 2011, Paech 2012, Latouche 2015). The injustices resulting from the environmental pressures, however, are only one of multiple reasons why a shrinking of GDP is seen as necessary. Some proponents of the discourse consider the **capitalist economy**[13] itself as a causal factor in existing global, intergenerational and social injustices (e.g. Latouche 2015) and obstructive in the attainment of a good life for many people (due to exploitative conditions). They call for the transformation of capitalist systems into a solidarity economy (e.g. Schmelzer and Passadakis 2011; on the concept of the solidarity economy, cf. Ronge 2016). According to the ideas of this kind of economy, a significant proportion of economic activities would take place outside of money-based markets, thereby leading to a lower market-related value creation, i.e. GDP, than in existing wealthy economies. Feminist economists, too, advocate a similar vision to that of the solidarity economy. They focus, however, on a further injustice, i.e. **gender relations** in the market economies of wealthy countries.[14] We can see this, for example, in the fact that work that is paid relatively badly, or even not paid at all, is mostly carried out by women, e.g. reproductive and care work (cf. on this Picchio 2003, Bauhardt and Caglar 2010). Some feminist economists argue that the monetary sector would have less of a role to play in a

[13] According to the prevailing understanding of capitalism, this economic system is characterised by four qualities: (i) privately owned means of production; (ii) free labour markets; (iii) capital accumulation; (iv) markets as a means of allocation for goods and services (cf. Jaeggi 2016: 46; similarly, Andreucci and McDonough 2015).

[14] This is not to suggest that degrowth proponents believe that gender injustices are only a problem in wealthy market economies. This problem also exists in less wealthy countries, and in fact to a greater extent. There is even a negative correlation between gender inequality and material affluence (Nussbaum 1999), a fact that no one would dispute within the degrowth discourse. Nonetheless, gender inequality in the Global South may be caused by other factors than these injusticies in early-industrialised countries. The degrowth discourse explicitly addresses the latter question.

This distinction between (a) the critique of the conditions in wealthy market economies and (b) the critique of the conditions in poorer countries of the Global South (with considerably different political and economic institutions) is of great significance in the understanding of the degrowth approach. All the points of criticism reflected here also apply to the non-wealthy economies, and in many cases to a significantly greater degree. The degrowth proponents merely argue that there are also certain injustices in the wealthy countries of the Global North, claiming, in addition, that in wealthy countries these are generated by the economic order, the constitutive objective of which is economic growth. There is no contradiction between this approach and the claim that many countries in the Global South need further economic growth.

gender-equal economy, which is why this type of economy would be accompanied by lower GDP (Haug 2011, d'Alisa et al. 2015).

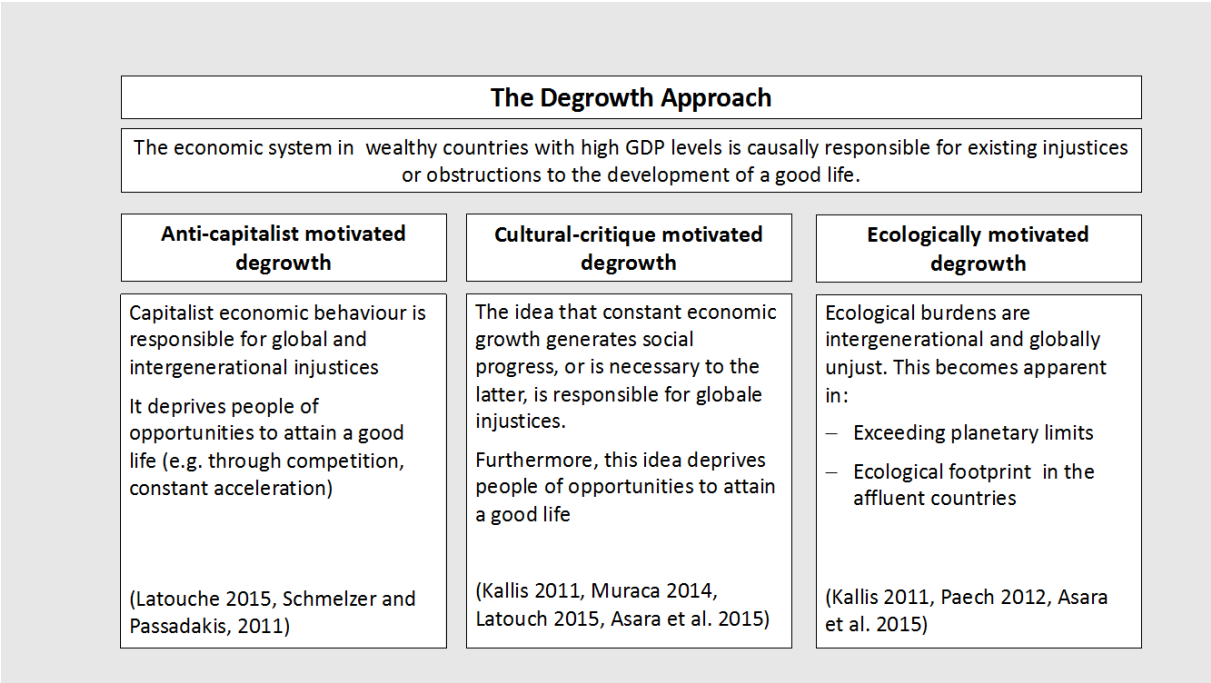
Ultimately, numerous authors have criticised the idea that there is a close link between economic growth and social progress or development (e.g. Illich 1973, Miegel 2010, Welzer 2013, Latouche 2015). Latouche (2015: 31 ff.) and Martínez-Alier et al. (2010: 1743) have called this strand of criticism **"cultural criticism"**. This critique does not focus on the aforementioned considerations of justice; instead, it draws on a different normative source: proponents of cultural criticism believe that further economic growth in wealthy countries will not contribute to a better life for their citizens. Within this discourse, there is consensus that a modern economy, which draws on the division of labour and on money-based markets, has a considerable influence on social relations (prominent here are: Polanyi 2001 [1944], Rosa 2005: 257 ff.) and therefore also determines the opportunities for the realisation of constituents of a good life. In the degrowth discourse, individual self-determination (autonomy), social affiliation (and, in connection with this, the cooperative or solidarity-based rationale for behaviour, maintaining friendships and familial relationships, and conviviality), enjoyment of leisure time (the ethos of play) and a meaningful life (or rather, the possibility of pursuing meaningful or fulfilling activities) are of particular importance (cf. Miegel 2010, Welzer 2013, Muraca 2014, Latouche 2015). Proponents of the degrowth strategy argue that (i) the current economic system based on continual growth has a negative influence on these constituents of a good life, (ii) the latter could be more effectively realised than is currently the case if economies produced a lower GDP, and (iii) realisation of these consistuents would improve many people's quality of lifes (Muraca 2014, Latouche 2015).

The proponents of the degrowth discourse agree that neither the elimination of existing injustices nor the attainment of a better life can be achieved as long as wealthy countries maintain economic systems that generate the current high levels of GDP.[15] In order to eliminate these deficiencies, they call for a change in economic systems. According to them, this change should lead to economic systems with a significantly lower proportion of activities that have monetary value and are therefore included in the GDP. An economy transformed in this way would necessarily mean a reduction in GDP per capita (for an overview of up-to-date research results on degrowth, see Kallis et al. 2018).

Several degrowth variants can be distinguished, depending on what is regarded as a key social challenge. These are shown in Figure 2 (similar distinctions can be found in Ott 2012).Figure 2 All degrowth proponents believe that at least one of the aforementioned deficiencies can only be eliminated through policy measures that lead to a reduction in GDP. However, the degrowth variants presented above are not mutually exclusive: some authors ascribe several deficiencies to the growth-oriented economic system. We will come back to the ecologically motivated degrowth approach in more detail in the following sections, for this explicitly refers to the relationship between resource consumption and economic development which is the main focus of our analysis.

[15] For example, Kallis (2011: 874) writes: "Sustainable degrowth […] postulates that throughput cannot be reduced with growing GDP, and even more, that throughput degrowth will inevitably entail a smaller – and qualitatively different – economy, i.e. GDP Degrowth"; Martínez-Alier et al. (2010: 1745) write: "In eyes of de-growth proponents, economic growth, even if disguised as sustainable development, will lead to social and ecological collapse"; Kallis et al. (2015) state: "Degrowth is not the same as negative GDP growth. Still, a reduction of GDP, as currently counted, is a likely outcome of actions promoted in the name of degrowth."

Figure 2: Comparison of degrowth approaches



Source: own illustration, IÖW

2.2.2 Arguments for the Ecologically Motivated Degrowth Approach

The degrowth approach can be defined on the basis of the two relationships that we introduced as distinguishing features in Chapter 2.1:

- Relationship between **economic output and resource consumption respectively environmental pressures:**
  Wealthy countries will only be able to reduce their environmental pressures (resource consumption) by an amount that constitutes a globally appropriate contribution to compliance with planetary boundaries if they significantly reduce their economic output (measured in GDP per capita).
- Relationship between **economic output and social well-being:**
  Maintaining or increasing social well-being in wealthy countries is not dependent on a continued increase in economic output, measured in GDP, in these countries. It is rather the case that social well-being in wealthy countries can – and in fact, from the point of view of some authors, should – be fostered (meaning that opportunities for a "better life" should be increased) by transforming their economies in a way that significantly shrinks GDP per capita.

The theory regarding the relationship between economic output and resource consumption (or environmental pressures) plays a pivotal role in justifying the ecologically motivated degrowth strategy. According to this approach, resource consumption and environmental pressures in wealthy countries can only be reduced to an extent sufficient for compliance with planetary boundaries if the economic output of these countries decreases. If this claim is true, and if, in addition, we accept the normative premise that principles of global and intergenerational justice require wealthy countries to reduce their resource consumption and environmental pollution, it follows that these principles of justice also require a decrease in economic output in wealthy countries (on the reconstruction of arguments for degrowth, cf. also Ott 2012).

However, this demand based on justice does not immediately imply that the degrowth strategy should be implemented. In order to justify this policy recommendation, we need to plausibly establish the claim that the implementation of the degrowth strategy – which would decrease economic output in wealthy countries – does not violate other principles of justice. Here the question arises whether a reduction in economic output would either disproportionately decrease the well-being of inhabitants of wealthy countries or expose them (especially the most disadvantaged members of the population) to other inequities, i.e. whether the degrowth strategy does not, in fact, violate the principles of social justice. Proponents of the degrowth strategy claim this is not the case. In order to justify this, they rely, once again, on the second claim differentiated above, i.e. the claim that social well-being can be increased while economic output decreases.

Below, we will examine the arguments for the two core claims in detail.

2.2.2.1 Argument for the Correlation Between Economic Output and Resource Consumption

We have identified in the literature three arguments for the degrowth claim stating that economic outcome and resource consumption cannot be decoupled to the required extent and within the required time frame. In this section we will outline these arguments, without, at this point, evaluating them.

The Impossibility of Decoupling – an Argument Based on Ecological Economics

Some economists have advanced the claim that it is impossible to decouple the increase in resource or environmental consumption from growth in economic output (e.g. Kallis 2011: 874). This impossibility claim was put forward by Georgescu-Roegen (1971) and has been the subject of debate ever since then. Georgescu-Roegen's basic idea is that economic output – i.e. the production of goods and services – requires energy input. According to the two principles of thermodynamics, energy input cannot rise indefinitely. This is because energy comes either from finite sources or (from the human perspective) from inexhaustible sources, but its output is constant (cf. Glucina and Mayumi 2010: 18). If, then, economic growth also requires an increase in energy input and the increase in energy input is limited according to the thermodynamic laws, this means economic growth, too, will be limited. Subsequently, empirical arguments have been advanced which support the claim that an increase in economic output is predicated upon additional energy supply (cf. Ockwell 2008 or Stern 2011 for an overview). Using time series of 100 years for the USA, Cleveland et al. (1984) have shown that energy consumption is closely correlated with economic growth and developments in labour productivity and price levels. Ayres and Warr (2005) have compiled a macroeconomic model in which energy input (or useful work) explains the development of total factor productivity and therefore of economic growth, showing that past economic growth rates can be traced empirically on the basis of the model (see also Warr and Ayres 2012).

Rebound Effects

According to the degrowth literature, another reason why economic growth cannot be decoupled from resource consumption to a sufficient extent and within the required time frame is so-called rebound effects – also called the Jevons paradox (e.g. Kallis 2011: 874, Muraca 2012: 541): technological progress, which increases resource efficiency, also contributes to a decrease in the price of the respective resource. In turn, this price effect increases the demand for the resource and, by increasing efficiency, decreases the possible reduction in resource consumption. It could even increase the consumption of the resource; this is called the backfire rebound effect (Santarius 2016). This is the argument made, for example, by Paech (2012: 84 f.): the income effects obtained by increasing resource or energy efficiency are spent again on the

market and ultimately used in order to consume further resources. For this reason, he doubts that decoupling can be achieved.

Unrealistic Efficiency Increases

Finally, the claim that decoupling cannot be achieved is justified by pointing out that meeting ecological targets (e.g. climate or resource targets) requires technological progress on a level that we have not yet observed (Kallis 2011: 874; Jackson 2009, Antal and van den Bergh 2015). The calculations presented in Chapter 2.1 show that if we are to reduce GHG emissions by an amount compatible with limiting global warming to 1.5 to 2 °C, with the economy continuing to grow by 2%, all economic sectors must decarbonise by an average rate of between 4 and 9% annually. Since 1990, we have seen a global decarbonisation rate of just under 1%. Degrowth proponents conclude from this that it is unrealistic to expect that in the next few years we will see technological advances leading to a fourfold to ninefold increase in decarbonisation rates annually. Ward et al. (2016) put forward a similar argument: by means of a model based on the IPAT identity, they show that even if we assume "extremely optimistic" growth rates for resource and energy productivity, resource and energy consumption will increase with further economic growth.

2.2.2.2 Argument for the Correlation Between Economic Output and Social Well-Being

Even if it were true that decoupling will not be achieved within the required time frame, this would not be enough to justify implementing the degrowth approach. This is because its implementation, which would involve decreasing economic output, might lead to further injusticies. To refute this objection, degrowth proponents must provide a plausible explanation of how, in a degrowth economy that will generate a significantly lower GDP, we can provide at least an acceptable baseline level of quality of life for everyone.

Some scholars try to argue on a macro-economic basis that implementing a degrowth economy will not lead to social inequities. Victor and Rosenbluth (2007), Victor (2012) and Jackson and Victor (2016) have published studies in which they try to demonstrate, by means of a macro-economic model, that a significantly reduced national economy may fulfil particular social criteria (e.g. a low unemployment rate).[16]

But as degrowth proponents are striving for a transformation of the fundamental institutions within the economy, macro-economic simulations come up against conceptual boundaries. Instead, the majority of the degrowth discussion is oriented towards a descriptive illustration of how social well-being can be maintained despite decreasing economic output. Here, we identify two claims advocated by degrowth proponents that differ in their justifications (and that are also contentious to varying degrees):

[16] The hitherto existing model by Victor illustrates correlations between very highly aggregated macro-economic quantities. This means that in a model such as this, the employment figures of course remain stable when, for example – as per the assumption in the model –, employees accept significantly lower wages. In reality, however, not only relative quantities (income inequality) and minimum social requirements but also the level of material affluence have a role to play.

We regard these studies as research projects providing fundamental research into the possibility of a macro-economic modelling of degrowth economies. Due to the simplicity of their models thus far, their results do not represent a reliable basis for social and political debates, which is why we do not discuss them in any further detail.

One of the challenges of a macro-economic modelling of the degrowth economy is that some of the neo-classical basic assumptions of established macro-economics are rejected in degrowth discourse (e.g. the assumption that utility from consumption represents the target quantity; that all economic agents focus their actions on increasing utility; that non-market services are assessable in monetary units, etc.). These theoretical foundations are regarded as unsuitable as a basis upon which to construct macro-economic degrowth models. Even simulations such as the widely received LowGrow model by Victor (2007) are beset by the problem that their empirical assumptions (elasticities, preferences of the actors, etc.) were observed in existing economies and it is unclear how these parameters would change if an economy developed in accordance with the ideas of the degrowth proponents.

- first, the negative claim, according to which GDP per capita is not an adequate indicator for social well-being;
- second, a positive claim specifying the concept of social well-being.

GDP Is Not an Appropriate Indicator for Social Well-Being

Firstly, degrowth proponents argue for the claim that GDP per capita is not an appropriate indicator for social well-being. This is because, on the one hand, the GDP includes services that neither increase social well-being nor reduce it, and on the other hand, there are activities that contribute to social well-being but are not included in the GDP.

The first category consists of activities that are included in the GDP as unavoidable contributions to goods and services but do not improve social well-being. Cited examples include: expenditure on prisons, expenditure on travel to work, accidents, expenditure on lifestyle illnesses, environmental disasters, insurance services (c.f. Seidl and Zahrnt 2010: 29). The second category, i.e. activities that are relevant to well-being but are not included in GDP calculations, consists firstly of activities conducted outside of formal markets that influence well-being. According to the degrowth literature, these are, for example, activities conducted within narrow social groups (families, households, friends, etc.): caring for relatives, basic everyday activities (cooking, washing, tidying up, etc.), but also enjoyable activities (games, conversations, private celebrations, etc.). Secondly, Seidl and Zahrnt (2010: 29) also include market activities that give rise to negative welfare effects that are not, however, represented in the GDP: e.g. noise pollution, damage to nature, depletion in stocks of non-renewable resources, etc.

If the GDP therefore does not adequately represent some elements of social well-being, it is possible, in principle, that social well-being could increase even if the GDP is declining. This would be the case, for example, if the positive contributions to well-being made by activities not taken into account in the GDP were to increase over a period of time to an extent that outperforms the decrease in economic output over the same period. In this scenario, people would be producing less but spending more time on fulfilling activities and interpersonal relationships associated with high levels of mutual recognition. They would be enjoying life more, so well-being would increase overall.

Given this basic possibility that well-being rises despite a decline in GDP, the question we must ask is: what exactly defines such concepts of well-being? This brings us to the discussion of the second claim.

Concepts of Social Well-Being

The identification of the components of social well-being is not discussed systematically within the degrowth literature. We have therefore analysed the suggestions and ideas put forward in this literature from the point of view of how they align with the three basic concepts of a good life (social well-being), defined within the philosophical literature (cf. Text box 1). In doing so, we found that there is no consensus on the concept of social well-being within the degrowth discourse. The suggestions discussed, however, can be categorised into two basic concepts of social well-being: hedonism and theories of objective value.

Text box 1: Basic concepts of social well-being

Three basic concepts of individual and social well-being can be differentiated within the philosophical literature: hedonism, the concept of desire fulfilment ("desire fulfilment theory") and theories of objective values ("objective list theories") (cf. Parfit 1984: 493 ff., Griffin 1986, Crisp 2016).

According to hedonism, individual welfare is experienced in highly subjective ways and consists in experiencing as much happiness and as little pain as possible. Two concepts of subjective happiness are differentiated within the psychological literature: happiness in the sense of the difference between positive and negative sensations, and happiness in the sense of individual Evaluations of satisfaction with life (Kahneman and Krueger 2006).

According to the desire fulfilment conception, individual welfare consists in implementing the social state an individual would wish for him/herself (under certain conditions of rationality) to be in (Parfit 1984: 494 f., Griffin 1986: 21 ff.). Two variants are differentiated within the desire fulfilment theory of well-being: the theories of factual and ideal desires fulfilment (Griffin 1986). According to the theory of factual desire fulfilment, individual well-being consists in the fulfilment of an individual's actual desires. An objection made to this theory, however, is that some desires individuals actually have may not be good for the people themselves due to various contingent conditions (being ill-informed, errors in rationality, myopia, psychological adaptation to the conditions, etc.). Numerous authors therefore argue that is it not factual but ideal desire fulfilment that should be considered the basis of human well-being (Harsanyi 1982, Griffin 1986, Adler and Posner 2006). Ideal desires are desires that an individual would harbour under certain ideal conditions (e.g. being well-informed, autonomy, rationality, etc.).

The concept of well-being prevalent within mainstream economics – the concept of preference fulfilment – is a variant of desire fulfilment theory. Because desires had been regarded as imposible to measure, preferences (behavioural dispositions) rather than desires became the point of departure for the conceptualisation of well-being. Individual utility levels consitute a numerical representation of individual preference orderings (on the historical development of the concept of utility, cf. Cooter and Rappoport 1984, Blaug 1996: chapter 9). In the theoretical literature, preference orderings are construed as ordinal and not interpersonally comparable, which significantly restricts their applicability in an evaluation of social states (Arrow 1951, Sen 1970). In applied mainstream economics, however, there is an established practice of using aggregated consumer spending as a measure of welfare. This is based on Samuelson's idea that monetary expenditure in the markets reveals individual preferences which, based on certain assumptions, can be aggregated to form a social welfare function. Elements of well-being for which there are no market prices would have to be added to this through individuals' willingness to pay (cf. Fleurbaey and Blanchet 2013: 76 ff.). According to the concept of social well-being prevalent within applied mainstream economics, this can be represented by the aggregation of consumer spending and individual willingness to pay for non-market goods and services.

The name "theories of objective values" refers to all concepts of well-being, according to which individual well-being consists in the realization of a list of certain values. These values are objective in the sense that their implementation may contribute to individual welfare without the individual perceiving them as positive (Parfit 1984: 499). There is no consensus within the academic literature on what the sources of these values are: the categories of "needs" (e.g. Doyal and Gough 1991, Max-Neef 1995) and "capabilities" (Nussbaum 2000) are two prominent examples. Nor is there consensus on the list of values that determine well-being (cf. e.g. Gough 2014).

The concept of happiness plays an ambivalent role within the degrowth discourse. On the one hand, the hedonist conception of well-being is often implicitly assumed in the degrowth literature when criticizing GDP growth (e.g. Latouche 2015b). Time series analyses for wealthy countries show that there is no strong correlation between GDP development and the temporal development of average life satisfaction (e.g. Clark et al. 2008: 96). This evidence has been called the "Easterlin paradox". Some degrowth authors use the Easterlin paradox to justify the claim that GDP is not an adequate indicator of social well-being. Instead, social well-being should be represented by means of individual life satisfaction or happiness, according to them (e.g. Layard 2005). This line of reasoning has been absorbed into the degrowth discourse (e.g. Kallis 2011, Muraca 2012, Latouche 2015b).

On the other hand, numerous degrowth proponents criticise the claim that social well-being is essentially something that can be experienced subjectively and operationalised through concepts of happiness (e.g. Muraca 2012, Latouche 2015). This ambivalence is clearly visible in, for example, the studies by Paech (e.g. 2012). Here, happiness seems to be the central normative category: Paech claims that a degrowth economy may open up the prospect of more happiness (ibid.: 11; cf. also ibid. section 6). Nonetheless, Paech distances himself from the idea that any kind of happiness increases well-being (ibid.: 148 f.), referring to "responsible happiness", without providing any substantial explanation of this concept.

Within the degrowth literature there are two prominent versions of **theories of objective lists** (cf. Muraca 2012: 542): Max-Neef's (1995) list of fundamental human needs and Nussbaum's list of central human capabilities (e.g. Nussbaum 2000). What both concepts have in common is that they do not try to define social well-being. Instead, they claim to specify a minimum standard for a fulfilling human life: both specify values that must be realized (or for which the possibility of realization must be created) in order for people to live a decent life. On the basis of these conceptions, proponents of the degrowth approach claim that some values from the lists of objective values have not been adequately realized in wealthy societies, or that they could be realized to a greater extent in a differently structured economy: examples for these values are social co-existence, solidarity, altruism, cooperation, enjoying leisure time, the ethos of play (Latouche 2015b: 59, Muraca 2014: 78 ff.) as well as autonomy or self-determination (Muraca 2014: 89, Latouche 2015b: 69 f., Paech 2012: 63 ff.).

2.2.3 Critique of the Degrowth Argumentation

2.2.3.1 Critique of the Claim that Decoupling Will not Be Achieved

Critique of the Argument from Ecological Economics

Even if the Georgescu-Roegen's claim were true that economic growth necessarily requires an increase in energy input, this would not be enough to justify the degrowth claim, i.e. that the environmental pressures can only be reduced to an extent that complies with planetary boundaries if, at the same time, economic output decreases accordingly. This is because even if the Georgescu-Roegen claim held, energy consumption in wealthy countries might still increase without this leading to undesirable environmental pressures (e.g. GHG emissions, accelerated loss of biodiversity, nitrogen and nitrate emissions).

But even in itself, the claim that economic growth is predicated on an increase in energy input has not been convincingly substantiated. The correlations between useful work and total factor productivity (TFP) highlighted by Ayres and Warr (2005, 2012) do not say anything definitive about causation. Moreover, the correlation between useful work and resource input presupposed by Ayres and Warr is dependent on the development of technological productivity (cf. Ayres and Warr 2005: 98). This means the observed correlation between useful work and

TFP is compatible with the claim that economic growth can be decoupled from resource and environmental consumption, where there is sufficient technological development (for an overview of the state of research on the role of energy in economic growth, cf. Stern 2011).

The fundamental problem of arguing for the impossibility of decoupling of economic output from energy input by referring to physical boundaries is that economic output is measured in a unit of value. This value is determined by market prices. Market prices, however, depend on preferences of market participants. GDP may also increase if market participants demand higher-quality, resource-light goods and services, or choose to consume either no or fewer resource-intensive goods and services.

Critique of the Argument Based on Rebound Effects

Rebound effects would only justify the claim of the impossibility of decoupling if the argument were focused on so-called backfire rebound effects, where the demand for resources induced by decreases in the price of resources is equal to or higher than 1, and consequently, increases in resource - efficiency actually lead to an increased demand for these resources. Weaker rebound effects do make decoupling more difficult, but not impossible. In this case, increases in productivity not only have to compensate for economic growth but also for the increase in resource consumption induced by the income effect.

It is not possible to predict precisely what effect future increases in resource efficiency will have on resource consumption and environmental pressures overall. This means it is not possible to verify the claim that future rebound effects would prevent ecological targets being met as long as economic output is continually increasing.

Critique of the Argument Based on Unrealistic Increases in Efficiency

The rates calculated for the required efficiency increases in GHG intensity illustrate that these targets cannot be achieved with the rates of economic decarbonisation we have seen thus far (c.f. Tables 1 and 3). We would, however, be drawing a false conclusion if we were to take the fact that we have not observed the required efficiency increases thus far as evidence that these are impossible, or that they definitely cannot be achieved within the relevant time frame. The rates by which a national economy is decarbonised, or the rates by which the intensity of resources is decreased, are parameters that are subject to political influence (e.g. through taxes, incentives, funding for technology, etc.). Simple linear projections of the development of such parameters are not a reliable basis for forecasting future development (for more detail on this, cf. Mattauch et al. 2017).

A similar criticism can be levelled at the modelling results in Ward et al. (2016). The results show that, based on certain assumptions (very optimistic in comparison with the growth rates for resource and energy productivity observed thus far) decoupling cannot be achieved. This does not, however, exclude the possibility of resource and energy productivity increasing more than was assumed in the “extremely optimistic” scenario, or of parameters shifting, e.g. assumptions about economic growth changing.

2.2.3.2 Critique of the Claim that Well-Being Can Increase as Economic Output Decreases

Proponents of the degrowth approach are committed to the claim that the lower economic output that results from implementing the degrowth strategy will not give rise to social injustices or cause a decrease in social well-being. One possible way to justify this claim would be to estimate the extent to which the GDP would decrease if the ecological targets were met, and then to empirically demonstrate how, in such a scenario, systems of social security, inter alia, would render their services (e.g. whether it would be possible to finance a basic income, whether high incomes/assets should be used for financing, or whether entirely different means

should be employed). We know of no calculations for such a scenario. In particular, proponents of this discourse offer no explanation of the basis upon which (and how) social well-being or the principles of social justice can be upheld if the GDP in wealthy countries decreases to an extent that is, according to the illustrative calculations based on the IPAT identity, necessary for meeting the climate targets (i.e. a reduction in GDP to 15% of the current level) without technological progress. Instead, the debate focuses on the theoretically prior question of whether it is possible, in principle, for social well-being to continue to increase if the economic output in wealthy economies is decreasing.

The negative claim, that GDP is not a comprehensive indicator for prevalent concepts of social well-being (cf. Text box 1) is widely accepted in the research (cf. Fleurbaey and Blanchet 2013) as well as on the political level (cf. Enquete-Bericht, Enquete-Kommission 2013). The more contentious question is whether GDP (or rather, the indicators related to it) is an adequate proxy for representing social well-being. Some authors regard it as inadequate (e.g. Kuznets 1933, Sen 1999: 291 ff., Dasgupta 2004: chapter 9, Costanza et al. 2009)[17]. There are, however, authors who defend the claim that GDP is an adequate proxy for a conceptualisation of social well-being (e.g. van Suntum and Lerbs 2001).

At this point, rather than exploring the indicator debate more deeply, we turn to the positive normative claim. It specifies a concept of social well-being according to which a reduction in economic output, measured in GDP, is compatible with an increase in social well-being. Here, we discuss which of the three established basic concepts of social well-being (cf. Text box 1 in Chapter 2.2.2.2) is compatible with the claim that a decrease in GDP is not necessarily accompanied by a decrease in well-being.

Research on happiness and satisfaction (the **hedonic concept** of welfare) provides no clear evidence for the claim that social life satisfaction or happiness remains constant or increases when economic output decreases (Clark et al. 2008, Weimann et al. 2012). In fact, time series for wealthy countries show that life satisfaction does not increase further beyond a certain level of GDP. Nonetheless, studies at the national level show positive correlations between life satisfaction and income (Clark et al. 2008), which calls into question the validity of the so-called Easterlin paradox.

According to the **desire fulfilment concept** of welfare, the normative degrowth claim states that individuals (under certain conditions of rationality) would desire to live in a society with a lower economic output. This concept of well-being has not been empirically examined, for there is no operationalisation of the desire fulfilment concept of well-being (and given the required conditions of rationality, an empirical study would be an intricate undertaking). Plausible arguments for this claim are being provided within the degrowth literature: e.g. that people wish to live in a society without consumption treadmills and other lock-ins (see section on positional goods in Chapter 3.1.3), to live in a society with stronger social solidarity, and to experience less stress. This of course does not answer the question of whether people (under certain conditions of rationality) would desire to live in a society with a lower GDP but with a greater consolidation of other desirable attributes (e.g. stronger social cohesion). However, according to this concept of well-being, the degrowth claim should be taken seriously that a reduction in material welfare

[17] These authors give examples of various reasons why the GDP is often not regarded as suitable for representing social well-being. Kuznets questions, as a matter of principle, whether a normatively loaded and complex concept such as social well-being can be represented by a number (cf. on this Lepenies 2013: 88 ff.). Sen's criticism (1999) is that the GDP is an output indicator, whereas social well-being actually consists in the opportunity or freedom to acquire things of value. The criticism levelled by Costanza et al. (2009) is that a significant aspect of social well-being – nature and its resources, its capital, its services – is not included in the GDP. Dasgupta (2004) develops his own concept focused, in particular, on natural capital (Dasgupta 2004: 146) and shows that traditional indices, such as net national income, derived from national accounting are not adequate indicators for representing changes in social well-being (ibid.: 151).

that is simultaneous with an increase in other values at least does not reduce the overall well-being.

On the other hand, this claim is more difficult to justify on the basis of the preference satisfaction conception of well-being prevalent in mainstream economics. According to this conception too, social well-being may in principle increase as GDP, and therefore consumer spending, decrease, if there is simultaneously a greater increase in the willingness to pay for non-market goods and services. However, there is no evidence that the individual willingness to pay for the social states resulting from socio-political transformations induced by the degrowth approach is so high that it would counterbalance the reduction in social well-being arising from the decrease in consumption as a response to these transformations.

The evidence in favour of the normative degrowth claim is more convincing if it is based on a version of the **theories of objective values.** According to these, social well-being increases if more people have the opportunity to fulfil all their basic human capabilities (or needs) to a sufficient extent to be able to lead a decent life as a human being. It is of course plausible that despite a reduction in GDP, members of society could possess certain basic human capabilities to a greater extent than before (e.g. access to nature, social solidarity). However, a complete justification of the normative degrowth claim needs an explanation of what kind of effects a reduction in GDP would have on basic human capabilities (or on the extent to which fundamental needs can be fulfilled). What is required here is a normative analysis of the degree to which the respective basic capabilities need to be fulfilled for a human being to live a decent life. As long as this is not clarified, the question remains open as to how many people in wealthy societies live under the minimum threshold of a decent life and how precisely we can assess the potential effects of a decrease in GDP on the realisation of objective values (irrespective of how they are operationalised).

Here too, therefore, the degrowth discourse points to an important question, and one that requires further research: we must take seriously the hypothesis that the wealthy economies can be structured in such a way that social well-being (according to the theories of objective values) increases even if GDP declines.

2.3 Green Growth

In our account of the green growth position, we will proceed in the following way: firstly (Chapter 2.3.1), we will present an overview of the different green growth approaches. Here, we will outline – by way of an overview and without any critical evaluation – the various strands as well as the associated claims of the green growth position. Secondly (Chapter 2.3.2), we will present in more detail the arguments used to substantiate the core claims of this position. The aim of this section, too, is to provide an outline; this does not imply that we support the arguments. Thirdly (Chapter 2.3.3), we will enter into critical debate with the arguments we have set out.

2.3.1 Characterising the Approach

In recent years, the green growth approach, which is a different kind of economic policy strategy for socio-ecological transformation, has established itself as a political target primarily within large-scale international organisations such as the World Bank or the OECD. Green growth approaches share the assumption that economic growth (in the sense of an increasing gross domestic product) and environmental and climate targets can be achieved simultaneously.[18]

[18] The OECD defines green growth as ”fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our welfare relies” (OECD 2011); for the World Bank (2012), green growth is ”growth that is efficient in its use of natural resources, clean in that it minimizes pollution and environmental impacts, and

Drawing on Jacobs (2013), the concepts on green growth can be divided into a standard green growth approach and a strong green growth approach (see Table 4).

Table 4: Overview of green growth approaches

Standard Green Growth Approach	**Strong Green Growth Approaches**		
Measures taken against climate change and environmental damage are more cost-efficient than bearing the long-term consequences of a "business as usual" approach. They therefore have the potential to create more efficient growth pathways.	Compliance with planetary boundaries is not only compatible with economic growth; environmental and climate policy measures may even increase the potential for growth.		
	Neoclassical Market Failure	Keynesian Green New Deal	Technology-Oriented Innovation Approach
	"False" prices on goods produced in ways that cause climate change and environmental damage result in an inefficient growth pathway; "true" prices have the potential to create more efficient growth pathways.	Fiscal stimulus programmes such as the "Green New Deal" have the potential to restore short-term growth in a recession and create more jobs.	Economic growth is triggered by key technologies that may induce growth phases lasting 50–60 years. The next growth phase could be driven by CO_2-neutral information technologies.

Source: own illustration, IÖW

The standard green growth approach assumes that the costs of measures for reducing climate and environmental damage are lower in the long run than the resulting costs of failing to act. The most well-known example of this approach is the so-called Stern Report. In the basic model of the Stern Report, a stabilisation of global greenhouse gas concentrations in the atmosphere would be associated with costs to the value of 1% of GDP, whereas in a business-as-usual scenario without an additional climate policy we would see social costs (or welfare costs) amounting to what would correspond to an annual reduction in GDP of between 5% and 20% (Stern 2007).

Proponents of the strong green growth approach are even more optimistic: they do not only assume compatibility between climate and environmental protection and further economic growth; they expect, in addition, that measures taken to comply with climate and environmental targets may spur on economic activity – and may do so not only in the very long term but potentially also in the relatively short term (Jacobs 2013). They back this up with three ideal-type strands of argumentation:

In the neoclassical theory of market failure, the assumption is that by correcting the factors responsible for market failure, it is possible to secure a more efficient allocation of resources, thereby bringing, at the same time, the economy potentially closer to its optimal growth pathway. Inherent in green growth concepts is a wide-ranging concept of market failure that captures the external costs of greenhouse gas production but also inadequate stimuli for knowledge production or the insufficient availability of common assets (Brown 2014).

During the financial and economic crisis in the years 2008 and 2009, the idea of green economic growth was linked with the Keynesian idea of an expansive fiscal policy, resulting in a Green New Deal. The assumption was that targeted state investments in green technology such as

resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters."

renewable energies or public local transport not only have a positive effect on the environment and the climate but also provide a fiscal stimulus for creating new employment and overcoming the global recession (Jacobs 2013).

Underlying the technology-oriented innovation approach is the hope that CO_2-neutral information and environmental technologies could trigger a "new industrial revolution", producing a similar growth effect to that of earlier key technologies such as the steam engine or the microprocessor (Stern and Rydge 2012).

2.3.2 Presentation of the Arguments for the Green Growth Approach

Proponents of the green growth strategy are – in contrast to the proponents of degrowth – convinced that a continual increase in economic output (GDP per capita) is desirable, even in wealthy countries. The reason for this is not that growth in GDP represents the only, or even the highest, social goal (Bowen et al. 2014: 409). Instead, green growth proponents believe that economic output contributes substantially to social well-being and that if it is reduced in wealthy countries it will not be possible to maintain the standard of social well-being in these countries.[19]

Green growth proponents, however, accept the normative requirements arising from the principles of intergenerational and global justice that wealthy countries are facing: the latter must reduce their environmental pressures respectively resource consumption substantially enough. In contrast to the degrowth approach, however, proponents of green growth argue that in the coming years and decades it is possible for wealthy countries to reduce their resource consumption and environmental pressures substantially enough, and that their economic output will continue to grow at the same time.

The core claims of the green growth approach, which are very contentious, are as follows:

- Relationship between **economic output and resource consumption (environmental pressures):**
  There is no necessary causal correlation between GDP growth and resource consumption or environmental pressures: a further increase in economic output (measured in GDP per capita) may accompany a reduction in environmental pressures. Further growth in economic output in wealthy countries may even contribute to a decrease in resource consumption and environmental pressures in these countries and – through the export or transfer of appropriate technologies – in other countries, too. This is because the reduction depends on technological innovations which decrease GHG and resource intensity. The introduction of technological innovations is a central driver of economic growth (cf. on this Chapter 3), which means that technological change, on the whole, may lead to higher economic output.

- Relationship between **economic output and social well-being:**
  The connection between the amount of GDP per capita and social well-being is very close: even though the GDP per capita does not provide a comprehensive or undistorted picture of social well-being, this indicator is still a reliable point of orientation for the level of social well-being. Without a further increase in the indicator GDP per capita (even in wealthy countries), the standard of social well-being achieved can be neither maintained nor increased.

[19] A compact discussion of the basic principles of welfare economics in the context of the green growth approach can be found in Hallegatte et al. (2011: 14–20). In contrast to the degrowth approach and the post-growth approach, the green growth approach does not see itself as a perspective that refers primarily, or exclusively, to early-industrialised and wealthy countries. On the contrary, the debate around green growth measures is focused on newly industrialised and developing countries that wish to increase their economic prosperity whilst taking into account ecological restrictions and social requirements (cf. World Bank 2012).

2.3.2.1 Justification of the Relationship Between Economic Output and Resource Consumption

The green growth discourse is essentially focused on substantiating the decoupling claim, i.e. the claim that economic growth and resource consumption, or rather environmental pressures, in wealthy countries can be decoupled from one another to a sufficient extent and within the available time frame.

The arguments used by the green growth proponents to support their view that GDP can, in principle, be decoupled from resource consumption, are as follows (cf. World Bank 2012, Hepburn and Bowen 2013): the GDP expresses the value of goods and services generated by a national economy over a period of time. The resources deployed in this, and the resultant environmental pressures, are not causally connected with this value; rather they are dependent on contingent and politically controllable conditions: the preferences of the economic actors and the standard of technology. If the incentives for economic agents are attractive enough, their preference will be for goods and services with lower resource intensity. In addition, if technology is developed in such a way that the market can supply goods and services with a lower resource input and fewer environmental pressures, this may generate a higher GDP at the same time as reducing resource consumption and environmental pressures (World Bank 2012: 34 ff.). Green growth strategies describe which measures may cause market participants to supply and demand goods and services with lower ecological impacts (cf. e.g. World Bank 2012: 36 ff.).

However, most green growth proponents are not primarily concerned with the question of whether the possibility of decoupling can, in principle, be substantiated. What is actually at the core of the discourse is the empirical question of whether, and under what conditions, current globalised national economies can, within an appropriate time frame, reduce global environmental pressures to such an extent that they can meet approved ecological targets. The early-industrialised, wealthy economies are of interest here. In this regard, proponents of green growth strategies claim that, by employing certain political measures – primarily market-based instruments such as environmental taxes or tradable certificates –, even wealthy economies with their disproportionately high resource consumption and environmental pressures can be transformed in such a way that their GDP continues to increase whilst, at the same time, the resultant environmental pressures are reduced to such an extent that they meet ecological targets within the required time frame.

On the one hand, green growth proponents justify this claim by means of ecological-economic modelling. Using ecological-economic models[20], they simulate the effects the suggested environmental policy measures will have on macro-economic figures (GDP or social well-being) and on ecological target figures (GHG emissions, ecological footprint). The results of the simulation show that in scenarios in which environmental policy measures are implemented, the result in wealthy countries (too) is higher economic growth and higher social well-being than in scenarios without environmental policy measures. Proponents of green growth strategies interpret the results of these model simulations as justification of the claim that wealthy countries will be able to achieve a decoupling of economic growth and environmental pressures within the required time frame.

On the other hand, green growth proponents also justify the decoupling claim indirectly. They estimate the level of investment that would be required to meet particular ecological targets. If the ecological targets could be met purely through additional investment, this would indicate that ecological targets could be met whilst at the same time maintaining economic growth.

[20] Integrated Assessment Models (e.g. Stern 2007, Nordhaus 2008), General Equilibrium Models (e.g. Jaeger et al. 2011), System Dynamics Model (UNEP 2011a).

According to Calderon et al. (2014), estimations that limiting greenhouse gas emissions to the necessary amount, i.e. emitting only 50 Gt CO_2e by 2030,[21] would require an annual investment within the range of 1–4% of global GDP (Calderon et al. 2014: 25). The UNEP study (2011a) models a scenario that assumes an additional annual investment of 2% of global GDP. The model result shows that in this scenario the global ecological footprint would decrease to 1.2 by 2050 and global GDP would increase faster than in the Reference Scenario (UNEP 2011a: 514).

Most green growth modelling has focused thus far on limiting GHG concentrations as the central ecological target (Stern 2007, Jaeger et al. 2011, Calderon et al. 2014).[22] Only the UNEP study (UNEP 2011a) has considered the ecological footprint as an indicator for environmental pressures, and modelled the possibility of reducing these, on a global scale, to below 1. In the context of the two ground-breaking agreements in 2015 – the adoption of Sustainable Development Goals (SDGs) by all United Nations member states and the Paris Agreement on climate change –, initial studies have also analysed further interdependencies between e.g. economic growth and other (ecological) development targets (von Stechow et al. 2016). The authors of this study are not aware of any explicit consideration of the possibility of compliance with several, or all, planetary boundaries while economic output is growing.

2.3.2.2 Argument for the Correlation Between Economic Output and Social Well-Being

The normative role of economic output is not discussed in any detail within the green growth discourse. Most authors adopt the concept, prevalent within mainstream economics, of social well-being as the summation of individual utility levels (e.g. Jaeger et al. 2011, Stern 2007, Nordhaus 2008). This concept represents an operationalisation of the desire fulfilment theory of social well-being. In the models considered here, utility levels are regarded as cardinal orderings and aggregated into a social well-being function using a totalling function. The UNEP study (UNEP 2011a) uses the Human Development Index (HDI) as an indicator for social well-being.

According to both these concepts of well-being, GDP captures a substantial component, and in this sense serves as a reliable proxy for assessing social well-being. The ecological-economic models take the non-investment portion of the GDP (the level of consumption) as a proxy for the social well-being of a country at a particular point in time. The GDP therefore represents one component in social well-being. The proxy for well-being used in the UNEP study, the HDI, closely correlates with GDP per capita (cf. Fleurbaey and Blanchet 2013: 9 f.). This ultimately stems from the fact that economic output, in the form of gross national income, makes up a third of the HDI, and that there is a similarly close correlation between the other components (life expectancy and literacy rates) and economic output.[23]

2.3.3 Critique of the Green Growth Argumentation

2.3.3.1 Critique of the Claim that Decoupling Will Be Achieved

Two variants of the decoupling claim are proposed from within the green growth discourse. First, the (theoretical) claim that it is economically possible to decouple economic growth and

[21] The GHG reduction targets of 50 Gt CO_2e by 2030 estimated in Calderon et al. (2014) lie within the upper range of scenarios for which climate models show a 50–66% probability of meeting the 2 °C target. According to Rogelj et al. (2015, Supplementary Table 3), the 2030 GHG emissions range for which climatological simulations show a probability ranging between 50 and 66% that global warming will remain under 2 °C is between 35 and 63 Gt CO_2e.

[22] The concept itself is comprehensive in its scope and takes all the relevant environmental aspects into account in the modelling (cf. Hallegatte et al. 2011). Social dimensions can likewise be included (cf. World Bank 2012).

[23] The HDI is one of the few measurements within the extended measurement of prosperity that is available for a broad sample of countries and was therefore also used in the UNEP study. However, the HDI is not very informative as regards the early-industrialised and wealthy countries, since for many years now these countries have generally achieved almost the maximum value of one.

resource consumption. This claim is consistent with most of the theories from macro-economics and environmental economics. It is only rejected by degrowth proponents. In Chapter 2.3.3 (Critique of the Degrowth Argument) we argue that the degrowth proponents' counter-claim – the impossibility of decoupling – is not reasonably justified.

However, evidence that it is, in principle, possible to decouple economic growth from resource consumption, is not enough to support the recommendation for going ahead and implementing the green growth strategy. Here, green growth proponents would have to claim – and this takes us to the second variant of the decoupling claim – that decoupling is not only possible in principle, but that it can actually be achieved to a sufficient extent and within the required time frame. With regard to climate policy, green growth proponents are implicitly committed to the claim that it is possible to succeed in achieving the decarbonisation rates needed to meet the climate targets over the next few years and decades.

This second, empirical decoupling claim has, however, thus far not been convincingly justified.

One argument supporting the claim that CO_2 emissions and the global ecological footprint can be reduced whilst at the same time maintaining economic growth uses the results from ecological-economic simulation models. There are, however, substantial objections to deriving policy recommendations from the model results. The models themselves are highly simplified and contain many parameters with unknown future values (cf. on this Betz 2008, Pindyck 2013, Stern 2013, Frisch 2013, Rosen and Guenther 2015). For this reason, Pindyck (2013, 2015) warns against using the results of ecological-economic simulation models (referred to as IAMs)[24] to justify political decisions.

Another objection to the studies thus far is that they do not show that a reduction in all relevant environmental pressures is possible to an extent that would comply with the planetary boundaries. Most of the studies focus on CO_2 emissions, but this is merely one of the boundary values. The most comprehensive study from an ecological perspective, UNEP 2011a, takes the ecological footprint as the relevant ecological indicator. Nonetheless, in the UNEP scenario, not even the CO_2 emissions are reduced sufficiently enough to limit global warming to 2 °C (Victor and Jackson 2011): according to the most ambitious UNEP G2 scenario, CO_2 emissions will decrease by 35% between 2011 and 2050 (UNEP 2011a: 514). Rogelj et al. (2015) argue, however, that they must decrease by more than 50% within this time frame in order to comply with the peak values that are compatible with meeting the 2 °C target. A similar objection applies to the calculations in Calderon et al. (2014) if they are used to support the claim that an adequate decoupling will occur. Calderon et al. (2014) identify measures that can be taken to reduce GHG emissions to around 50 Gt CO_2e (range 44–54 Gt) by 2050. With emissions at 50 Gt CO_2e by 2050, however, climatological models calculate a low probability that the 2 °C target will be met (Rogelj et al. 2015). The range of GHG emissions in 2050 for which climatological models simulate a 66% probability of meeting the 2 °C target is between 99 and 26 Gt CO_2e; the range for meeting the 1.5 °C target is between 4 and 19 Gt CO_2e. The respective simulations thus far, however, do not answer the question of which measures should be taken to achieve these ambitious reduction targets, what these measures cost, and what effect they will have on economic output.

Some proponents of the green growth strategy also admit that it is not possible to provide a reliable estimation of the costs of transforming economies in compliance with the planetary boundaries. This is because the necessary increases in decarbonisation rates and resource efficiency require disruptive or even radical technological change (Hepburn and Bowen 2013,

[24] IAM stands for "Integrated Assessment Models". These simulate both the ecological and economic implications of alternative policy pathways in an integrated way.

Aghion et al. 2014, Zenghelis 2016). Green growth proponents put forward various considerations in order to support their claim that over the next few years the necessary four- to ninefold increase in the rates of reduction in GHG intensity will be achieved: Hepburn and Bowen (2013) point to the potential in the photovoltaics industry (its substantial cost reductions thus far, and its upcoming potential technological developments), while Zenghelis (2016) points to the disruptive potential of electricity storage technologies. There is empirical evidence that economic agents tend, because of existing path dependencies, to stick with the technologies they have been using thus far, and not to invest in resource- or GHG-saving technologies (overview in Aghion et al. 2014). Green growth proponents conclude from this that if economic agents are persuaded away from existing path dependencies through political interventions (subsidies, incentives, institutional changes), this can escalate reductions in GHG intensity (e.g. Zenghelis 2016). This conclusion and the empirical and narrative evidence show that the necessary technological leaps are, in principle, possible. The evidence presented, however, does not prove that these technological leaps and their widespread diffusion and adaptation are at all realistic. They enable no reliable prediction that if the path dependencies are removed and GHG-saving innovations are promoted via other measures, this will bring about the reductions in GHG and resource intensity required in order to meet the ecological targets. This is because we cannot rule out the possibility that the rates of reduction in GHG intensity may nonetheless increase only 3-fold if all the proposed green growth measures are implemented consistently.

2.3.3.2 Critique of the Claim that the GDP Is a Reliable Proxy for Social Well-Being

Firstly, there are reasons against the use of GDP as an (approximate) indicator for the level of social aggregate of individual preferences. The GDP was not conceived as a representation of social preferences or the extent of their fulfilment, but as a method of measuring market activities (Lepenies 2013 provides a historical overview of this). This is why the GDP does not represent numerous goods, services and social and natural conditions that are not traded in markets but still provide utility to individuals (cf. on this also Chapter 2.2.2.2).

Secondly, a numerical representation of individual preferences or utility in cardinal orderings by means of market prices or willingness to pay conflicts with the idea that the weight of a preference should not be dependent on the income of the person in question. Market prices and willingness to pay depend, in reality, however, on the financial situation of the individuals.

Thirdly, objections are also made, from within the theory of welfare economics, to the view that social well-being should be represented as an aggregate of the extent of individual preference fulfilment. The cardinal representation of preference fulfilment goes against the basic intuition of the preference approach, based in welfare economics, which uses interpersonally incomparable representations of individual well-being (Arrow 1951).

Fourthly, however, the concept of individual and social well-being from welfare economics – as a representation of the fulfilment of individual preferences – is not an adequate concept of social well-being, as several scholars have argued (e.g. Sen 1981, Anderson 1993, Sagoff 2004, Hausman 2012, Mattauch and Hepburn 2016). The preference theory was developed in order to operationalise the desire fulfilment theory of welfare in an empirically verifiable way. It represents factual desires – if we abstract from the objections above (cf. Text box 1 in Chapter 2.2.2.2). From the normative perspective, however, the theory of factual desire fulfilment is highly implausible as a theory of individual or social well-being (cf. Text box 1 in Chapter 2.2.2.2). The theory of ideal desires is more convincing. However, GDP is clearly not suitable for operationalising the ideal-desire fulfilment theory of well-being.

2.4 Post-Growth and Precautionary Post-Growth Approach

According to the degrowth and green growth approaches, the future development of economic output plays a key – if also contentious – role in the context of socio-ecological transformation. In our discussion of the core claims of these two approaches, however, we have argued that neither the core claims of degrowth nor of green growth have a solid basis in light of current research. Neither claim can be plausibly justified; neither that the required degree of decoupling will be achieved in order to meet the ecological targets, nor that it is highly likely to fail. In light of this epistemic situation (insufficient knowledge of the relevant systemic relationships), the "post-growth" approach introduced in section 2.1 is one that must be taken seriously. This approach can be explained in terms of what it shares with, and how it differs from, the "degrowth" and "green growth" approaches.

Common to all three strategies is the acceptance of the **requirements of global and intergenerational equity:**

- Wealthy countries' contribution to global environmental pressures transgresses the planetary boundaries and is globally and intergenerationally unjust.

The post-growth approach remains agnostic with regard to the relationship between **economic growth and resource consumption:**

- It is not known how the GDP per capita would develop in wealthy countries if their economies were transformed in such a way as to ensure that these countries do not put ecosystems under disproportionate pressure. It is possible that the GDP per capita would increase, but it is also possible that it would shrink significantly.

Proponents of post-growth see the relationship between **economic growth and social well-being** as follows:

- Economic growth is not a comprehensive or reliable indicator for social progress: social well-being in wealthy countries may increase even if the GDP per capita is decreasing. GDP per capita should not be ascribed any central importance in the legitimation of political measures; in cases of social trade-offs it should always be considered in the context of other welfare indicators.
  Post-growth proponents, however, are not committed to an unequivocal concept of social well-being. All three basic concepts (hedonism, desire fulfilment theory and theories of objective values) are compatible with their approach. However, the post-growth approach contradicts the prevalent concept of social well-being, according to which preference fulfilment, which is realised through market transactions and aggregated into a social measurement in the GDP, is a reliable proxy for social well-being even if considered in isolation.

Within the discourse on socio-ecological transformation, these three claims and the approach resulting from them have been advocated under different names by many authors within the discourse on socio-ecological transformation (post-growth, a-growth, the new economics of prosperity), as mentioned in Chapter 2.1. In addition, however, the term "post-growth" is used in the German discourse to refer to an approach that we have characterised as "degrowth". Its proponents do not accept the second claim above. Originally, Niko Paech used the term "post-growth" arguing for economic policy strategies which in our categorisation would fall under the "degrowth" approach, since Paech is convinced that socio-ecological transformation is only possible if GDP per capita is significantly reduced. The same can be said of the texts by Schmelzer and Passadakis in which they argue for post-growth strategies: the differentiations made in our text show very clearly that these are degrowth strategies. In more recent texts and

in English-language publications, these authors even explicitly use the term "degrowth" when discussing their suggestions.

In order to avoid terminological confusion, we suggest calling the approach we analytically differentiate from the three theories above the **"precautionary post-growth approach".** According to the pragmatic model of scientific policy advice (Habermas 1968) and its extension into a "pragmatic-enlightened model" (Edenhofer and Kowarsch 2015), we could alternatively use the term "pragmatic" to characterise and designate our approach. This is because this approach reflects a critical reciprocal relationship between scientific experts and the political public, a relationship called for by Habermas (Habermas 1968: 129).[25]

Through our own definition we hope to make clear that the basic claims are accepted by such different authors as Jackson (2009), Seidl and Zahrnt (2010), van den Bergh (2011), Jakob and Edenhofer (2014: 456) as well as Dasgupta, Edenhofer et al. (2017), which means that these authors can be interpreted as proponents of a precautionary (or "pragmatic") post-growth perspective.

Political Implications of the Precautionary Post-Growth Approach

The degrowth and green growth approaches already contain antithetical political implications, due to their respective commitments regarding economic growth. However, it is not immediately evident what political recommendations can be derived from the agnostic core claims of the precautionary post-growth approach.

Two essential policy recommendations are compatible with the precautionary post-growth approach, and the proponents of this approach argue for these with different points of emphasis:

- Van den Bergh (2011) as well as Jakob and Edenhofer (2014, 2015) see the **conceptualisation of a political orientation in relation to social well-being** as a central political challenge. Such a conceptualisation could be the basis for identifying possible pathways that allow compliance with ecological guard rails without significantly reducing social well-being, or, in the case of conflicts between values (e.g. between the rights of future generations and the rights of people living in the present day), making these transparent and integrating them into public processes of deliberation.
- Seidl and Zahrnt (2010, 2012, 2015) believe the essential political challenge lies in the central social institutions moving towards **independence from economic growth**. Only a transformation of these social sectors would make it politically possible to implement measures that would effect a significant reduction in resource consumption in wealthy countries.

These two implications neither contradict nor mutually exclude one another. Their relationship is, rather, one of complementarity. On the one hand, a transformation in social institutions that gives them (greater) independence from economic growth may be necessary so as not to fall short of the guard rails of social well-being. On the other hand, however, configuring institutions in such a way that they are as independent as possible from economic growth requires a positive concept of the socially guaranteed minimum of basic goods, i.e. where the guard rails should be in terms of the availability of basic goods. We will subsequently present the two political demands in more detail.

[25] Habermas's model of scientific policy advice is based on a continual deliberative process between science and politics/society. Edenhofer and Kowarsch (2015) set out a detailed derivation of the underlying, pragmatic-enlightened model of policy advice.

Conceptualisation of a Political Orientation in Relation to Social Well-Being

Van den Bergh (2011: 885) argues that (i) economic growth is neither a necessary nor an adequate condition for social progress (i.e. an increase in social well-being), and (ii) GDP is not a reliable indicator for social well-being imply that GDP should not play any part in the legitimation of sustainability policies because it is not a reliable indicator for social progress. He therefore introduces the "a-growth" position, in which the GDP is rejected as an indicator for social progress. However, he does not present an alternative conceptualisation of social progress or of what should serve as a reliable indicator.

In his policy recommendations, Jackson emphasises the need to develop a new conceptualisation and operationalisation of social well-being ("prosperity") (Jackson 2009: 103 ff.) and an idea of how (to some extent) we can free social well-being from its dependence on further economic growth. Jakob and Edenhofer (2014) go one step further by suggesting an alternative way of measuring social progress: "welfare diagnostics" (Jakob and Edenhofer 2014: 459 f.) To accommodate the variety of legitimate concepts of social well-being, they argue against operationalising any particular concept of welfare; rather they focus the diagnostics on providing information about the necessary portfolio of goods required in order to ensure that all members of society can realise their respective concept of a good life (they refer to "basic needs").

Dasgupta, Edenhofer et al. (2017, sections 4.3.3 and 6) have put forward a suggestion for a concrete operationalisation of this approach of "welfare diagnostics". Here, in the first stage of a political process that would involve an extensive integration of scholars as well as stakeholders and the public, relevant welfare dimensions and the informative indicators for these dimensions would be established, and the necessary minimum provision of social and environmental goods defined. In the second stage, the boundaries in terms of consumption of, or impact on, critical natural resources and sinks would be set, and measures would be decided upon that would guarantee compliance with these boundaries. The third stage would then be to invest in public infrastructures in such a way as to make the greatest possible contribution to improving human welfare. In addition to compliance with critical lower thresholds, this concept emphasises the role of a social and political discourse – informed as well as possible, not least by science – in resolving unavoidable trade-offs through weighed decisions. The GDP would still play a role in these decision processes in as far as being taken into account when establishing, as an initial step, a suitable set of indicators for the multiperspectival measurement of well-being. However, the GDP would be only one welfare indicator among others, incorporated because of the information it provides about the activities traded on the market of a national economy.

Social Institutions' Independence from Growth

It is to Seidl and Zahrnt's (2010, 2012) credit that they have stressed a further political implication of the precautionary post-growth approach. They have argued that **societies' dependence on growth** is the main obstacle to the implementation of policies that would cause an adequate decrease in the environmental pressures by wealthy countries. What they mean here is the fact that core social sectors and institutions are dependent on economic growth in order to function (Seidl and Zahrnt 2010: 23). These include, for example, health insurance and old-age provision, the labour market and consumption (Seidl and Zahrnt 2012: 114). Jackson regards the economic and social stability in wealthy countries overall as dependent on growth (Jackson 2009: 44). Seidl and Zahrnt call for a conceptualisation and realisation of a post-growth society, i.e. a society whose basic institutions ought to function as independently as possible from the development of economic output (Seidl and Zahrnt 2012: 113). In this respect they believe it is essential to develop suggestions for how to configure the respective institutions in such a way that they have (greater) independence from growth.

The call for core social institutions in wealthy societies to be configured, as far as possible, in such a way that they function adequately even if they are independent from economic growth, can be justified on the basis of the fundamental claims of the post-growth position and the **precautionary principle.** The discussion of the decoupling claim has shown that the causality of the relationship between economic growth and resource or environmental consumption has not been understood adequately enough to be able to reliably forecast whether decoupling will be achieved to an adequate extent and within the available time frame. In light of available scientific background knowledge, there is a serious possibility that this decoupling could fail. This means that this is a scenario that must be taken into consideration when choosing strategies for action. If this scenario should then actually become a reality, without societies having taken the relevant precautions, this would have devastating social consequences, for a decline in GDP would severely impede the functioning of almost all publicly financed institutions, if not cause them to collapse. In a situation such as this, the moral imperative of the precautionary principle is that relevant social institutions must be transformed on a precautionary basis in such a way that they can render services to an appropriate standard in a way that is independent from the future development of economic growth.

The aim of the precautionary post-growth approach is therefore to create social institutions that are frequently referred to in connection with "resilience". Resilient systems are distinguished by their ability to render their core services in spite of shocks and disruptions (Holling 1973, Folke et al. 2010). As part of the argument for independence from growth on the basis of an ethical principle and the similarity between this and the idea of resilience, Konrad Ott suggested to our team of authors to consider the post-growth approach as a resilience strategy motivated by ethic of responsibility. We believe that the research must now focus on analysing the relationship between the objective of eliminating social institutions' dependence on economic growth and that of making them resilient.[26]

The debate thus far, however, has merely substantiated the normative requirement to make central social institutions as independent as possible from economic growth. In order to empirically justify the precautionary post-growth approach, we must also clarify which institutions are dependent on economic growth, whether they can function independently of economic growth, which services they can render in so doing, and which instruments can be employed in the implementation of this goal. These questions represent an important analytical step in terms of our research objective, and we will discuss these in subsequent chapters.

2.5 Preliminary Conclusions

In this chapter we have discussed some contentious answers to the question of which implications for economies of an early-industrialised, wealthy country might result from the double requirement to comply with planetary boundaries and not to violate the core principles of social justice. We have systematised the related conceptions discussed in the literature into three basic approaches: "degrowth", "green growth" and "post-growth". The differences between these approaches can be demonstrated by examining the various answers to the following questions:

[26] It remains unclear whether social security systems should aim at the goal of resilience or the goal of robustness in the face of variations in GDP. In addition to their robustness, resilient systems are characterised by their ability to adapt to the changing environmental conditions (Folke et al. 2010). Trade-offs may arise within social systems in the tension between their robustness and their adaptability, and in the absence of a systematic analysis it is not clear how such trade-offs can be resolved. This is because robust systems do not allow external shocks to negatively impact their functionality (up to a certain extent, after which robust systems completely collapse). Resilient systems, by contrast, allow external shocks to negatively impact their functionality, but they recover relatively quickly; i.e. in reaction to the shocks, they change in such a way that they can continue to render their services to an appropriate standard.

How is the economic output of wealthy, early-industrialised countries (measured in GDP per capita) expected to develop if these countries are transformed in such a way that their impact on ecosystems is not disproportionate within the scope of the planetary boundaries?

How important is economic output (measured in GDP per capita) in maintaining social well-being?

The answer to the first question given by proponents of the degrowth approach is not convincing. They claim that economic growth in wealthy countries will decline (or will have to decline) if these countries are to meet the ecological targets. However, the evidence they present to substantiate this claim is not convincing.

Nonetheless, the discussion of this degrowth claim highlights the fact that the opposing claim – that the ecological targets will be met in wealthy countries with growing economies – has thus far not been justified either. Model results demonstrate that it is technically possible to decouple economic growth from resource consumption and environmental pressures. However, it is not possible to reliably forecast whether the necessary technologies will be invented implemented quickly enough to be able to meet the climate targets. Moreover, we do not yet know how economic output will develop if not only one ecological target – GHG emissions – but all the environmental pressures relevant to compliance with the planetary boundaries (i.e. phosphate and nitrogen pollution and land use in particular) are reduced at the same time.

Concerning the second question, it is the answer given by proponents of the green growth approach that is not convincing. The claim that social well-being cannot be sustained without maintaining economic output (GDP per capita) cannot be substantiated on the basis of prevailing concepts of individual and social well-being (hedonism, desire fulfilment theories, theories of objective values); it can only be based on a concept of welfare that was established within 20th-century welfare economics (well-being as preference fulfilment). However, the evidence presented in favour of the normative claim that the concept of well-being based on preference fulfilment ought to be the concept that defines the political orientation is just as unconvincing.

Nonetheless, the debate about the role of economic output in social well-being highlights an important point: the way in which early-industrialised, wealthy countries are structured nowadays means that economic output and the income generated play an important part in the way fundamental social institutions function, institutions that facilitate numerous aspects of a good life for human beings (social security systems, spending on education, etc.). If social well-being is to be maintained in these countries even if economic output is in decline, these social institutions must be able to be transformed so that their services can be rendered in a way that is (more) independent from economic output.

Taking the critique of the two approaches of degrowth and green growth as our starting point, we have differentiated a third approach which we call the “precautionary post-growth approach”. This approach does not claim to know how economic output will develop if wealthy countries’ economies are transformed in such a way as to be consistent with global ecological targets. However, there is a serious possibility that it could significantly decline. To ensure that, in such a case, social well-being is maintained in wealthy countries (and to adhere to other principles of social justice), our team of authors believes there is a need to identify the potential for making social sectors and institutions independent from economic growth, to verify how this potential can be realised, and to implement corresponding measures, as long as these are productive and socially acceptable.

Since our characterisation of the “precautionary post-growth approach” has been rather abstract thus far, in the following chapters of this discussion paper we will explore what it might constitute in terms of content.

In this regard we will discuss, on the one hand, whether the economy of an early-industrialised wealthy country such as Germany should be judged as dependent on economic growth (Chapter 3). To clarify the discursive context of the post-growth approach a little, we will first of all examine the question (which is pivotal in the degrowth literature in particular) of which so-called "drivers" of economic growth are relevant. We will then go on to discuss the question of whether there are social sectors that could be considered to be dependent on economic growth.

In Chapter 4 we will turn to the question of which measures and instruments could be employed in implementing a post-growth society. To this end, we will present the measures and instruments suggested within the post-growth and the degrowth discourse as having a potential influence on the drivers of economic growth. Finally, using the example of social security systems and safeguarding jobs, we will analyse whether it is possible to free these domains from their reliance on economic growth.

In the final chapter we will identify and summarise the research questions and socio-political issues that would arise if we initiated the transformation of society with the aim of making it more sustainable and less reliant on economic growth.

3 Growth Drivers and Growth Dependencies

3.1 Growth Drivers

3.1.1 Overview of the Drivers

By growth drivers we are referring to fundamental mechanisms, factors and processes that are responsible for the trend in economic output measured by gross domestic product (GDP). At least since Adam Smith's "The Wealth of Nations" (1776), the question of why prosperity differs across countries has been one of the discipline's fundamental subjects. Moreover, "growth economics" has developed as a sub-discipline (for an historical overview see Barro and Sala-i-Martin 2004).

This fundamental question is currently being debated from two opposing perspectives in two economic discourses that are taking place completely independently from one another. On the one hand, proponents of the degrowth discourse[27] debate which mechanisms, factors and processes are responsible for economic growth – the concept of a "growth driver" is widespread here. The focus is on a socio-ecological restructuring of the economy that also aims to weaken the growth drivers. On the other hand, the temporary lack of economic growth in wealthy countries has also triggered a debate in mainstream economics over what is known as secular stagnation.[28] The discourse on secular stagnation discusses factors that can explain why many wealthy economies and some previously very fast-growing emerging countries have only shown comparatively small GDP growth rates in recent years. We have analysed selected key literature from both discourses in order to identify growth drivers relevant for the project as fully as possible. In doing so we used reverse reasoning on the debate on secular stagnation to identifythe growth drivers with the greatest relevance for the present from the extensive literature on neoclassical growth economics.[29]

In the following table we offer an overview of the mechanisms that are interpreted as growth drivers, especially within the degrowth literature.[30] The table is not designed to be comprehensive, neither do we subscribe to the theory that the individual mechanisms are in fact growth drivers.[31] We have systematised the mechanisms identified based on their level of effectiveness. Yet, it is not evident from the form of presentation in the table that, in accordance with degrowth literature, individual mechanisms do not act as growth drivers in isolation, but only, or most potently, combination with other mechanisms. We will address the question of

[27] As part of the discussions on growth drivers and growth dependencies, various references have been made by the proponents of degrowth and post-growth – especially in the context of it being a very young research approach – to authors who, themselves, can be categorised as belonging to other research contexts, such as evolutionary economics. The arguments of these authors, who stand outside the post-growth discourse, often play a prominent role in the analysed discourses about growth drivers and growth dependencies, however. The study therefore also refers to the relevant authors. Nonetheless, this is not intended to assign these authors to the respective approaches in the post-growth discourse. The intention is merely to show which arguments are adopted by which approach.

[28] In addition, neoclassical growth economics in particular includes literature relevant to the debate on growth drivers that has been developed over several decades and that is now highly differentiated theoretically and empirically.

[29] The discussion on secular stagnation is multi-layered: from identifying growth-inhibiting factors as well as measures to overcome them, through to opinions that presume that the economic growth processes in early-industrialised economies have largely come to an end.

[30] The drivers cited are mainly taken from the literature on the degrowth discourse. In the context of the discussion on secular stagnation the following supportive / inhibiting factors are referenced: demographic change, innovative capability, education, economic inequality, national debt, price of innovative products, capital intensity, emerging economies.

[31] The mechanisms reproduced do not differentiate between factors that influence cyclical (i.e. short-term) or long-term development trajectories. Such differentiations, as well as the perception of their relevance between the different macroeconomic schools (in particular Keynesianism versus neoclassical economics), will be considered and discussed in detailed analyses within the subsequent sections.

whether the elements shown here are genuinely growth drivers and how exactly they work in the following sections that look at selected mechanisms.

Table 5: Systematised overview of the drivers of economic growth named in the analysed literature

Level of effectiveness	Mechanisms that act as growth drivers according to the literature on degrowth	
Guiding principles	Mental infrastructures that make us cling to economic growth	
	Growth belief	
Institutions	Interest rates on loans	
	Money creation by commercial banks	
	Technological innovations	Lead to an increase in labour productivity and capital productivity
	Level of education (in the sense of human capital)	
	Price reductions of factors of production (raw materials, energy, etc.)	
	Competition between economic actors	
	Globalisation: intensification of international trade, rise in cross-border value chains	
Business	Share-holder value oriented firms	
	Advertising	
	Planned product obsolescence	
Individual and psychological factors	Striving for recognition through improved relative position (positional consumption)	
	Striving for recognition through the social symbolism of material goods (status consumption)	
	Striving for material prosperity as a central source of human welfare	

Source: own depiction

Text box 2: The secular stagnation theory

The hypothesis that developed economies can be caught in a long phase of low or completely negligible economic growth – "secular stagnation" – was first formulated by US economist Alvin Hansen in 1938, nine years after the start of the Great Depression. In view of the preceding phase of strong expansion Hansen, who was President of the American Economic Association, questioned whether, against the background of, at that time, stagnating population growth, the attractive investment opportunities in the USA could be so extensively exhausted that the level of private savings remained structurally above investment demand. In this case, only a negative real interest rate would be able to restore the equilibrium necessary for full employment and economic growth. Should the negative real interest rate not be achieved through monetary policy restrictions, the consequence would be ongoing stagnation (Hansen 1938). At that time the course of history – first the Second World War, which saw massive national spending; and then

the baby boom – disproved the theory of imminent secular stagnation in the USA. Nevertheless, the essential theoretical plausibility of the hypothesis remains.

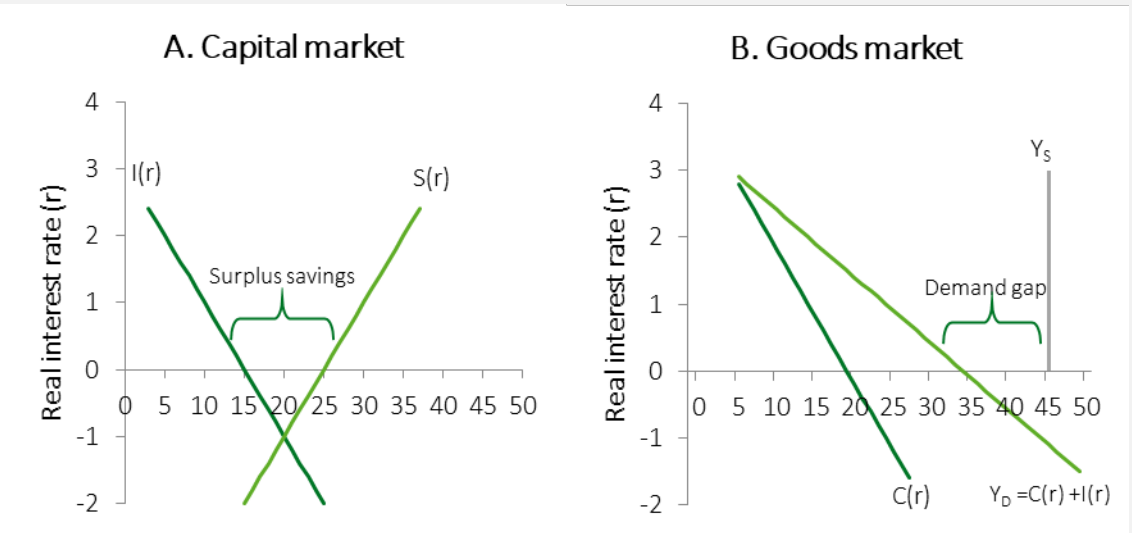
In November 2013, Larry Summers, the former Chief Economist at the World Bank, put the concept of "secular stagnation" back on the agenda at an International Monetary Fund (IMF) conference, as a means of clarifying fundamental crisis phenomena in the global economy (a written draft followed in Summers 2014).

In essence, the arguments for the theory of secular stagnation can be divided into supply-oriented and demand-oriented rationales.

Supply-side lines of argument are based on the foundations of the neoclassical growth model that attempts to explain an economy's production opportunities and therefore the potential supply of goods and services (cf. also Chapter 3.1.4.2.2). From this perspective, the secular stagnation theory is then in essence based on the fear that future production opportunities could grow far less dynamically, because the availability of the requisite means of production could shift; or simply because productivity advances are slowing down. Possibly the most famous representative of the supply-oriented line of argument is the US economist Robert Gordon. Alongside his reference to a possible absence of groundbreaking new enabling technologies, Gordon (2014) sets out six reasons why economic growth in the USA could level off at a lower rate in the medium term. He names the following reasons:

- **demographic change,** which could shorten the average working time;
- a **stagnating level of education,** which would have a direct impact on labour productivity;
- **rising levels of income inequality,** through which the lower 99% of the population would not benefit from economic growth;
- high levels of **national debt,** which would either lead to increased taxes or lower government spending;
- **globalisation,** which (in the USA) led to trade deficits and higher unemployment;
- and **climate change,** which, firstly, could trigger direct costs (e.g. destruction caused by weather extremes); and, secondly, could direct innovation efforts in the area of energy efficiency, which could consequently make genuinely groundbreaking innovations (such as the steam engine and the petrol engine) less likely.

Figure 3: Model of secular stagnation



Source: own illustration, IÖW

Figure 3 illustrates in a stylised manner the demand-oriented line of argument for secular stagnation developed by Hansen and picked up by Summers. Graphic A (capital market) shows that capital market actors make their savings and investment decisions depending on the real interest rate (r), defined as the difference between the nominal interest rate minus the inflation rate. In normal times the capital market finds its equilibrium, because the real interest rate can adapt so that investment (I) and savings (S) correlate. In a secular stagnation scenario, however, even with very low interest rates, savings are still very high and investment is low.

The equilibrium interest rate required for balancing therefore lies in the negative zone, as per Graphic A. It is conceivable that this negative real interest rate cannot be achieved by restricting monetary policy, e.g. because the nominal interest rate is already virtually zero and inflation is low. For the purposes of simplification, the illustration assumes that there is a real interest rate floor of 0%. A surplus of savings is therefore shown, i.e. the imbalance in the capital market persists. This has implications for the goods market. The aggregate supply (Y_S) here is independent of the interest rate, since in the short term it is only determined by the given production opportunities. The aggregate demand (Y_D) is the sum of consumption and investment. Consumption, in turn, is the difference between income (Y_S) and savings (S). Due to the surplus savings, the sum of investment and consumption is structurally smaller than the production potential and a lasting demand gap develops, which is associated with unemployment and economic stagnation.

The explanation shows how a phase of continued economic stagnation with minimal or no economic growth can be theoretically motivated. This demand-oriented line of argument forms the springboard for the recent economic debate; yet it is by no means the only convincing explanation for possible long-term decreases of the growth dynamic.

3.1.2 Corporate Objectives and Behaviour

In this chapter we will examine the claim from degrowth literature that corporate behaviour is a major driver of economic growth. The concept of corporate behaviour is used in a broader sense here and includes corporate behaviour – or the behaviour of decision-makers within companies – that promotes growth and that, according to the degrowth literature studied, is influenced in particular by the existing institutional frameworks and funding requirements. The reasoning will first consider the line of argument found in degrowth literature. This will be followed by a classification according to selected economic theories that are especially apposite with respect to the aims of the study, as well as according to empirical findings. Building on these foundations, we will assess whether corporate behaviour can be evaluated as a growth driver.

3.1.2.1 The Driver's Mode of Action According to Degrowth Literature

In parts of degrowth literature corporate behaviour is used to explain how a growth cycle develops (Jackson 2009, Schmelzer and Passadakis 2011). In part, corporate behaviour is discussed explicitly as a key growth driver (Posse 2015, Gebauer et al. 2017, Bender and Bernholt 2017). A variety of supply-side and demand-side impact chains are assumed. On the supply side, companies decide on the level of their investment and whether, and to what extent, to extend production capacity. Companies cannot directly decide on the demand (for consumer goods) but they can try to influence consumers' preferences – by means of marketing instruments (advertising, product design, planned obsolescence, etc.) – so as to generate additional demand, or at least create increased demand for their own products. Companies are then in turn able to react to an increase in demand achieved through the use of marketing tools

by expanding their production capacities. This means that companies essentially have the means to contribute to aggregated economic growth through a growth-oriented strategy.

Below, we will discuss arguments from degrowth literature that establish why companies might explicitly choose to grow. Two of these reasons are deduced, as it were, "from within" the company itself: the impact of the legal form of a company and its corporate objectives. A third, often cited argument "from without" presents an external reason for corporate growth: competition with other companies. In conclusion, we will describe how, from the perspective of post-growth literature, the aforementioned marketing instruments are used to stimulate consumption.

Binswanger (2013) first emphasises the significance of the business' legal form on its growth orientation. Thus, Binswanger asserts, **shareholder-oriented business forms**, which in Germany are predominantly stock corporations, drive growth. The incentive structures, in particular the shareholders' interest in increasing the value of their investments, are created to prompt corporate decision-makers to strive for the highest possible profits. The profits generated can either be paid out directly to shareholders as dividends, or retained and reinvested, which ought to lead to an increase in the share value. Binswanger states that, for shareholders, there are financial incentives for **imposing reinvestment through corporate policy** (Binswanger 2013).

Secondly, according to the degrowth discourse, businesses often pursue "growth" explicitly as a **corporate objective**. This focus on corporate growth has multiple reasons, the authors state. On the one hand, this corporate objective correlates with the aforementioned business forms. For example, the objective of increasing the value of the company shares held by the shareholders (and thereby indirectly increasing corporate growth) is more deeply entrenched in limited liability companies and stock corporations than it is in other business forms (Posse 2015). Similarly, accounting focused on financial indicators, which externalises many social and environmental costs, makes focusing on growth an attractive prospect (Posse 2015, Gebauer et al. 2017, Bender and Bernholt 2017).

Since, thirdly, companies are often in a position of intense **competition**, the incentive is generally speaking to reinvest profits in order to gain a competitive advantage, according to authors such as Schmelzer and Passadakis (2011). When profits are primarily used for reinvestment purposes this leads to expanded production capacities, whereby economies of scale and concomitant competitive advantages can be obtained (for instance synergies, learning curve effects and better financing terms, as well as discounts in procurement (Posse 2015)). If the company were instead to use a larger proportion of the revenue for other purposes, it would not be able to remain competitive in the long term and would ultimately run the risk of insolvency (Schmelzer and Passadakis 2011). Paech (2012) extends this competition argument further to include an international dimension and identifies the increasing reduction in spatial and temporal transaction costs in international trade as a reinforcement of the growth driver. Gebauer et al. (2017) also emphasise the issue that, when global comparisons are made, there are significant regulatory differences in terms of environmental and social standards and company taxation, whereby companies are in the position of externalising costs, increasing profits and thereby gaining greater room for manoeuvre for corporate growth.

The explanations so far show why companies might try to grow and, in particular, focus on a strategy of investment, i.e. the expansion of their production capacities. However, the post-growth literature also references strategies for increasing consumer demand in order to achieve corporate growth through an increase in the quantity of goods sold. This fourth aspect is

associated in the literature with companies using advertising, planned obsolescence and product design – summarized here under the concept of "marketing instruments" – to increase sales.

These instruments are implemented to increase consumer demand, especially in saturated markets (Latouche 2009). Advertising is seen as a tool to increase demand for the company's products by encouraging customers to consume more or new products (Latouche 2009, Paech 2012). In addition, the authors state products are designed in such a way that they either constantly have to be bought again, or new products are launched in the market at frequent intervals, replacing the old versions (Paech 2012, Gebauer et al. 2017). Lastly, products have a short lifetime, for example through the use of low-quality wearing parts (often described as planned obsolescence) and insufficient spare parts provision (Schridde 2012). In the literature, therefore, advertising, product design and planned obsolescence are seen as instruments of demand stimulation that, in practice, are often interconnected.

In the post-growth literature studied, these four interconnected mechanisms are the focus for discussion. They are intended to explain why and how companies contribute to aggregate growth through investing and/or stimulating demand. According to the literature, shareholder-oriented legal forms and the definition of company growth as a goal are self-induced (internal) incentive structures for growth. Strong competition and/or dependence on pre-financing are described as externalconditions that can prompt companies to expand their production. According to the examined authors, companies have two primary strategies for growth: they can use revenue for investments in order to expand production capacities; or they can put the income towards marketing instruments, in order to increase demand for their products and thus contribute to making growth of production capacities a possibility. The extent to which these mechanisms appear plausible from various economic perspectives is the subject of the following section.

3.1.2.2 The Growth Driver Against the Backdrop of Selected Economic Theories

Industrial Economics Theories

The descriptive representation of market and corporate structures and their impact on companies' market behaviour, which in turn affects the market outcome, was at the heart of early industrial economics. This market structure / market behaviour / market outcome paradigm in "classical" industrial economics first adopted its analytical approach in the 1970s and, since that point, has largely become a sub-discipline of neoclassical microeconomics (Porter 1980). The equilibrium models of the Cournot, Betrand or Stackelberg oligopolies take a formal approach to representing the strategic behaviour of companies in defined markets. They aim to assess the welfare effects of strategic behaviour in imperfect markets (Tirole 1988).

In line with its neoclassical foundations, modern industrial economics models profit maximisation as companies' primary objective. Every individual decision, which also, where applicable, includes growth that has been pursued explicitly and/or the instruments used to achieve it (investments, product design, advertising, etc.), is derived from an appropriate maximisation calculation with regard to future company profits. For cases of limited competition, a central result was established in the context of corresponding models: that companies can potentially consciously increase their profits by deliberately reducing the quantities sold and, by virtue of this, elicit an above-average increase in sale prices (cf. Bester 2003). From an industrial economics perspective, therefore, growth can be a means to an end, but never the end in itself. The temporal horizon of profit maximisation can vary enormously. Modelling, however, usually assumes the maximisation of all discounted profits expected in the future.

If, for example, we consider a two-stage model for the use of advertising, the first stage involves companies deciding on their optimal budget for advertising measures based on their cost structure. Put more simply, companies first decide whether they want to advertise and, if so, how much advertising they want to use to market their product. The companies' objective is to position themselves in the market so as to be able to maximise their own expected profits. Influenced by the new cost structure the second stage then follows, which involves quantity or price competition. Product design and/or product differentiation can also be modelled in a similar way: e.g. as research and development or quality competition, or as compatibility competition (Engelhard 2012: 7 ff.).

More complex approaches that address the relational structure and possible conflicts of interest inside and outside of companies – for example between the owners and managers of a company in line with what is known as the principal-agent theory – also show objectives that may conflict with maximising profits. Principal-agent models assume that shareholders demand profit maximisation to increase the value of their shares and corresponding dividend payouts; however, the management can (also) pursue other goals, on account of its advantage in terms of information – for instance increasing its professional reputation through forced growth of the company.[32]

This means that in contrast to post-growth literature, corporate behaviour within models of industrial economics is not inevitably a growth driver. In particular, in certain market environments it is theoretically also possible for a company to consciously reduce its production where this then leads to an above-average increase in prices, thereby generating higher profits overall.

The Perspectives of Evolutionary Economics and Complexity Economics

The perspectives of evolutionary economics and complexity economics, which are closely linked, primarily deal with the change in economic systems and therefore direct their gaze towards transition processes in particular. In this approach the economy is understood as a complex, adaptive and permanently evolving system whose elements are often strongly coupled in non-linear ways. As an independent sub-discipline within economics, evolutionary economics first gained a foothold at the end of the 1980s. Two articles in particular are thought to be constitutive: from the perspective of content, the research carried out by R. Nelson and S. Winter on the question of innovation and market dynamics, which culminated in 1982 in the publication of the "An Evolutionary Theory of Economic Change" monograph, is worthy of note. From a methodological point of view, the theory of complex adaptive systems makes a significant contribution. It was developed in the 1990s by researchers at the Santa Fe Institute and led to the alternative label of "complexity economics".[33]

The members of the Committee on Evolutionary Economics, which was set up in 1991 at the German Economic Association, are predominantly interested in focusing on explaining the endogenous emergence of innovations and thus of economic change as a central characteristic of past and present economic systems. In contrast to the neoclassical mainstream, the following five assumptions are typical of evolutionary economics' own methodological identity:

[32] The behaviour of the management team is often analysed with reference to the terms "Corporate Finance" and "Corporate Governance". For a detailed overview see Tirole (2006, chapter 1).

[33] The explanations are largely based on the German-language overviews by designated chairs at https://tu-dresden.de/bu/wirtschaft/me/forschung/evolutorische-oekonomik and https://evolecon.uni-hohenheim.de/100440. The latter source also documents the official perspective of the Committee on Evolutionary Economics at the German Economic Association (VfS).

- Heterogeneous nature of the actors: Evolutionary economics assumes "population thinking" and rejects the representative actor approach that underpins many standard economic models. The heterogeneous nature of the actors represents an important wellspring for innovation.
- Variation, selection and retention: Most theoretical evolutionary models are based on a version of the traditional Darwinian laws and the selection mechanism.
- Uncertainty: A side effect of innovation is genuine uncertainty. Uncertainty means that the future is open to qualitative change and cannot inherently be foreseen by economic actors.
- Entrepreneurship: Economic actors operate creatively. Confronted with uncertainty, they look for new solutions to existing problems. Economic activity is an open and, inevitably, a learning process that is no stranger to error.
- Imbalance dynamic: Evolutionary models investigate self-organisation phenomena of economic systems far from states of equilibrium.

The evolutionary or complexity perspective on economic phenomena sees itself as complementary to other approaches. It emphasises interdisciplinarity and applies methods such as those from biology and physics. Agent-based simulation and the analysis of (complex) network structures play a significant role just like findings from non-linear dynamics used to analyse interactions.

In complexity economics economic growth can be described as the result of the interplay of physical technologies (methods and designs for transforming matter, energy and information for the purpose of achieving one or multiple objectives) and social technologies (methods and designs for interacting and organising people for the purpose of achieving one or multiple objectives) (cf. Beinhocker 2007: 257 ff. and 276 ff.). While the concept of "physical technologies" largely resembles the traditional concept of technology, the concept of "social technologies" encompasses not only institutions, but also all types of structures, roles, processes and social and cultural norms.

With regard to economic growth and the specific role of the company, complexity economics assumes another objective function than neoclassical industrial economics. Instead of profit maximisation, in accordance with the evolutionary approach the Darwinian logic of survival and growth is understood as the central imperative: according to Beinhocker (2007: 429), management must sketch out and execute business plans that enable the company's business units to exist and grow over a long period of time. From an evolutionary perspective, therefore, profit maximisation is not a purpose at all, but "only" a fundamental boundary condition that a company or business unit must fulfil to achieve its survival objective in perpetuity.

The different hierarchies also go hand in hand with expanding the perspective. From an evolutionary perspective "profitability" appears to be a multidimensional problem, because various groups of stakeholders need to be satisfied. Reducing this to the goal of (short-term) maximisation of profits is consequently rejected as being dysfunctional in the long term (cf. Beinhocker 2007: 427 ff.). By adopting the imperative of survival and growth, the complexity or evolutionary economics perspective thus has a certain proximity to the opinion of those degrowth authors who see growth as companies' core objective.

Theories of Monopoly Capitalism

The central point of departure for theories of monopoly capitalism is the observation that economies are not shaped above all by fully competitive markets in which the market participants are pure price-takers, as presumed by earlier economic theories. Instead, many

markets are identified as oligopolistic. Monopoly capitalism theorists explain corporate behaviour and the resultant macroeconomic dynamics based on these market structures.

The theories are often based on precursors within institutional economics. Early preliminary research on the subject goes back to Hilferding and Bottomore (1990), Veblen (2005 [1904]), Steindl (1954), Sweezy (1942) and Baran (1962). These early analyses culminated in the book "Monopoly Capital: An Essay on the American Economic and Social Order" (Baran and Sweezy, 1966). Since then, approaches have expanded in theoretical terms (Foster 2014 [1986], Fine and Murfin 1984) and supplemented with various aspects, for instance the role of digital technologies (McChesney 2013), the effects on the labour market (Braverman 1974) and the explanation of economic crises (Foster and Magdoff 2009). The analysis begins with the assessment that, in many markets, a small number of companies supply the majority of production. These large companies behave in a certain respect as if they held a monopoly (whence the name of the theoretical approach). Despite being in competition with each other, in this approach companies usually do not compete by lowering prices.[34] At the same time they attempt to maximise profits by, among other things, introducing cost-cutting technologies. This strategy, against a backdrop of weak price competition, enables companies to generate high profit margins and high overall profits.

According to theories of monopoly capitalism, the role of management is central to the use of profits. In the majority of listed companies, the incentive structures for managers are designed so that it makes sense to target profit maximisation and corporate growth. Profit maximisation firstly serves to be able to pay dividends to shareholders. Even more importantly, however, high profits increase the room for manoeuvre when expanding market share and achieving concomitant corporate growth. There are three reasons for this. The author states that, firstly, company growth means an increase in the value of shareholders' assets. Foster (2014 [1986]) argues that this is primarily in the interest of wealthy shareholders, since they are not reliant on short-term dividend payouts. Secondly, company growth also implies improved social position of managers within the company – since they define themselves predominantly by the size and growth of the company (Baran and Sweezy, 1966). Thirdly, high profits allow the development of new products and advertisement of these products. In the view of theories of monopoly capitalism, these two aspects – product development[35] and advertising – are the primary means large companies use to compete with one another in established markets (McChesney et al. 2009).

Many of the arguments presented within degrowth literature therefore correspond to ideas from theories of monopoly capitalism that have existed for some time. These identify connections between the business form of stock corporations and the explicit objective of corporate growth. They likewise link competition situations with companies' growth-oriented behaviour. Last but not least, they argue that the marketing instruments also cited in degrowth literature (advertising, product design, obsolescence) are used especially in established markets that are characterised by a handful of large companies.

[34] According to Fine (1984), price reductions rarely occur, especially in established markets. Here, previous battles for market share led to the establishment of a small number of companies who learned from the past that price competition is often detrimental to all companies concerned. The author writes that this created an implicit agreement not to use price reductions as a means of competition. Fine states that in addition, price competition appears to be less expedient than in competitive markets, since the companies' products often vary in terms of quality.

[35] Product obsolescence also plays a role within these theories. Baran and Sweezy (1966) see planned obsolescence as part of the strategy of companies with substantial market power to be able to distribute many products. McChesney et al. (2009) assert that planned obsolescence is a result of a specific correlation between marketing and product design. The authors state that the process of product design often begins with market research on which products generate high sales. Products are then developed accordingly and in such a way that they have a deliberately limited lifetime.

3.1.2.3 The Driver Against the Backdrop of Empirical Findings

In the following section we shall be examining the extent to which the four aforementioned theoretical arguments within degrowth literature that identify corporate behaviour as a growth driver can be proven empirically.

To the best of our knowledge, there is virtually no empirical evidence of the influence of **business forms** on macroeconomic growth. By means of a non-representative survey of 700 SMEs, Gebauer and Sagebiel (2015) find that the legal form can influence a company's growth trajectory. On the basis of a survey of, predominantly, SMEs they explain that, according to their own statements, the majority of public, charitable and sole proprietorships and, as a rule, partnerships too are pursuing little or no further growth. In contrast, those in stock corporations who were surveyed mostly declared a goal of moderate growth. Graham et al. (2005) surveyed a similarly non-representative sample of 401 managers in the USA, in order to better understand the primary corporate objectives of larger companies. A majority of the managers surveyed think it is especially important to adhere to pre-defined short-term or long-term profitability targets.

To the best of our knowledge, there are only a few empirical findings on the issue of what impact the different **target setting** within the company policy has on companies' actual growth. Liesen et al. (2013) conclude that the companies analysed that do not grow do not primarily align their business activities with business parameters such as sales, profit or employee numbers, but are focused on alternative target criteria such as, for example, process and product quality, resource efficiency, or quality of life or work; yet there is still a place in the market for them. Thus, it seems possible that companies who are not focused on growth but on other goals consequently grow less and achieve their corporate objectives in other ways.

Regarding the role of **competition**, it can be said that it generally appears to be easier for (small and medium-sized) companies to decide not to grow and to maintain the size of their company where they are not in direct competition with competitors but occupy a niche in the market (Liesen et al. 2013). In contrast, however, two thirds of the companies surveyed in Gebauer and Sagebiel's research consider themselves exposed to a high level of intense competition, since they have a large number of competitors, their products are highly interchangeable, or they operate with existing overcapacity or within saturated markets (Gebauer and Sagebiel 2015).

Other empirical works also show that smaller companies grow more strongly on average – which can be ascribed among other things to the fact that they have less market power on account of their size, and thus face stronger competition (see previous section on economic theories). In a regional survey Variyam and Kraybill (1992) found that smaller companies exhibited higher growth rates than larger ones and that, among small companies, those that produced the highest growth rates (already) had several branches. The negative correlation between company size and growth is explained by, for instance, sunk costs.[36] For example, costs from previous periods for the construction of a new production facility are no longer incurred, e.g. for market or product development (Cabral 1995). This could be an incentive for small companies to grow. Gebauer and Sagebiel (2015) state that the growth trajectory of small and medium-sized companies is significantly weaker the smaller and older they are and if they operate in slow-growing markets. A negative attitude towards growth may not only be justified by the aim of avoiding risk but is also labelled as a decision for the company's own business autonomy (Gebauer and Sagebiel 2015).

[36] The concept of sunk costs describes a company's costs that have already been accrued and that are therefore irrelevant to future decisions, e.g. about the continuation of a project.

On the other hand, the empirical literature referred to above neglects the fundamental challenges of identification, aggregation and endogeneity. With some theories, the problem of identification consists in the fact that, occasionally, overly extensive conclusions are deducted from empirical observations. With regard to the will to grow as an (explicit) corporate objective, the question arises as to how, within an empirical analysis, it is possible to identify those companies that actually also want to grow but that, due to various reasons, are unable to do so. The keyword "aggregation" connects the unexplained relationship between the undeniable, existing growth of individual companies and macroeconomic growth against the background of the fact that, at the same time, many companies, especially small ones, are forced to exit the market after a relatively short period of time due to a lack of success. How can the fact that the macroeconomic balance is (regularly) positive – in terms of an increase in real GDP – be attributed to the individual companies? Ultimately, a phenomenon such as the legal form of a specific company is not given exogenously; at the least, the respective founders of the company have made a conscious decision to choose from the portfolio of available legal forms. This decision is indeed endogenous, however – the subsequent development of the company cannot be viewed independently of those motives that initially prompted the founders to choose the specific legal form. Even if different legal forms were systematically bound up with different growth dynamics, the issues of identification and aggregation would still be relevant in this context.[37]

Several empirical studies indicate that the fourth mechanism – the impact of **marketing measures,** especially **advertising,** on consumer behaviour – is at play here. Research by the German Institute for Economic Research (DIW Berlin) directly investigates the connection between advertising and economic growth (Hoch et al. 2016). This empirical analysis shows that, for a sample of 19 OECD countries, advertising costs promote growth of GDP. An increase in advertising costs of 1% (relative to GDP) increases economic growth by approximately 0.02 percentage points on average.[38]

In addition, there are also a number of studies that, in the overall view, suggest that advertising has an impact on the level of consumption. On the one hand, in a longitudinal study Opree et al. (2014) find a positive correlation between the confrontation with advertising and more materialistic behaviour (in children). In addition, according to Watson (2003), there is an empirical correlation between materialistic values and the propensity to consume. Watson also finds a positive correlation between materialistic values and the probability of borrowing money for consumption-related purposes. As a whole, these empirical findings indicate that advertising contributes to increased levels of consumption by changing values.

The question of whether companies use planned **obsolescence and corresponding product design** to increase consumption has been investigated empirically in a study by the German Federal Environmental Agency (Umweltbundesamt, UBA) (Prakash et al. 2015). The authors conclude that the products last as long as necessary and not as long as possible (Umweltbundesamt 2016b: 31). The study first shows that the initial service life of most of the product groups examined has decreased in recent years and that much of the electrical and electronic equipment was replaced and disposed of before reaching the average initial service life or before five years had passed since its manufacture. At the same time, the study did not confirm built-in obsolescence in the form of manipulation to the design or the conscious

[37] From a historical perspective, the introduction of the limited liability business form may have altered the growth path. This institutional innovation – in some sense also a technological advance – is not explicitly addressed in the post-growth literature referred to, however.

[38] As a comparison: in 2015 GDP in Germany rose by 1.7%. An increase in this growth rate by 0.02 percentage points would therefore raise growth to 1.72%. The associated increase in economic performance equates to a sum of approximately 60 billion euros in 2016.

introduction of weaknesses in order to create new sales. The study did however establish that manufacturers plan the product lifetime with the aim of adapting the technical product lifetime to the product's service life, for the purposes of, for example, reducing the costs and workload involved in storing replacement parts and carrying out repairs. To achieve this goal, all the components within the product should, where possible, have a similar lifetime.

A report (Maisch et al. 2014) on behalf of the Bundestag parliamentary group Bündnis 90/Die Grünen on planned obsolescence concludes that the practices of planned obsolescence cannot be justified by customer expectations. According to this report, planned obsolescence promotes questionable innovations that could significantly damage society and the environment. Furthermore, the study decided that a stronger orientation towards profits and capital markets correlated with lower consideration of ethical aspects. Building on this finding, the study concludes that more profit-oriented companies have a tendency to tolerate planned wear and tear as a corporate strategy. A connection can thus be made to the above argument regarding the business form.

Overall, we can conclude that companies consciously keep the lifetime of their products shorter than technical feasibility would allow. On the one hand the studies do not substantiate, though, whether this shorter lifetime is the reason for a short service life, or whether the short time during which consumers use the product is the original reason for this corporate behaviour. On the other hand, the product lifetime is one of various objectives whose implementation can lead to trade-offs (e.g. cost reduction, aesthetic properties, user comfort, etc.). Companies therefore do not aim for the *maximum* product lifetime but find a balance between manifold objectives while taking into account their own goals and offering goods that match with these differing factors. In accordance with neoclassical industrial economics, companies will ideally offer the *optimum* service life relative to their objectives. Irrespective of the question of whether de facto existing markets correspond to ideal neoclassical markets, the following thought process makes clear that the optimum service life is certainly shorter than the maximum possible: an increase in lifetime tends to go hand in hand with increasing marginal costs. After a certain point the gain of an extended lifetime is linked with very high costs. Even a company not oriented towards profit may prefer not to go past this point, because avoiding these high costs in one area may create greater added value for its customers in another area – through a lower purchase price if by no other means.

3.1.2.4 Assessing the Driver

Companies' behaviour plays an important role in the degrowth literature studied when explaining aggregate growth. Individual business forms, explicit corporate objectives and the competitive situation are described as the primary reasons behind why companies strive for growth. At the same time, in the view of degrowth literature investments and marketing instruments represent the most important strategies for achieving the growth objective. However, this literature does not explicitly state why or to what extent positive GDP growth should necessarily result on aggregate from the growth of individual companies, or even the majority of companies – where less successful companies (completely) withdraw from the market at the same time. If one contrasts the perspectives from degrowth literature with the theoretical perspectives of (i) neoclassical industrial economics, (ii) the systemic evolutionary perspective of complexity economics, as well as (iii) theories of monopoly capitalism, the greatest similarities can be seen with monopoly capitalist and complexity economics approaches. Neoclassical industrial economics, on the other hand, assumes that all corporate decisions are ultimately subject to the objective of maximising profits, and that growth is thus not a goal, but can only ever be a means to an end. However, when discussing the concept of the principal-agent theory, the in-depth literature highlights that managers do not necessarily

pursue the objectives of the company's owners (profit maximisation), but rather their own interests. This can motivate them to focus predominantly on the company's growth.

The empirical findings do not permit clear conclusions to be drawn as to whether the mechanisms highlighted in the degrowth discourse are relevant.

No less importantly, the number and significance of the empirical studies cited varies considerably and the different relationships were only examined by a small number of studies. On the level of an individual entity, the connection between shareholder-oriented business forms and growth appears to be positive, although this is based on very few studies. The same applies to the connection between growth as a corporate objective and a company's actual growth pattern. Generally speaking, the relative size of the company and the competitive intensity also appear to be positively linked to growth. Here, the empirical literature is more extensive and thus more reliable. The positive links between the use of marketing instruments for increasing consumption and the aggregate growth thereby induced are likewise supported by some studies. These links appear to apply more clearly to advertising than to planned obsolescence and product design. For theoretical reasons it remains unclear, however, what would follow from the empirical contexts discussed with regard to an impact at the macroeconomic level, even if the empiricism were clear.

On the question of whether **corporate objectives and behaviour** represent a relevant driver of aggregate growth, we cannot offer a conclusive, scientifically substantiated assessment. We consider the assumption that companies are driving growth as actors to be entirely plausible, though.

3.1.3 Positional and Habitual Consumption

Numerous degrowth authors maintain that one reason for continuous economic growth originates from certain consumption practices (e.g. Jackson 2009, Roepke 2010, Paech 2012: 110 ff.). Thus, it is assumed that specific consumption practices function as growth drivers. Substantively, this argument goes beyond consumption contributing to GDP as expenditure component. Economists agree that – ceteris paribus – increased consumption leads to increased overall demand.[39] Some degrowth authors see a long-term phenomenon in certain consumer practices that could also contribute to explaining an economy's growth path. To describe this phenomenon they sometimes use the metaphor of a treadmill, which activates a continuous increase in consumption, thereby making an ongoing contribution to economic growth.

Within the degrowth literature that we analysed we identified two types of consumption that are interpreted as growth drivers: positional consumption and consumption from habituation effects. Both types of consumption present two effects: on the one hand, their contribution to economic growth, i.e. their role as a growth driver; and on the other hand, their effects on social well-being. As the explanations below show, part of the criticism from the degrowth literature targeted at these types of consumption is based on the assumption that they do not add value to social well-being (see also

Text box 3 in Chapter 3.1.3.3). Nonetheless, this section concentrates on the discussion of their functioning as growth drivers.

[39] The precise economic role of consumption is disputed between the neoclassical and Keynesian perspectives, however: in the neoclassical theory increases in consumption lead to short-term impacts on the production volume (Mankiw 2010). Demand-related factors thus only explain short-term divergences from long-term (growth) trends. In Keynesian theories (Hein 2014) on the other hand, greater capacity utilisation in companies as a result of increased demand leads to higher investments by companies and, subsequently, to higher employment, more income and, in turn, to more consumption. Demand-related effects can therefore lead to higher growth.

In the following sections we discuss what role these two types of consumption play in economic growth. We first outline in which sense the respective type of consumption is seen as a growth driver within the post-growth literature, followed by a theoretical classification. Next we cite the empirical evidence identified with reference to the growth-driving mechanism. In an excursus we analyse the assertion that these types of consumption contribute to dysfunctional economic growth in the sense that the economic growth resulting from them does not increase social well-being.

3.1.3.1 The Driver's Mode of Action According to Degrowth Literature

Jackson (2009: chapter 4) uses the argument that numerous goods and services have social significance, and are thus a benefit for consumers, alongside their actual use benefit.[40] Jackson states that, because of this social significance, consumption of these goods and services brings with it social recognition and higher social status. According to Jackson, consumption of goods with social significance takes place for the purpose of positioning oneself relative to other people, e.g. to achieve social recognition or higher social status. The author asserts that, overall, positional consumption does not lead to an increase in social well-being, but to a general increase in the level of income: *"What matters – more than the absolute level of income – is having more or less than those around us […]. At the societal level though, there is a clear danger that this positional race doesn't contribute much to overall prosperity. […] This reasoning suggests that, at the level of society as a whole, income growth – and the associated material throughput – may be a 'zero-sum game'."* (Jackson 2009: 39).

According to Binswanger (2006), positional consumption leads to a phenomenon that he describes as the "positional treadmill". Binswanger (2006: 368) asserts that this occurs as follows: individuals strive to improve their relative position within their social peer group and realise this goal through positional consumption. In order to invest in positional goods, they therefore strive to obtain an increasingly higher income. However, when sufficient numbers of individuals attempt to improve their position within their social group in this way, the average level of consumption of the social group rises, and each individual must then consume even more in order to position themselves better in relation to those around them. This powers the cyclical nature of the treadmill: when the average level of consumption increases, individuals strive in turn to improve their level of income further; the aggregate effect of this is, however, to generate a further rise in the level of consumption. Yet the rise in the level of income means nothing more than GDP also rising (more precisely: higher GDP must be earned to generate higher aggregated and individual income). Consequently, Binswanger also describes a growth driver with the positional treadmill (similar: Kallis 2015).

Moreover, degrowth authors argue that the increasing level of consumption is integrated into the social structure in such a way that lessening consumption would be difficult: according to Roepke (2010: 108), when new products and living standards and the associated expectations become the norm, the new standards are integrated within the social and material structure of society and can thus develop into restrictions and create lock-in effects. Roepke also states that economic boom periods in particular lead to consumers starting to demand goods that were not the norm prior to that point. In time, consumption of these goods becomes the norm. According to Roepke, consumption practices sometimes establish themselves to such an extent that they result in path dependencies (lock-ins). This means that many consumption and behavioural practices are entrenched in such a way that diverging from them is associated with a high level of cost (time required, social pressure). As examples of this, Roepke (2010) begins by citing numerous technical products that, over time, have become items that are now essential for living

[40] We offer a brief historical overview of the theories of consumption with social significance in Chapter 3.1.3.2.

a normal life (e.g. information and communication technologies). Secondly, she describes infrastructures or established technical norms from which it is highly detrimental to individuals to deviate (e.g. infrastructure designed for individual car traffic; architectural standards that, in some areas, do not allow building without air conditioning).

Regarding the question of whether these types of path dependencies that result from consumption practices represent growth drivers, we make a distinction between two effects. On the one hand, the path dependencies described above may result from an interdependency between technical innovations, changes to social norms and consumption behaviour. For example, the result of technological innovations can be a product (e.g. a telephone or car) that encounters broad social acceptance over time. In this way social norms change, with the product becoming an accepted part of everyday life. Technical infrastructure is constructed that makes using this product easier, or makes it very difficult to do without it. Over time, consumption of this product will increase many times over. In this example it is not immediately clear, however, what exactly caused the undeniably higher consumption of the product in question over time and what should thus be considered as the growth driver: technical innovations have a role to play here, presumably also the change in social norms. Changes to consumption behaviour may be a result of technical innovation and social change in this instance. Nonetheless, the extent to which they constitute a growth driver remains unclear.

On the other hand, the path dependencies described may stem from another effect, known as the "hedonic treadmill". Binswanger (2006: 369) describes this effect as follows: a one-off increase in an individual's income would only lead to a short-term rise in hedonic benefit (happiness, satisfaction with life). This, Binswanger argues, is due to the fact that levels of aspiration increase in line with the increase in income. Where an individual has a higher level of aspiration, the level of income necessary to achieve the same level of hedonic benefit also rises. This creates a hedonic treadmill (cf. Binswanger 2006: 369). According to Binswanger, the problematic consequence of the hedonic treadmill lies in the fact that, despite the increase in income over time, happiness levels remain constant. We will discuss the effects on social well-being in Text box 1 in Chapter 2.2.2.2 and

Text box 3 in Chapter 3.1.3.3. Here we focus on the fact that the described phenomenon of the hedonic treadmill consequently leads to the powering of economic growth – ceteris paribus – and thus represents a growth driver: individuals strive to increase their income because they expect this to make them happier. Once they have achieved this, their level of aspiration rises and they then strive to raise their income even further in order to experience the same surge in happiness. In the aggregate of individual actions, economic output with which the income is generated increases ceteris paribus and the cycle continues.

3.1.3.2 The Growth Driver Against the Backdrop of Selected Economic Theories

In the section above we took two effects from degrowth literature that we identified as growth drivers stemming from consumption practices: drivers from positional consumption (positional treadmill) and from habituation effects (hedonic treadmill). Both types of consumption became the subject of scientific debate long before the degrowth discourse; below we classify them briefly within the corresponding contexts of the social sciences.

The concept of "positional goods" was introduced by Hirsch (1976), though Schneider (2007) asserts that the phenomenon had already been described by Rae (1834). Hirsch and Rae write that positional goods are characterised by their consumption representing a social scarcity and only being accessible to a minority of society (a high social position is a paradigmatic example of this type of good, since its rank is distinguished precisely by the fact that this position can only be held by a few).

Despite the definition, however, there remains no clear consensus on the identification of positional consumer goods. This is mainly because analytically separating an item's status components from its utility function also turns out to be very difficult. This issue is illustrated again in the following example: someone who buys a Ferrari or an Armani suit may above all have a particular penchant for beautiful cars or fashionable suits. Moreover, their consumption choice may also be shaped by their perception in their social environment. Conversely, the motivation to purchase a Ferrari or an Armani suit may arise out of their self-image and identity (Bursztyn et al. 2017). In all these cases the consumption of goods that can be seen to be associated with wealth endows the individual with a benefit, even if it is one that is not visible to other people (Akerlof and Kranton 2000).

Many other social scientists have described types of consumption and goods that fall under this broad definition of positional goods. Veblen (1899 [1834]) introduced the concept of conspicuous consumption, describing the phenomenon that people buy goods for reasons of status. Conspicuous consumption describes the consumption of luxury goods that are perceived by others. The price mechanism is said to be a distinctive feature of conspicuous consumption: individuals are ready to pay a higher price for goods that are functionally identical, in order to signal social status. A drop in price would therefore lead to a drop in demand, since the status would fall in line with the reduction in the price. According to Mason (1998), the role of conspicuous consumption gained significant traction over the course of the 20th century, since the phenomenon now affects not only higher income groups, but the whole of society.

Duesenberry (1949) establishes the hypothesis that individual consumption and savings behaviour depends on the consumption and savings behaviour of other members of a social group (the "bandwagon effect") as well as on the individuals own income in relation to others ("relative income hypothesis"). Many social scientists have described and analysed how social practices and norms, which go hand in hand with social pressure, make it difficult to deviate from the existing social conventions (Scitovsky 1976: 124, Bourdieu 1977, Hand et al. 2005, Shove 2010).

The concept of the hedonic treadmill comes from the literature of psychology. It was introduced by Brickman and Campbell (1971) and describes the phenomenon that a one-off increase in income for an individual only leads to a short-term rise in hedonic benefit (happiness, satisfaction with life).

The literature we have studied discusses the types of consumption depicted here, although in particular with respect to their effects on social well-being (see also

Text box 3 in Chapter 3.1.3.3). The question from the degrowth literature, as to whether these types of consumption represent growth drivers, i.e. whether the mechanisms associated with them actually lead to economic growth, is not discussed. The two treadmills describe two self-reinforcing effects in consumption. If they are a real phenomenon, the corresponding growth drivers are also likely to exist. The key question now is empirical: do the two treadmills actually exist and, if so, how strong is their influence?

3.1.3.3 The Driver Against the Backdrop of Empirical Findings

The empirical literature on positional goods is, to the best of our knowledge, not very well-developed. As discussed above, it is not easy to determine the share of positional consumption within overall consumption. This is due to the explication of what positional consumption is: in accordance with Frank's (2008) explication, any goods and services can be positional and it would first need to be checked experimentally (for all goods and services) whether they fall under the heading of positional consumption.

Empirical studies show, however, that social positioning makes a significant contribution to individual levels of life satisfaction (Clark et al. 2008). Most of the empiric results refer to the strength of the positional effect by income (i.e. the difference between individual income and that of the individual's social group) on satisfaction with life or work. Certain studies established that the positional effect of income is significant. Sometimes it was found that the influence of income on satisfaction with life was entirely positional (Clark et al. 2008). According to other assessments, relative position in income has the strongest effect on satisfaction with life in comparison to other influencing factors investigated (Clark et al. 2008). Nonetheless, the evidence for positional consumption making people more contented with their lives does not yet show that the positional treadmill actually exists (that people thus consume ever more over time in order to position themselves better relative to others).

It is equally rare to find literature on the question of whether the hedonic treadmill causes a lasting rise in consumption. However, the psychological basis of this treadmill, the adaptation effect – i.e. the phenomenon of an increase in income only leading to a temporary increase in happiness and level of satisfaction and the fact that the latter "adapts" to a reference point – has a proven empirical foundation (Clark et al. 2008). In contrast, the change in aspirations through additional income is harder to ascertain empirically, although some studies supply evidence for the effect (Easterlin 2005, McBride 2006, cited in Clark et al. 2008).

There is currently only one study – by Bursztyn et al. (2017) – that addresses all three questions. It firstly separates the consumer product's utility components from its status components; secondly, it investigates the existence of a positional or hedonic treadmill. In an initial experiment Bursztyn et al. (2017) supplied a group of bank customers, the experimental group, with a "platinum credit card" that features a selection of benefits, e.g. access to premium airport lounges. A second group of bank customers, the control group, were supplied with a standard credit card, yet with the same benefits and features as the platinum credit card given to the experimental group. Therefore, the two cards only differed from each other in their external appearance. In their results the authors show that the demand for the platinum credit card was greater and, thus, that the difference in demand could be ascribed purely to the perceived status of the platinum card. Based on transaction data, it could even be demonstrated in a second step that, in contrast to the ordinary credit cards belonging to the control group, the platinum credit card was used more in social contexts, i.e. in restaurants, bars and clubs. This fact suggests that the demand for positional goods tends to be motivated more by the relative social setting than by individual self-perception.

In a second experiment the same authors tested the existence of external effects on the basis of status consumption. To do this they upgraded two groups of platinum credit card users to a "diamond credit card" that was more expensive but that had identical features. The experimental group was also informed that the income criterion of their current platinum credit card (not for the diamond credit card though) had recently been lowered, meaning that customers in lower income brackets now also had access to this offer. As a result, it was demonstrated that this additional information virtually doubled demand for the diamond credit card. In light of this, the lower earners reduced the status appeal of the platinum credit card and increased pressure on the higher earners for even "better" products. The authors succeed in proving that positional consumption and/or habituation effects can indeed lead to people consuming more (cf. Weiss and Fershtman 1998 for an overview). This experiment may support Frank's (2005) opinion that external effects stemming from positional goods can potentially lead to wasteful consumption and inefficient innovation with respect to ever newer positional goods.

Text box 3: Dysfunctional growth: link between positional consumption, habitual consumption and social well-being

Both in the post-growth literature (e.g. Jackson 2009, Paech 2012) and in the broad realm of social science literature (e.g. Veblen 1889, Scitovsky 1974, Ng and Wang 1993, Frank 2008) the two types of consumption discussed here – positional consumption and consumption resulting from adjusting one's level of aspiration – have attracted considerable criticism for the fact that they are types of consumption that are inefficient in the sense that they do not enhance social well-being and that the welfare that emanates from them could be achieved with less resource expenditure. Below, we will discuss the link between the two types of consumption and social well-being.

Positional Consumption and Welfare

The fundamental idea behind why positional consumption does not contribute to social well-being is as follows: with positional consumption individuals strive to increase their individual welfare in order to put themselves in a better position relative to their social group. When an individual positions themselves better relative to others, though, (e.g. by increasing their level of income), the individual does indeed experience a boost to their welfare; yet this has a negative external effect on the welfare of all other members of the social group, since their relative position has diminished as a result. Positional consumption can potentially act as a zero-sum game with regard to social well-being (if we abstract from the respective benefit through the utility components of the status product): some individuals improve their positions; others' positions worsen – however overall nothing changes (cf. Ng and Wang 1993 for example).

In economics literature, a possible negative external effect of positional consumption on social well-being is picked up in the theory. Ng and Wang (1993) propose a theoretical social well-being function that takes into account the negative externality from both positional consumption and environmental pressures. Their social well-being function demonstrates the theoretical possibility that growth of GDP due to the resultant negative external effects (through positional consumption and environmental pressure) reduces social well-being (Ng and Wang 1993). The negative external effect of positional consumption also underlies Hirsch's (1976) theory: Hirsch asserts that, because positional consumption represents a zero-sum game with respect to social well-being and, as societies grow in material prosperity, positional consumption represents an increasingly large share of overall consumption, the development of social well-being is reaching its limits.

Wendner and Goulder (2008) use a theoretical model to analyse the effects of a product's status component on excess tax burdens and the optimal supply of goods. The nub of the argument is that the taxation of consumption should be higher than the otherwise optimal level if a status component can be assumed.

The Adaptation Effect and Social Well-Being

The metaphor of the hedonic treadmill suggests that the treadmill-triggering effect, the adaptation of preferences or wishes, is irrational: the authors state that the change to the standard has no positive effects on individual welfare in the long term – once the individual has become accustomed to the altered standard. The effort that led to the change in standard and that is required in order to maintain it seems to be useless from the point of view of individual welfare.

In economic welfare theory this effect can be represented by the fact that individual welfare at a given point in time depends not only on the level of consumption, but also on the relationship of

the individual level of consumption to a reference level. The reference level may depend on past income or on the expectations of future income. On the one hand, the rise in income at one point in time has a positive effect on welfare at this point in time (since the consumption level increases). On the other hand, it also has a negative influence on welfare in the future, since it raises the reference level (cf. Ng and Wang 1998 or Clark et al. 2008 for recommendations concerning a formal representation of the effect).

The theory that adaptation effects give rise to no (or highly discounted) increases in individual welfare applies only to certain perceptions of individual welfare, however, namely perceptions in accordance with which individual welfare is determined through hedonic conditions (satisfaction, happiness) alone. Critics of these explanations of welfare, however, assert that they neglect the fact that changes in objective circumstances (such as material prosperity, increase in income) may have an effect on individual welfare, even if life satisfaction levels do not rise. The change in standards, expectations, etc. can be a result of different reasons: it may represent a learning effect or an objective improvement of life circumstances. Where the adjustment of expectations to higher standards is the result of a learning process, for instance, the consistent satisfaction with life after adjustment of expectations is not a sufficient marker to say that welfare has remained the same.

In conclusion, we can state the following: in the view of many authors, positional consumption exerts a negative external effect on social well-being. Our research leads us to conclude that the empirical questions of how strong this welfare effect is and how widespread positional consumption is cannot be answered. The habituation effect observed in psychological literature cannot be clearly determined with regard to its ramifications for individual welfare: in some cases there may be a rise in welfare despite consistent life satisfaction; in other instances, this is not the case. To assess this issue further it is important to discuss the normative level of what a “good life” is and the role that consumption plays within this.

3.1.3.4 Assessing the Driver

In degrowth literature two types of consumption are considered important reasons for increasing levels of consumption, and thus – through the corresponding economic impact chains – seen as drivers of economic growth: firstly, positional consumption and the resultant positional treadmill; secondly, habitual consumption, i.e. consumption due to adaptation of the individual’s level of aspiration and the concomitant hedonic treadmill.

The phenomena that underlie these types of consumption – positional consumption and the habituation effect – have long been the subject of discussion within the social sciences. Normatively, these phenomena have so far been of particular interest because of the assumption that they make no or extremely negligible contributions to social well-being. The degrowth discourse brings another perspective into play, namely the question of whether positional consumption and consumption due to the habituation effect should not also be seen as drivers of economic growth.

At the theoretical level we have distinguished two effects that can each be interpreted as growth drivers: positional and hedonic treadmills. Due to the few empirical papers on this topic, we are not able to comprehensively substantiate the questions as to whether these treadmills indeed exist in prosperous economies and, if so, how strong their influence is, within the scope of this study. The previous empirical research results nonetheless indicate that consumption of positional goods is primarily motivated by the relative social setting and that it can also cause external effects. The psychological effect underlying habitual consumption, the adaptation effect, is likewise documented empirically numerous times. To this extent, positional and habitual

consumption can be seen as a relevant potential driver. The fact remains, however, that the empirical literature used here refers to only a few empirical papers. It will therefore be necessary to investigate positional consumer goods in further research projects. Two questions appear to be especially important for determining the relevance of positional consumer goods in the welfare debate in policy and society: (i) How significant can we estimate the aggregate relevance of positional goods? (ii) Can the claim of degrowth literature according to which the sum of all external effects that can be positively and negatively connected with positional goods will inevitably turn out negative, be substantiated empirically?[41]

Following the examination of growth drivers at corporate and consumer levels in the previous two chapters, in the next three chapters we will look at the interrelationship between technological change, natural resources and economic growth.

3.1.4 Increase in Labour Productivity and Capital Productivity

Continual productivity advances are a relatively new phenomenon in the history of humanity. It was only with the first Industrial Revolution in the 19th century and the invention of steam engines and railways that the era of technological innovations and sustained economic growth began. This development received a considerable boost through the second industrial revolution at the start of the 20th century.[42] Inventions such as the petrol engine, electrification, plastics and assembly line work triggered a large number of subsequent innovations whose influence was evident in sustained growth up to the 1970s. Private transport available to the masses, homes with running water, fridges and central heating systems enabled significant improvements to welfare in industrialised nations and, through this, the wider population was able to participate in the achievements of technological change for the first time.[43] The so-called "Third Industrial Revolution" goes back primarily to the utilisation of computers and the Internet (Gordon 2012). Technological change as a trigger of productivity gains is seen as an important influential factor for ongoing economic growth. The following chapters will describe how it is visualised in the degrowth discourse, will present theoretical and empirical findings, and will close with a classification of technological change as a growth driver.

3.1.4.1 The Driver's Mode of Action According to Degrowth Literature

Technological change is discussed as a growth driver in both mainstream economics and the degrowth literature. Technological change alters the productivity of factors of production such as capital, labour and material. In addition, the introduction of new technologies often changes the relationship between the quantities of the factors of production used.

According to Jackson (2009) and Paech (2012), the growth dynamic is created by companies always trying to maximise their profits to satisfy investors' demands (see also the explanations

[41] From a neoclassical perspective it does not appear to be at all inevitable that positional consumption has a net negative external effect, since opposing positive external effects are also conceivable. When positional consumption is envisaged as the expression of individuality, for example, this impetus can potentially also lead to a particular performance and commitment that may possibly also lead to a positive external effect. Moreover, positional goods that are less price-sensitive can also permit the introduction of beneficial innovations that subsequently provide advantages to a broader audience. One possible example of this is cars in the premium market segment, which were the first to offer safety features such as airbags. The installation of rooftop solar panels or modern battery storage devices may also be triggered by "positional aspects" in addition to energy supply and climate protection motives, e.g. by identifying oneself as an environmentally motivated and avant-garde technophile. It cannot therefore be concluded from one negative positional effect alone that the sum of all possible external effects of positional goods will inevitably be negative.

[42] Industrial revolutions describe epochal changes that are triggered by enabling technologies, which form the basis for numerous further innovations.

[43] It was during the decades immediately after the Second World War that GDP per capita experienced the biggest jump in industrialised countries. This fact also indicates that the effect of individual drivers (e.g. technological progress) can be amplified further through their interaction with other political and economic changes (e.g. worldwide opening of the markets, availability of fossil resources). In order to keep the complexity of the description to a minimum, the drivers are dealt with in sequence here.

on the "Corporate objectives and behaviour" driver in Chapter 3.1.2). To achieve this objective, they constantly look for new, more cost-efficient production options through which they can increase labour productivity. These increases in productivity of the factors of production allow the evolution of a growth dynamic through a demand effect. The authors state that this is due to the higher factor productivity going hand in hand with a more cost-effective production process, consequently leading to falling product prices. This then increases the real aggregate demand, since more goods can now be purchased on the same nominal income. The company consequently expands its investment and production. As a result, more output and income are generated, thus causing economic growth.

Moreover, the authors argue, due to the general market conditions, companies show a tendency to use efficiency gains to expand production instead of to save costs and keep production levels constant. Among other things, this then gives the company advantages over its competitors (see also the explanations on the "Corporate objectives and behaviour" driver in Chapter 3.1.2). According to the authors, because of the competitive pressure market actors try to achieve cost benefits by expanding production, as this is the only way they can survive in the market (Schmelzer and Passadakis 2011). Paech (2012) refers to the economic phenomenon known as economy of scale, i.e. where companies are frequently only able to exploit the efficiency potentials of new technologies if they build new or larger production sites, expand the infrastructure and increase input (Paech 2012).

Furthermore, many authors from the degrowth discourse believe that technological change leads indirectly to economic growth if it increases labour productivity. Higher labour productivity means that fewer personnel are required to achieve the same output. According to the line of argument presented above, the resulting unemployment can in part be avoided by increased demand due to the price reductions. Where the demand effect is insignificant, however, the aggregate demand can decrease on account of the decreased purchasing power through redundancies and diminishing trust in the future. The growth spiral described above morphs into a deflationary spiral with falling levels of production and employment (Jackson 2009). Nation states are dependent on revenue from wage income, however, e.g. for the provision of public services and financing the general government budget. High unemployment is also seen as one of the greatest social problems (see also the explanations on the growth-dependent area of employment in Chapter 3.2.2). According to Schmelzer and Passadakis this causes politicians to implement measures to promote economic growth (Schmelzer and Passadakis 2001, Jackson 2009). Policy measures to increase GDP can therefore be interpreted at least in part as a reaction to technological change.

3.1.4.2 The Growth Driver Against the Backdrop of Selected Economic Theories

Classical Theories

Two authors stand out among the ranks of classical economists with respect to the role of technological change: Adam Smith and Karl Marx. Smith is seen as the founder of the modern discipline of economics. Even though it is not explicit, economic growth is implicitly a central concern within his theory of economics: "Smith could very well be called the first growth theorist" (Johnson 1997: 1). According to Krelle and Coenen (1988), Smith's line of argument can be expressed as follows in modern terminology. Total production (Y) is determined by the average labour productivity (Y/L), the labour force participation rate (L/B) and the total population (B). L describes the number of employees: $Y=(Y/L)*(L/B)*B$. On the basis of this identity it becomes clear how central labour productivity is for economic growth, and even more so for the growth of per capita income in Smith's theory. In Smiths theory the most crucial determinant of labour productivity is the level of division of labour: "The greatest improvement

in the productive powers of labour […] seem to have been the effects of the division of labour" (Smith 1998 [1776]: 17). The rising level of division of labour is closely linked with accumulation of capital: "labour can be more and more subdivided in proportion only as stock [of capital] is previously more and more accumulated" (ibid.: 361). The rationale is, thus, that investing in new manufacturing sites and improving division of labour go hand in hand with each other. What Smith calls the division of labour is then termed technological change by subsequent authors.

Marx developed a theory to explain why companies introduce cost-saving technologies and why they have to do so. He argues that companies are in competition with each other and, in trying to sell their respective products on the market, are primarily competing on price (Mandel 1974). To survive this competition, companies introduce cost-saving technologies where possible. The introduction of new technologies goes hand in hand with investment, which leads to continuous accumulation of capital in the long term. The company is therefore both incentivised and pressured into introducing these technologies. The incentive comes in generating extra profits, the author states. This is because, if a company is the first to introduce a cost-saving technology, it can continue to sell the product at the old price for a certain amount of time, thereby increasing its profit margin. Once other companies in the market have also introduced the technology, the price of the product falls and the opportunity to boost profits passes (Harvey 2010). The price competition simultaneously represents a compulsion to introduce the new technologies: if a company does not do so, in future it will no longer be able to supply the product at a competitive price and will be excluded from the market (Sweezy 1942). Like Smith, Marx also identifies a close connection between investment and technological change. Both need to take place where companies are competing with one another.

The availability of new technologies is thus one of the core growth drivers in these theories: where new technologies are available, companies use these to drive up their profits – they are forced to introduce them to avoid being excluded from the market. This corresponds to the argument in the post-growth discourse that technological change ultimately leads to a growth dynamic, due to general competitive conditions. A further conclusion is that technological change in conjunction with other mechanisms leads to growth and/or only exists through this interplay.

Both theories have been added to in past decades through the discussion of the role of demand and the route by which innovations come about. According to the Schumpeterian innovation theory, innovations create their own demand. In its original form, the theory assumes in-house corporate incentives for innovation that, in turn, lead to movements in the markets, economic developments and, ultimately, to changes in consumer behaviour (Schumpeter 1961). Accordingly, changes in consumer demand are to be understood only as a reaction to new or modified offers, not as their cause. In contrast to this supply-oriented approach, or "push effect", Schmookler (1966) gives the demand side first place in his considerations. According to the author, it is above all the expected or current needs of consumers that have a significant influence on companies' innovation behaviour. This approach is also discussed in the literature as a "demand-pull effect" (Schmookler 1966, Kleinknecht and Verspagen 1989).

Neoclassical Theories

The neoclassical growth model is the standard model within mainstream economics. It describes an economy's production opportunities and, therefore, the potential supply of goods and services depending on the underlying factors of production and technologies. Robert Solow

(1956) and TrevorSwan (1956)[44] are seen as the founders of the theory. In the model, the aggregate production emerges through the interplay of various factors of production, e.g. capital and labour. Through these the available (natural) resources are used for the transformation into new goods and services during the production process. If one of the factors of production is expanded or used more efficiently a greater quantity of goods can be manufactured – creating growth.

The mainstream economics' growth models identify two principal reasons for economic growth: firstly, an extension of one of the factors of production, such as labour, capital or territory. The stronger integration of women in the labour market since the 1970s is an example of this mechanism, but the enormous expansion of material capital stock during the first Industrial Revolution in the 19th century also forms part of this schema. In the neoclassical model the expansion of capital stock arises through aggregate saving. To the degree that a part of the output produced is used to reinvest in the available capital stock, the stocks of machines and equipment grow and production opportunities increase. The capital stock then always rises when the amount of investment exceeds the write-offs (i.e. the wear and tear) of the capital stock available (Barro and Sala-i-Martin 2004).

Economic growth driven solely by expanding factors of production would nonetheless at some point reach its natural limits. The expansion of the labour production factor, for example, is limited by the natural constraints of population growth. When there are no spatial limits the capital stock can indeed be continually deepened or improved; it is characterised by decreasing marginal returns, however. This means that, for a given number of employees, every additional unit of capital generates less and less additional production. For example, the first computer purchased in the workplace leads to a very high increase in an employee's production potential; the second computer in the same workplace will not entail any further expansions of production, however (Barro and Sala-i-Martin 2004).

Through the use of an abstract capital concept the model can also explain economic growth when the aforementioned factors of production are kept constant. Behind the concept of human capital lies the idea that labour as a factor of production can be magnified not only by simply extending working hours, but also that it is determined by its quality. Therefore, within the neoclassical model, growth is also possible when there is a rise in the average level of education and human capital as a factor of production is thereby enhanced (Lucas 2015). The idea is that better trained employees can produce a larger quantity or higher quality of goods and services by means of greater labour productivity. Investment in education thereby leads to increased prospects for growth. The positive effect of education is further amplified by external effects on the performance of other employees who, for example, can also be more productive as a result of receiving better instruction. The likelihood of innovation creation also increases in line with the knowledge of employees in research departments (Sianesi and van Reenen 2000).

Secondly, in neoclassical models growth arises through an increase in labour productivity due to technological change. Since "simple" expansion of production factors cannot necessarily be considered a permanent growth driver, the increase in labour productivity and thus of technological change plays a special role. The constant changing of the production technology,

[44] The Solow or Solow-Swan model, which was introduced in 1956 by Robert Solow and Trevor Swan, is today commonly considered to be the formal starting point for the "growth economics" sub-discipline. As an exogenous growth model it forms the basis for numerous further developments within the neoclassical growth theory, as well as the departure point for the beginning of empirical growth economics with the first papers on what was termed "growth accounting" by Moses Abramovitz (1956) and Robert Solow (1957) among others. Following various extensions within this exogenous model framework – including analysis of differing saving rates, explicit inclusion of the state sector and international capital flows – the end of the 1980s saw endogenous growth theories developed, in particular by Paul Romer, Philippe Aghion, Peter Howitt and Charles I. Jones. A detailed historical overview can be found in Barro and Sala-i-Martin (2004).

i.e. the interplay of production factors, is measured as total factor productivity. This describes any part of economic growth that cannot be explained by an expansion of the production factors. An increase in total factor productivity can only be achieved through technological change and innovations. Innovations allow a larger quantity or greater quality of goods and services to be produced on the basis of the same amount of capital and the same number of employees. Technological change is therefore the key influential factor for economic growth in this theory as well (Solow 1956, Swan 1956).[45]

Keynesian/Demand-Side Growth Theories

In Keynesian theories the amount of economic growth is analysed as the result of the interaction between aggregate supply and aggregate demand. In contrast to neoclassical theories, here, it is predominantly demand-side dynamics that play a central role alongside supply-side dynamics. As we shall see below, technological change is also of pivotal importance in Keynesian growth theories. While in most Keynesian theories technological change is presented as a result of other growth drivers rather than being a causal driver per se, in some theories it explicitly increases growth.

Similar to neoclassical theories, Keynesian theories initially did not focus on technological change but rather on the development of capital and labour as production factors – and additionally on the development of demand. Scientific papers in the 1930s to 1960s laid the foundations for constructing the theoretical basis. The concepts of capacity and demand effects (Domar 1946) played a decisive role. Investment took centre stage here and continues to steal the spotlight in the Keynesian growth theory. On the one hand, positive net capital spending increases production capacity. On the other hand, investment leads to greater demand, since additional employees are hired to create and operate new production facilities and these employees in turn spend their salaries and have an impact on demand.

Keynes (2006 [1936]) focuses his analysis on the possibility that demand is insufficient to utilise production capacity to the full. In his view the key reason lies in the introduction of labour-saving technologies, causing a reduction in the number of jobs and decrease of wages. If demand is not increased by means of other factors (in particular government spending or exports) the economy may stagnate or even shrink. This leads to the question of whether and how sufficiently effective demand can be achieved in order to prevent unemployment. On the one hand, this can happen via structural measures that increase demand long term – for example, by putting employees in a better negotiation position to obtain higher salaries and, as a result, having the ability to consume more (Dutt 2010). Another possibility is that a lack of demand is offset by government investment (Brown-Collier and Collier 1995).

Similar to traditional theories, a close correlation between investment and technological change is evident. The assumption is, therefore, that different technologies with different labour productivity aspects are available at a certain point in time. Businesses can choose different technologies along this "technical progress function" (Kaldor 1961). Technologies with higher labour productivity are simultaneously characterised by a higher capital coefficient. Investment in technologies with higher labour productivity therefore also implies greater levels of investment and thus an increase in capital intensity long term (this is known as capital deepening). Due to the decreasing marginal returns on capital, however, this process is only possible to a limited extent (Kaldor 1957). Similar to the assumptions in neoclassical theories, the process of capital accumulation therefore ends when there is no exogenous technological

[45] In the further developments of the neoclassical model technological progress is derived within the models ("endogenised"); likewise all other determinants of the growth process (saving, consumption and investment decisions) are deduced from the preferences of the market participants (consumers and businesses) (cf. explanations from p. 101 onwards).

change. Only technological change can explain a continual accumulation and rise in labour productivity (Hein 2014).

Where the introduction of new technologies is closely bound up with investment, the question arises as to what determines the investment. The most important influential factor for investment in Keynesian/demand-side growth theories is the existing and expected capacity utilisation (Kalecki 2013). When, as a result of real experience or promising macroeconomic developments, companies expect to sell lots of products in the future, they have an incentive to invest. Since demand primarily emanates from consumers and government, their behaviour is pivotal for the amount invested and thereby also for the speed of technological change (Kalecki 2013). A core assertion by Keynesian authors is that a lower income disparity leads to higher consumer demand and thus both the aggregate demand and growth increase (Stockhammer 2011).

In Keynesian theories, too, technological change thus plays a key role for economic growth. The central causal chain goes from aggregated demand to investment to technological change. At the same time, there are also theories that describe the causal chain in parallel in the other direction – from the availability of technologies to investment and thus to higher wage income and demand. The arguments propounded in Keynesian theories are for the most part consistent with the lines of argument of post-growth authors. In particular, the argument that politicians try to prevent unemployment caused by technological change by initiating growth stimuli is based on these theories.

New Growth Theories and Their Ongoing Development

The new growth theories also try to explain the causes of technological change as drivers of economic growth (Romer 1990). Similarly to classical theories, they argue that entrepreneurs always have the incentive to invest in research and development if they hope to gain an advantage on the newly created markets. The advantage results from the opportunity to be the sole supplier to the market of the newly developed products. Businesses with new products temporarily become monopolists and can use high prices to generate large profits without competition. A prerequisite for this incentive structure is a functioning patent law as well as reliable enforcement.

The endogenous growth theories were developed further through a stronger focus in growth research on the behaviour of businesses operating in competitive contexts(Aghion et al. 2015). At their core, the models are based on the idea of “creative destruction” that was coined by Schumpeter (1911). A company thereby has the option of using its work or financial resources either for the production of existing products, or of partially using them to develop new products or production technologies through research and development (R&D). Where companies decide to invest in R&D, there is a high probability that they will succeed in coming up with innovations that provide them with a market advantage over their competitors. The structure of the market in which the businesses operate is crucial for their choice. In a competitive environment, a company is essentially in constant danger of being excluded from the market by a more productive competitor, due to the latter either being able to offer a comparable product at a cheaper price, or being able to produce a better or more innovative product for the same price. To the extent that competition between companies exerts a constant existential pressure on market actors, this competition can be identified as a key growth driver of market economies.

By looking at endogenous growth theories, which attempt to explain technological change, it becomes clear that competition between companies can explain the emergence of innovations and, therefore, the continuing growth dynamic. This is consistent with the reasoning of post-

growth authors that competition is an important precondition of the growth dynamic at the level of both individual businesses and whole economies.

Looking at the different theories illustrates the central role that technological change occupies in all established theories for explaining economic growth. Many of the lines of argument presented in the post-growth discourse build on the economic theories presented here. In various theories, as well as in the post-growth discourse, competition is considered to be the precondition for the emergence of innovations and a sustained growth dynamic. The Keynesian theory supports the assertion that there are attempts to resolve the issue of unemployment caused by technological change through policy measures.

3.1.4.3 The Driver Against the Backdrop of Empirical Findings

In this chapter we will first present the empirical findings on the correlation between technological change and economic growth. We will subsequently focus on the preconditions that lead to innovations and technological change.

Technological Change as an Explanatory Factor for Sustained Economic Growth

The empirical evidence confirms the neoclassical theory to that effect: that the expansion of factors of production can in fact explain growth drivers, although it is presumably ruled out as a permanent driver. The US economist J. Gordon (2012) illustrates this using the example of women's participation in the labour market in the USA. According to Gordon (2012), economic growth in the USA up to the end of the 1990s was supported by the increasing participation by women in the labour market. With the integration of American women in the labour market, today this effect is, however, virtually fully exploited. A one-off "quantity effect" can therefore be achieved this way, but the expansion of gainful employment can only be seen as a sustained driver of economic growth to a limited extent. The consideration of the human capital factor leads to a similar conclusion. Barro (1991) and Mankiw et al. (1992) initially show in their 1960–1985 analysis that the core hypotheses of the neoclassical growth model endure in this period where the growth of human capital is also taken into account as another significant input factor alongside labour and capital. Further empirical studies support the link between the average level of education within an economy and its economic output (Wößmann 2009, Hanushek and Wößmann 2012). One result of the investigations is that education only has an impact on economic growth to the degree that cognitive skills are taught in the classroom. The quality of education as a determinant of economic growth therefore becomes more important than the amount of education. Interpreted statistically, an increase of 100 points in the PISA tests leads to an expansion of the long-term per capita growth rate of close to 2 percentage points (Wößmann and Piopiunik 2009). Goldin and Katz (2008) quantify the proportion of improved "educational output" in the USA between 1890 and 1970 at 0.35 percentage points of the annual growth rate of GDP per capita. Despite the clear empirical evidence for the influence of education on economic growth, its lasting role as a growth driver is probably likewise limited. This is because it does not seem to be possible either to continually increase the number of years spent in education, or, within a given time period, to constantly transmit "more" or more complex knowledge that would make children's and young adults' later work output more productive. Benjamin Jones (2009) describes this phenomenon as the "burden of knowledge". In contrast, he asserts that in creating sustained systemic economic growth the influence of innovations and technological change is more important. There is considerable evidence for the correlation of research, innovation and productivity growth and corresponding aggregate growth (see Guellec and Pottelsbergh de la Potterie 2001, Westmore 2013). Technological innovations are not nature-given phenomena, but the result of political and entrepreneurial activities, e.g. in the domain of research and development. Attempts are therefore made to

empirically identify the structures and dynamics that support innovations, in order to gain a better understanding of technological change. The results of various studies are presented below.

Conditions for Innovations and Technological Change: the Link between Innovations and Competition

In empirical economic research today the conditions for innovations and technological change are researched primarily in the disaggregated view, i.e. by using microdata on individual companies and their innovation activities, e.g. in the form of registered patents. Aghion et al. (2005) show, based on British panel company data, a non-linear correlation between competition and innovative capability. The correlation therefore follows a reversed U-shaped curve between competition and innovation: where competition is low, few innovations can be observed. The impact of competition increases with rising intensity until it reaches a maximum and, where competition is very strong, it declines again. Where competition is very low, e.g. with services provided locally, there is very little pressure to innovate. Many businesses of the same size can then coexist without the urge to grow. As competition increases the pressure to innovate grows likewise. In general, markets that have a strongly competitive nature are characterised by high rates of businesses entering and exiting the market. The process of creative disruption ensures that in competitive environments many companies cannot survive and are therefore forced to file for bankruptcy. At the same time, the influx of new ideas and innovations means that new businesses are constantly able to enter the market (Aghion et al. 2015). One example of this is the start-up industry for digital information technology. There is a point, however, where the intensity of competition leads to individual companies succeeding in setting themselves apart from their competitors and achieving a leap forward in innovation. At this point, other (or new) businesses can only make up ground at a considerable cost, and the innovation dynamic wanes. The initial investment is too high for potential new entrants to draw level with the top industry players. Established businesses, on the other hand, do not need to invest as much in new technologies, because they face less pressure from competitors. There is therefore a tipping point at which the additional intensity of competition can result in the aggregate innovation dynamic slow down. Before this situation takes hold, strong growth of individual businesses can often be seen. Small companies are then denied entry into the market (Aghion et al. 2015). One example of this type of situation is the market for computer software.

This shows that the competitive intensity a business faces is a determinant for the development of innovations and technological change. In addition to the competitive intensity, the environment in which a company can or must operate is also pivotal for the creation of innovations, as we will explain below.

Innovations and National Company Structure

Companies competing within international markets per se face stronger competition than suppliers of goods or services that are difficult to trade across national borders. The business structure within an economy is crucial for the national dynamic of technological change. Where a country has a large number of businesses that are technological market leaders in their sector, competition consequently magnifies the incentive to assert oneself in the market and drives forward the creation of new innovations. In economies in which businesses mainly want to catch up in order to adapt to the latest technologies, measures that weaken competition can have growth-stimulating effects, because they offer a protected space to implement the adaptation being striven for (Aghion et al. 2015).

At the same time, the empirical growth research indicates that spillover effects from knowledge can lead to positive external effects within and between related economic sectors. Businesses

with a high innovative capability can therefore also be implicit growth drivers, in that they support innovations in other economic sectors (Romer 1990).

In addition to the competitive intensity and company structure, an appropriate and secured legal framework is a further precondition for businesses' innovation activity. Companies can only successfully innovate within adequate legal frameworks. Qian (2007) demonstrates this using the example of patent laws. She analyses national pharmaceutical patent law data from the 1980s and 1990s in order to quantify the impact of existing patent protection on the emergence of innovation. Her findings suggest that the implementation of national patent laws can increase the growth of innovation. Aghion et al. (2015) also show that procompetitive product market reforms only have an impact on economies' innovative capability where a patent right is guaranteed. This phenomenon is all the more pronounced in sectors in which innovations are associated with high initial investment and uncertainties. Qian (2007) and Koppel (2011) emphasise that the innovation-promoting effect of patent rights only takes hold when it is embedded within additional institutional frameworks. This includes the availability of well-trained personnel and the guarantee of functioning property and competition rights. Specific policy measures such as tax incentives for research and development, or the guarantee of patent rights are recommended for promoting the company's innovative capability (Westmore 2013). With regard to Germany, the recommendation is to introduce an R&D tax subsidy for the purposes of promoting innovation and creating (product markets) and maintaining (labour markets) flexible frameworks (IW Köln 2015).

A look at empirical research clearly shows that competition is an important explanatory factor for the successful development of innovations. Having said that, competition does not lead to pressure to innovate and to new technologies across the board. Rather, the outcome depends on various factors that characterise the market structure and thus influence the competition. These include the extent of competition between individual companies in a sector, the status quo of production technologies and the existing lead that individual companies have, as well as the competitive landscape at a national or international level (Aghion et al. 2015).

The competition can thus be identified as a central precondition that propels businesses to permanent innovations, thereby favouring economic growth. Next, we shall assess the correlation postulated between technological change and economic growth.

Innovations and Aggregated Demand

The hypothesis from Keynesian and Schumpeterian theories, which can also be found in the degrowth literature, that the direction of companies' innovation activity directly or indirectly depends on selection through demand, has been investigated empirically several times. With regard to consumer demand, Hippel (1988) confirms that innovations can originate from consumer demand. According to the author, in history it was often consumers who acted as creators or initiators of important commercial products and process innovations in a wide range of industries. In his view, the manufacturers only have a production function for the innovation incentives initiated by customers.

More recent studies, in contrast, criticise the monocausality in Schmookler's as well as in Schumpeter's hypothesis and constitute an interdependency between innovations and market structures. In other words, a strict division between supply and demand-oriented forces is not far-reaching enough, so that newer research approaches incorporate parts of both the Schumpeterian and Schmooklerian theory. Knell (2012) and Edler (2013) provide a current overview of important papers on empirical investigations of demand-driven innovations.

In addition to the relationship between consumer demand and innovation the question of whether and how government demand and government spending influence companies'

innovation behaviour is also discussed in the literature. In her book "The Entrepreneurial State", which came out in 2013, innovation economist Mariana Mazzucato describes the state as innovator. She distances herself from the thought that the government only guarantees the framework conditions and infrastructure so that the market can develop freely and creatively. In her view, Germany's rise to economic superpower in the 19th century is, for instance, the result of a government-backed system of technical education and qualification. In a series of detailed case studies from areas including information technology, the pharmaceutical industry and biotechnology she argues that government research laboratories and public institutions are mainly responsible for high-risk innovations. Profit-oriented companies only tap into the trend of these developments at a later phase, once the initial difficult steps have already been taken. The most prominent example here is Apple. From semiconductor technology to the development of touchscreens, through to GPS, microdrive technology, high-performance batteries or the "Siri" voice assistant – the development of all the key technologies found in iPods, iPhones and iPads received considerable support from the state in their initiation and financing, states Greffrath (2014). Not to mention the Internet, the genesis and construction of which would have been unthinkable without public money (ibid.). Critics of this representation occasionally refer to the fact that the state typically promotes scientific projects that would have been undertaken in any case. Kealey (2015) and Mingardi (2015) are among those offering a more extensive critique of Mazzucato's book.

3.1.4.4 Assessing the Driver

Overall, there is broad consensus that technological innovations are closely bound up with economic growth. The degrowth literature presented here shares the assessment of more established economic theories, according to which competition is a precondition for innovations and technological change. The literature is therefore in line with the traditional and the endogenous growth theories. The latter also emphasise that, for developing innovations, certain conditions such as property and patent laws must be fulfilled to enable innovations to be developed.

The claim that growth policy represents a possible reaction to the unemployment resulting from rationalisation is established in particular by Keynesian theories. Here, the state has the opportunity of promoting economic growth by boosting demand. By and large, the theories propounded in the degrowth discourse are thus based on various theories. At the same time, yet further important arguments are quoted in economic theories as to how technological change contributes to growth, which are not taken into account in empirical detail in the degrowth literature: the role of education (as a temporary influential factor), the U-shaped correlation between competitive structure and technological development, the legal framework, the role of the state and demand for the emergence of innovations.

The empirical findings presented that show that there is a strong link between technological change and economic growth are also unequivocal. The empirical investigations likewise reinforce theoretical considerations that technological change only leads to economic growth under certain conditions. These include national and international corporate structure, the design of legal and institutional frameworks and the structure of the prevailing competitive landscape.

3.1.5 Digitalisation

In this chapter we will explicitly discuss the question of whether and to what extent the latest digital technological developments that are foreseeable or anticipated in the near future (will) induce economic growth. Naturally, we cannot reliably say ex ante which digital technologies

and applications will play the most important role in this context. Certainly, the discovery and integration of new, digital technologies have already led to the emergence of an efficient information and communications technology (ICT) in recent years. This has significantly altered social and economic structures and created new business models with major growth potential. In this context there is talk of this giving rise to a third industrial revolution and, to some extent, already prophecies of a fourth industrial revolution. The assumption is that, in the course of further digitalisation, more epochal changes can be expected, in particular that all devices will be digitally interconnected and responsive via an IP address. The effects of this fourth industrial revolution – the comprehensive integration of increasingly intelligent and autonomously operating components – are being discussed using the key words "Industry 4.0", the "Internet of Things" and others (OECD 2017). In addition, there is increasingly literature on the question of the ecological effects that digitalisation entails. Contradictory effects can be observed: on the one hand, digitalisation can go hand in hand with higher energy and resource productivity. On the other hand, the production and use of information and communications technologies also implies additional energy and resource usage. Moreover, in many cases digitalisation leads to rebound effects that counteract increases in efficiency. It is difficult to provide a final assessment at the present moment in time (Lange and Santarius 2018).

Whether the anticipated digital change actually turns out to be a driver of significant advances in productivity and the resulting economic growth is currently the subject of a far-ranging, controversial debate that falls roughly into two camps. On one side are authors who claim that the new technologies hold enormous potential for increasing labour productivity. On the other side of the argument the reasoning is that, especially in comparison with earlier industrial revolutions, the new technologies are not expected to entail any notable increases in labour productivity.

These debates have also been taken up and discussed in the degrowth discourse. The first subchapter will present the positions set out in the degrowth discourse. These will subsequently be clarified against the background of the general debate. In the third subchapter we will consult empirical studies on the classification of the different approaches.

3.1.5.1 The Driver's Mode of Action According to Degrowth Literature

The role of the latest and of future digital technologies has previously only been addressed and discussed in degrowth literature by individual authors. In accordance with the general debate, two opposing fundamental approaches can be identified on the issue of whether new digital technologies can conceivably be growth drivers.

Paech (2012, 2017) and Santarius (2017) support the claim that the current developments may lead to a sharp rise in labour productivity and trigger further technology-driven growth in the future. In the authors' view, the established mechanism of action of technological change as a growth driver can be transferred to digital technologies. Digitalisation is comparable to past economic revolutions, they assert, which means that massive increases in productivity can be expected. The authors furthermore emphasise that the increasing distribution and use of digital technologies also has significant impacts on specific demands, such as energy. Since we can also observe distinct economic, psychological and structural rebound effects in the domain of digital technologies, consumer demand in particular will increase. As a consequence, they state, the new digitalisation technologies can be evaluated as growth drivers because they increase labour productivity and, at the same time, strengthen demand.

Vis-à-vis the claim that new (digital) technologies will lead to strong growth, the opposing claim states that it will generate hardly any increase in labour productivity. The assumption of a very small productivity effect is also cited as a crucial reason for the plausibility of the scenario of a

lasting phase of low or no economic growth ("secular stagnation"). D'Alisa et al. (2016) from the degrowth literature refer to this theory of secular stagnation, but propose a totally different approach to handling this scenario than that proposed by the mainstream discourse. Representatives of both supply-oriented and demand-oriented economic policy look for opportunities to create the prerequisites for a revitalisation of the growth dynamic by means of measures on the supply and/or the demand side of the economy in order to ward off the threat scenario of secular stagnation (cf. Institut der deutschen Wirtschaft Köln Consult/RWI 2015). On the contrary, d'Alisa et al. (2016) argue for avoiding corresponding measures and, instead, exploiting the expectation of secular stagnation in order to initiate a socio-ecological transformation.[46]

These opposing approaches within the degrowth literature take up the broad scientific and social discourse on the effects of new technologies and can be traced to one of the two dominant perspectives in this discourse. These perspectives will be introduced in the next chapter.

3.1.5.2 The Growth Driver Against the Backdrop of Selected Economic Theories

The two opposing approaches to the question of the extent to which new digital technologies (will) drive economic growth are both founded on economic analysis. At first glance, these approaches differ in particular as to whether they see potential in the use of digital technologies to significantly increase labour productivity. At second glance, they also differ in regard to the temporal focus of their analysis: while the "optimistic" authors primarily try to anticipate future developments and do not attribute too much importance to current observations on the missing productivity effect of new technologies, "pessimistic" analyses predominantly focus on the visible, obvious minor productivity effects of digital technologies and contrast these with the disproportionately larger impacts of previous technological upheavals.

The **"optimistic" view** advocates an enormous increase in productivity as a consequence of further digitalisation. According to one line of argument, fundamental requirements for rapid technological evolution in the domain of digitalisation are met (Brynjolfsson and McAfee 2014, Pratt 2015). Pratt (2015) describes the exponential growth of the worldwide potentials of all significant components in the IT sector (processing power, data storage, the Internet's size and performance, the availability and performance of local wireless communication) and parallel advances in mechanical and plant engineering (electronic and digital tools, storage of electrical energy and energy efficiency) as technological drivers of progress. On this basis, the author writes that extensive progress and developments are expected in areas that are described in terms of keywords like artificial intelligence, machine learning or deep learning, and big data analysis. These technologies are intended to form the foundations of both new software and intelligent hardware, e.g. in the shape of robots with the capacity to learn and interact and which could be used in both production and nursing, for example. Digital networking and independent learning form two self-reinforcing processes: devices and machines that act and actively learn as a result of empirical knowledge rather than programmed algorithms could, in the future, resolve issues with an efficiency and effectiveness hitherto unknown. Consequently, the author states, machines might not only take over physical work and predictable routines, but also areas of knowledge work that were not previously considered suitable for automation.

The implementation of these potentials would massively expand the possible range of applications by digital devices and contribute to a significant increase in labour productivity.

[46] In addition to these two approaches there are authors in the degrowth literature who assert that the new technologies can be used to promote other – non-market style – types of economies. This controversy is most widespread among authors with regard to commons. The authors discuss whether new technologies can be used for a commons-based society or economy (Helfrich 2012, Habermann 2016). Since these analyses do not deal directly with the question of whether the new technologies drive economic growth they are not analysed further at this juncture.

Prominent proponents of this claim include Erik Brynjolfsson and Andrew McAfee (2014), who see enormous productivity potential above all in machines adopting cognitive routine activities. In their view, the major productivity boost from computerisation and digitalisation is still to come. The inventions required to do this already exist. As soon as a critical spread threshold is exceeded, a large potential for productivity advances and associated growth is supplied through a constant wave of new combinations of these technologies, the authors state.

In Germany, the impacts of these technologies are predominantly discussed using the buzzword Industry 4.0. This describes the evolution towards a production environment consisting of intelligent, self-managing machines. In this scenario, people in future will increasingly place customised production orders and, by doing so, will have the capacity individually to influence product design or features. In an intelligent factory, so the concept goes, these orders will move through the entire value chain independently. This means that intelligent algorithms could be used to book the processing machines, organise the necessary materials, and provide instructions regarding delivery to the customer. In the spirit of Brynjolfsson and McAfee's (2014) words, everything needed to make this possible has already been invented. Existing technologies, such as decentralised intelligent systems or industrial wireless internet connections, are available and "only" need to be combined in new ways (Ganschar et al. 2013).

The **"pessimistic" view** in contrast advocates the claim that the latest and future technological digital developments will not lead to significant increases in productivity. Gordon (2012) argues that the third industrial revolution (the introduction and spread of computers and information and communications technology) had a much weaker influence on productivity growth than its precursors. The reason given for this is the characteristics of the new technologies. According to Gordon, the introduction of steam engines, spinning wheels and train tracks in the first industrial revolution (1750–1830) led to enormous increases in productivity. In the second (1870–1900) it was electricity and the petrol engine. The third revolution, involving computers and the Internet since 1990, has, Gordon asserts, already passed its zenith, but has not led to comparably high growth in productivity.[47] Tyler Cowen (2011) reaches a similar conclusion. In his opinion, technological development in early-industrialised countries has slowed over the course of recent decades. Even the innovative potential of ICT fails to reach earlier technological innovations, he states. One reason he mentions is that the mechanisation of society is already on a high level and earlier sources of economic growth, such as a rise in the level of education, are to a great extent fully exploited in early-industrialised economies.

The diverse nature of the perspectives and the diverging appraisals of technological developments by "optimists" and "pessimists" do not necessarily constitute an insurmountable contradiction, however. The interpretation of new digital technologies as "General Purpose Technologies" provides an interpretative approach that can connect both perspectives: in the short term, productivity and growth impacts that were previously missed are subsequently correctly identified by the "pessimists". Nonetheless, for the medium to long term the "optimistic" view may be the right one. This is because the productivity impact of enabling technologies may only become noticeable after a considerable delay. Productivity, employment and output would rise significantly in the longer term; in the short to medium term though, a new general-purpose technology may initially have a decelerating or negative effect on these outcome variables.

[47] Growth continued until the beginning of the economic and financial crisis; however Gordon ascribes this less to technological change and much more to a quantity effect that was achieved through the greater participation by women in the labour market and the baby boomer generation. He argues that innovations from the digital revolution first and foremost affect consumer goods, which, however, are now more marginal than fundamental in nature. Thus, for instance, the CRT television was replaced by the flat screen; or the Walkman by the MP3 player – these innovations did not fuel sustained leaps in productivity, however.

Several aspects can therefore be responsible for this delay in the productivity effect: firstly, new enabling technologies entail learning costs and the necessity of supplementary inputs. The resources for these must potentially be obtained from other production sites, which first of all causes a reduction in productivity. Additionally, better-trained personnel are often required to establish the new technologies in other sectors within the economy. These personnel need to be better remunerated accordingly, on account of their technical skills, which consequently results in a rise in salary level. Thirdly, the gradual adaptation to new enabling technologies also has an impact on businesses entering and exiting the market. This step can lead to a rise in unemployment in the short term. Fourthly, these aspects can have a considerable and initially possibly negative impact on the company's stock exchange prices. In summary, new enabling technologies can thus lead to a temporary decline in economic growth. Following a phase of restructuring and adaptation, however, they can in the long term have a positive effect on economic growth (Aghion and Howitt 2008). Whether the new technologies represent an enabling technology in this sense of the word cannot be clarified on the basis of theoretical arguments. Empirical findings provide additional insights here.

3.1.5.3 The Driver Against the Backdrop of Empirical Findings

In recent years, ICT technologies have in fact driven aggregate growth, albeit (thus far) to a lower extent than previous technological upheavals. In recent times the available data at the economy level have even pointed to a weakening in the increase of labour productivity. However, we cannot readily draw conclusions from this undeniable correlation as to the causes of an overall decline in labour productivity. The fact that the decline in labour productivity does not apply to so-called "frontier" businesses at the cutting edge of productivity development in their respective industries shows that the underlying causes require a more complex analysis than is possible here. Irrespective of whether measured in a national or international context, those companies in the lead due to their productivity development demonstrate an uninterrupted trend of increasing productivity.[48]

The interpretative approach of the delayed adaptation and diffusion of new enabling technologies that, due to their revolutionary nature, involve substantial and time-consuming investment in physical and human capital, provides a specific interpretation of the productivity paradox observed for new digital technologies (cf. Helpman 1998, in particular the article by Helpman and Trajtenberg).[49]

[48] A plethora of explanations has been set out and tested empirically in the macroeconomic discourse regarding the "productivity puzzle", i.e. the phenomenon that the positive productivity growth of these companies apparently contradicts the stagnation of labour productivity on an aggregate level (see the overview in Haldane 2017). Microeconometric analyses based on corporate data refer to two views in particular (cf. Andrews, Criscuolo and Gal 2016). The online article by Andrews et al. (2016) is an abridged version of this study for 24 OECD countries. Analyses with qualitatively equivalent results for individual countries can be found in Haldane (2017) for the United Kingdom and in Cette, Corde and Lecat (2018) for France. For a presentation of the debate on the productivity paradox focusing on Germany see (Wirtschaftsdienst [Economics Review – Journal of Economic Policy] 2017: 83–102, Weber et al. 2017).
On the one hand, the speed with which the "laggards" in the productivity distribution of companies within a sector catch up with the "frontier" companies leading the sector has decreased, which is manifested empirically in a spread of the productivity distribution (Andrews et al. 2017: "performance gap"). Complementary to this, the scope and speed of the diffusion and adaptation of productivity increasing innovations have tailed off. This finding can be structurally attributed to the fact that reallocation processes in many countries have proceeded much more slowly since the financial crisis. Normally, in processes of "creative destruction", the factors of labour and capital are time and again transferred from less productive companies to companies achieving greater productivity, or to newly founded companies. In many countries these productivity boosting "entry and exit" processes also appear to be disrupted due to the fallen interest rate level that was a consequence of the global financial and economic crisis, since less productive companies survive (longer) when financing costs are low (cf. Haldane 2017: 5). Deficits in competition policy have been identified as another reason behind delayed reallocations processes (cf. Andrews et al. 2016: 35 ff.).

[49] This interpretative approach refers to political steering options, since the breadth and scope of diffusion and adaptation processes also depend on the design of (public) framework conditions. This applies, for example, to the availability of a broadband infrastructure, which may represent a precondition for corresponding investment at the level of individual entities (cf. Schmidt and Elstner 2017 regarding the situation in Germany).

Assessing the further impacts of digitalisation on productivity growth in the sense of "Industry 4.0" is extremely difficult (OECD 2015b). Data from recent years show that a moderate decline in the increase in labour productivity has been recorded in all early-industrialised countries (Davies 2016). For example, the annual rise in labour productivity in the USA is approximately 0.5% versus 3% in previous decades (Papanyan 2015). ICT plays a significant role within the productivity increases achieved, however. According to econometric estimates, a 10% increase in investment in ICT results in a 0.5% rise in productivity (Sachverständigenrat [German Council of Economic Experts] 2015). Half of the increase in the total factor productivity in Germany can be ascribed to ICT-producing areas. At the same time, the contribution of ICT capital to productivity growth has declined since 1995 (Sachverständigenrat 2015). The productivity growth of world-leading companies that consistently utilise the latest technologies bucks the general trend and has been robust since 2004 (OECD 2015b). Against this backdrop, the explanation that it is less an issue of there being a lack of productivity boosting innovations, but rather that the real issue lies in the slowed diffusion and adaptation of these innovations appears plausible. The OECD states that the innovations developed in and also directly utilised by the frontier companies establish themselves much more slowly in the broader economy and society than was seen with earlier innovations (OECD 2017).

In Germany, the technological change that can be seen in ICT-producing industries is rarely reflected in areas with intensive ICT usage, such as in the form of more efficient administrative structures. In other countries, such as the USA, the picture is very different and there is a higher rate of diffusion of technologies (Sachverständigenrat 2015). Among other things, this is attributed to differences in training measures, restructuring of companies or the costs of market research. Whether or how quickly and comprehensively digitalisation will be reflected in the shape of increased productivity seems therefore to depend on and be influenced by institutional and policy frameworks (OECD 2015b, Sachverständigenrat 2015, Bernstein and Raman 2015).

An additional explanation of the tiny increase in productivity observed to date is then seen in the fact that technological innovations in the domain of ICT can mean important and positive changes for people, albeit that this may not necessarily be reflected (in full) in the GDP. Ayres and Warr (2005) accordingly observe absent economic growth, despite innovations in areas such as medical technology. In their opinion, relevant advances are especially noticeable in an increase in quality of life – e.g. in the form of falling child mortality rates and increased life expectancy. They state that the effect on GDP is negligible, however. In the area of largely ad-financed digital services provided without user payments and offered on platforms, it is equally assumed that the lack of financial transactions systematically understates the actual productivity growth and the associated increase in consumer benefits (cf. Brynjolfsson and McAffee 2014).

Looking at the empirical evidence illustrates the difficulty of reliably gauging and evaluating the impacts of digitalisation. At the present point in time it is not possible to derive a clear confirmation from the data in favour of either the "optimists" or the "pessimists". However, there is empirical evidence that the claim of a phased, decelerated implementation of new enabling technologies may prove to be an adequate interpretative approach for explaining the alleged productivity paradox of digital technologies (see McKinsey Global Institute 2017, OECD 2017).

3.1.5.4 Assessing the Driver

In the degrowth literature the discussion of new technologies as a possible growth driver has only recently begun and is merely taken up by a handful of authors (Paech 2012, Santarius 2017, d'Alisa et al. 2016). We can identify two opposing explanations of the connection between new

technologies and economic growth. On the one hand, some authors see great potential for economic growth impulses in digitalisation and other technological approaches, which, in their view, will entail further environmental problems and exacerbate the existing environmental challenges. On the other hand, in a secular stagnation scenario that is concomitant with small increases in labour productivity, there is an opportunity to transition to a post-growth society. These differing perspectives within the degrowth discourse are bound up with the general economic and social debates on this topic. "Optimistic" researchers (Brynjolfsson and McAfee 2014, Pratt 2015) advocate the thesis that significant leaps in productivity and growth through future technological developments can be anticipated. In contrast, "pessimistic" scientists expect no noteworthy leaps forward in productivity as a result of digitalisation, which, in their view, makes a secular stagnation scenario appear plausible (Gordon 2012, Cowen 2011).

In recent years, computer and ICT technologies have evidently still driven growth, albeit to a lower extent than previous technological upheavals. At the current margin the present data situation indicates a weakening of the rise in labour productivity at the economy level, whereas companies manufacturing ICT and in the vanguard internationally do not follow this trend. This suggests the conclusion that new technologies do indeed raise productivity in certain areas, but that they have not to date led to a boost in aggregate growth. The interpretative approach of the slowed adaptation and diffusion of new enabling technologies that, due to their revolutionary nature, involve substantial and time-consuming investment in physical and human capital, offers one possible interpretation of the productivity paradox of the new digital technologies. This interpretative approach refers to political steering options, since the breadth and scope of diffusion and adaptation processes also depend on the design of (public) framework conditions. This applies, for example, to the availability of a broadband infrastructure, which may represent a precondition for corresponding investment at the level of individual entities.

It is difficult to predict whether the new technologies will have a greater effect in the future than to date. Based on the qualitative arguments from the different sides, however, the application of technologies appears to hold great potential for increasing labour productivity. Nonetheless, whether this translates into economic growth depends on other economic factors.

3.1.6 Access to Natural Resources

Both in the degrowth literature and in certain economic theories an important role for economic growth is accorded to access to natural resources. Access to natural resources is discussed in particular as a precondition of technological change and, therefore, of economic growth. The following section will first discuss what role the use of resources plays for economic growth according to the reasoning of the degrowth discourse. Thereafter, we will compare two fundamental economic approaches – environmental economics and ecological economics – in terms of their views on whether easy access to (cheap) natural resources is a prerequisite for economic growth. Finally, we shall reiterate the empirical findings.

3.1.6.1 The Driver's Mode of Action According to Degrowth Literature

The argument that economic growth is based on an increase in resource or energy usage is often (in part implicitly) advocated in degrowth literature (Paech 2012, Schmelzer and Passadakis 2011). Some of the authors explicitly mention this assumed interdependency and create a connection between technological change and resource usage (Jackson 2009, Jackson and Victor 2011, Richters and Simoneit 2016, Paech 2012). The authors argue that innovations are a pivotal factor in generating economic growth. Technological change is a central aspect in the explanation of the economy and growth cycle in Paech (2012), Jackson (2009), Jackson and Victor (2011) and Richters and Simoneit (2017). For these authors, however, it is not

technological innovations that are the fundamental drivers or the primary underlying source of economic growth. In their view, innovations are ultimately "only" an aid to replace the input factor of labour with energy, which then, they assert, manifests itself in a rise in labour productivity.

Jackson (2009) and Jackson and Victor (2011) highlight the role of companies operating within a competitive sphere, which is also central within this context: companies endeavour to reduce the overall costs of the input factors of labour and energy/resources in order to remain competitive in the long term. Since energy/resources are relatively cheaper than human work, substituting energy for manpower (on the basis of fossil resource usage in particular) will reduce costs, the authors state. Under the given framework conditions, technological change therefore usually goes hand in hand with a reduction in the input factor of labour and an increase in resource usage or energy consumption.

Richters and Simoneit (2017) also state that companies acquire competitive advantages by shifting the production factors towards energy, because energy is a low-cost option compared to human labour. They sharpen Jackson's (2009) argument and take a different view as to what is meant by technological change. They argue that technological change describes the development of those technologies in particular that cost-effectively substitute energy from natural resources in place of human labour (Richters and Simoneit 2017 following Kümmel 2011). They see technological change that is realised through skilful resource usage as the crucial growth imperative (Richters and Simoneit 2017: 175). This interplay of the development of certain technologies and the cost-effective availability of natural resources causes an automation dynamic in the economy that consists of permanently replacing expensive human labour with inexpensive "capital-energy combinations" (Kümmel et al. 1997: 874 taken up in Richters and Simoneit 2017: 174). In this sense, affordable resources are considered a prerequisite for technological change and therefore also for a technology-driven growth dynamic.

3.1.6.2 The Growth Driver Against the Backdrop of Selected Economic Theories

This subsection juxtaposes the main perspectives of environmental economics and ecological economics in terms of the question of whether, from these theoretical perspectives, increasing resource and energy usage are a necessary prerequisite of economic growth or even a driver of economic growth. Ecological economics starts from the premise that, under the given conditions, the growth impulse is invariably associated with increased levels of resource consumption due to an increase in labour productivity. Conversely, proponents of environmental economics predominantly assume that technological innovations can increase both labour and resource productivity at the same time, and thus economic growth (per capita) does not depend on increasing use of resources. These differing perspectives crystallise into three key debates: (i) the question of the extent to which renewable energies can bring about independence from increasing resource inputs; (ii) the effects and conditions of (further) tertiarisation on resource requirements; and (iii) the question of the extent to which decoupling of resource consumption and economic output has already been observed and can be considered generalisable.[50]

Firstly, according to environmental economics, new, efficient technologies may be instrumental in achieving economic growth without the consumption of additional (fossil) resources. Renewable energy has an important part to play in this: even when energy is imperative as an input factor, environmental economists argue, it can be generated from renewable and thus

[50] The allocation of separate, divergent opinions to "environmental economics" and "ecological economics" naturally does not do justice to the complexity of the scientific discourse and the differentiated approaches of individual authors; moreover, the borders between the two "camps" are increasingly fluid. Since a detailed, author-specific presentation would exceed the parameters of this study, we will still deploy a more generalist comparison.

ecologically sustainable sources. Ecological economics, on the other hand, starts from the premise that new technologies require increased resource input elsewhere. Establishing new, supposedly more environmentally friendly technologies such as renewable energies is said to result less in a reduction but rather a shift in resource consumption. Due to the increasing significance of solar energy, less coal is accordingly needed to produce electricity; yet other raw materials like rare earths and a considerable input of energy are required to manufacture solar panels, as well as large surfaces for their use (Foley et al. 2005, Peters and Hertwich 2008, UNEP 2011b). According to ecological economics, additional resource input remains a requirement for economic growth, even if this is achieved by establishing new technologies (Kümmel 2011, Antal and van den Bergh 2016).[51]

Secondly, environmental economics concludes from the fact that value creation has shifted towards the service sector that future growth can increasingly take place without additional consumption of resources. In Germany – as in all other early-industrialised countries – employment and value creation have undoubtedly shifted from agriculture to industry and from there to the service sector. Environmental economics assumes that the relationship between economic growth and resource consumption may weaken further, up to full decoupling, if economic value creation continues to move to the service sector.[52] In contrast, ecological economics states that increased resource input was not only a requirement in the past for tertiarisation-related structural change, but this will continue to be the case in the future. For ecological economics the sector shift is not an indication that future economic growth can be achieved without an increase in the resource input. On the contrary, it is argued that the sectoral change that occurred so far could obviously only take place with a substantial additional input of resources – in the form of energy generated by fossil resources. Corresponding innovations then enabled expensive human labour to be replaced by cheaper energy in sectors like agriculture and industry (Kümmel 2011, Ayres and Warr 2010).

Thirdly, environmental economics concludes from the reduction in resource intensity of GDP seen at the current margin in some countries that future growth is increasingly realisable without additional consumption of resources. The basis for this is the empirical observation that the resource intensity of GDP, i.e. the aggregated resource input per unit of output value, has fallen in some early-industrialised countries. Conversely, ecological economics still sees a rise in resource input as a precondition for economic growth. From a global perspective, ecological economics attributes a large part of the reduced resource intensity of GDP in some early-industrialised countries to the outsourcing of energy intensive production stages. The line of argument is that within early-industrialised economies, the increase in value creation where levels of resource usage are kept consistent or reduced is realised above all by importing energy, semi-finished goods and raw materials from other parts of the world, especially from emerging and developing countries. Economic growth depends very strongly on increased resource usage, the authors state. Accordingly, from a global perspective economic growth is still based on increasing the use of raw materials (Kümmel 2011, Antal and van den Bergh 2016, Brand 2016).

The juxtaposition of the arguments makes it clear that, from the point of view of environmental economics, cheap access and the increased use of natural resources are not necessary requirements for technological change or future economic growth. It also demonstrates that the reasoning found in the degrowth literature is closely bound up with ecological economics. From

[51] A comprehensive analysis of the resources required for the energy transition in Germany has been put forward by Angerer et al. (2016).

[52] The decoupling perspective is not limited to the service sector, however: when a very widespread closed circle economy is combined with a virtually complete energy supply based on renewable energy, there is subsequently also potential for decoupling in the manufacturing industry sector (OECD 2012).

this perspective, a constant increase in the use of natural resources is a prerequisite for technological change and economic growth.

3.1.6.3 The Driver Against the Backdrop of Empirical Findings

In the following, we will present the results of empirical studies for the correlation between resource consumption and economic growth observed to date. Since the correlation is very complex, many partial aspects cannot be taken into account. These include an assessment of which proportion of resource consumption is accounted for by economic growth, as well as an analysis of the correlation between the cost of raw materials and economic growth. Using the data for Germany, we will demonstrate empirically that the data can be brought in line with both the environmental economics theory (decoupling works) and the ecological economics theory (decoupling does not work). We will also explain why this is the case.[53]

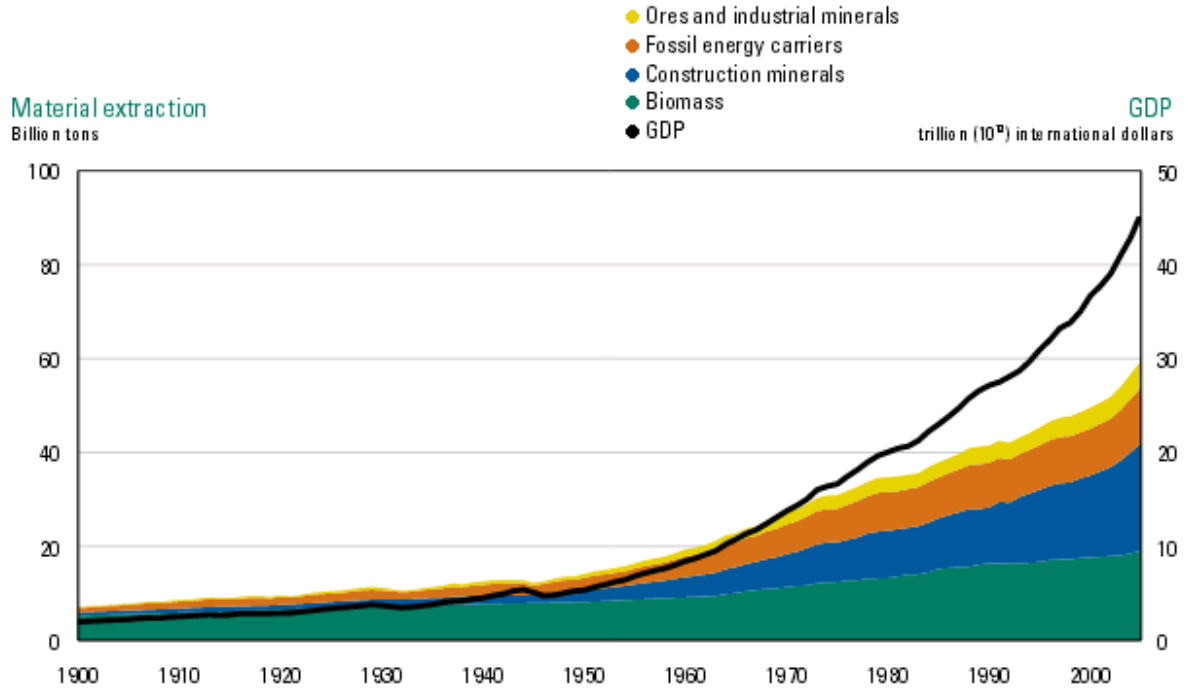
Looking to the past shows that, in early-industrialised economies, bar cyclical fluctuations, there has been continual economic growth for almost 200 years and that this is concomitant with increasing global consumption of resources. Since around 1950 most parts of the world have seen especially rapid growth, with Europe, the USA and Japan leading the way. From 1900 to 2005 global GDP rose by a factor of 23 (UNEP 2011b). In the same period, global extraction of important resources such as biomass, fossil fuels, ores and industrial and construction minerals rose eightfold.

The close coupling between economic output and consumption of energy and resources was also seen during economic crises in which the falling economic output went hand in hand with lower resource usage (to illustrate, Figure 4 shows the correlation between resource consumption and economic growth). Since 1970, however, resource consumption per value unit has decreased globally, i.e. consumption of resources has grown more slowly than GDP. This effect becomes clearer still if we consider only the per capita use, i.e. ignoring the influence of population growth on resource consumption. The per capita use doubled in the last century to 9 tonnes of material usage per year on average. Resource consumption per capita thus grew many times less than global GDP (UNEP 2011b). These data suggest the conclusion that global economic growth has to date been accompanied by a constant rise in resource consumption; additional resource consumption has, however, decreased in relation to economic output for decades.

Nonetheless, this aggregated view says less about how the correlation between economic growth and resource consumption is presented in the disaggregated view, i.e. regarding specific resources and individual economies.

[53] With the aid of models that use energy data to populate the simulation of historical economic growth, scientists conclude that exergy – which, roughly speaking, means the usable energy contained in natural resources – is an important factor in explaining historical economic growth (see Kümmel 2011, Kümmel and Lindenberg 2014).

Figure 4: Resource consumption and economic growth 1900–2005



Source: UNEP 2011b

In respect of individual countries and specific resources, a considerable reduction of the correlation can be observed in some instances. Firstly, in some early-industrialised countries the resources and energy intensity of GDP is in marked decline (Giljum et al. 2014). Secondly, some countries are seeing falling absolute levels of consumption of specific resources despite positive growth rates. Germany's primary energy consumption, which has been slowly declining since 1990 while GDP has increased, can be cited as an example of this absolute decoupling. Primary energy consumption is defined as the sum of all energy sources obtained domestically[54], together with the balance of imported/exported amounts (for a precise definition see UBA 2017a). According to UBA, the reduction in primary energy consumption is achieved above all by developing renewable energy and improving the efficiency of conventional power plants. When interpreting this development, however, we must take into account that these processes have physically defined limits (UBA 2017a). The primary energy consumption per unit of GDP has fallen significantly in the same period, due to the positive economic growth and the associated rise in the denominator of the ratio (Arbeitsgemeinschaft Energiebilanzen [German Working Group on Energy Balances] 2017). The reduction corresponds to an increase in GDP energy efficiency (energy input per unit of GDP) of 30% over the past 25 years (Arbeitsgemeinschaft Energiebilanzen 2017). These figures indicate that economic growth in Germany has increasingly decoupled from energy consumption and the associated demand on resources. This empirical evidence would support the perspective described above as "environmental economics", according to which future economic growth can be decoupled from the (increased) consumption of critical resources.

[54] According to UBA, primary energy sources include, for example, lignite and hard coal, mineral oil and natural gas that are either used directly or converted into what are termed secondary energy sources, such as coal briquettes, fuels, electricity or district heating (UBA 2017a). Primary energy consumption has fallen from 14.9 thousand petajoules (1990) to 13.4 thousand petajoules (2016) (a reduction of 10%). Final energy consumption has fallen from 2.6 thousand terawatt hours (1990) to 2.5 thousand terawatt hours (2015), which equates to a reduction of 4%. This means that part of the reduction in primary energy consumption is the result of greater levels of efficiency in power plants (figures from UBA 2017a).

The situation is different, however, if the analysis is based on an expanded database. Firstly, the results can sometimes show increased resource consumption despite lower resource intensity when the energy and resource inputs contained within imported goods are included (Giljum et al. 2014). UBA has calculated that these so-called indirect flows are six times larger for some raw materials than is shown in the raw materials' direct trade flows (UBA 2016a). Another piece of research concludes that from 1990 to 2008, the indirect material flows increased by 75% (UBA 2013). Secondly, additional consumption can be established with regard to some resources. For example, globally, the use of space is increasing significantly (Bodenatlas 2015). Any raw materials required for building new, technical devices are likewise becoming more important. Metallic raw materials, such as lithium for mobile phones and laptop batteries, or neodymium for wind turbines and electric cars, consumption of which has increased considerably in recent years, play a key role (UBA 2012). Consumption of iron ore, bauxite, copper and nickel is currently growing even more strongly than global GDP (Jackson 2009). These data raise doubts about the thesis that future global economic growth can increasingly be achieved independently of access to and use of natural resources.

3.1.6.4 Assessing the Driver

The thesis that technological change and the economic growth thereby generated necessarily go hand in hand with increased consumption of natural resources is widespread within the degrowth discourse. One difference in relation to other drivers is that access to (cheap) natural resources is seen less as a driver in the sense of a causal mechanism, but rather in the sense of a precondition for technological change and the economic growth initiated as a consequence. In particular, it is argued that economic growth in the past would not have been possible without increased consumption of fossil resources.

It has been illustrated using empirical evidence that, historically, in each case there was a close link between economic growth and increased use of natural resources. Since the 1970s, however, relative decoupling has been observed when viewed in aggregate – the global national product is increasing more rapidly than global consumption of resources (see Figure 4). At the level of individual resources there have recently been divergent developments in different economies, whereby even absolute decoupling processes – increasing national product and absolute decline of specific resources – can be noted. Nonetheless, to avoid optimistic fallacies, the energy and resource inputs contained within imported goods must be considered in national analyses.

While in the past global economic growth invariably went hand in hand with increased resource consumption, it is not possible to formulate a clear answer to the question of whether an increasing consumption of natural resources (or a consumption transgressing ecological boundaries) is also essential to *future* economic growth: firstly, the structure and, therefore, the resource basis required for a future national product is undetermined. Even if we extrapolate from the situation today, an answer appears at most to be possible with a view to specific resources and regarding the technology in place today. With regard to a decoupling of economic growth and resource consumption as a whole, the developments of the substitution possibilities between various resources and changes in technology are pivotal. The team of authors was unable to reach a final consensus as to whether access to natural resources can be understood as a driver. In the view of some authors, no convincing line of argument could be identified to say that access to resources still drives economic output in early-industrialised economies today in a causal and lasting sense.

3.1.7 Monetary System and Banking

Some economists consider the monetary and financial system, specifically the banking system, as an important growth driver within the economy (e.g. Binswanger 2006, Douthwaite 2000, Binswanger 2009, Antal and van den Bergh 2014). Within the degrowth literature in particular, various authors identify this connection as a central systemic driver (cf. Latouche 2015b, Paech 2012, Rezai and Stagl 2016, Mellor 2015).[55]

Can we find a significant reason in the existing monetary system for the economy continuing to grow or growth being continually stimulated? Can a "need" for economic growth be derived from the monetary system in the sense that it is required for the stability of the economic system and the only means of avoiding critical developments, including societal ones? These questions are gaining a lot of attention in growth-critical debates. Discussions are contentious, with very varying results (cf. Strunz et al. 2015, Richters and Siemoneit 2016, Schindler et al. 2017).

At the beginning of the chapter we will contrast the considerations of the degrowth discourse with monetary theories in order to gain differentiated insights. We will first introduce two opposing views on the role of the monetary system in relation to real economic growth. Next, we will present the opinions of some very prominent authors in the degrowth debate who argue that the monetary system leads to a growth imperative and thus constitutes a growth driver. We will then contrast this with the growth economics perspective. Finally, we will draw our conclusions.

3.1.7.1 The Growth Driver Against the Backdrop of Selected Economic Theories

Monetary System, Interest Rate Determination and Economic Growth

When discussing the monetary system, different economic theories ascribe very different effects to its impact on real economic growth.[56] In the following we will contrast the core statements from two central economic paradigms: the neoclassical and Keynesian theoretical approaches.

Theories based on the neoclassical model, which form the mainstream in monetary theory and the related monetary macroeconomics, differentiate between the short-term and long-term in the analysis of the monetary system. While monetary supply in particular is conceded to have a certain influence on economic growth in the short term (Mankiw 2010), it is not a significant factor in the long term (Acemoglu 2009). Here, growth is explained on a non-monetary basis using real factors and mechanisms, e.g. population growth and technological change. In the neoclassical view the economic entities are not a "monetary illusion", i.e. in the long term, nominal income increases are not mistakenly equated to real income increases (measurable in goods). In accordance with this approach an increase in the amount of money by the central banks in the long term does not lead to real increases in income but can only smooth out economic cycles in the short term. Ultimately, sooner or later nominal variables adjust to the real variables. This is why in the context of long-term analyses that refer to economic growth

[55] In this context, authors within both the degrowth and the post-growth discourses advocate the theory that the monetary system is not a growth driver, but, as an institution, is itself dependent on continuous economic growth in order to function robustly. In the terminology of the post-growth literature, the monetary system (in connection with the financial system as a whole) can accordingly be viewed instead as a growth-dependent area (Jackson 2009). In the eyes of the proponents of post-growth the monetary and financial system must therefore be changed in such a way that this system becomes compatible in future with a non-growing yet robust economy. At this juncture there is an interface to the mainstream discourse in that the resilience of the financial system to various shocks is an intensely discussed topic that has led to numerous regulatory adjustments since the financial and economic crisis. The characteristic difference is, of course, that the mainstream discourse does not focus on the scenario of permanently sluggish growth, but the stress tests, for example, are about testing the vulnerability of individual banks and financial market actors (micro-prudential) and of the system as a whole (macro-prudential) in the event of short-term deviations from the underlying assumptions (also referring to growth) and identifying the potential ramifications.

[56] In this text the presentation focuses on analyses of the monetary system in the more restricted sense – i.e. the interplay of savings, bank lending and the banks' associated activities. The essential differences in the views can be seen from this. We will therefore not look more comprehensively at the financial system as a whole (which the monetary system forms part of).

trends (and not the cyclical fluctuations around the trend, the economic activity) – for example the theory of an impending phase of sustained low or zero growth ("secular stagnation") – the real rather than the nominal interest rate is considered.

In neoclassical models the monetary system in the short term is primarily modelled as a money market with a money supply and demand curve. At the intersection of the curves there is an equilibrium interest rate (Felderer and Homburg 2005). The money supply in the model is determined by the willingness of households to save. The money demand depends among other things on the company's demand for credit, which in turn is determined by the marginal capital productivity and thus by technological change (ibid.). This means that in neoclassical theories it is technological change and household preferences that determine the amount of investment, the interest rate and economic growth.[57] There is thus no growth impulse originating from the monetary system itself.

In Keynesian-type theories the monetary system is, on the contrary, considered to have a significantly more important role with regard to real economic growth.[58] Two schools of thought can be identified here.

The first perspective (based on Keynes (2006 [1936]) works from the premise that the money supply is provided exogenously by the central bank. In contrast, the money demand is primarily determined by households' liquidity preferences. The more households favour money as a particularly liquid means compared to other investments, the higher their demand for money becomes. Money supply and demand together determine the interest rate. This in turn influences the amount of investment (and thereby also economic growth), since interest payments represent a cost factor for businesses.

In the second perspective within the Keynesian line of thought the money supply is determined endogenously: commercial banks can create additional money by means of bank lending. Money supply can therefore react flexibly to money demand. Money demand increases with companies' credit demand, which in turn depends on the planned production volumes, which are aligned with the (anticipated) demand for the end products. The interest rate is primarily set by the central bank's interest rate policy (Godley and Lavoie 2012). Even with the explicit involvement of commercial banks, Keynesian theories hold that growth is largely driven by investment corroborated by expected sales.

3.1.7.2 The Driver's Mode of Action According to Degrowth Literature

Within the degrowth discourse the basic (Keynesian) hypothesis is largely adopted: that the monetary system is not neutral, but that it exerts a fundamental influence on economic growth (Kennedy 2012, Mellor 2015, H. C. Binswanger 2006, M. Binswanger 2009, Douthwaite 2000, Farley et al. 2013, Lietaer et al. 2012, Löhr 2012). There is some contention over the precise nature of this influence and its scope, however. For example, Binswanger (2006) advocates the thesis that the existing economic system is reliant on growth (there is, the author asserts, a so-called "growth imperative"), and that this can be attributed among other things to the state of the monetary system. The claim that the existing monetary system induces a growth imperative

[57] This argument is based on theories around the short term. Theories regarding the long term use the same logic without explicitly modelling the money market.

[58] In current economics the basic models presented here still only play a small and above all a didactic role; in monetary macroeconomics, however, it is DSGE models (Dynamic Stochastic General Equilibrium Models) that dominate in the "new Keynesian economics": these models are characterised on the one hand by a neoclassical micro-foundation under stochastic uncertainty, whereby on the other hand the inertia of adjustment processes ("sticky prices") leads to "Keynesian effects" arising in the short term, i.e. a positive economic impact of monetary policy. In the long term, i.e. after all adjustments to create a new equilibrium, there is no remaining growth impact in these models, in line with the "classical" neutrality of monetary policy. A comprehensive introduction to "New Keynesian Economics" can be found in Galí (2015); meanwhile, Clarida, Galí and Gertler (1999) provide a concise overview.

has in turn received a high level of criticism. By way of example, Strunz et al. (2015) and Richters and Siemoneit (2016) have expressed doubts as to whether the justification of the claim put forward by Binswanger (2006) is consistent. Jackson and Victor (2015) use models to demonstrate the possibility of an economy in which the basic functional mechanisms of the money system take effect not experiencing sustained growth.

At the Corporate Level: Interest Rates as Drivers of Corporate Growth

At the micro level the school of thought in the degrowth discourse is that companies that finance their business activities via loans with (positive) interest rates tend to show (stronger) growth. A connection is thus drawn between a company's growth and its ability to generate profits. Businesses follow targeted growth strategies to be able to generate sufficient sales and associated contribution margins as well as to be able ultimately to pay back the interest, the authors write (Binswanger 2006, Paech 2012). In addition, investors themselves exert pressure on companies to pursue growth strategies – equally so that they can then pay back their loans (Posse 2015). The higher the interest rate, the stronger the growth imperative consequently would become.

Nonetheless, it remains unclear in the degrowth literature which direction the causal chain is operating in: is borrowing an incentive for a company to grow – or is it much more the case that companies that decide to grow take out loans in order to do so? In the latter case, generally speaking a positive or higher interest rate would inhibit corporate growth rather than promote it, since the costs associate with the interest would ceteris paribus necessarily lead to companies investing less. At the macroeconomic level, in aggregate, the argument goes that this effect will certainly dominate: the lower the real interest rate, ceteris paribus the higher the incentive for companies to invest and, therefore, the more this investment contributes to economic growth.

As a first deficit in the degrowth literature on the monetary system, it should therefore be noted that there is no possibility of a consistent transition from the micro level of individual companies to the macro level or that this is not undertaken. If individual companies were actually forced to grow faster by higher interest rates, how can we explain the overall extant observation that ceteris paribus companies invest more when interest rates are low? Assuming that companies are in competition with each other, each company that otherwise faced the same requirements would always have an advantage if it paid a lower rate of interest for its investment loans.

Macro Level: Bank Deposits, Money Loss and Accumulation of Financial Securities

At the macro level the line of argument in the degrowth literature states that the phenomena of credit money creation by commercial banks and positive interest rates are incompatible with non-growing economies. The detail of the reasoning varies between the authors. Most of the time, however, the focus is on the fact that bank deposits created by private banks are always generated as a loan with interest payment. In order for the borrowers to be able to pay back the interest, more money that can be effective in the economic cycle must always be generated over time. According to this line of argument, this is only possible when the amount of money continues to grow overall over time. In order for the system to remain robust, this monetary growth must go hand in hand with real growth (Kennedy 2012, Mellor 2015).

Binswanger (2006) tries to present these considerations with the aid of a relatively simple growth model. He places the focus on the temporal disintegration of production and consumption. Companies incur expenses for their production that they finance in advance via loans. Simplifying, Binswanger assumes that production only involves wage costs. The company's wage costs are households' income and thus simultaneously determine the possible demand for the products by consumers. In addition to expenditure on wages, however, companies now also have to render payments for interest rate costs to the banks due to the

external financing. Yet in Binswanger's model these interest rate payments are not fully converted into demand. Rather, banks withhold part of the interest rate payments to increase their equity (hence the modelling prediction). In so doing they withdraw money from the cash cycle. In Binswanger's model the banks have an incentive to increase their equity, since it offers them the opportunity to grant a higher volume of loans, i.e. to create more money and thus expand their business. According to the model, in order to close the gaps in demand caused by this equity accumulation, production and thus future wages must grow steadily over time. The central concept of the model is that the current year's wages are used to buy the goods produced in the previous period. Ergo, where the company's expenditures in this year (and thus the employees' wage income) are higher than the previous year, companies are able to achieve sufficient contribution margins to be able to service both wages and interest payments.

Binswanger's analyses allow two effects to be inferred, which various degrowth authors interpret as growth drivers[59]: in addition to the positive interest rate already presented, which leads to a growth imperative, the nature of the banks then represents a second growth driver in that part of their income received as interest payments is not returned to the economic cycle in a way that has an impact on demand, Binswanger states, but is instead accumulated as equity.

3.1.7.3 The Monetary and Financial System from the View of Modern Growth Economics

At the interface of development and growth economics the role of the monetary and financial system has been systematically researched for decades, beginning at the latest with Gurley and Shaw (1955).[60] The authors hone in on the question of which mechanisms and conditions need to be in place for the monetary and financial system to make a positive contribution to higher economic growth.

From a theoretical perspective seven impact chains in particular are motivated, via which a better developed monetary and financial system[61] can contribute to higher economic growth:

- Improving information production and processing, which then means resources can be allocated more effectively (Boyd and Prescott 1986);
- Higher efficiency of the capital allocation through generation of better information about companies and corresponding bank lending (Greenwood and Jovanovic 1990);
- Increase in the rate of technical progress through the identification of companies with the greatest chances of success in establishing innovations (King and Levine 1993);
- Strengthening of corporate governance with positive impacts on growth (Bencivenga and Smith 1993);
- Enabling of trade, insurance and risk pooling (Acemoglu and Zilibotti 1997);
- Promoting the accumulation of physical and human capital in economies with wealth inequality and credit constraints (e.g. Banerjee and Newman 1993, Aghion and Bolton 1997, Piketty 1997);

[59] Binswanger (2006) himself articulates them as elements that determine the growth imperative. As aforementioned, however, the theory that conventional economies are subject to a growth imperative is highly contentious. In the discussion of growth drivers we are also concerned with weaker elements, namely those that contribute to economic growth (without forcing it).

[60] The views are based on Aghion and Howitt (2008: 147–148).

[61] Taking a comprehensive view, the monetary and financial system includes not only the respective actors (banks and other financial intermediaries, such as insurance companies), but also the corresponding markets for various financial securities and the contracts used for them.

- Reducing transaction costs and promotion of greater specialisation with positive effects on innovation and growth (Greenwood and Smith 1996).

Goldsmith (1969) was the first to use systematic empirical research. Due to the strong development of empirical methods for the credible identification of causal connections in recent decades, works produced since the 1990s are of particular interest. The trend is increasingly moving in the direction of not taking analyses of aggregated data for individual countries or for comparative units within individual countries (for example the German federal states) as a basis, but rather using disaggregated microdata for a large number of individual companies (e.g. Demirgüc-Kunt and Maksimovic 1998). Levine (2005) provides a comprehensive overview of empirical growth economics on the role of the monetary and financial system.

The modern growth theory indeed sees no inherent growth imperative in the monetary and financial system, though it considers it an especially relevant part of any institutions that, depending on their design, are able to prevent or promote growth. Corresponding models can not only explain divergences in the growth paths of different countries with differently structured financial systems, but also different growth dynamics in industry sectors that differ in the extent of their external financing needs. A broad empirical literature confirms this indirect effect of the monetary and financial system on economic growth. A concise overview can be found in Aghion and Howitt (2008: 127 ff.).

3.1.7.4 Assessing the Driver

Within the degrowth literature there is a lively debate over the question of whether and which causal effect the monetary system might potentially exert on economic growth. The assertion that there are elements within the monetary system that force economic growth ("growth imperative") has not (to date) been argued convincingly in the literature, however. A lack of clarity equally exists as to which definition of money each author in the degrowth debate uses. Different delimitations of the monetary and financial system are discussed, which makes mutual reference more difficult (Schindler et al. 2017).

Binswanger's model in particular is indeed very well-known in the (German-speaking) degrowth discourse; it cannot, however, make a substantial contribution to explaining the complex processes in the economic system.[62] His results are based on unrealistic model assumptions that are simultaneously highly critical for the results (e.g. with regard to the chronological sequence of companies' borrowing and production activity). The assumed motives (banks predominantly strive to build up a large amount of equity in order to be able to grant loans) and interdependencies (equity does not, at least in part, have a detour effect on demand) are likewise implausible and some explicitly contradict the observable reality. In reality, to increase their returns, banks rather strive to operate with the least possible equity, meaning the banking regulator has to set minimum requirements.

In conclusion, on the one hand there is no convincing basis for seeing a causal driver of economic growth in the monetary system. That the scope and quality of the monetary and financial system can have a positive influence on the growth dynamic that has been nurtured by other sources is, on the contrary, both theoretically convincingly motivated and empirically proven in modern development and growth economics.

[62] There are different opinions regarding the assessment made by the authors of this discussion paper, as contentious debates within the project advisory committee have shown.

3.1.8 Preliminary Conclusions

According to the degrowth approach, a sufficiently strong reduction of environmental pressures cannot be achieved without a reduction in economic output in prosperous economies. From this perspective it is essential to understand which economic mechanisms cause continuous economic growth and, thus, counteract the attaining of ecological objectives. Within the degrowth discourse the existence of such mechanisms is discussed under the term "growth drivers".

There are numerous mechanisms that operate at all societal levels and which authors from the degrowth discourse maintain are growth drivers. From the multitude of these mechanisms we have subjected six to an in-depth analysis to examine whether they ought to be classified as growth drivers in light of the state of economic research, i.e. as any mechanisms that are responsible for economic output growing in the long term.

There is unanimous consensus within the discipline of economics that **technological innovations** enable economic growth. However, technological change is not an automatism that generates economic growth under any circumstances. As empirical studies show, its effect depends in fact on conditions such as national and international company structure, legal and institutional framework conditions, or the dominant competitive landscape. Conversely, it is disputed within the discipline of economics whether the **latest technological developments,** which are grouped under the umbrella heading of "digitalisation", will trigger a growth boost.

In addition, we consider **positional and habitual consumption** as a driver of economic growth. The mechanisms asserted in the degrowth discourse can be justified based on social science and psychological research. Within the scope of this study we are not able to determine the empirical strength of the treadmills created by positional and habitual consumption, however. The previous empirical research results indeed indicate that consumption of positional goods is primarily motivated by the relative social setting. Moreover, it seems plausible that this consumption is associated with negative external impacts. It should be noted, however, that the literature used as a basis here only includes a small number of empirical studies; it therefore appears necessary to investigate the phenomenon of positional consumer goods in future research projects, also taking into account the extent, if any, of macroeconomic relevance.

According to our analyses, two other mechanisms that are highlighted as growth drivers in the degrowth discourse on the contrary supply prerequisites or enabling conditions for economic growth to take place: **the access to natural resources and the monetary and financial system.** The availability of natural resources is undoubtedly a necessary condition for economic activities. Furthermore, being able to access cheap resources was highly relevant during various historical phases (of capitalist development). The team of authors was unable to reach a final consensus as to whether access to natural resources can be understood as a driver. In the view of some authors, no convincing line of argument could be identified to say that access to resources still drives economic output in early-industrialised economies today in a causal and lasting sense.

Regarding the monetary and financial system, there is no convincing basis for seeing this as a causal and long-term driver of economic growth. That the scope and quality of the monetary and financial system can have a positive influence on the growth dynamic that has been nurtured by other sources is, on the contrary, both theoretically convincingly motivated and empirically proven in modern development and growth economics.

On the question of whether **corporate objectives and behaviour** represent a relevant driver of aggregate growth, we cannot offer a scientifically substantiated assessment. We consider the assumption that companies as actors can drive growth to be plausible, though. Nonetheless,

based on the current state of research, it cannot be claimed that corporate business forms, competitive structures in the markets or the objectives pursued by companies play a decisive role here. There is also no clear answer to the question of whether companies' marketing strategies represent a growth driver. Empirical studies show that advertising expenditure can function as a "GDP multiplier" at the aggregate level. It can also be shown that companies, when designing their products, do not aim to achieve maximal service life, but instead focus on achieving the optimal service life of their products calculated on the basis of cost reduction and profit maximisation.

On the question of the influence on or mitigation of drivers, no consensus could be established between the authors. Some make reference to the fact that a weakening of separate drivers could contribute to reducing consumption of the environment and resources, without this necessarily engendering concomitant loss of welfare. Others express the opinion that policies that focus on or are targeted at mitigating drivers would restrict economic dynamics without ensuring support for achieving the objectives (adhering to planetary boundaries). Rather, the aim should be to influence economic dynamics in such a way that they support sustainable structural change.

Consequently, a detailed analysis has been conducted of the drivers addressed in the post-growth discourse and their relevance for growth; equally, an in-depth analysis of the empirical literature has been carried out. This provided a comprehensive, systematic stock-take of the discussion about growth drivers and their economic basis, making them available for public discussion. Joint recommendations for action could not be developed, however, due to the differing opinions on the question of a possible mitigation of growth drivers.

3.2 Growth-Dependent Areas

In this discussion paper we define as growth-dependent those areas of society, structures, institutions, etc.

- that fulfil a socially desirable function, or that contribute to a widely socially accepted objective and
- whose functional capacity or contribution under the present framework conditions depends on the economy growing continually.

Growth-dependent areas constitute a barrier to the implementation of policies that – at least in the short to medium term – seem very likely to lead to a reduction in economic output: if a policy leads to the reduction of the economic output measured using GDP, this policy jeopardises the functional capacity of an area that is socially desirable or that contributes to a widely socially accepted objective. Growth-dependent areas therefore represent a hurdle to the implementation of numerous ecological policies and the realisation of a post-growth society. Their endangerment would, according to Seidl and Zahrnt (2012: 112), trigger political, economic and social dissatisfaction and unrest, which all politicians will try to avoid. In essence, two standards for growth dependence of varying levels of ambition are conceivable, which will become apparent in particular in the area of social security. If a system is already described as growth-independent if it won't collapse without growth, then growth-independence is significantly easier to achieve than when a certain level of output also needs to be maintained. In the text that follows, both versions of independence from growth will be addressed but the stronger version of growth dependency will be considered the relevant one. This is because maintaining the output level ought to form part of the widely socially accepted canon of objectives.

3.2.1 Overview of Growth-Dependent Areas

In Table 6 we provide an overview of the various societal areas and institutions that are identified as growth-dependent areas, especially in the degrowth and post-growth literature.[63] Fundamentally, the provision of all state-financed public goods is dependent on tax revenues and thereby directly linked to economic output. Moreover, the realisation of widely socially accepted (and, in part, legally enshrined) tasks, such as the protection of job opportunities, or healthcare and pension expenditure for example, depends to a great extent on the level of economic output (per capita). Furthermore, in parts of the literature separate economic institutions (such as financial markets) and actors (such as companies) are also considered to be growth-dependent. Ultimately, growth dependencies can also be located at the political level, since some authors see the level of economic output achieved since the post-war period as an important precondition for the stability, acceptance and development of the democratic order.

[63] In part we have also supplemented sources outside of the post-growth literature that, without even mentioning "growth dependency" explicitly, still contain fully analogue arguments and that are also to some extent cited in the post-growth literature: e.g. Beck (1986), Scharpf (1997) and Friedman (2005).

Table 6: Growth-dependent areas

Area		Explanation
Government budgets	**Social security systems:** Health insurance Pension insurance Long-term care insurance Unemployment insurance Accident insurance	All social security systems rely on constant revenue. They are currently financed through social security contributions and, in part, also by federal government tax subsidies (e.g. according to §§ 213 and 215 SGB VI.). Their funding is therefore directly reliant on economic output. Moreover, under the given conditions, the healthcare and pension systems are dependent on revenue that is not only constant but also growing. Due to demographic change and, where applicable, technological innovations in medicine, the financing needs in these areas will rise in the future. In this sense they are dependent on growth.
	Tax and transfer system: Educational spending Public order and security Defence Other public expenditure (including housing, transport, health and environment) Debt servicing	Economic growth leads to rising tax revenues for public budgets; the effect is disproportionate for progressive tax rates. Tax revenues are used to finance public goods such as education, public security and infrastructure. The provision of these public goods is thus dependent on the performance of GDP (BMWi 2016, BMF 2016). National debt has a particular role to play: firstly, economic growth is required to generate additional state revenue. This can then be used to pay the interest on the national debts accrued, without the need to restrict other expenditure. Secondly, reducing the debt ratio is a political goal. If this is to be achieved without reducing government spending on public goods, the government must generate additional revenue and economic growth is an appropriate means of doing so. Thirdly, economic growth is an indicator of governments' creditworthiness. This has an impact on the interest rate governments are charged to take out new loans (Seidl and Zahrnt 2010).
Economy	**Financial markets and banking**	In Chapter 3.1.7 we discussed the monetary system and banking as a possible driver of economic growth. However, some authors interpret the financial system itself as a system that is dependent on growth (Jackson 2009, Paech 2012). The financial system constitutes a core infrastructure for the viability of a modern economy. Should the stability of the financial system depend on continuous economic growth it would likewise represent a growth-dependent area.
	Companies (for example): Securing employment Occupational pensions Debt servicing Competition	In Chapter 3.1.2 we examined corporate objectives and behaviour as possible drivers of economic growth. Companies can also, though, be described as actors dependent on economic growth (Jackson 2009: 61 f.). According to this author, they are subject to systemic growth drivers (such as technological development, economic competition, borrowing) and, under these conditions, companies' existence relies on their growth.

Area		Explanation
Politics	**Government**	Output legitimation: Scharpf (1997) argues that economic growth after the Second World War was used among other things to expand welfare state guarantees and enabled governments to undertake market-correcting interventions. This, the author states, contributed to the legitimation of the democratic form of government. From this perspective, the extent of acceptance for the democratic constitution and its institutions also depends on economic growth.
	Social stability	Using historical examples from early-industrialised economies, Friedman (2005) argues that economic growth enables cultural and civilising progress in political communities (especially nation states), e.g. greater tolerance, greater fairness and the strengthening of democracy.
Employment		Seidl and Zahrnt (2012: 112) note that securing employment and eliminating unemployment is a commonly used argument for striving for economic growth. This argument is based on the following consideration among others: technological innovations lead to an increase in labour productivity. Increased labour productivity results in the same economic output being achieved with lower levels of labour. If average working time is not reduced, the argument states, a constant level of employment can only be achieved through expanding the production volume, i.e. a higher GDP (Jackson 2009; Reuter 2010; Antal and van den Bergh 2014).
Social balance, social cohesion and distributive justice		According to Beck (1986), in the post-war period high economic growth enabled the requirement of social justice to be met through the dynamic known as the "elevator effect": in relative terms, social inequalities did not decrease; in absolute terms, however, all social strata rose in prosperity and were able to enjoy a higher standard of living (Möhring-Hesse 2010). According to the author, further absolute rise in the living standard across all social strata will continue to depend on economic growth.

Source: own depiction

In this text we focus on two areas that are described as growth-dependent within the post-growth literature, and which are considered to be of high social relevance: employment and the social security system (with the emphasis on pension and healthcare provision). We will explain how the growth dependency is justified in each case. In Chapters 4.2 and 4.3 we shall discuss whether and – where possible – how these areas can be configured to be less dependent on growth.

These two areas have been chosen for the following reasons:

- In early-industrialised societies, such as Germany, gainful employment is not only the key means for most people to secure their financial income; it also serves to achieve numerous non-material elements of a good life. These include, for instance, social recognition, self-development and maintaining social relationships. We therefore understand employment to be a core mechanism in life satisfaction, at least in the status quo.
- Social security systems and, especially, healthcare and pension provision, perform a pivotal safeguarding role. Due to demographic progression and the technological innovations in medicine, we can also expect that the demands on the pension system (especially due to longer life expectancy) and the healthcare system (through the rise in costs entailed by increased life expectancy) will continue to increase in the future. Even to maintain the existing level of benefits and contributions, it may be necessary for financial revenues to continue to grow. There is a dual challenge here for societies aiming to not be reliant on growth.

3.2.2 Employment

There is widespread opinion in both economics and economic policy discussions that economic growth is necessary for the purposes of preventing a rise in unemployment and creating additional jobs.

The statistical connection between growth and employment is discussed in simplified form under the name *Okun's Law*. Okun (1963) empirically demonstrated a negative correlation between economic growth and the change in the unemployment rate for the first time. A large number of current studies confirm this link (Ball et al. 2013, Knotek 2007). One explanation that is widespread in post-growth literature regarding the rise in the unemployment rate in the absence of economic growth points to the increase in labour productivity. Increased labour productivity results in the same economic output being achieved with lower levels of labour. If average working time is not reduced, the argument states, a constant level of employment can only be achieved under these conditions by expanding the production and sales volumes, i.e. through growth (Jackson 2009: 62; Reuter 2010: 92 f.; Antal and van den Bergh 2014: 11).

In mainstream economics literature Okun's Law is generally interpreted in a different way. Unlike in much of the post-growth literature, unidirectional causality is not assumed, and employment is therefore not primarily seen as the result of economic growth. Rather, the assumption is that the growth of employment could represent an important prerequisite for and source of economic growth, for example because higher levels of labour and better "matching" of companies and employees can also result in more or better-quality goods (and services) being produced (Mankiw 2003). Under the given economic policy and structural framework conditions (including labour productivity, which can determine the amount of investment and level of wages), in the neoclassical model companies or other employers make their decisions by means of their respective job demand. At the same time, people make decisions about their labour supply – e.g. depending on the wages offered and their personal time restrictions. In the mainstream literature of labour market economics, the general assumption is that the volume of employment results from the fact that labour supply and demand meet at labour markets. Both conditions that influence the labour supply and those that determine the labour demand therefore influence employment and can thus, ceteris paribus, lead to higher economic output (Wagner and Jahn 2004). As assumed in the post-growth literature, the positive correlation between growth and employment remains unchanged. However, from the point of view of mainstream economics there is no unidirectional causality between economic growth and employment. The causal direction of action can also operate the other way around: where better

matching leads to higher employment, for instance through an improved service by employment agencies, as a consequence, this then translates into greater economic performance, i.e. growth. Which direction of action dominates the mutual interdependence in a specific situation depends on the given context.

In neoclassical models unemployment is frequently explained through market frictions, asymmetrical information or through labour market institutions (such as unions, specific regulations, etc.) that contribute to market equilibrium (labour supply = labour demand) not being achieved. Within this logic, however, even technological progress can lead to unemployment if the introduction of new technologies is associated with such high adaptation costs that companies invest less in modernising their capital stock than is required for full employment. Adaptation costs can arise from the fact that new production technologies are bound up with approval procedures, occupational safety, training sessions or environmental and climate protection measures (Wagner and Jahn 2004).

The question of work and employment is contentious and is discussed in different ways in growth-critical debates. One reason for this lies in the fact that gainful employment is closely bound up with many other social aspects, e.g. with the decision and power relationships within companies, with social inequalities, with gender relations and with the ecological effects of economic activity.

Degrowth and post-growth authors share the conviction that socially accepted and recognised occupations should not just serve for the purpose of generating earned income. By doing so, they expand the usual public and economic discourses on what employment ought to provide and take into account other purposes for which people pursue employment. In the latter discourses there is a widespread assumption that it is politically or socially desirable to achieve, where possible, (full) employment (in accordance with the relevant definition) in formal markets (especially through monetary income) for securing livelihoods. Under this assumption, the key question for a post-growth society is whether there are still enough opportunities to secure employment in a non-growing economy, so that involuntary unemployment can be prevented or kept at a low level.

Degrowth and post-growth authors question the implicit assumption in this question that securing income is the only or the most important purpose of human labour, however. In contrast to the standard models of neoclassical economics, degrowth and post-growth authors emphasise that human labour serves other important purposes for human welfare as well. In this context, they discuss the question of how employment relationships in modern economies can be organised so that, in addition to generating an earned income, people pursue meaningful activities and at the same time protect resources. This often goes hand in hand with the social revaluation of certain activities, such as subsistence and care work, that so far have been unremunerated (or performed in informal markets). Activities that are not directly traded in markets are perceived as growth-independent in the post-growth literature.

3.2.3 Social Security

Government budgets, and in particular the public social security systems, require ongoing revenue for their functionality, which depends on economic output. We can illustrate this connection by looking at the government budget revenues in Germany. The country's revenues consist primarily of taxes and net social security contributions; in 2014 they amounted to approximately 1.29 billion euros (Statistisches Bundesamt 2015). Through their direct link to wage income social security contributions especially depend directly on wage levels and the number of people in gainful employment. A change in the average level of wages or employment therefore has a direct impact on social security revenues. A similar situation applies to tax

revenues. Despite a multitude of different types of tax here, too, the connection with economic output is unambiguous: taxes on wages, which alone account for approximately 35% of tax revenue, are also directly connected to wage growth, as are social security contributions. Taxes from sales (value-added tax), which also amount to approximately 35%, are the second large source of tax revenues and depend on the consumption options. This means that they rely indirectly on income trends (BMF 2011). The amount of revenue generated by these types of taxes is therefore directly linked to economic output and the associated wage bill.

General government expenditure in 2014 amounted to approximately 1.27 billion euros, whereby the monetary social benefits and social benefits in kind came to approximately 0.69 billion euros, which accounted for more than half of the total expenditures (Statistisches Bundesamt 2015). The two branches of pension and healthcare provision occupy the largest share of the social budget at 31% and 23% respectively.

Against this background economic growth can improve financing flexibility and scope in two ways in that, firstly, more people find employment that is subject to compulsory social security contributions and, therefore, the transfer figures can be reduced; secondly, wages and the absolute contributions made can also increase with contribution rates remaining unchanged.[64] Conversely, social security systems come under financial pressure in a recession, since, on account of their constituting a significant share of public expenditure, they can be most affected by a drop in revenue and, at the same time, expenses (unemployment insurance) also increase. Social security systems receive 65.2% of their financing from social security contributions on income subject to insurance contributions (34.8% employer contribution and 30.4% employee contribution). The financing is, therefore, very directly affected by higher unemployment or a lower or slower pace of wage level increase in cyclical or structural economic crises (cf. Bundesministerium für Arbeit und Soziales [Federal Ministry of Labour and Social Affairs] 2014).

In Germany, the statutory pension system (SPS) and the statutory health insurance (SHI) are financed mainly through intergenerational redistribution. This means that the benefits for eligible beneficiaries are essentially financed through the contributions made by the working population in the same year. Where population trends remain constant – understood here as a constant relation between the recipients of benefits and the working population – economic growth would either enable an increase in benefits or a reduction of the contributions.

However, regarding the two biggest public social securities in Germany – pension and healthcare provision – further developments also increase growth dependence.[65] Due to the current demographic change in Germany both systems are facing the challenge that an increasing number of eligible beneficiaries will, in future, need to be financed by a working population that is declining in relative terms.[66] Falling birth rates on the one hand and increased life expectancy on the other hand lead to the fact that, in relative terms, not only do more older people need to

[64] A third mechanism is purely mechanical in nature, but nonetheless still relevant for evaluating an economy's financial robustness, for example with regard to the risk assessment of its government bonds through the international finance markets: the debt ratio, which sets the volume of accumulated national debt in relation to economic output, automatically decreases where GDP grows while nominal debt remains unchanged. In order to eventually comply with the debt ceiling of the Stability and Growth Pact (60% of GDP), extensive debt repayment (and the associated renunciation of other uses of budget surpluses) would therefore not be required if the economy grows steadily – the debt ratio would fall due to the growing denominators alone. Conversely, zero growth also implies that, for example, the objective of a constant debt ratio can only be achieved when there is no new debt (once the target value is achieved).

[65] In discussing possible reform options, in Chapter 4.3.1.2 we explain that this growth dependency is not a specific feature of redistribution systems, but that it also exists in the case of fully funded systems.

[66] In 2009, for 100 people of working age in Germany (aged between 20–65) there were 34 people of retirement age (age 65 and up); in 2030 it is likely to be more than 50 for 100. In 1970 this old-age dependency ratio was only 25 (Statistische Ämter des Bundes und der Länder 2011).

be supported, but also that these people will continue to be eligible for much longer (Höpflinger 2010). In view of this development, a relationship between the level of social security contributions and the level of benefits provided, which is unchanged compared to the status quo, is not to be expected, even assuming a moderately growing economy (here 1%). In this context, economic growth can contribute to lessening the required decrease in benefits and/or the increase in contributions. A lack of economic growth or even a decline in economic output would aggravate the necessity and depth of structural reforms of social security yet further.

In this respect, growth dependence does not mean that the systems cannot exist without economic growth. In an accounting sense, social security systems can be organised in ways not dependent on growth. Current and future income and disbursements ought to be able to be balanced over time (the intertemporal budget restriction is then fulfilled). This is not, however, the understanding of growth dependence that we primarily assume in this discussion paper.[67] This is because, for achieving ecological objectives as well as keeping to the principles of social justice, the question of whether, despite a potentially stagnating or diminishing economic output, social areas can continue to perform their functions at a certain socially acceptable (or justifiable legitimacy) level is especially relevant. The two trends – demographic change and technological developments in the domain of medicine – will increase the need for social security benefits. If revenues were to be preserved at today's levels, this would consequently lead to the average level of benefits diminishing. The question of whether it is socially acceptable and justifiably legitimate for the average level of benefits from social security systems to fall must be discussed in deliberative public debates and, ultimately, falls to politicians to decide. The concept we assumed, which is more comprehensive in comparison to the accounting understanding of growth independence, makes explicit that the evaluation of whether and when a system is growth-independent cannot be separated from the question of which future function or capability is (still) socially acceptable and theoretically justifiable because the level of benefits accorded and the amount of contributions required are directly linked to economic performance.

Due to demographic change, structural reforms are more important than smaller differences in economic growth for maintaining the financial sustainability of social security systems. This is also because the SPS, for example, is designed as a responsive system: higher economic growth leads to scope for wage increases during an individual's working life, and wage increases that have been implemented lead to higher benefits in the retirement phase on account of the principle of equivalence. In other words, structural reforms are crucial to ensure the sustainability of social security – but the evolution of economic growth over time has major significance on the level of benefits and contributions on which income and expenditure are balanced (for the definition of sustainability see the excursus at the end of this section).

Werding (2014) demonstrates this in projections of population trends and their effects on public finances from 2012 to 2060. The model findings illustrate that, even with moderate economic growth of approximately 1% we can anticipate far higher contributions for people in employment. Simultaneously, a lower pension level is to be expected relative to average wages.[68] The system can also be maintained without economic growth in the sense that the intertemporal

[67] The decision to base the analyses in the discussion paper primarily on the "strong" understanding of growth independence, which does not abstract from the contribution-benefit ratio and from the benefit level, was made by the majority of the authorial team but was not a unanimous decision.

[68] A falling pension level relative to average wages does not imply a decreasing pension level in absolute nominal amounts, which is frequently misunderstood in public discussions. The "pension level" defines the relation between the income of the "standard pensioner" with regard to the "average earner" among contributors. The pension amounts paid out will conceivably continue to increase even with a falling pension level, but less strongly than the average wage.

budget constraint[69] is maintained. In scenarios without economic growth, however, pension levels in particular would fall significantly more or the revenues would need to be raised to a correspondingly high level.

The future cost structure of the SHI, on the other hand, depends not only on demographic changes. Rather, the literature points to complex interrelations that can exist between medical and technological development, income and healthcare expenditure. In the following, we will outline these in brief:

- Demographic trends have a significant effect on SHI through two parallel mechanisms. Firstly, SHI like SPS depends on wages and employment; secondly, the expenditure per individual covered rises with age (see also Breyer 2015). At the same time, therefore, a greater number of old and ill people will need to be financed over a longer period of time – and as per the case of SPS, this needs to be achieved with fewer people contributing.[70] Nonetheless, the dynamic of demographic trends is not enough to explain the continual rise in healthcare expenditure in OECD countries to date. Since 1970, the proportion of GDP ascribed to healthcare costs rose by approximately 3.5 percentage points to 7% on average in 2010 – in a period where GDP has also risen sharply (de la Maisonneuve and Oliveira Martins 2015).

- An additional impact on healthcare costs is likely to arise through an income effect. At the micro level of individuals an income effect can be explained in such a way that people with increasing incomes also have a larger budget at their disposal, thus can also spend more overall on healthcare products and services. It should be noted, however, that the effect of individual income plays a subordinate role in countries with developed health insurance systems, because costs are generally covered by the insurance (Dybczak and Przywara 2010). The macroeconomic income effect is therefore more significant and is reflected in the readiness of the society to make provision for additional funds to cover the health of the population where national income is high. Empirically estimated income elasticities vary considerably from country to country and by the respective methods used. It is therefore not clear how big the income effect really is. It is proven, however, that healthcare expenditure is influenced by national income (Getzen 2000). Since, historically, healthcare costs rise more than national income (see above), health must either be a luxury item (income elasticity > 1), or there are additional reasons for explaining the rise in costs alongside the income effect and demographic change. Newhouse (1992) explains part of the cost increase by means of relative prices. Health expenditure accordingly constitutes a specific example of Baumol's Cost Disease. According to the author, since the healthcare sector is especially labour-intensive and, simultaneously, only has minimal opportunities for increasing labour productivity, the healthcare sector may become increasingly expensive in relation to other economic sectors, if wages are aligned with the general wage level (that is determined by sectors with larger productivity increases) rather than with labour productivity in the healthcare sector.[71] Empirical investigations into the Baumol effect in healthcare generate a variety of results (see Dybczak and Przywara 2010 for an overview). Hartwig (2008) finds major and statistically significant effects, which substantiates his scepticism that it will be possible to substantially limit the rise in healthcare costs in the long term. To the best of our knowledge, the question of whether the Baumol effect still holds true in an economy that is

[69] A public budget is considered to be sustainable if its intertemporal budget constraint is maintained. That signifies that all future expenditure as well as existing debt levels must be covered by future revenues at all times, based on expected revenues according to the current legal status. If the intertemporal budget restriction is violated a sustainability gap will form. It specifies the extent to which government revenue and expenditure (or the income and expenditure of the subsystem under consideration) would have to be adjusted immediately and permanently in order to close the financing deficit that would otherwise arise.

[70] The discourse conducted under the keywords "medication and compression hypothesis" on the effects of technological development in the medical sector on morbidity is not explicitly modelled but taken into account by means of age profiles of benefits expenditure coupled to income growth rates. For more information on this debate see SVR 2011 p. 165.

[71] Baumol's Cost Disease is discussed in greater detail in Chapter 4.2.1.

less dependent on growth has not yet been researched. Further research is required to answer the question of whether this would also be the case if labour productivity were to increase further in certain areas of the economy.

- Medical and technological development is generally identified as one of the most important causes of cost rises in the healthcare sector (de la Maisonneuve and Oliveira Martins 2015, Dybczak and Przywara 2010). Two different types of technological progress are identified as essentially conceivable: (1) innovations that replace less efficient technologies or practices and that must have a cost-reducing impact; and (2) technologies that are supplementary to existing technologies, e.g. that allow treatment of illnesses formerly considered to be incurable (Dybczak and Przywara 2010). Research by the European Commission (Dybczak and Przywara 2010) suggests that the majority of the cost increases can be explained by the supplementary part of technological progress. Cost-reducing innovations in the sense of (1) cannot significantly weaken these increases.

There has been criticism from post-growth authors that some of these medical accomplishments, including the development of many new medications, entail no or purely marginal advances. Studer (2010) gives the example of the development of more precise diagnostic capabilities, without the corresponding treatment options being available. These types of development fuel growth, Studer writes, yet only generate small gains from a healthcare perspective (Studer 2010). In addition, there are incentives in the patent system that make the development of additional diabetes or cancer drugs more lucrative than the development of cost-effective drugs, e.g. against tropical diseases that, in global terms, demonstrate a much higher benefit-cost ratio (Habermann 2016).

Werding (2014) calculates that the real expenditure on SHI could double to approximately 302 billion euros by the year 2060 (2012: 166 billion euros, both in 2005 prices). In relation to the increase in economic output within Werding's (2014) projection, this corresponds to an uplift from 6.7% to 8.3% of GDP.[72] Similarly to with the SPS, considerable extra expenditure is anticipated.

3.2.4 Preliminary Conclusions

In this section we recommend seeing as growth-dependent those social domains, structures, institutions, etc.

- that fulfil a socially desirable function, or that contribute to a widely socially accepted objective and
- whose socially acceptable functional capacity or contribution under the present framework conditions depends on the economy growing continually.

From this perspective, many social institutions and areas are prima facie possible candidates for growth-dependent areas (cf. Table 6 in Chapter 3.2.1). We focus on two socially significant areas: social security systems and employment.

As part of our analyses of the **social security systems,** healthcare and pension provision were taken to be the most relevant insurance segments to examine in detail. These systems are mostly

[72] The model used for the projections in Werding (2014) is described in detail in Werding (2011). The results identified in the "growth" part module are based on a simple neoclassical growth model in the tradition of Solow (1956) and Swan (1956), supplemented by the factor of human capital. The set assumptions and interim results or demographic principles from the "labour market and population" and "population" modules from upstream modules of the model flow into the simulation of GDP, as well as further aggregate factors (productivity and wage growth, capital stock, interest rate and deflators). All results are "projections", i.e. assumption-based model calculations in nature. The macroeconomic background scenario specified in the "growth" part module illustrates endogenously the part of the effects of demographic change for aggregate development that can be clearly theoretically substantiated or empirically verified (cf. Werding 2011: 14 ff. and 52 ff.)

directly linked to wage income (in the redistribution system) or tax revenue (tax-financed systems). Due to demographic change (and, with regard to health insurance, due to medical and technological development as well) the volume of benefits will need to be expanded in the coming years and decades in order to maintain the benefit level considered socially acceptable. These two effects make the system dependent on growth: to retain their functionality at a reasonable level in the long term, the systems are reliant on their revenues growing over the coming years.

The discussions between the project participants on the growth-dependent areas have shown that the way in which growth dependence is defined is a decisive factor. There are different opinions here, although overlaps do at least exist. From the general accounting perspective, the respective systems could exist and be stabilised even without growth – in the sense that the intertemporal budget constraint can essentially be maintained through corresponding adjustment of revenue and expenditure. Where the contribution-benefit ratio worsens questions of distributive justice arise: to what extent are such deteriorations in line with the principles of social justice? Is it possible to alleviate social hardship through redistribution – and are such redistributions justified?

These two understandings of "growth dependence" – in the manner assumed here and in the accounting sense – clarify a socio-politically relevant implication of the term: the evaluation of whether and when a system is growth-independent cannot be separated from the question of which future function or capability is (still) socially acceptable and how the financial burdens of providing the benefits will be shared. In turn, this question cannot be decided from a purely academic perspective. This is because what is termed a "socially acceptable level" and seen as fair distribution in the area in question must be debated in a deliberative social discourse and will ultimately fall to politicians to decide.

Conversely, concerning **employment** we were not able to corroborate the claim that this area can be classified as growth dependent. Indeed, there is a clear positive correlation between employment and economic growth. The causal interdependency is by no means trivial, however. The starting premise within the degrowth and post-growth literature and many public debates is that the volume of employment is dependent on economic growth. In newer mainstream labour market economics, the scope of employment is predominantly seen as the result of an economy's structural characteristics, for example the quality of the 'matching' between employees and employers in the labour markets. Improved matching would subsequently lead to additional employment and consequently, ceteris paribus, also manifest as aggregate growth. From this perspective there is therefore no unidirectional causality between employment and economic growth. Which direction of action dominates the mutual interdependence in a specific situation depends on the given context. Nevertheless, it seems sensible to explicitly analyse the employment aspect from the point of view of growth dependence. Not least, the great importance of this link in public debates provides a good reason for doing so.

4 Instruments and Options for Reform

4.1 Instruments for Meeting Ecological Targets in Accordance with the Degrowth and Green Growth Approach

Below, we will provide an overview of the possible measures and instruments with which, according to the degrowth and green growth literature, we can achieve the goal of reducing resource consumption and environmental pressures. According to the degrowth approach, these instruments can be used to weaken the growth drivers; according to the green growth approach, they will deflect economic activities and steer them in the direction of "green" economic sectors. For the sake of greater clarity, we have encapsulated these in clusters of measures. Table 7 provides an overview of the clusters, after which we will describe their ideas, and in Table 8 we list, by way of example, measures and instruments from the individual clusters. Here, we have allocated to the green growth approach measures that have a role to play in both green growth literature and degrowth discourse, since this is where they were first formulated and where they have greater (relative) importance.

Table 7: Overview of selected clusters of measures from the degrowth and green growth discourse that aim to meet ecological targets

Increasing labour intensity	**Degrowth**
Institutional reforms to reduce competition pressure	
Regionalising economic behaviour	
Decelerating and de-commercialising individual behaviour	
Systematic transformation of the monetary and financial system	
Internalising external costs	**Green Growth**
Measures aimed at changing behaviours	

Source: own depiction

Clusters of Measures from the Degrowth Discourse

In Chapter 3.1.4 we presented the increase in aggregate labour productivity caused by technological innovations as a relevant driver of economic growth. The degrowth literature therefore discusses measures through which economic institutions can be changed in such a way that increasing labour productivity does not lead to the production of ever more goods and services. We have bundled the respective measures into a cluster called **increasing labour intensity.**

A further cluster consists of measures that aim to reduce **competition** within the economic system through institutional changes. This is because competition between economic actors in the markets plays, according to the degrowth literature, an important role in several mechanisms that are considered within the degrowth discourse as growth drivers: corporate objectives and behaviours as well as an increase in labour or capital productivity (competition impels economic actors to increase their factor productivity).

The cluster **regionalising economic behaviour** encompasses measures and instruments that can be employed in establishing the principle of an economic behaviour that operates mainly (although not exclusively) in small areas and small production units. Within the degrowth discourse, this principle is based on the idea that in regionally focused economic behaviour,

economic effects are triggered which weaken the various growth drivers: there would be less competition (in particular, less international competition), which is what causes the aforementioned mechanisms to kick in; it would be possible to establish regional currencies, which – as various degrowth authors anticipate – would reduce the pressure for growth; and it would be easier to establish a small-scale method of production in which labour intensity would increase (the driver here being the increase in labour productivity).

The cluster **decelerating individual behaviour** encompasses measures and instruments that are intended to weaken the driver "positional consumption". The measures are focused on changing individual patterns of consumption in such a way that combinations of utility change and utility fulfilment is characterised by significantly less environmental consumption. The measures encapsulated in this cluster are distinguished from the measures in the cluster "institutional reforms to reduce competitive pressure" by the fact that this cluster is primarily focused on individual behaviour and not on changing institutions.

Finally, in Chapter 3.1.7 we showed that numerous proponents of the degrowth discourse have argued that the way the monetary and financial system of modern national economies is constituted makes it a key driver of economic growth. One cluster of suggestions for measures and instruments is therefore focused on establishing a **monetary and financial system** that would weaken, or even remove altogether, any mechanisms that drive growth.

Clusters of Measures from the Green Growth Discourse

The cluster **internalising external costs,** which is prominent in the green growth literature, contains relatively "classic" (financial and regulatory) eco-economic instruments that are intended to integrate ecological effects of economic activities into the market prices.[73]

Within this strand of the debate, there is also a discussion focused on measures through which the **behaviour of economic actors** can be **influenced** in the desired direction, in this case in the direction of strengthening "green" economic sectors.

Further measures and instruments that promote a market penetration of green industries are encapsulated in the cluster **regulatory or institutional measures for strengthening "green" industries.**

Table 8 below lists the measures and instruments allocated to the selected clusters:

[73] Because of major overlaps, it is not possible to selectively differentiate between green growth instruments and the established policy suggestions from environmental and resource economics respectively ecological economics. According to Bowen (2015: 239), the green growth approach comprises three elements in particular: (i) eliminating market failure that results from external (ecological) effects, (ii) stimulating long-term "green" growth by promoting corresponding innovations, and (iii) improving the short-term macro-economic perspective through a "Green fiscal stimulus". Whereas, particularly in the context of the recent global financial and economic crisis, there was a demand for measures focused on a "green" business cycle policy that have since become less important, the demands for an internalisation of external economic effects as well as for measures to induce innovative structural change that will take economies a step further in the direction of resource-light and decarbonised economic behaviour ("decoupling") are still very current.

Based on the ideal of Pareto-efficient taxes – which, due to information problems can never be implemented –, in terms of the internalisation of external effects, neo-classical environmental economics places emphasis on measures to be cost-efficient; this can be achieved by introducing either price control (environmental taxes) or quantity control (certification schemes) (cf. Hepburn 2006). In comparison with these alternative variations on a market-based environmental policy with the aim of cost-efficiency, the state's conditionality policy in the form of imperatives and prohibitions is, from a theoretical point of view, seen as a subordinate political instrument, as it will probably only lead to efficient outcomes in exceptional circumstances (cf. Weimann 1995: 259 ff.).

A broader theoretical perspective beyond neo-classicism also leads to a broadening of the instrument cluster proposed for the implementation of the green growth approach. For example, Grubb et al. (2014) proceed from the assumption that there are three necessary policy pillars based on three areas, each with characteristic differences in terms of rationales for action and key actors, spatial and temporal scales, as well as risk structures and capital intensities: they argue that in the area of individual behaviour, the "behavioural economics" approach, which is informed by behavioural science, is the appropriate theoretical perspective, as individuals generally do not correspond to the abstraction of a "homo oeconomicus", and, instead of rational utility maximisation, often tend to demonstrate a behaviour of "satisficing", and sometimes even of ignorance. Here therefore, they argue, in addition to the price, information measures, standards and consciously set defaults ("nudging") also have a significant role to play in influencing consumers to make decisions on a green growth basis.

In the area of the behaviour of companies and organisations (e.g. local governmental authorities), however, they argue, the neo-classical rationality assumptions of conscious optimisation and a focus on price signals is well substantiated and has been empirically confirmed in many cases. They believe that market-based instruments and price steering with regard to companies have a central role to play in bringing about less environmentally damaging products and processes. The introduction of prices for emissions (through respective taxes or tradable certificates), ecological tax reforms and the abolishment of ecologically damaging subsidies, as well as payments for sustaining ecosystems and the services rendered by these ("Payments for Ecosystem Services") are concrete instruments within this second pillar (cf. Ekins et al. 2017: 300–302).

If we wish to promote a comprehensive transformation in the direction of a resource-light economy, we must also ultimately consider, in addition to growth economics, the findings of evolutionary and institutional approaches. Based on an understanding of path dependencies, emphasis is placed on promoting innovation (cf. Hepburn et al. 2018), on strategic investments (cf. Mazzucato 2017), particularly in the area of infrastructure, as well as on the plea – made by some authors – for "green" industrial policy (Rodrik 2014).

Table 8: Selected measures and instruments for meeting economic targets in accordance with the degrowth and green growth discourse

Cluster	Measures/Instruments (or Intermediary Goals)
Systematic transformation of the monetary and financial system	Regional currencies with circulation safeguarding
	Introduce sovereign money/100% minimum reserve for commercial banks
	Consolidate and expand cooperative banks
	Reduce companies' dependence on leverage in the form of interest-based credit
Institutional reforms to reduce competitive pressure	Consolidate business forms that are based on the common good and less focused on competition and maximising returns
	Unconditional Basic Income
	Upper limits for income and assets
	Increase the availability of common goods
	Advise politicians and the media to reduce the public regard for the GDP
	Introduce a Henry George tax (land tax)
Increasing labour intensity	Reduce the capital intensity of production by reducing levels of specialisation
	Shift towards a higher proportion of (labour-intensive) services
	Reduce labour costs on an absolute or relative level (to encourage labour-intensive activities), e.g. by reducing tax on labour or increasing tax on resources or other factors of production
	Use productivity gains to reduce working hours
Regionalising economic behaviour	Shorten value creation chains
	Regional complementary currencies
	New educational focus: e.g. skills and crafts, sustainability education
	Promote repairs and recycling
Decelerating individual behaviour	Provide information on consumption and the environment in school lessons; use media to promote voluntary reduction in personal consumption, etc.
	Highlight alternatives to "consumerism" that can be implemented in practice
	Increase availability of common goods (e.g. urban gardening)
	Higher tax on positional goods
	Restrict advertising (for resource-intensive products/ services)
	Promote innovations that improve the social (immaterial) aspects of welfare

Cluster	Measures/Instruments (or Intermediary Goals)
Internalising external costs	Broaden the ecological tax reform
	Create markets for pollution rights, etc. (certificates)
	Reduce subsidies that are harmful to the environment
	Legal regulations
Changing behaviour	Promote individual voluntary commitments
	Steer people away from their consumption behaviour through price incentives, educational measures, etc.
Regulatory/institutional measures to strengthen "green" sectors	Promote public basic research and private investment in R&D
	Improve the financing options of small businesses that have the potential for green innovation
	Invest in infrastructures (such as power supply lines for EE, broadband networks or the transport infrastructure)
	Quotas (e.g. overfished oceans)
	Promote the distribution of labels that provide better information on product features
	Introduce a Henry George tax (land tax) and use the income for ecological projects

Source: own depicition

Within this research study, we have not focused in detail on the aforementioned instruments for dealing with growth drivers; instead, we have concentrated on describing instruments that weaken growth-dependent areas. We thought this made sense for two reasons. On the one hand, considering the highly diverse perspectives that prevail within these debates both in society and among ourselves within our team of authors, this route seemed to us to be the most consensual. Within the author team there is a range of opinions on how to assess approaches to weakening the growth drivers. A few of the authors believe it would be worth addressing this question in further research projects. On the other hand, there is a certain overlap between the two subsets of instruments for dealing with growth drivers and those for dealing with growth dependencies.

4.2 Instruments for the Attenuation of Growth Dependencies in the Employment Sector

The post-growth discourse on the topic of protecting employment can be divided into two strands within the literature. We will examine these below.

One strand of the discourse accepts the normative assumption that a key purpose of employment is to secure an adequate **earned income.** The aim of this strand is therefore to devise a shrinking, i.e. non-growing, economy in which there is nonetheless a high degree of employment within the labour markets (e.g. Koepp et al. 2015, Reuter 2010, Victor 2008, 2014, Jackson and Victor 2011).

Another strand, by contrast, aims to strengthen, in addition to the formal ("first") labour market, a **further sector of recognised employment** (a "second labour market") (Koepp et al. 2015). In this sector, the idea is that citizens can pursue various forms of work based on motivations other than earning money. Here, different ideas prevail regarding what exactly this second sector of

socially recognised work should look like and what would motivate citizens to pursue such lines of work.

Paech (2012) describes a subsistence-oriented employment sector in which people produce goods and render services in small production units. The idea is that people carrying out more work themselves and building up a subsistence economy would give rise to a new balance between self-sufficiency and dependence on others, which should reduce the relevance of earning money in the labour market. According to Miegel (2010), some activities from the monetary-based labour market are transferred to the social group of the family or a community for which people work on a voluntary basis. Here, the transition between private and professional life becomes more flexible, and independent, self-directed activities gain in importance. Nørgård (2013) argues for the need to establish, alongside labour markets in which there is a supply of, and demand for, professional work, another sector of meaningful work.[74] Here, the individuals involved would not be working for the purpose of earning a monetary income in return, but rather of undertaking fulfilling activities. Within feminist economics, the argument is advanced that there is a need to establish a sector outside the monetary markets within which activities connected with reproduction have social recognition (Biesecker 2009, Biesecker et al. 2012). Authors who argue strongly for an extension of the sector of socially recognised work in addition to the formal labour market are not primarily concerned with creating sufficient employment opportunities in a post-growth economy, but rather with fundamentally restructuring labour itself.[75]

Debates with a critical approach to growth offer, primarily, four key suggestions for reshaping employment. Below, we will present these proposed solutions in more detail. Here, Chapters 4.2.1 to 4.2.3 will follow the first of the aforementioned strands,[76] and Chapter 4.2.4 will follow the second.

4.2.1 Sectoral Transformation

The first suggestion is to induce a sectoral transformation that reduces environmental pressures whilst at the same time generating jobs (Jackson et al. 2014, Jackson and Victor 2011, Reuter 2010, Reuter 2014, Victor 2008). This suggestion is based on the idea that relocating sectors with lower labour intensity to labour-intensive sectors will create additional jobs.

This sectoral transformation is, to a certain extent, seen as a continuation of the existing transition from the industrial to the service society. Whether the transition to the service society can actually be achieved in terms of resource-light economic behaviour, however, depends on two aspects: on the one hand, it is not enough merely to relocate employment to the service sector, while "dirty" or resource-intensive production continues to increase in terms of its value creation and the associated resource consumption. Very little would be achieved in ecological terms if, in theoretically extreme circumstances, resource-intensive production was completely automatised and continued to grow, but all employment was located in the service sector (cf. Kümmel 2011). On the other hand, it is questionable whether service sectors per se are environmentally friendly. Wölfl (2003) argues that resource-intensive services also exist, and that these are particularly prevalent in the information technology sector. Because this sector is

[74] The author calls this the "amateur economy". However, he does not mean that the economy is amateurish, rather he chooses to use this term because of its Latin origin (p. 63), i.e. activities that are undertaken out of love. We believe the most appropriate translation into English here is "meaningful economy".

[75] As well as the strands presented here, growth-critical authors also discuss approaches in which wage labour no longer has an important role to play and production processes are organised exclusively outside of the markets. Nelson (2016a, 2016b), for example, argues for a moneyless economy in which all resources are used as commons and the reward for the work consists in the security of supply and being able to influence production methods and conditions of exchange (cf. also Habermann 2016).

[76] The representation of these first three approaches in based on Lange (2017).

playing an increasingly significant role, it is also questionable here whether the transition to a service economy would result in lower resource consumption.

In order to ensure that sectoral transformation in terms of a post-growth society both reduces resource consumption and protects jobs, we would have to adhere to two conditions (cf. Lange 2016): on the one hand, growth in the labour-intensive but resource-light ("clean") sector would actually have to be accompanied by a reduction in the resource-intensive ("dirty") sector. If, for instance, a higher number of services are rendered, resource-intensive production would have to be reduced in another sector. This is why Kallis (2011) argues, employing the buzzword "selective growth", for a shrinking of particular sectors whenever others grow. On the other hand, the growing sector would actually have to be "cleaner". A transition to the service sector would be of no ecological benefit if the services were resource-intensive.

In this context, authors critical of growth usually demand the development of those social services for which there is already a documented demand, for instance within the "care sectors": childcare, education and health and social care (Jackson 2009, Reuter 2010, Victor 2008). Reuter and Zinn (2011) point out that a sectoral transformation would require sufficient "mass income", as otherwise, even though there might be needs and a corresponding supply, an insufficient demand for services would arise. In particular, the distribution of low wages would limit the expansion of services considerably (Giannelli et al. 2016). It might also be possible to promote the expansion of the service sector by building up public sector employment. This would increase the influence of the state on the labour market (Antal 2014); it would require a massive injection of private capital into the public sector (Zinn 2014). If there were to be an acceleration in the development of public sector employment, this would have to be financed by correspondingly high levels of taxation.

In early-industrialised national economies in recent years, we have seen a very clear shift in fields of activity away from the production of goods and towards the provision of services. Demographic developments are reinforcing the trend towards tertiarisation, because the demand for care and healthcare services is increasing in these ageing societies. This has made it possible to examine the instrument suggested in the post-growth literature to a certain extent with regard to its effects on growth and employment. This shift, however, has not been purposefully accelerated by political decision-making; rather it has arisen from a structural change in production processes. According to Reuter (2010), the transformation into a service sector was determined by two decisive factors: (1) productivity growth and (2) saturation tendencies. Whereas saturation tendencies would arise in the primary and secondary sector, which would reduce employment if productivity were to increase (Fisher 1939), the service sector is characterised by the fact that it is not subject to market saturation. Fourastié, too, suggests there is no saturation with regard to services. The reasons he gives for this are that, firstly, the lives of consumers are improved (e.g. through products in the fields of culture and tourism), and secondly, services are indispensable in the production of products from the other sectors (e.g. research, education and administration) (cf. Fourastié 1967). If, however, we follow the line of argument based on temporal efficiency, the market potential of services is not unlimited, since each person can only avail him/herself of a limited number of services with a duration greater than zero.

Thus far, however, it is unclear how the costs of a further targeted development of the service sector could be financed (Antal and van den Bergh 2014). As already discussed in Chapter 3.2.3, a problem intrinsic to the expansion of the service sector is subsumed under the concept of "Baumol's Cost Disease". Underlying this is the idea that different productivity gains can be made in different economic sectors. In classical labour market theory, wages are a representation of labour productivity. Baumol's findings (1967) are that when there is an increase in labour

productivity within one sector, the wages in the other sectors adapt to this development. In practice, this happens through wage and salary negotiations, where wages in "unproductive" sectors are adapted to aggregate productivity developments. As a consequence, services become relatively more expensive (Baumol and Bowen 1966). Furthermore, new findings in computerisation and its influence on employment suggest that a simple separation between the primary, secondary and tertiary sector may not do justice to the complex reality. Frey and Osborne (2013) show that in future, not only routine tasks from the primary and secondary sector could be replaced by computers or robots, but increasingly also knowledge-based activities in the service sector. Conversely, this means that by improving computer technologies, such as big data or machine learning, we could also achieve significant productivity increases in the service sector. Thus, the idea of simply shifting labour into this sector would not necessarily lead to increased employment – shifting labour into the service sector will probably not automatically protect jobs.

With the aid of a macro-economic model, Victor and Jackson (2012) explore how far it is possible to meet the target of reducing greenhouse gas emissions in Great Britain by at least 80 % by 2050 (cf. Department for Business, Energy & Industrial Strategy 2013). Three sectors are introduced in an extension of the LowGrow model. First, a "conventional" sector in which labour productivity grows by 1% per year; second, a "green" infrastructure sector with the same productivity growth; and third, a "green service sector" in which productivity declines by 0.3% per year. Within this framework, the authors simulate political measures in three scenarios for the British economy that build upon one another. First, the expansion of green technologies; second, the expansion of green technologies and a reduction in working hours; and third, the expansion of green technologies, a reduction in working hours, and a transformation towards green services. Within this model, the target of reducing greenhouse emissions in Great Britain by 80% by 2050 could only be met in the third scenario.

Empirical Evidence

Uppenberg and Strauss (2010) have studied the productivity potential of services and found evidence for the claim that, in comparison to agriculture and manufacturing, there is relatively little potential for productivity increases in the service sector. In a decomposition analysis over the period 1996 to 2005, they attribute the output growth for each of the four sectors of agriculture, manufacturing, construction and services in the former EU-15 countries, and additionally the USA, to the two components of employment and productivity development. Whereas in manufacturing the output growth was a result of strong productivity growth and a simultaneous decline in employment, two thirds of output growth in the service sector (on average around 3% annually) could be attributed to employment growth and only a third to productivity growth. In the USA, the United Kingdom and the Netherlands, substantial productivity growth in the sector of business or market services[77] contributed to particularly high growth rates in aggregate productivity within the period under analysis. Other service sectors, however, demonstrated no noteworthy productivity growth.

Nordhaus (2008) has studied the existence of "Baumol's Cost Disease" in the United States. He found clear evidence that low-productivity sectors had higher relative costs. Moreover, he found that the expansion of the service sector between 1948 and 2001 had weakened aggregate productivity growth.

[77] "Market services" here comprise the sub-sectors trade, tourism, transport & communication, finance and business services. The area of social services, e.g. the health service, is not included.

Bates and Santerre (2013a, 2013b) confirm the phenomenon of "Baumol's Cost Disease" within the US-American healthcare and education system. Their results are consistent with increased spending on education and healthcare services in American households.

This means that empirical observations support the theory in the post-growth literature that there is less productivity growth in the service sector than in the primary or secondary sector. However, they also support the theory of "Baumol's Cost Disease". These results suggest it is difficult to finance the relocation of employment into less productive sectors. At the same time, it is important to bear in mind that the ex-post evaluations presented here are often very difficult to generalise, which means they have a limited capacity to forecast the conditions in a post-growth society.

4.2.2 Change of Direction in Technological Transformation

In the past, technological change has led to an increase in labour productivity. The second suggestion under discussion both in degrowth and post-growth discourses and among green-growth proponents aims to change the direction of technological change. A variety of measures for achieving this is under discussion:

- internalising external ecological costs – e.g. by factoring in environmental damage through ecological taxes (Daly 2008, Binswagner et. Al. 1981) or through cap-and-trade systems (Alcott, 2010; Daly, 1991; Douthwaite, 2012; T Jackson, 2009; Kallis and Martinez-Alier, 2010; Victor, 2008);
- ecological regulation (Schmelzer and Passadakis, 2011);
- abolishing ecologically problematic subsidies (Paech, 2012);
- reducing non-wage labour costs (Bierter 2000, Rätz et al. 2011).[78]

These instruments lead to a change in the relative costs of labour and natural resources or energy. The aim of the first four instruments is to raise the price of resources and energy as factors of production, thereby – relatively speaking – reducing the price of labour as a factor of production. The aim of the last-mentioned instrument is to reduce the price of labour as a factor of production for businesses.[79]

A change in the direction of technological transformation would entail future research and innovation being more strongly focused on improving resource efficiency or reducing the emissions intensity of production processes, instead of – as has been the case thus far – increasing labour productivity (and thereby reducing the costs of labour as a factor of production). It is assumed that, as a consequence, labour productivity will increase less, remain constant, or even decline.

The hope that these measures will help to achieve, as well as an improvement in environmental quality, an improvement in the employment situation, is often called the double dividend(Goulder 1995). This was also the aim of the ecological tax reform passed in Germany by the red-green federal government in 1999. As part of this reform, tax on energy consumption was gradually raised. On the one hand, this was to provide incentives for energy efficiency, and

[78] It must be emphasised here, however, that this should not contribute to a precarisation of jobs or to a reduction in net pay (Biesecker and Winterfeld 2014).

[79] It is worth noting that the following measures would likewise contribute to sectoral transformation, as discussed in Chapter 4.2.1. The rationale here is similar: if labour as a factor of production becomes cheaper relative to resources and energy, labour-intensive and non-resource-intensive goods become relatively cheaper – and are therefore higher in demand.

on the other, the income from the tax was used to reduce pension contributions and thereby impact positively on employment.

Jarass (2010) describes how the tax burden is concentrated on labour as a factor of production. In many industrial nations, the tax systems were introduced in periods of high economic growth and less international integration between value creation chains. Because, since then, the systems have not undergone adequate reform, they have not been able to meet the requirements of globalisation. This is particularly the case under the conditions of decreasing economic growth, according to Jarass. Consequently, nowadays it is the middle class in the labour-intensive service sector in particular that has to bear a disproportionate tax burden: Jarass argues that the actual tax and duty burden on the compensation of employees amounts, on the whole, to around 45% (20% employee social security contributions, 14% employer social security contributions, and 13% average tax burden).[80] The high labour costs give rise to an enormous pressure on labour-intensive activities. The rationale of the measures discussed here is that this pressure will be transferred to resource-intensive factors of production. Accordingly, Jarass (2010) specifies three necessary objectives of tax reform: firstly, non-wage labour costs could be reduced by placing a greater burden on capital expenditure or on energy and resource consumption; secondly, environmentally harmful subsidies would have to be redirected and there would have to be more stringent taxation procedures; thirdly, contributions to social security would need to be deducted from the tax.

Jarass (2010) argues that these problems were not adequately addressed with the 1999 ecological tax reform. It is true that taxes on energy consumption were increased, and up to approximately 80% of tax revenue was used to reduce social security contributions. However, Jarass states that, in comparison with the EU average, the tax and duty burden on energy and resource consumption in Germany is still below average, and the tax burden on labour is above average. Schratzenstaller (2017) has put forward a suggestion that ties in with the current situation: a sustainability-oriented reform of the tax and duty system in Germany.[81]

Some authors of post-growth literature argue that the changed production processes and service provision should, in the main, take place outside of gainful employment. They argue that tasks that used to be unpaid and have been commodified in the process of industrialisation should be de-commodified again: here, the population would take on, for example, subsistence tasks, manual jobs, care work, repair work in repair cafés, or it would recycle used goods (upcycling). Introducing technological change that leads to more labour-intensive processes is accompanied by a cultural transformation that increases the value of subsistence tasks and legitimises alternative usages of goods (Paech 2012, Miegel 2010). This kind of technological transformation could even mean that the transition to a post-growth economy will lead to an increasing demand for labour (Sorman and Giampietro, 2013).

Critics argue that measures to increase production costs, e.g. ecological taxes, would merely result in resource-intensive production processes being relocated abroad, where production

[80] Breidenbach, Döhrn and Schmidt (2017) offer a current, disaggregated analysis of the tax and duty burden at the household level. Within the group of employee households who acquire their taxable income mainly as employees and are fully subject to social insurance contributions, the burden is always significantly over 45% where the income is higher than the average (taxable) gross income (around 35,700 euros per household). The burden is highest, at 48%, among households where the income is between 40,000 euros and 80,000 euros. For incomes above this amount, the burden is slightly less, because social insurance contributions, indirect taxes and other duties rise disproportionately in relation to income. Even incomes between 20,000 euros and 30,000 euros are already taxed at more than 45%.

[81] The suggestion comprises three pillars: (i) a significant reduction in duties on labour, in particular for lower incomes; (ii) greater maximisation of unused potential in the area of environmental taxes (e.g. through a cross-sector CO_2 tax and a radical restriction of environmentally counterproductive privileges, e.g. the diesel tax privilege or the company car privilege); and (iii) a consolidation of taxes on assets and investment income by modernising property tax (updating assessed tax values), in particular an inheritance tax reform that, for the most part, eliminates exceptions and generates long-term, stable and increasing tax revenue through a combination of moderate tax rates and high personal tax allowances.

costs are relatively lower (Bach et al. 1995). They fear massive job losses, and neither would there be any advantage from an ecological perspective. This criticism, however, is only valid if, despite reduced taxation on labour as a factor of production, overall costs were to increase. Moreover, introducing such measures on a supranational level, as well as in combination with countervailing duties (Grubb et al. 2014) could counteract a relocation. There has thus far been no research on to what extent this development would present differently in an economy that is not growing.

Empirical Evidence

The effects of a reduction in labour costs can be analysed by studying the transferability (incidence) of tax decreases. In the theory of financial economics, an incidence analysis is used to test the effects of higher and lower taxes on different population groups, and what distribution effects (might) arise. In practice, increases in labour costs are much more frequent than decreases. This relationship is also reflected in the scientific literature. The theoretical finding that higher labour costs result in lower wages (Gruber and Krueger 1991, Gruber 1994), or that rigid wages lower employment (Kugler and Kugler 2008, Heckman and Pagés 2003), has been empirically verified multiple times. Although, thus far, there have been very few studies on the effects of reductions in labour costs, the aforementioned studies all come to the conclusion that the incidence of decreases in tax on labour tends to be passed on to employees in the form of higher wages, but it does not result in higher employment.

Kramarz and Philippon (2001), for example, have studied the effects of changes in labour costs on employment in the low-wage sector. According to the authors, tax subsidies on labour as a factor of production have no significant influence on the probability of employment. Gruber (1997) studied the effects of the privatisation of the social system in Chile. In the production-sector firms under study, average income tax decreased from 30% to 5%. He found strong evidence that the tax decrease is reflected primarily in higher wages but not in increased employment. He argues that the impact of this unparalleled exogenic shock on labour costs should, however, be assessed in the context of high inflation in Chile and is therefore not necessarily transferable to other circumstances.

Bennmarker et al. (2008) present similar evidence for the reduction in income tax by 10 percentage points that was implemented in North Sweden in 2002. They argue that although this did not have an effect on employment, it no doubt had a positive effect on wages and the probability of new companies coming to the area. They point out that other, more detailed studies focus on the extent to which the establishment of new companies in turn has a positive impact on employment.

The reception of the 1999 ecological tax reform in the economic science literature is mixed (Goulder 2013). Böhringer and Schwager (2003) level the criticism that the success of an ecological tax reform is often assessed in connection with an improvement in the employment situation. They argue, however, that such a double dividend in the tax reform is highly unlikely, as the decreases in tax on labour as a factor of production would first of all have to compensate for the negative effects of the environmental tax on employment. They point out that if the ecological tax reform does not have any positive effects on employment, this could provoke a negative attitude towards the tax reform among the population, even though, from an ecological perspective, it is an important and effective reform. The authors argue, therefore, that environmental taxes should be used specifically to meet environmental targets; they should not be coupled with a second objective of protecting employment. Instead, this objective should be achieved independently. Only in this way, they argue, is it possible to measure how far the environmental tax is contributing to meeting ecological targets.

Kohlhaas (2005) has studied the aggregate effects of the ecological tax reform. His findings are consistent with the double dividend. According to his investigations, the ecological tax reform has contributed successfully to reducing CO_2 emissions and increasing employment. Bach (2009) confirms that the employment situation has been improved by the tax reform. According to his calculations, it has put a few billion euros into pension funds. This means it has been possible to raise the pension level slightly, whilst at the same time reducing the pension contribution rate. He argues, however, that the ecological tax reform has not achieved its actual goal of improving the quality of the environment. Primarily, Bach holds the tax exemptions for individual, particularly energy-intensive branches of industry responsible for this. Overall, the double dividend of an ecological tax reform is controversial, but at least a few empirical studies focused on Germany indicate that the 1999 tax reform could have had positive effects on employment.

4.2.3 Reducing Working Hours

Perhaps the most prevalent approach to dealing with work and employment in post-growth societies is the idea of reducing average working hours (Asara et al. 2013, Jackson 2009, Kallis et al. 2013, Kallis et al. 2012, O'Neill et al. 2010, Paech 2012, Reuter 2010, Schmelzer and Passadakis 2011, Schor 2015, Skidelsky and Skidelsky 2012, Victor 2008).

The argument is that if labour productivity increases as a result of technological transformation, employment figures can be kept constant by reducing working hours sufficiently (Victor 2008). Underlying this is the assumption that increases in labour productivity, constant output and constant employment can only be reconciled with one another if each employee's working hours are reduced. Victor (2008) models this relationship in his LowGrow model, which implements the effect of reducing working hours. His simulation for the Canadian economy illustrates how low economic growth can be combined with decreasing greenhouse gas emissions, decreasing unemployment, decreasing poverty and a lower debt ratio. In the LowGrow model, increases in labour productivity can be compensated for and full employment achieved by reducing average weekly working hours by 15% between 2005 and 2035. From the perspective of some post-growth economists, this much-quoted result supports the claim that reducing working hours is the right response to (future) labour productivity gains.

Seen from a different perspective, reducing the time spent on monetarily paid work is a necessary prerequisite for freeing up time for the "second labour market". According to degrowth and post-growth proponents, this second labour market ought, as explained at the beginning of Chapter 4.2, to fulfil both an economic and a social function. Paech (2012), for example, sees it as playing a central economic role. In the time that is not being spent on paid work, people would focus on a diverse range of subsistence tasks. If, in their free time, people were to produce certain goods themselves (e.g. gardening), participate in community production (e.g. community-supported agriculture), or repair products (e.g. repair workshops), then they would also need less income in order to buy products. Within feminist economics, the second labour market is seen as performing the function of dividing more evenly between the sexes activities that are currently carried out essentially by women without adequate social recognition (e.g. reproductive work). The prerequisite for this would be that men, in particular, would spend less time in the first labour market (Biesecker et al. 2012). Finally, some authors point out that the second labour market can also fulfil socio-political functions. There is discussion, for example, around the extent to which reducing working hours would strengthen social solidarity, since people would have more time for socially useful tasks (Schor 2015). Likewise, there is an argument that democracy can be strengthened if people have more time to inform themselves and get involved in democratic processes (Wittmann 2014).

From the perspective of proponents of a second labour market, time outside of gainful employment should also be used for unpaid work (not only for leisure). The assumption here is that no further productivity gains can be made in paid work, and work in the "second labour market" is necessary to maintain welfare. A reduction in working hours would have to be accompanied by a shift in consciousness and values away from materialistic attitudes. This would mean de-valuing paid work and increasing the value of meaningful work, skills and crafts (Paech 2012, Miegel 2010). According to the authors, the state and civil society could support this shift with educational and information campaigns.

Sometimes, reductions in working hours are also linked to positive effects on employment. If working hours were reduced so drastically that the volume of work sank below the level of production necessary for the existing output, this would lead to an output gap. Some post-growth economists believe that this gap would be closed by recruiting more people (cf. Reuter 2010). Similar considerations are behind the concept of job sharing, which emerged in the 1980s.

Fundamental to the assumed effectiveness of reductions in working hours is, however, the assumption that there is a set amount of work that can be divided between several workers. However, this hypothesis is contentious, for, according to e.g. Kramarz et al. (2008), the demand for work is dependent, inter alia, on income distribution and price changes. From the perspective of mainstream economists, the assumption of a constant demand for work is based on a fallacy that is called the "Lump of Labour Fallacy". In essence, they argue, there has been a failure to recognise that the demand for work is not fixed but is constantly changing according to the general economic conditions. In particular, Hunt (1999) argues that the demand for labour depends on the price per hour of work, which rises in the case of reduced working hours, mainly because of compensatory wage adjustment and increased administrative and other fixed costs per hour. Hunt and Katz (1998) argue that consequently, a reduction in working hours has immediate negative effects on the demand for work. According toKrugman (2003) and Scherf (2013), the idea that there is a constant amount of work is therefore a fallacy that could have serious consequences, which means reducing working hours is not a suitable instrument for improving employment relations in the labour market. Moreover, Freeman (1998) argues that because of the differences in the abilities of employees and the unemployed, reducing working hours could lead to an increased skills shortage. As well as the question of whether reductions in working hours affect employment at all, the direction of potential effects is also contentious. Further below, we will analyse the empirical literature concerning the signs and the strength of the effects of reductions in working hours on employment.

In addition, in the post-growth literature, the question of how reductions in working hours should be introduced and implemented remains open. In the first instance, individuals themselves would have the opportunity to decide whether or not to work reduced hours and ask for a reduction (Paech 2012, Elgin 1993). In addition, the negotiation between the representatives of employees and employers plays an important role in facilitating part-time work nationwide. Trade unions, for example, could address relevant ideas in wage and salary negotiations more forcefully (Steinrücke 2016). In addition, introducing a cross-industry legal upper limit for average weekly working hours is conceivable. France implemented this measure in 2000 with the introduction of the 35-hour working week. The economic effects of the legal cap have been explored in various studies. We will present the results of these in the empirical section below. Another possibility would be for the legislator to make part-time work more attractive in terms of taxation, both for the employee and for the employer. One example of this would be introducing a progressive income tax linked, among other things, to the number of weekly working hours of the employee (Pullinger 2014). In addition, the state could promote

reducing working hours by creating legal rights and further incentives for employees. Examples of this would be child maintenance, care-giver leave and the recently debated model of tax-incentivised parental leave, in which there is a partial compensation for reduced income. However, among these suggestions, there is no discussion of the degree to which reduced working hours should be compensated with wage adjustment.

We must also take into account employees' and employers' concerns. Both groups potentially have cause to object to job sharing (Antal and van den Bergh 2014). On the one hand, employees might fear that due to reductions in their real wages, they will not be able to maintain their standard of living. On the other hand, employers might be concerned that due to poor arrangements and coordination among employees, the quality of the products might decrease. Moreover, particularly in industries that require highly qualified staff, it is questionable whether the increased demand for highly specialised skilled employees could be met at all.

Bosch (2000) cites four conditions for successfully reducing working hours:

1. From his point of view, employers have incentives for compensating reduced working hours with overtime for staff already in employment and de facto employing no new workers. This means the employment structure within companies would also have to fully adapt to reduced working hours in order to have an impact on the actual hours worked.
2. Continuing and advanced training programmes are required to be able to divide specialised production processes between the appropriately trained employees.
3. As is the case in most western European countries and in Canada, non-wage labour costs have to be imposed not based on the number of employees but in proportion to the wages paid. This would ensure that companies are not penalised for recruiting new staff.
4. Real wages are increasing ever more slowly in most industrial countries, which makes it difficult to reduce working hours when wages are increasing at the same time. This means that as long as there is no broad consensus for post-growth concepts among the population, the basic prerequisite for an acceptance of reduced working hours while real wages are decreasing is a stable and egalitarian distribution of income.

Reuter (2010) likewise anticipates problems with regard to the social acceptance of reduced working hours. He therefore suggests, inter alia, increasing the attractiveness of substituting working hours with free time. The available measures here would be sabbaticals, early retirement provisions or extended parental leave.

Empirical Evidence

As already indicated further above, the empirical literature indicates there is no clear correlation between reduced working hours and employment. There is evidence for neutral, positive and negative effects on employment. Only under certain circumstances does reducing working hours seem to actually create additional jobs[82] (Schwedinger 2015, Zwickl et al. 2016). Zwickl et al. (2016) find little empirical evidence for the claim that reducing working hours would lead to negative effects on employment.

Studies that explore reductions in working hours in Germany predominantly conclude that there is no significant correlation between reduced working hours and employment (cf. Lehment 1991, Hunt 1996). Lehment (1991) studied the gradual reduction in working hours in Germany

[82] According to Schwedinger (2015), the following factors influence the effects of a reduction in working hours: business hours and the reorganisation of labour; labour cost development and productivity effects; qualification measures and available skilled staff; flexibilisation and informalisation; the possibilities of avoiding the reduction in working hours; fixed personnel costs; wage level and acceptance; the macro-economic context and political consensus.

from 1973 to 1975 and from 1985 to 1990. For both periods he concludes that even delayed effects of reduced working hours do not have any impact on the number of jobs.

Hunt (1996) uses the variation in collectively agreed working hours for different industries in Germany. First of all, working hours were negotiated down from 40 to 37 hours a week in the metal processing and printing industry. In other sectors, working hours were reduced only later on and by very little, or they were not reduced at all. In response to a reduction in the collectively agreed working hours by one hour, employment rose by 0.3–0.7% for workers and by 0.2–0.3% for salaried employees. In the period from 1984 to 1989, employment increased by 1.1% overall when the collectively agreed working hours were reduced by an average of 1.7 hours. In comparison to the employment trend in the USA, Hunt argues, this was, however, only a small increase in employment.

Kramarz et al. (2008) argue that one of the reasons reductions in working hours in Germany have had little effect on employment is the trade unions' negotiating skills. They point out that the unions often focused on negotiating reduced working hours with full wage adjustment. However, although they improved the conditions of employment of those already in employment, this was at the expense of creating jobs for the unemployed. Hunt (1996) shows that the reduction in working hours by 1% was accompanied by raising the hourly wage by 0.78 to 0.95%. Schank (2006) explores the correlation on the disaggregated level of individual companies and concludes that there are similarly strong effects. The empirical evidence therefore confirms that reductions in working hours have been introduced with almost full wage adjustment, thereby supporting the line of argument inKramarz et al. (2008).

When compared internationally, the results of the studies on reducing working hours turn out to be less consistent. In France in the year 2000, under Prime Minister Jospin, a legal upper limit of 35 hours was set for average weekly working hours. There is heterogeneity in the evaluation results.

Hayden (2006), for example, identifies positive effects of the introduction of the 35-hour working week in France. The introduction of the so-called Aubry laws led to a 3.2-hour reduction in average weekly working hours for full-time employees between 1997 and 2002, taking the average down to 35.6 hours. Unemployment fell by approximately three percentage points from the announcement of the 35-hour week in 1998 to 2002. France was undoubtedly in a phase of economic growth during this period, which raises the question of to what extent reductions in working hours contributed positively to the increase in employment at all. Husson (2002) compares the employment trend in this period to a contrafactual scenario without reduced working hours and finds evidence that reductions in working hours were a crucial factor in creating jobs between 1997 and 2002. Beffy and Fourcade (2004) draw similar conclusions. Kramarz et al. (2008) come to the opposite conclusion on the introduction of the 35-hour week in France. They argue that numerous companies, particularly in sectors with low productivity, were not able to cope with the introduction and had to file for bankruptcy. The conclusion we can draw here, therefore, is that the complex effects of reducing working hours have not yet been adequately investigated.

4.2.4 Less Dependency on Earned Income

A fourth cluster of suggestions, which is connected in particular with the concept of a second labour market, aims to make people in a post-growth society less dependent on earned income and therefore less dependent on employment in the first labour market. Two approaches can be differentiated here.

The first approach relates to the idea – explained above and very prevalent in the post-growth literature – that a society needs fewer and fewer workers in production if labour productivity is continuing to rise and, at the same time, the economy is not growing, or rather is not growing to the necessary extent. Furthermore, and particularly in connection with recent developments in digitalisation and Industry 4.0, the argument is advanced that in future there will be even fewer well-paid jobs as well as fewer, and often more badly paid, employment opportunities (OECD 2015a). Similarly, there has been an increase in the proportion of capital income (cf. Stockhammer 2013). Overall, in a non-growing economy, this would mean a more pronounced income gap and a rise in unemployment. To counteract this, the argument goes, there should be greater redistribution of national income. In the post-growth literature there is, in particular, much contentious discussion around the unconditional basic income (UBI), which every citizen would receive irrespective of his/her financial situation and without having to render a service in return (cf. on this in detail Chapter 4.3.3.1, which also presents empirical studies and simulations of the unconditional basic income). Within the scope of this study, we have been able to provide only a very limited analysis of this proposed basic income.

The second approach aims to reduce the need for monetary income: if goods and services were produced and used outside of market structures, individuals would also need less income. In this regard, the concept of "commons" or even commons-based production by workers with equal rights" (Helfrich and Bolier 2015: 92) is of central importance in post-growth debates. The idea is that needs can be satisfied collectively without any requirement for remuneration. The key principles here are that the use of a product is not directly connected with the contribution to the production of the product, and that the products are produced collectively and their consumption is divided (Habermann 2016). Proponents of this idea argue that collective production and use reduces the amount of products needed – for on the one hand, products are shared, and on the other, commons-based production generally goes hand in hand with subsistent lifestyles (Helfrich and Bolier 2015). A similar concept is that of the non-commercial sharing economy or of collaborative consumption, which is based on the shared usage or acquisition of consumer goods and resources that are not required by individual users on a permanent basis. Examples are car sharing and sharing books or manual equipment; their usage is regulated, for example, by lending exchanges or user networks. Approaches such as these put emphasis on the utilisation value of resources (Habermann 2016). The idea is that accessing collectively utilised goods should reduce dependence on monetary income without people having to go without.

4.2.5 Preliminary Conclusions

Although there is a clear correlation between economic growth and employment, the causal interdependence is by no means trivial: authors of post-growth literature often assume a clear causal direction, whereby the volume of employment is unilaterally dependent on economic growth. Labour market economists see the extent of employment primarily as the result of the structural characteristics of a national economy, in particular the quality of the so-called matching between employee and employer on the labour markets. The employment created in this way plays – among other factors, such as the demand from abroad – a significant role in the resulting economic output of the national economy. In the case of ecologically motivated restrictions, (at least) two possible chains of effect ensue for the interplay between employment and economic growth: in the scenario from the post-growth perspective, profound ecological measures reduce economic growth, the consequence being corresponding job losses. From the point of view of mainstream economics, strong regulation would first of all reduce the demand for labour in the industries concerned, and then it would induce, ceteris paribus, a decline in employment and consequently also in economic output. The qualitatively identical result –

reduced employment along with reduced or no economic growth at all – is at all events the theoretical basis of the measures that are proposed, in particular by the post-growth literature, for weakening the dependence of employment on growth.

In this chapter we have discussed the following four measures: (i) acceleration of the sectoral transformation into a more fully developed service society; (ii) stronger orientation of technological transformation towards increases in resource productivity, the consequence of which being less rationalisation pressure on labour as a factor of production, (iii) reduction of working hours in order to distribute the volume of work, which is assumed to be constant, across a higher number of employees; and (iv) attempts to make income less dependent on employment.

With regard to the first suggestion, an analysis of the literature has shown that the post-growth debate (to a large extent) is based on an aggregate macro-level: the basic aim is to shift economic activities with high labour productivity and high resource consumption towards activities with low labour productivity and low resource consumption. For example, authors from the post-growth and degrowth discourse propose developing social services within "care sectors" such as childcare, education and health and social care. In the literature we analysed, however, we found no convincing answers to key questions such as how to finance these additional social services in the existing institutional setting, how to practically implement the processes of transfer between the sectors and industries, and which empirical investigations would support the suggestions. Neither do the respective suggestions adequately address the socio-political challenge that, in a market economy, activities with lower labour productivity go hand in hand with lower remuneration.

What the first two measures have in common in particular is their confidence that political decision-making has a very strong influence on the design of jobs, whilst at the same time avoiding undesired side effects and the welfare losses associated with these. Theoretical and empirical findings from mainstream economics, however, raise serious doubts about how far we can be optimistic that these instruments are capable of steering the economic situation appropriately. On the one hand, a policy-steered shifting of employee groups between different sectors could be connected with welfare losses if we assume there was no absolutely drastic misallocation of factors of production in the base case. Furthermore, an accelerated development of the (public) service sector could even be more dependent on growth (or on the tax revenue connected with this) in the sense that a significantly greater cost pressure might arise because, although the wages in the service sector are based on the general wage level, the work itself cannot, in actual fact, be made more productive ("Baumol's Cost Disease").

It is unclear whether a targeted reduction in working hours would actually have positive effects on employment. This is because, in reality, the volume of work is by no means constant ("Lump of Labour Fallacy"). Because the cost structure and ultimately also the demand for labour by companies could be influenced negatively, it is possible that the reduction in working hours would also negatively affect employment, as we have seen, for example, in the context of governmental programmes for early retirement. Neither is the information provided by empirical studies without ambiguities: these identify both positive and negative effects. Precisely how a reduction in working hours impacts on employment, as described above, is dependent on other economic conditions. This is why the key question in the analysis of the reduction in working hours is which mechanisms reduce growth.

Instruments such as a radical eco-tax may well be a stronger incentive for a technological transformation that increases resource productivity. Realising a "double dividend" in the form of

a simultaneous increase in employment is, however, highly contingent, and is dependent, inter alia, on the overall configuration of the tax system in the base case.

The aforementioned approaches to making income less dependent on employment do not point to a reliable route out of growth dependence – at best, they indicate which routes might lead to a weakening of this dependence. In the case of the unconditional basic income, this assessment inevitably results from its construction. Irrespective of the source used to finance a basic income, there is still a direct or indirect dependence on the level of economic output, and the taxation is inevitably linked to this.

The concept of a commons-based production by workers with equal rights and the non-commercial sharing economy aim to reduce the dependence of monetary income. The basic assumption here is that formal employment in labour markets, or rather in the "first labour market", will decline as a result, inter alia, of an ecologically induced decline in growth, and that the focus will then be on satisfying a high proportion of needs despite the decrease in earned income. In a nutshell, therefore, these approaches do not make employment less dependent on growth; instead, they make the satisfaction of needs less dependent on income, which represents a different, no doubt also desirable goal.[83]

We should emphasise that the empirical criticism of the suggested instruments referred to above is based on ex-post evaluations and the analysis of marginal changes in economic models that have only a limited ability to represent complex system changes with non-marginal changes. This is also why this method has only a limited capacity to predict possible conditions in a post-growth society. The method does make it possible, however, to at least make some general points about the challenges and the effects that accompany the respective instrumentation.

Furthermore, the critical assessments do not in any way imply that the suggestions from the post-growth literature cannot be realised to different extents. It is, for instance, entirely conceivable that actors might decide to change their behaviour due to shifting framework conditions. In the interests of their members, trade unions might, for instance, decide, on a case by case basis, in favour of reduced working hours instead of wage increases. It is likewise possible, and in fact probable, that employment will be further relocated into the service sector. There is, however, a considerable difference between such changes happening as a result of direct political intervention or as a result of decentralised actors adapting in response to new technological developments, an increasing demand for services (e.g. due to demographic change), or resource consumption becoming more expensive (e.g. due to a cross-sector ecological tax). In this respect, it is therefore important that policies create appropriate and flexible framework conditions in order to initiate these processes of structural change in a timely manner and to ensure that people who lose their jobs have a good prospect of being able to take on new and adequate employment quickly. A flexible and politically manipulable framework also makes it possible to further develop ideas related to commons-based production or a non-commercial sharing economy on a voluntary basis.

[83] It seems entirely possible that the approaches presented here could contribute to this goal – the question, however, is to what extent. If we look at it in simple terms, the increase in the income independence of the satisfaction of needs would have to be so great that the assumed extent of the decline in income could be compensated for within the first labour market. Two considerations suggest this result is highly contingent: on the one hand, the extent of the (ultimately global) distribution of labour and the associated specialisation advantages in the first labour market are much greater than can possibly be realised in the alternative contexts. On the other hand, the "currency" of a monetary income is more universally applicable and redeemable than the utility claims within a non-commercial sharing economy. Dispensing with specialisation advantages as well as disproportionately high transaction costs could, at best, be offset in individual cases by the fact that participation in these alternative systems brings many additional benefits.

4.3 Instruments for the Attenuation of Growth Dependence in Social Security Systems

In the following chapter, we will first of all introduce instruments that some authors believe have the potential to reduce dependency on economic growth within the specific systems of pension schemes and health insurance. We will then go on to discuss cross-system measures, such as the introduction of an unconditional basic income, as well as instruments suggested in the literature that could make the incomes of public budgets – and thereby potentially also social security – less dependent on growth.

4.3.1 Suggestions Regarding Pension Insurance

Growth dependence in pension systems, which is caused, in particular, by demographic change, is not only a subject of discussion in post-growth discourses but also in mainstream discourses. The starting point for the suggestions for reform debated in these contexts is, inter alia, a need to adapt to demographic change. Scenarios that model demographic change can be used productively to acquire insight into the nature and scope of the growth dependencies of a social security system. For this reason, we will present, on the one hand, different suggestions from the mainstream debates for structural reforms of the statutory pension system (SPS) that would overcome the challenges of the SPS resulting from demographic change. On the other hand, we will present ideas from the post-growth discourse. Here, we will show that the post-growth discourse not only addresses the growth pressure resulting from demographic change but also argues that making pension schemes overall less dependent on financial revenue should weaken growth dependence.

4.3.1.1 Adjusting Length of Working Life

One suggestion – much discussed in mainstream discourses – for reducing the ratio of pensioners to working age people is to adapt the length of working life to higher life expectancies (SVR 2011). It is possible to do this in two ways: on the one hand, the period before starting work – i.e. the education period – could be shortened, and on the other, the age of retirement could be postponed. A later retirement age would double the positive effect on the budget of the intergenerational redistribution pension system, for it would increase the number of people continuing to pay into the system as well as reduce the number of people claiming their pensions. The German Council of Economic Experts (Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung, SVR 2011) is therefore in favour not only of raising the retirement age to 67 in 2029 but also of introducing a regulated adjustment of the statutory retirement age based on future life expectancy. It bases this recommendation on the probability that life expectancy will also increase further beyond the year 2029, arguing that in 2045 and 2060 we will therefore probably need a statutory retirement age of 68 or 69.

It is questionable, however, whether an increased statutory retirement age would actually translate into people retiring later, or whether people would still retire earlier and accept the associated cuts in their pension benefits. In addition, some authors fear that, particularly in manually demanding jobs, it is much more difficult to remain in employment into old age. Giesecke (2014) analyses the effect of the German pension reform, which, from 1997 to 2004, gradually integrated the age factor into the pension formula (§ 77 German Code of Social Law VI). The reform provides monetary incentives for complying with the statutory retirement age: for each year a person retires before the statutory retirement age, the reform reduces the level of pension benefit by 3.6%. The results suggest that men to whom the reform applies have been retiring, on average, 7 months later than before the reform. Women have been retiring 4.5 months later. However, Giesecke finds significant differences between professional groups. For

people in manually demanding jobs, the effect is 40% weaker than in the rest of the population, which suggests it may be a lot more difficult for people with manually demanding jobs to lengthen their working lives, especially within their original professions. Similar results are found in Giesecke and Okoampah (2014). They do not only find that people in manually demanding jobs retire, on average, approx. one year earlier; they also establish that the reason for this difference can predominantly be explained by the demands of their work.

Raising the statutory age of retirement, coupled with monetary incentives, does therefore seem to postpone the age at which people retire, thereby relieving the burden on the SPS. In the case of otherwise unchanged arrangements, however, this leads to an effective pension cut for those people who, because of their line of work, are not in a position to retire later. According to the German Council of Economic Experts, a (further) increase of the length of working life should therefore be accompanied by a parallel upgrading of the reduced earning capacity pension (cf. SVR 2014: 20). Whether this suggestion would provide a way of balancing out the disadvantages for people who, because of the exertion involved in their jobs, are not in a position to retire later, is a question that must be discussed elsewhere.

4.3.1.2 Supplementary Funded Pension Scheme

In recent decades, as a supplement to the intergenerational redistribution system, a parallel funded pension system has gradually been established in Germany. In this system, people provide independently for their future by investing part of their income in private annuity funds or pension schemes. In the context of the pension reform in 2001, steps were already taken in Germany to introduce a parallel funded pension system. Since then, the supplementary private retirement provision has been subsidised by the government (through the so-called "Riester" or "Rürup" pension plan) (Werding 2013). The idea behind this was, in particular, to make up for any demographically-induced decline in the level of pension benefit. According to Werding's (2013) calculations, the level of pension benefit could in fact be stabilised by a compulsory private supplementary pension based on the conditions of existing systems.

However, there are also challenges for funded systems. Firstly, a compulsory private pension is an additional financial burden for the working population, because as well as contributing to the state pension system, they also have to contribute to the funded system. Secondly, when the baby boomer generation reaches retirement age, it will begin depleting its savings. It is then conceivable that demographic change will lead to an imbalance in the savings deposits markets, because fewer young savers will succeed older ones and counterbalance the demand for investments. This entails the risk that the market can only return to its equilibrium when the value of savings deposits decreases. This, however, causes a decline in the older generation's real pensions. Although these risks can be diluted by diversification on the international capital market, there is still the potential danger of a devaluation due to an adjustment of exchange rates (Barr 2002).[84]

Seidl and Zahrnt (2012) interpret funded provision systems as growth-dependent because their functioning is dependent on the generation of capital yield and therefore on economic growth (p. 112). Moreover, they argue, the capital value of savings underlies fiscal risks, which are felt more keenly when there is weak economic growth (Seidl and Zahrnt 2010). However, from the perspective of some authors, the funded provision system can be considered a growth driver, for the capital deposited within it is given out as credit on the different capital markets at the highest possible interest rate, thereby contributing to economic growth. In addition, funded provision schemes are often based on unrealistically high economic growth rates (Höpflinger

[84] It is possible, however, to protect against exchange rate risks. In addition, in the case of diversified investments on an international capital market, there are exchange rate opportunities as well as risks.

2010). Furthermore, the returns on the annuity funds and pension schemes may be highly dependent on (global) growth prospects. Overall, therefore, the funded provision system does not make the retirement provision any less dependent on economic growth.

4.3.1.3 Statutory Pension for All

The SPS encompasses around 70% of all people in gainful employment (Werding 2013). In recent times, in the context of the coalition agreement (2018) and the setting up of the "Verlässlicher Generationenvertrag" ("Reliable Intergenerational Contract") commission (BMAS 2018), more and more people are calling for a reform that would integrate the entire population in gainful employment into the SPS. The hope underlying this suggestion is that the integration of civil servants, the self-employed and people in marginal employment would increase the revenue in the SPS, and that this would make it easier for the system to cope with demographic change. However, this is a contentious assumption. The German Council of Economic Experts, for example, pointed out early on that including additional occupational groups in an intergenerational redistribution system can only ever have a temporary positive impact, as these groups must sooner or later also benefit from the insurance, i.e. they will themselves claim their pensions (SVR 2001).

Nonetheless, from a theoretical perspective, we cannot in principle exclude the possibility that this suggestion for reform may have a positive effect. There are two fundamental reasons for this: firstly, a reform such as this could be developed in such a way that only new – i.e. young – self-employed workers or civil servants would be integrated into the SPS. On the one hand, this would guarantee, above all, that existing provisions for civil servants stay valid. On the other hand, this arrangement would bring additional revenue into the SPS relatively quickly. The disbursements for these newcomers would, however, lie so far ahead in the future that the considerable impact of demographic change would by then already be weakened. Secondly, taking into account people in marginal employment, such as people with "mini" or "midi jobs", as they are called in Germany, could obviate a possible source of poverty amongst the elderly.

Werding (2013) simulates the effects of a reform that would integrate newly self-employed people and newly employed civil servants into the statutory pension system. According to the author, this would extend the intergenerational redistribution system enormously over a long period of time. Including young self-employed people and civil servants would first of all increase the revenue in the SPS without significantly affecting the disbursements. Then, through the sustainability formula, this would lead to lower contributions and higher benefits for people currently claiming pensions. In this context, Sinn (2000) refers to temporary introductory returns that would, however, have to be compensated for by future generations.

Buslei et al. (2016) simulate the absorption of marginally employed people as well as the integration of civil servants and self-employed people into the SPS. Their results suggest that because marginally employed people could only make low contributions, their absorption into the system would barely have any impact in the short to medium term. The absorption of self-employed people and civil servants, though, would lead to an increase in the assessment base of the contributions, thereby allowing a significant decline in the contribution rate of 1.9 percentage points – in comparison with the status quo. Moreover, in the current pension adjustment regulation, this would lead in subsequent years to an increase in the current pension value and therefore the pension benefits. In the short to medium term, the people who would benefit from this would be those still active in their professional lives and contributing to their pensions, for they would have lower contribution rates, as well as those who are currently claiming their pension, for they would enjoy higher pension benefits. As expected, however, the decrease in contribution rates would not be sustained in the longer term, as an increasing

proportion of the self-employed included in the SPS would themselves begin to claim (generally high) pension benefits. In 2040, however, the effect of the decrease would at all events amount to around 0.7 percentage points. According to the simulations, despite the decrease in comparison with applicable legislation, the effect of demographic change would by no means be eliminated. This means that contribution rates would increase and the level of cover would fall from 2020 at the latest.

In its 2016-2017 annual report, the German Council of Economic Experts studied a series of alternative scenarios, specifically the inclusion (i) of all self-employed people and civil servants, (ii) of all self-employed people and (iii) of only those self-employed people who thus far have not contributed to any compulsory retirement provision (cf. SVR 2016, text box 21, 307–309). The temporary effects of the decrease would be at their strongest in the first case scenario, but then, towards the end of the period under consideration (2070-2080), the level of cover would drop to within the same range as in the baseline scenario (without including any self-employed people or civil servants), however with an increased contribution rate (because claims by those insured additionally would then have to be financed by relatively fewer contributors).

If in variant (ii) only newly self-employed are included, the temporary effects of the decrease are significantly weaker; at the same time, however, professional pension funds partially based on the intergenerational redistribution system would be lacking in the respective contribution payments, for in the case of a compulsory SPS insurance, there would be no further succession of self-employed people with voluntary cover. In what is, from the German Council of Economic Experts' point of view, the easiest variant to implement, (iii), the effects are even less significant. One reason for this may be that there is, among the self-employed without cover, a high proportion of so-called solo self-employed with relatively low income.[85] In the simulation of this scenario (iii), the analysis up to the year 2080 nonetheless shows, for a period of several decades (from around 2030 to 2070), an increase in the pension level of one percentage point and a simultaneous reduction in the contribution rate of around half a percentage point (cf. SVR 2016: 308, figure 82 and SVR 2016: 331). The qualitative adjustment requirements of the SPS in response to demographic change – higher pension contribution rates, a reduced net level of cover before tax, as well as increased federal subsidies – are not called into question by any of the three scenarios of a "pension for all", rather they are merely somewhat attenuated in scope.

In a nutshell, the "pension for all" approach would be able to slightly mitigate the effects of demographic change in the SPS and slightly reduce the intergenerational redistribution system's growth dependence at least on a temporary basis. It is important to bear in mind here that the reform would only slightly and in the short and medium term decrease the need for structural adjustment. Later generations would no longer benefit from the reform; on the contrary, they would have to pay somewhat higher contribution rates.

4.3.1.4 The Beveridge System

In the debate around possible pension reforms, there are also regular calls for a fundamental switch to the so-called "Beveridge System", which, in its basic form, consists of a minimum state-guaranteed pension that can be supplemented specifically by corporate, state or private supplementary pension schemes. The perceived advantage of this model is that it guarantees

[85] The majority of the SVR advocate a compulsory insurance for self-employed people, who are not currently obliged to have cover, in order to prevent potential free rider behaviour (refraining from paying contributions during working life but then claiming the basic pension in retirement). From the SVR's point of view, however, it is irrelevant whether this compulsory insurance is part of the SPS or a private insurance (cf. SVR 2016: 307). In his minority vote, Peter Bofinger argues that this compulsory provision should be part of the SPS. This would also make it possible to implement the aforementioned effects for scenario (iii) concerning contribution rates and level of cover in the period to approximately 2070.

better cover at retirement age for risk groups in the labour market (e.g. Meyer 2013). It is, however, a priori not clear how a Beveridge system would fair in terms of growth dependence.

The German pension system follows the "Bismarck" model, which is characterised by its income-based claims. Its characteristic feature is the protection of social status through the pension system, i.e. an individual's position within the distribution of income during his/her working life leads, due to the proportionality of previous contributions and later benefits ("the principle of equivalence"), to a corresponding position in the distribution of pension benefits (cf. Deutsche Rentenversicherung Bund 2018). Other European countries – such as Great Britain or the Scandinavian countries – follow, by contrast, the Beveridge system, thereby generally including all people in gainful employment, such as in the "pension for all" approach. In addition, however, there is often a further state system for income-based supplementary pensions (Werding 2013).

Within the specialist economics literature, opinions are divided on the question of what a Beveridge insurance model, optimised for welfare, would look like (Fehr et al. 2013). Two counteractive effects would be at work here. With a non-income-dependent minimum guaranteed pension, the system would become considerably more progressive, i.e. a disproportionate burden would be placed on higher incomes in order to finance the minimum guaranteed flat-rate pension for all those covered. On the one hand, the fear is that free riders would give rise to negative incentives for the supply of labour, which could then have a negative effect on employment. On the other hand, a progressive system would provide better protection in the face of uncertainties and crises in the labour market. Fehr et al. (2013) employ a multi-generational model in order to determine the optimal ratio for income-dependent and non-income-dependent elements of the SPS. Their results imply a ratio of 40% guaranteed minimum pension and 60% income-dependent components in the pension system. The proportion of minimum guaranteed pension would make this system significantly more progressive than in the status quo.

Meinhard (2014) develops a model that might represent such a hybrid form. It would provide for a minimum guaranteed pension of 800 euros, but, at the same time, it would retain income-based elements.[86] It would provide for an extension of the compulsory cover to all citizens over the age of 18, as well as ensure parity between employees' and employers' contributions. Should, however, the employee not be able to afford his/her minimum contribution, this would be supplemented through tax revenue once the employee had reached retirement age, as long as the minimum guaranteed pension of 800 euros could not be met without subsidies (Meinhard 2014). Following the example of the Swiss pension model, the income threshold[87] would be abolished. This means that the existing principle of equivalence within the SPS would indeed be loosened up, but it would not be eliminated completely. The principle of contribution equivalence would remain in place up to a pension disbursement amount of 1.5 times the average pension.

Meinhard (2014) estimates the economic effects of the suggestions described above based on the data set of the German Socio-Economic Panel (Sozio-oekonomisches Panel, SOEP). In his estimation, including all people in gainful employment would indeed increase revenue in the pension funds by around 105 billion euros per year, but at the same time, civil servants and the self-employed would acquire pension rights, which would in turn increase the disbursements. In addition, introducing a minimum pension would give rise to an additional burden of around 26

[86] Meinhard 2014 described his model as "citizens' insurance". In order to avoid confusion with the citizens' insurance within the social health insurance we describe further below, we do not use this term here.

[87] The income threshold indicates the amount up to which SPS contributions are taken from the income of a person with statutory insurance. The portion of income that exceeds the income threshold is not taken into account. In 2016 it was 6,200 euros per month in western Germany and 5,400 euros in eastern Germany.

billion euros per year. These excess expenditures could, however, be compensated for by abolishing the minimum guaranteed pension and payments to surviving family members. Overall, according to Meinhard (2014), switching to a universal system results in a significant re-structuring on the financial side with additional revenue of between 20 and 50 billion euros.

Meinhard comes to the conclusion that the intergenerational redistribution pension system has proved its worth during the years of the financial crisis. A minimum pension, along with a simultaneous abolishment of the income threshold and the associated weakening of the equivalence between income and pension, could prevent poverty amongst the elderly, particularly for low-income households. On the other hand, Werding (2013) criticises the minimum guaranteed pension from the perspective of distribution policy. As an alternative, he argues for employing targeted measures that focus explicitly on the income situation of the supported households.

The literature does not explicitly discuss the question of how far a Beveridge system demonstrates higher or lower growth dependence than the Bismarck system. However, it is apparent that the Beveridge system is closely linked with the level and development of economic output: in a growth scenario with correspondingly positive effects on employment, either the contributions required to finance the minimum guaranteed pension must be reduced, or, if the level of contribution remains constant, the minimum guaranteed pension must be increased. Conversely, in a shrinking economy it would be necessary to increase the contributions or reduce the level of pension benefit. In a Beveridge system with a fixed level of pension benefits, growth dependence would therefore be even more pronounced than in a flexible, responsive system in which the amount of disbursements is linked with the (growth-dependent) amount of contributions.

4.3.1.5 Recognition of Non-Market-Based Activities

The suggestions presented thus far relate to different forms of monetary financing for the pension system. The range of topics is broadened within the post-growth discourse. Even if the proposed solutions are not as detailed and quantified as in the mainstream solutions, the central idea is to extend the range of benefits of a retirement provision system with values that are not traded on markets. Within the existing intergenerational redistribution system, monetary values are exchanged between age cohorts living in the same period (between people contributing to the system and people claiming monetary pension benefits). Höpflinger (2010) suggests extending the intergenerational contract by adding a social solidarity component and including non-market-based, socially valuable activities in this exchange too. According to Höpflinger, a pension system such as this could include not only monetary contributions but also various socially valuable activities (Höpflinger's examples are community work or people carrying out work themselves). In addition, the benefits claimed from the pension system would not be exclusively monetary.

This suggestion means that the dichotomy between working age and retirement that is anchored in the existing retirement provision would be eliminated (e.g. Höpflinger 2010, Paech 2012, Haug 2011). This is because numerous activities construed as contributions to the pension system could be carried out through into old age – and are currently carried out on an informal basis (Schneider et al. 2015, Höpflinger 2007): e.g. care work, community work or civic engagement.

In this regard, some authors suggest conceptualising human activities differently. Haug (2011) differentiates between four equal spheres of activity: (1) gainful employment, (2) family work, (3) community work and (4) development opportunities. Haug argues that everyone should be entitled to dedicate themselves to each of these areas equally. Ruh (1996) offers a more refined

suggestion for reconceptualising working hours, differentiating between seven different forms of activity: (1) working hours for the purpose of earning monetary income that add up to a maximum of a half-time post; (2) free time; (3) "me-time", i.e. having time to oneself; (4) voluntary time for community work, in which services can be rendered that fall outside economic parameters, e.g. socially focused tasks carried out on an informal basis, or operating exchange networks; (5) an obligatory period of community work (e.g. in the form of a year of service within the community) for young and retired people as part of a new generational contract; (6) time for carrying out work oneself, e.g. housework, repairs and other tasks that are taken out of economised labour and undertaken by individuals themselves; and (7) reproduction time for developing, supporting, educating and caring for future generations. The authors argue that alternative models for working life such as this, coupled with new forms of unpaid community work and work carried out oneself, would dissolve the separation between formal and informal work and in this way support and promote the social benefits of older generations. It would become the norm for people to remain independent through to old age, supported by the voluntary social contributions of others.

Within the post-growth discourse there have not yet been any detailed discussions on exactly how these different types of activity could be established and institutionalised in a modern society.[88] In principle, these activities could be taken into account in the pension formula in a similar way to how this is already implemented in care of the elderly: people accrue pension points in the SPS if they contribute at least 14 hours per week informal care for a relative (§ 3 German Code of Social Law VI).

In addition to the ambiguities around implementing a pension system broadened out to include non-monetary activities, there are also arguments against shifting activities into the non-professional sector, e.g. care of the elderly. Firstly, the work would not be paid, which means people in carer roles would be dependent on additional sources of income. This double burden can be connected with negative effects on the carers' health (Schmitz and Stroka 2013). Secondly, qualifications are necessary in order to ensure, for example, the quality of the care. Thirdly, it is unclear how the quality of care and support services, especially in the private sphere, can be assessed. Sometimes there is a higher guarantee of quality in the care provided by trained professionals than in the case of family members working on an informal basis.

Time Credit Systems

A suggestion, picked up on in the post-growth literature, for implementing the pension system set out above is the introduction of time credit systems. These kinds of systems are usually discussed in the context of accompanying, supporting and/or caring for older people. This is why we will focus below on this area of care. However, the idea of time credits may also be applied to the other activities mentioned above.

In a time credit system, citizens would provide voluntary support, accompaniment and/or care in the elderly care sector. In return, they would receive time credits which they could exchange for similar services at a later point in time. Time credit systems could function as an interest-free, inflation-free alternative currency; they have already been implemented on a smaller scale in Switzerland, Japan, Germany and other countries. The aim of such systems is to meet the increased demand for support and care due to demographic change, curtail the expected increase in the cost of care services, and provide an improved infrastructure for supporting older generations (Köstler 2006, Oesch and Künzi 2008). At the same time, time credit systems

[88] Further below, we discuss two more specific examples: "time credit systems" and "unconditional basic income".

support the execution of meaningful work through to old age and promote an appreciation and utilisation of the time older people have available (Oesch and Künzi 2008).

Empirical observations show that time credit systems have a mobilising effect because they integrate people who had not otherwise engaged prior to the introduction of such a system (Robert Wood Johnson Foundation 2007). There can also be a quantitative and qualitative improvement in meeting the needs of older people, for some services are often exclusively offered within the parameters of a time credit system, e.g. small domestic repairs or supporting someone after a period in hospital (Oesch and Künzi 2008). It is unclear, however, how far such systems can cover the increased demand for support and care services and curtail rising costs. The results from literature research and expert interviews suggest that the services rendered through time credit systems support care services but cannot replace professional care services. Oesch and Künzi (2008) therefore conclude that time credit systems can only cover the increased demand for supporting older people in conjunction with existing support and care structures. Furthermore, the economic impacts of systems such as this have not been conclusively investigated. Existing initiatives make it possible to delay admission to an elderly care or nursing home, which can reduce costs for the health service (Oesch and Künzi 2008). However, it is also important to take into account both the cost of providing such systems and the potentially increased costs of care provided outside of a hospital context (Robert Wood Johnson Foundation 2007).

In terms of practical implementation, hybrid exchange systems turn out to be the most successful. Here, individuals can choose whether to be compensated through time credits or money. Their success is due to the fact that they offer higher levels of incentive to participate, and once they have got off to a good start, they pay for themselves (Oesch and Künzi 2008). However, one challenge of current initiatives is the long-term securing of guarantees for redemption. These can take the form of guarantees from communities or of credits that are backed up with money.

4.3.2 Suggestions Regarding Health Insurance

The growth dependence of health insurance systems – which is a result, in particular, of both demographic change and developments in medical technology[89] – is likewise not only a subject of discussion in post-growth literature but also in mainstream literature. For this reason, we will present, once again, different suggestions from the various debates on the possibilities for structural reform within statutory health insurance (SHI).

4.3.2.1 "Citizens' Insurance"

Since the Rürup Commission, which operated from November 2002 to August 2003, there have been repeated discussions around a major reform of SHI, employing the idea of a "citizens' insurance", i.e. a basic universal insurance. This could eliminate the duality in the current system, which consists of private and statutory health insurance.

The various concepts of a citizens' insurance come predominantly from the left of the political party spectrum. What is generally common to all the suggestions is the aim of extending cover to all people in gainful employment, i.e. to civil servants and the self-employed, who thus far have been treated separately. Furthermore, the Social Democratic Party (SPD), the Left Party and the Green Party all agree that there should be parity in income-based contributions, i.e. the employee and the employer should share these out equally between them. The SPD would, in

[89] As we describe in Chapter 3.2 in more detail, in the past, many of the cost increases in the health system could be explained by advances in medical technology.

addition, like to secure a gradual increase in tax participation by the federal government in the citizens' insurance. The Left Party and the Greens do not support this suggestion. Their proposal is to extend the financial basis of the citizens' insurance by placing duties on capital income. There are also different suggestions regarding the income threshold. The Left Party proposes eliminating it completely, the SPD would like to remove the upper limit for contributions by employers, and the Greens plan to raise this to the level applied in the SPS.

Like the "pension for all", the hope behind the citizens' insurance is that it will be easier to cope with the challenges of demographic change if the burdens are distributed more equally across the population. This would overcome the status quo of the present system, in which high-income claimants, for the most part, have private cover and do not participate in solidarity-based SHI (Leiber and Zwiener 2006). In the new system it is primarily people with a high income and who currently have private health insurance who would pay in higher contributions, as then the contributions would no longer be exclusively based on their age and their risk estimate with regard to their future health, rather exclusively on their individual income. This is precisely what proponents of the citizens' insurance see as the advantage of such a reform. On the one hand, it would remove the "unfair" competition between statutory health insurance funds, which must insure against all risks, and private funds, which may limit themselves to lower risk subscribers. On the other hand, it would improve the financing of health insurance funds overall (Leiber and Zwiener 2006).[90]

In addition, according to its proponents, a citizens' insurance would improve the cover of self-employed people with a low income. Changes in an individual's employment history blur the boundaries between dependent employment and independent work. As well as those who have chosen to become self-employed, many people are more or less forced into formal self-employment under sub-contractors and franchising in many service professions, in the healthcare and care sector, but also in the building sector (Kurth et al. 2016). The social security would have to be adapted to these developments and would have to cover people in self-employment more effectively – its proponents believe the citizens' insurance would achieve this.

Thus far, it is unclear how the transition from the status quo to the desired model would function. All the suggestions are based on the assumption that there would be no new admissions into private health insurance schemes (Paquet 2013). There would probably be a right of continuance; nonetheless, the future of private health insurance schemes would be unclear. They could presumably also offer a citizens' insurance, but some authors, e.g. Paquet (2013), doubt whether they could be competitive in this area, as their staff is significantly better paid.

Because the financing of healthcare provision would be improved through the citizens' insurance, this could contribute to lowering growth dependence. A system with a broader financial basis would have more scope for reacting to demographic change and would therefore be less reliant on increases in earned income. In actual fact, Augurzky and Felder (2013), for example, have found that the rate of contribution to healthcare funds would fall by 0.7% if everyone who currently has private insurance were to be transferred into the SHI. Rothgang et al. (2011) have calculated a decline of 1.2%.[91] However, we must also consider that the effect of

[90] An experiment was set up in the state of Hamburg in 2018, that some saw as promoting competition, while others saw it as a step towards citizens' insurance. The aim of the "Gesetz über die Einführung einer pauschalen Beihilfe zur Flexibilisierung der Krankheitsvorsorge" ("Law on the Introduction of a Flat-Rate Benefit for More Flexible Healthcare Provision") was to allow, from August 2018, civil servants in Hamburg, to choose between: continuing to receive an allowance and insuring themselves privately, or contributing to statutory insurance, where the City of Hamburg pays the employer's share.

[91] These models, however, do not consider the question of which system would be used for the remuneration of doctors within a citizens' insurance. If doctors' trade unions did not agree to the entire remuneration system being based on the uniform assessment scale of the SHI, this would lead to an increase in the remuneration level.

decreasing the contribution rate would probably only be felt in the medium to long term, as, given the right of continuance of those currently privately insured, the SHI member base could only be expanded very slowly (Pfaff et al. 2005).

However, there are also critical voices who question eliminating the duality. Augurzky and Felder (2013), for example, emphasise the significance of private health insurance as an important complement to statutory health insurance. Due to demographic development, they argue, the intergenerational redistribution system faces serious problems that can be better compensated for within private health insurance by utilising the international financial markets. Moreover, in simulations of a citizens' insurance they find there would be negative effects on employment due to the increased non-wage labour costs of higher earners.

In the following two sections we will discuss each of the "small-scale" suggestions for reform separately; they are indeed part of a comprehensive concept of citizens' insurance, but in principle they could also be introduced separately. They explore the economic consequences of the various aspects of a citizens' insurance in isolation from one another.

Abolishing the Income Threshold

Abolishing the income threshold would undoubtedly improve the financial basis of the SHI and could make the system more robust vis-à-vis the consequences of demographic change. This is also confirmed by the model calculations by Augurzky and Felder (2013). In their simulation, the income threshold of the SHI is raised to the level of the SPS (in the year 2013: €69,600). Consequently, the contribution rate to the SHI would fall by 0.5 percentage points by 2040. Despite this, Augurzky and Felder (2013) take a critical view of this measure. They argue on the one hand that raising the income threshold would strengthen the redistributive character and therefore the taxable character of the SHI. This, however, would contradict the original aim of using the health insurance not for implementing distribution policy objectives but for creating incentives for the efficient provision and availment of healthcare services. They believe that the implementation of political preferences with regard to equitable distribution should be concentrated within the tax and transfer system and not, due to negative efficiency aspects, additionally within health insurance.[92] Secondly, Augurzky and Felder (2013) fear there would be negative effects on the supply of labour, or even that qualified skilled personnel would go abroad.

Tax-Based Financing

One suggestion frequently put forward in the context of a citizens' insurance is to extend the financial basis to other types of income, in particular capital income. In the corresponding scenario calculation by Augurzky and Felder (2013), the capital gains tax would be raised from 25 to 30%. The state would place the resultant increased income at the disposal of the healthcare fund in the form of a tax subsidy. This would lead to a minimal reduction in the contribution rate of the SHI (0.1 percentage points in 2040). Including a capital gains tax as part of the financing model for the SHI would therefore be, at best, symbolic.

Monetary Incentives

Studer (2003, 2010) has suggested slowing down rising costs for patients by means of incentive systems, which would help to decouple the healthcare system from the need for growth. Systems that would come under consideration here would be those in which the availment of healthcare systems were linked with financial incentives designed, at the same time, to be socially responsible. One possible approach would be to divide up the insurance contribution, with one

[92] For a regulatory discussion on the functions and principles within the tax and transfer system as well as the duty system, see e.g. Schmähl (1984).

portion of the premium flowing into a personal, earmarked healthcare account belonging to the person insured, and the other portion into a solidarity account. Healthcare costs would initially be covered by the personal healthcare account. Once this was exhausted, patients would then have access to the solidarity pool, minus the cost sharing fee. If the person insured remained in good health, the amount saved in the healthcare account would grow and the premium share would gradually reduce to zero. This would give those persons insured an incentive to take an active approach to maintaining their health and only to claim healthcare services where there is an appropriate relation between costs and services. Studer does not directly mention adapting the insurance premium and the maximum personal contribution rate to the income of the person insured, but we believe this would be necessary in order to fulfil the principle of distributive justice.

Furthermore, Studer (2010) discusses approaches in which those insured would undergo a voluntary health test accompanied by a health consultation. If they fulfilled certain criteria, e.g. regarding body weight, fitness, relaxation ability and no addiction to drugs, they would receive a discount on their insurance premium (e.g. 5–15%) over a particular period of time (e.g. two years).

A greater assumption of responsibility such as this, however, raises the question of to what extent people are, can be or should be (co-)responsible for health and sickness. Critics of such approaches therefore argue that they could lead to people with illnesses being made responsible for the state of their health (Marckmann et al. 2004). This would mean that promoting personal health competencies and extending the options in terms of the medical action individuals could take would not only lead to empowerment but also to a burden of obligation (Ahrens 2004), which might also involve individuals having to take financial responsibility for their health (Ried et al. 2010). However, the complex interplay between genetic and external factors (e.g. burdens created by working and living conditions that are distributed in socially inequitable ways) influences patients' behavioural room for manoeuvre in terms of restoring or maintaining their health. For Ried et al. (2010), using individual responsibility as a financial steering instrument in order to legitimate reducing costs within the healthcare system is therefore ethically indefensible, and Ahrens (2004) surmises a systematic overestimation of the effect of educational measures.

Moreover, it is unclear how far the prospect of downstream financial burdens would motivate the people concerned to switch to preventative behaviour, or how far it would be possible to decrease healthcare costs by employing financial incentives (Ried et al. 2010). For example, the introduction of a quarterly surcharge for visits to a doctor's practice from 2004 to 2012 in Germany had no long-term effect on the number of visits to the doctor (Jörg 2015). Neither would the fall in demand for healthcare services necessarily lead to a fall in costs. Lower demand for medication over the past decade has not, for example, led to a fall in benefit payments. Rather, these have risen sharply due to medication becoming increasingly more expensive (Hoh and Honekamp 2010).

4.3.2.2 Shift in Consciousness

Another suggestion is to initiate a shift in consciousness in the approach to health (Studer 2010). Educational measures improving individuals' own competencies, and the associated assumption of responsibility by individuals themselves should enable citizens to take a more active approach to maintaining their health, and to deal with illnesses and treatment options on a more conscious level. Central to this is learning how to use household remedies, activating the body's capacity to self-heal, and developing the ability to comprehend illness as a learning process.

Studer (2010) claims that this may lead to a more conscious and targeted, and therefore also more measured, approach to modern medicine.

Another suggestion within the post-growth literature is, as a cost-cutting measure, to integrate more helpers without medical qualifications (Boyle et al. 2006). In the case of some chronic illnesses, changes in individuals' own lifestyles requiring high levels of self-motivation are very important for successful treatment. It is precisely here that such helpers could make an important contribution. A successful example of this is the British model of the "Expert Patient Programme", in which patients with chronic conditions support newly diagnosed patients by offering self-management training and sharing their experiences. As well as promoting a more conscious approach to one's own illness and an improved sense of well-being, the programme has led to a significantly reduced uptake of medical services (Bower et al. 2010).

Supplementing Orthodox Medicine with Complementary Medicine

According to Studer (2010), health systems in a post-growth society would not only be based on body-centred orthodox medicine but would take the holistic medical approaches of complementary medicine into greater consideration. With chronic illness in particular, it is important to consider the connections between physical symptoms and psycho-social conditions. According to Studer, integrative approaches are often better here than purely body-centred orthodox medicine. Studer argues that as well as promoting health, integrative medical approaches may contribute in the medium and long term to reducing costs.

A study by Studer and Busato (2010) shows that Swiss doctors with additional qualifications in complementary medicine spend significantly more time on diagnosis and therapy but prescribe less medication. Higher personnel costs are covered by lower medication costs, which means the costs per patient are no higher. At the same time, there is a reduction in medium- and long-term follow-up costs because the emphasis is not on treating symptoms but on understanding and treating the causes of illnesses. The prerequisite for such developments in the healthcare system would be, inter alia, the creation of legal framework conditions that officially recognise and promote complementary medicine.

Boyle et al. (2006), in addition, emphasise the need for a close relationship between doctors and patients in which the patient's knowledge is taken into equal consideration. They argue that the focus of existing healthcare systems on the clinical picture instead of on individual patients neglects the knowledge potential of the patients themselves, who often know their bodies and their illnesses best. Actively involving the patients in processes of diagnosis and treatment, they say, leads to more effective, more individual treatments and enables patients to assume greater responsibility themselves.

The effectiveness of complementary medicine practices is, however, disputed. Opponents criticise the lack of comprehensive clinical evaluations for analysing the effectiveness of methods, the speculative theoretical explanatory models, and the anecdotal character of much of the ostensible evidence of efficacy. Moreover, the effects of some alternative medicine practices have not yet been empirically verified (Schultz et al. 2006). Nonetheless, positive effects have been observed in some alternative medicine practices. Some authors attribute these to the improved quality in the interaction between patients and doctors, which frequently goes hand in hand with treatment in complementary medicine and is possibly more important than the treatment method itself (Turner et al. 1994, Di Blasi et al. 2001, Kelley et al. 2014).

Working and Living Conditions That Are Beneficial to Health

Post-growth authors also believe that in order to decouple the healthcare system from growth it is necessary to create legal framework conditions setting out working and living conditions that

are beneficial to health. As well as conventional protective measures, Studer (2010) also mentions numerous measures with preventative effects that ought to reduce healthcare costs in the long term.[93] Furthermore, Seidl and Zahrnt (2015) call for a critical analysis of (direct and indirect) subsidies on sugar, meat and other animal proteins which lead, in the long term, to lifestyle illnesses associated with high costs. Boyle et al. (2006) believe it is necessary to introduce incentive mechanisms for companies to offer products that are beneficial to health and to increase the use of health indicators as national indicators of welfare. Wilkinson and Pickett (2010) as well as Studer (2010) also point to the influence of social inequalities on the state of people's health within a society. They identify a relationship between illnesses and both poverty and overconsumption. According to Wilkinson and Picket (2010), where social inequalities have been reduced, this has had a positive effect on the state of health of people within a society. However, this causal interpretation of the correlations presented by Wilkinson and Pickett is highly contentious within the literature.[94]

Practical Example: Artabana Network

One example of what healthcare provision in post-growth societies might look like is the Artabana network, which is widespread in Switzerland and Germany (Habermann 2016). Artabana is a solidarity-based community, organised into local units, which covers people if they fall ill. Central to it is a stable basis of trust among its members, who mutually support one another in maintaining their health. The aim of the network is to contribute to a new, holistic understanding of the implementation of social security. Local Artabana communities are combined into regional confederations and consist of 5 to 30 members who meet up regularly. In Germany there are currently over 200 local Artabana communities.

Members pay monthly contributions, which they reassess every year, and which consist of what they themselves expect to pay for healthcare provision and managing illnesses, as well as an additional amount for local and national emergency funds. The members have complete financial autonomy and decide themselves what they would like to contribute individually and how the money should be used. If they fall ill, they become self-pay patients who are free to decide what kind of therapy and treatment to pursue and are free to negotiate costs with doctors. In this way, the system can also be used to finance alternative treatment methods. In situations in which the finances required exceed the individuals reserves, such as in the case of an accident or if there is a need for care, the solidarity-based funds can be used.

This means that all members have a basic cover, the type and scope of which is comparable with statutory health insurance schemes. However, there is no entitlement to access the solidarity-based funds. The specific coverage of the solidarity-based benefits is determined by dialogue between the members. In principle, decisions are taken on the basis of consensus or at least with a qualified majority of 75%. Thus far, however, there have been no studies that have reviewed the practice of this network with regard to its long-term capacity and social scalability.

[93] These are: restricting working hours, reducing night and shift work, adequate maternity and paternity leave, measures for reducing traffic and avoiding pollution and noise immissions, protection from radiation that is harmful to health, promoting social integration, preventing violence and addiction, promoting agriculture in harmony with nature, promoting healthy food, protecting nature as an environment and the basis of life.

[94] Wilkinson and Pickett (2010) have been much criticised in the literature for listing purely descriptive and, in each case, exclusively bivariate regression analyses (on the correlation between "inequality" and X, where X may stand for various indicators such as satisfaction with life, criminality, health, etc.) and misinterpreting these as an analytical tool for deriving causal statements. They have even been criticised, in particular, by empirical economists who have equally studied increasing inequalities in depth and also see these as a cause for concern. By way of an example, Deaton (2011) explores the correlation between inequality and health.

4.3.3 Cross-System Suggestions

4.3.3.1 Unconditional Basic Income

Both in the sections on the independence of employment from growth and in those on social security systems, we have mentioned the concept of unconditional basic income as a suggestion under discussion in the post-growth literature. In this chapter we will turn to the analysis of its effect in terms of promoting independence from growth.

Within the overarching concept of the "unconditional basic income" (UBI), the discussion focuses on different concepts that would enable each citizen to receive a set amount of state-financed income independent of their individual economic situation. The advantages that individual proponents associate with the basic income range from more opportunities for individuals to determine their lives themselves, free from the fear of losing their livelihood (Werner 2007), through to possible institutional efficiency gains. Here, the expectation is that many of the social benefits that have thus far been means-tested would be replaced with the unconditionally guaranteed basic income (Althaus 2007, Straubhaar 2008). What all of the ideas have in common is that they make an insurance against loss of income in old age superfluous, since the basic income would be paid out through to the end of the individual's life. This would make the SHI redundant. There are different answers to the question of how, with respect to the SHI, the loss of net social contributions could be compensated for. The financing of a UBI could also take different forms depending on the concept.

Concepts for the UBI

The concept proposed by Dieter Althaus, the former Minister President of Thuringia and party member of the Christian Democratic Union of Germany (CDU), is based on a negative income tax modelled by Milton Friedman (1962). All incomes would be subject to a 40% flat tax. The resulting tax liability would be offset against a basic income. Individuals with incomes of more than €1,500 would pay a positive income tax to the tax office and those with incomes less than €1,500 would receive a citizens' benefit in the form of a negative income tax. In addition, they would receive a "health and care premium" of €200 paid directly into the health insurance funds. Depending on the individual's employment history, people over 60 would be paid a minimum guaranteed pension, as well as a supplementary pension and a pension for parents, of maximum €1,800 per month. Benefits already acquired that exceed the minimum guaranteed pension would be financed by a supplementary pension allowance during the adjustment period. This would in turn be financed by a payroll tax of 12% initially. The financing of the so-called "solidarity-based citizens' benefit" would be based on three pillars. First, the flat tax of 40% on all incomes, inclusive of capital income and the basic income; second, an expansion of value added tax into a general "consumption tax" of 19%; and third, a payroll duty of 18% on the part of the employer.

Fuest and Peichl (2009) simulate a variant similar to the unconditional basic income based on the wage and income tax statistics, and on the SOEP. People over the age of 18 would receive €700 per month and a further €500 for each child. As in Althaus's model, the basic income would offer a "health and care premium" of maximum €200. Furthermore, incomes under €1,400 would be netted at 50% and incomes over €1,400 would be taxed at 25%. People with incomes over €1,400 would, in addition, be granted half of the citizens' benefit as a tax exemption, the result being that the tax system would have an (indirectly) progressive effect (Fuest and Peichl 2009). Employers would pay a tax amounting to their social contributions thus far. Based on this assumption, the labour costs and therefore the demand for labour would remain constant within this model. In the final analysis, the basic income would certainly create slightly positive incentives, but overall it would lead to a funding gap of 30.3 billion euros. The

authors conclude that basic income concepts either could not be funded or would have a negative effect on employment.

The model by Götz Werner, the former head of the health and beauty store "dm", provides for a higher basic income, which would guarantee citizens the opportunity for self-determination by making them financially independent. The exact amount of the basic income is not explicitly stated in the model, but the title of Werner's 2007 book "1000 € für jeden" ("€1000 for everybody") might serve as a point of reference here. According to Werner, the income would be financed through value added tax, which, at the same time, would become the only tax (Initiative Unternimm die Zukunft 2018).

In 2008, the Hamburg Institute of International Economics analysed the concept of an "ideal-typical" basic income. This would constitute a lifelong, unconditional transfer payment amounting to the minimum level of subsistence. Foreigners living in Germany would be entitled to claim the basic income depending on the length of their legal residency in Germany (10% per year – i.e. after ten years of residency they would be entitled to the full amount). The amount of the ideal-typical basic income is not explicitly defined but would be subject to a policy decision. In principle, high basic incomes would require high tax rates; low basic incomes would enable low tax rates, according to Straubhaar (2008). Every euro earned in excess of the basic income would be subject to a flat tax. Tax exemptions would not apply, as the UBI would function like a tax exemption. All benefits financed by taxes and duties, including the SPS, unemployment and long-term care insurance as well as the ALG II unemployment benefit, housing benefit, child benefit and social benefit, would be stopped. This would lower non-wage labour costs. In the model analysed by the Hamburg Institute of International Economics, basic health and accident insurance would be compulsory. The contribution necessary for providing minimum benefits within a health insurance fund would be offset by, or calculated on the basis of, the basic income, and would be presented in the form of an insurance voucher that could be redeemed with any health or accident insurance and would provide a basic level of cover. Furthermore, all socio-politically motivated regulations within the labour market (protection against dismissal, minimum wages, master contracts) would be removed.

As well as the approaches to financing the UBI that have been presented thus far, some growth-critical authors suggest financing the basic income either by taxing resource consumption and/or capital and high income (cf. Schachtschneider 2014) or through money creation by the state (Alexander 2014, Raventós 2007). These authors also discuss the introduction of both upper income and asset thresholds in order to counteract the trend towards increasing social inequalities (Alexander 2014, Daly 1991).

Is an Unconditional Basic Income Independent from Growth?

What the suggestions for an unconditional basic income presented here have in common is that they are financed through taxes. If they were adopted, the intergenerational redistribution system within the SPS, and in most of the suggestions also in the SHI, would be suspended[95].

However, the extent to which the UBI and the accompanying tax-based financing could mitigate the problems of demographic change and the concomitant growth dependence of retirement provision is at least very questionable. As explained further above, taxes too are predominantly dependent on wages. The extent to which tax revenue is determined by economic growth is in turn dependent on the specific design of the tax system.

[95] Although necessary at this point, we will not now go on to discuss the regulatory matters in connection with the principle of equivalence that is anchored in the SPS and that would be relaxed through tax-financed retirement provision. For further literature on this topic, see e.g. Schmähl (2013) and Schramm (2008).

The effects of demographic change on the assessment base for income tax are difficult to quantify (SVR 2011). In the current status quo, the income tax rate during an individual's working life is generally well above that in the retirement phase. This means contributions by the working population tend to be subject to higher taxes than the associated pension payments. In an ageing society the tax revenue would therefore, ceteris paribus, fall. The models proposed by Straubhaar and Althaus would be financed by a flat tax on income. Retirement income would therefore be subject to the same tax rate as earnings from gainful employment. However, the assessment base for people in gainful employment will probably continue to be higher than that of the pensioners, which means that in an ageing society with a UBI, an ever-increasing proportion of basic incomes and pensions would have to be financed by the incomes of those in gainful employment. Here, incomes over a particular threshold would finance the basic income for people on lower incomes. All pensioners solely in receipt of the solidarity-based citizens' benefit would have to be co-financed by positive taxes paid by those in gainful employment. A negative income tax would therefore suspend the intergenerational redistribution system only for low earners. Thus, the models proposed by Straubhaar and Althaus do not adequately address the problems of demographic development.

Werner (2007) provides for financial redress through a consumption tax that could be increased up to 100%. According to Werner, financing the basic income through value added tax represents an option in which the demographic development would not pose a problem for the tax revenue (Initiative Unternimm die Zukunft 2018). In general, the savings ratio reduces in old age, as older people need to put less money aside. If the consumption ratio in an ageing society were to increase, and if the additional consumption were to happen in the country, then the tax revenue from a consumption tax in an ageing society could rise. This of course would require the basic incomes provided through tax to be high enough so as not to compromise consumers in their consumption capacity.

The preference structure of the older generation would play a pivotal role in this. If there were to be an increased demand for non-tradable services, this would reduce activity within the (capital-intensive) sector of tradable goods, and the capital stock within companies would decline. This would impact on company earnings and the associated tax base. Financing the basic income through a consumption tax could therefore in fact sever the pension system's direct financial dependence on the incomes of people in gainful employment. However, because taxes are to a large extent dependent on growth, the UBI may in theory solve the problem of demographic change as regards the intergenerational redistribution system, but it cannot sever the dependence of retirement provision on growth.

This is because irrespective of whether a basic income is financed by an income tax or a consumption tax, the tax revenue is primarily dependent on the level and development of economic output and therefore on economic growth (SVR 2011). The concepts for an unconditional basic income presented here would therefore not be able to disentangle the public finances and the social security system from the dependence of tax revenue on economic growth.

The post-growth literature, too, presents a range of objections to the introduction of an unconditional basic income. On the one hand, authors criticise the minimal redistribution effect despite the high financial expenditure. A basic income of 700 euros for adults and 400 euros for children would result in annual costs of approx. 650 billion euros (Hauser 2006). This corresponds to approximately three quarters of the entire German social budget in 2015 (Bundesministerium für Arbeit und Soziales 2016). In order to avoid an oversupply and in order to cover the costs, many of the existing benefits would have to be abolished, which at least calls into question the redistribution effect some of the proponents of the basic income believe it

would produce. Hauser (2006) also levels the criticism that introducing an unconditional basic income would redistribute large amounts of public money without disadvantaged people benefiting from this. Topping up low incomes, he argues, would be much more cost-effective. On the other hand, critics fear people would be less motivated to work, particularly low earners, who would probably be less willing to take on gainful employment (Hauser 2006). At the same time, a basic income would incentivise immigration, even if it were restricted to people with their primary residence in Germany (Hauser 2006).

4.3.3.2 Eco-Taxes

In terms of the goal of establishing a sustainable society that is less reliant on economic growth, the eco-tax would have two advantages: firstly, introducing or increasing an eco-tax would increase tax revenue that could then be used to finance, for example, transfer payments. Secondly, it would create an incentive for consumers to purchase environmentally friendly goods (steering effect). In contrast to regulatory measures with the aim of steering behaviours, an incentive-based measure such as a tax would require little expenditure on information and monitoring. However, the eco-tax would only be suitable in the phase of transition from an environmentally unfriendly to an environmentally friendly post-growth economy. This is because once the goal of a climate and environmentally friendly economy was achieved, energy, for example, would be consumed from renewable sources and the revenue acquired through an eco-tax would fall, provided the tax rate didn't increase.

For this reason, a quantity tax (i.e. taxation per quantity unit consumed) would be preferable to a value tax (taxation per price unit consumed). Should environmentally and climate unfriendly goods become cheaper because of lower demand, the tax revenue in a quantity taxation system would only decrease to the extent that smaller quantities are consumed. In a price tax system, by contrast, there would be a much sharper decrease in tax revenue because both quantity and price would decrease during the transition to an environmentally friendly economy. Depending on how the ecological tax is designed, it could have regressive distribution effects: low earners generally spend a higher proportion of the household income on energy than high earners, which means they would be spending more on taxes too.

An empirical example of the introduction of an eco-tax is Germany. Since the introduction of the "Gesetz zum Einstieg in die ökologische Steuerreform" ("First Step toward an Ecological Tax Reform Act") in 1999 (BGBl. I: 378), a number of tax laws with ecological objectives have been passed. Since 1999 there has been a tax on electricity – with eco-electricity being partially exempt from this[96] – as well as an increase in fuel tax. However, the tax liability does not apply to everyone to the same degree. Some energy-intensive sectors of industry have been exempted from it in order to prevent international competitive disadvantages. This may have severely weakened the steering effect (DIW 2010). For example, the fuel tax has not been able to reverse the long-term trend towards the increased use of cars. The tax revenue from environmentally-related taxes amounted to 58.2 billion euros in 2015.

Another empirical example of the introduction of an ecological tax is British Columbia, Canada. The coal tax law passed here in 2008 was the very first one of its kind in North America. In 2012 the tax amounted to 20 USD per tonne of CO_2, covering around two thirds of all greenhouse gas emissions in the province. By introducing the coal tax, the CO_2 emissions were reduced by 5 to 15% (cf. Murray and Rivers 2015). The tax revenue was used to finance tax decreases in other areas – e.g. to prevent degressive effects of tax in the low-wage sector.

[96] However, the tax exemption for eco-electricity is very limited and does not take effect in many cases (see § 9 Stromsteuergesetz / Electricity Law).

4.3.3.3 The Henry George Tax

A further political instrument that could be suitable for topping up the tax revenue in the context of a post-growth economy is the so-called Henry George tax, or a variant of this. This tax concept is named after the American economist Henry George (2006 [1879]), who suggested imposing only a single tax – specifically, a tax on the value of land.[97] Because, George argued, the value of land is primarily dependent on investments in public goods (e.g. investment in infrastructure, an intact environment, etc.), which in turn are financed to a considerable extent by the state budget, the next logical step towards tax equality would be a tax levy on the ground rent for the benefit of society. Speculative gains (e.g. in the case of price increases in urban centres) would also be levied through the tax. George's hope was that this would lead to a fall in the demand for land and therefore a decrease in prices.

From the perspective of taxation theory, the land tax has the advantage that the supply of land is of course fixed and perfectly inelastic, so there would be no erosion in the tax base (Stiglitz 2010). A second argument advanced in favour of the Henry George tax and in contrast, for example, to the consumption tax is that it would have no degressive effect. On the contrary, it would result in a more even welfare distribution because, in most cases, people in the low-wage sector do not own any land. In addition, in its proposal for a reform of the land tax in Germany, the Nature and Biodiversity Conservation Union (NABU) suggests a positive steering effect of land tax that could also be interesting in terms of an environmentally and climate friendly post-growth society. This tax would increase the incentive to build on land in urban regions more efficiently – i.e. to build upwards rather than outwards. It would therefore restrict additional soil sealing. A tax exemption for private (re-)natured land, e.g. forests, could increase these incentives further (NABU 2011).

In Germany, the land tax is already a separate value tax on land that flows into the municipalities. However, at 1.6% of all tax revenue, it is relatively small (Destatis 2016). The legal basis is the "Grundsteuergesetz" ("Land Tax Law"). Each municipality sets an individual tax rate by applying a specific collection rate to the standard nationwide values for built and unbuilt real estate established through a standardised method. This means that structures are already in place for developing a more comprehensive land tax.

A good example of the introduction of a Henry George tax is Pittsburgh in the US state of Pennsylvania. In general, in the USA, a flat tax rate is applied to the value of land, including any buildings that may stand on the plot. However, Pittsburgh's taxation system has functioned separately since 1980. In 1980 the land tax rose sharply, amounting to five times the buildings tax. In combination with a reduction in buildings tax, this triggered a building boom (cf. Cohen and Coughlin 2005). The Henry George tax meant that it became considerably more expensive to own unbuilt land than it did to own built land with its associated revenue. This created stronger incentives to invest in buildings rather than buy land and speculate on price increases.

Overall, the result is interesting: the Henry George tax – which, because of the apparent independence of its assessment base from growth, appears to be an attractive candidate for financing a post-growth society – could itself trigger growth effects through the incentives it induces. Whether this effect is desirable from an ecological perspective depends on whether the induced growth would be connected with (additional) environmental pressures, and what these might be. If we assume that corresponding regulations would at all events ensure compliance with ecological restrictions, then the potential growth effect induced by a Henry George tax would be positive.

[97] An up-to-date discussion can be found in Edenhofer et al. (2015).

4.3.4 Preliminary Conclusions

In this subsection we have discussed the instruments and measures that have been suggested in the literature for weakening the growth dependence of two social security systems – pensions and health insurance. We have considered the following options for reform in detail:

- Distributing the burdens between contributors and claimants differently (adjusting the length of working life; funded pension insurance within the SPS);
- Expanding the contributor base ("pension for all", Beveridge system within the SPS, citizens' insurance, tax-based financing);
- Extending the understanding of what counts as a contribution or a benefit (recognition of non-market-based activities and time credit systems within retirement provision);
- Causing a reduction in insurance claims and the benefit volume (through a shift in consciousness towards healthy living).

As regards pension insurance, we conclude that the measures we have analysed have only a relatively low potential for eliminating or considerably reducing growth dependence. Neither a longer working life nor the "pension for all" nor a basic income can fully eliminate the direct connection to economic output on a permanent basis. In essence, these ideas for reform propose, above all, alternatives to the current burden distribution. Temporary initial gains, such as are possible in the model of a "pension for all", can at best be interpreted as a temporary relaxation of growth dependence. In periods when there are distinct demographic imbalances (such as the retirement of the baby boomer generation), these ideas for reform can be considered from this perspective, where appropriate. The positive effect described is certainly tainted with an uncertainty arising, in particular, from the insecurity about how the labour market will adapt. And one thing is for sure: these ideas for reform are unable to substantially contribute to a permanent reduction in growth dependence.

Even those approaches from the post-growth literature that aim to extend pension insurance by integrating non-market-based, socially valuable activities can, based on the empirical studies thus far, at best offer only a marginal reduction in growth dependence. Due to the lack of empirical research results, it is not possible to quantify the extent to which the respective benefits can be provided outside of the market (nor the quality of these) and how these would affect the growth dependence of pension insurance. Theoretical arguments, however, suggest there would be no substantial effect. They suggest that systematic impediments – e.g. demographic change or efficiency and time budget restrictions on non-market-based activities – would still exist after the reforms. Beyond the positive activation effects, which would be limited in terms of their potential, we would expect to see rather minor net effects, the nature of which would still be uncertain.[98]

This is because the systematic relations would continue to exist even in a correspondingly extended system – e.g. the fact that in future, because of demographic change, an increasing number of older people will have to be provided for and cared for by a decreasing number of younger people. Furthermore, each hour of work can only be performed once, either within the labour market with correspondingly positive contribution effects or in the context of a non-market-based activity. This means that beyond the positive activation effects, which would be

[98] As individual time budgets are limited, we must assume that a higher proportion of non-market-based activities would lead to a reduction of market-based activities and therefore activities subject to taxation and contributions. Consequently, the receipts and expenditure of the established social systems would decrease or increase less sharply than would be possible in the case of a mere extension of working life. As a result, the existing growth dependence would then in fact be intensified, or would at least be less weakened than would be possible in a policy approach more strongly focused on increasing the premium volume.

limited in terms of their potential – e.g. accepting socially focused activities in parallel with drawing a pension –, only rather minor net effects would be conceivable, the nature of which would still be uncertain. Moreover, it is at present not clear what contributions and benefits within a pension system extended to include non-market-based activities would look like.

There is greater potential within health insurance – if not for an elimination of, then indeed for a certain reduction in, growth dependence. This is why the starting point would have to be the cost side of the system in particular. Greater efforts to prevent illnesses through stronger incentives for health-conscious behaviour, as are suggested by several post-growth authors, for example, could contribute to this. However, the demographic challenge represented by the fact that health insurance must increasingly be financed by fewer people of working age cannot be managed through measures such as these, and neither can the financing of developments in medical technology. This is why a re-structuring of revenue and expenditure plays a prominent role in the proposed solutions above. In this respect, however, the result is the same as in the case of pension insurance: even if the individual options for reform differ in terms of their specific burden distribution, further economic growth would still enable, within each system, a more favourable contribution or tax-benefit-ratio than could be achieved without economic growth.

Some members of our author team, however, are of the opinion that we cannot, in principle, deduce from these assessments that it is neither possible nor conceivable to design social security systems in such a way as to make them substantially less dependent on growth. It should merely be emphasised that, based on what we know thus far, the measures considered in this discussion paper are not adequate enough to achieve this goal. It is therefore not possible to say anything about the potential of further conceivable measures.

5 The Precautionary Post-Growth Approach and Societal Change

Wealthy industrialised countries must align their economy with planetary boundaries. This has now become a normatively recognised and widely accepted objective, both in societal and policy terms. As is discernible from the discussion on the growth question, the socio-political discourse on environmental politics is to a great extent segmented and polarised, with proponents of green growth and degrowth at the two ends of the spectrum of opinion. This prevents important findings from both strands of the debate from being brought together productively. Given the very demanding and antagonistic "green growth" and "degrowth" approaches (cf. Chapters 2.2 and 2.3), for the purposes of developing consistent sustainability policies, it seems preferable to explore room for mutual understanding in the sustainability debate and productively identify elements of consensus. The present discussion paper would like to submit a proposal for this in the form of a precautionary post-growth approach.

Complying with planetary boundaries requires far-reaching social change. As the results from Chapter 2 show, it is not a case of pursuing one single specific transition path or one specific environmental policy approach in isolation, given our limited knowledge. In our view, we must instead develop action-oriented "pragmatic" strategies and corresponding "policy mixes" that refer to appropriate and mutually compatible elements of different strategic approaches, and which can be connected in the "here and now". The authors thus offer a proposal to achieve this: the precautionary post-growth approach (cf. Chapter 5.2).

Irrespective of which approach to transformation is ultimately followed, it requires the relevant knowledge of how fundamental economic and social change processes take place and which factors affect them. At the beginning of this chapter, we will therefore provide a brief overview of the heuristics currently under discussion, without claiming to do justice to the full complexity encompassed by these different approaches (Chapter 5.1). We will then relate these to the precautionary post-growth approach (Chapter 5.2) and outline its elements of action.

5.1 Conditions and Dynamics of Social Change Processes Targeted at Complying with Planetary Boundaries

In the relevant academic discourses there are many different answers to the question of which factors significantly influence profound social change processes. One relevant approach to the question could be the ex-post evaluation of the emergence of our "growth society" based on economic growth. In economic history and institutional economics discourses, the theory that **cultural changes** are primary triggers for the growth dynamic and the emergence of the growth-driven society is increasingly being advocated.[99]

With regards to the social importance of economic growth, the emergence of a **"culture of growth"** (Mokyr 2016) and the resulting changes in social practices have led to much greater levels of welfare compared with previous epochs in humanity's evolution. At the same time, these developments resulted in a questioning and endangering of quintessential livelihoods in

[99] Mokyr (2016) refers to the cultural prerequisites for social change and focuses in particular on fundamental "beliefs". The change of the "belief system" primarily refers to the perception of nature. This, the author notes, in connection with the specific contexts in Europe (competition between smaller states and cities) and the emergence of networks (science, academia and engineering), was ultimately crucial for the Industrial Revolution. McCloskey (2016) starts from the premise that it was not the available energy resources or innovations of the 19th century or the emergence of the market institutions (factors that already existed in other parts of the world) that were pivotal, but rather the cultural factors and ideas. Denzau and North (1994) likewise refer to the role of ideas and institutions in social change. It becomes clear that both economic historians and institutional economists see the role of ideas and guiding principles as essential to economic development. References to the discussion on sustainability can, for example, be found in Meyerhoff and Petschow (1996).

human society, as the overstepping of individual planetary boundaries demonstrates. The hitherto dominant "culture of growth" is deeply rooted in the formal and informal **institutions** that "steer" our society. This means that if policy approaches are to contribute to complying with planetary boundaries, they must also take into account cultural change towards a possible "culture of sustainability" – beyond material objectives and the instruments directly aimed at these.

A robust change process towards a sustainable society that enables social well-being within planetary boundaries will not be possible without profound change of the formal and informal institutions. The **"institution hierarchy"** described by Williamson (2000) accordingly offers an orientation or heuristic as to which levels can be relevant in change processes at the institutional level. Williamson distinguishes four levels, with each level corresponding to different academic perspectives and analytical instruments. The uppermost level, "institutional embedding" (a particular focus of social theory, sociology and economic history), is followed by the "institutional framework" level (analysed by the theory of property rights and the economic theory of politics, among others). The third level concerns "governance structures" (addressed within institutional economics with transaction cost economics approaches), the fourth level is called "resource allocation" (contract theory, principal-agent theory, neoclassical economics). "Hierarchy" is therefore understood in terms of embedding, i.e. higher levels form the framework for lower levels, but not in the sense of a "one-way street" with regard to potential change stimuli.

Institutional change can be initiated via a "bottom up" or "top down" approach. Starting from influencing the allocation of resources, this can lead to "bottom up" changes being reflected at higher levels. It is also possible for social change to work its way down from the "institutional embedding" level via the institutional framework and governance structures to the level of resource allocation. The time horizons for the change processes differ significantly over the various levels. Also, informal institutions can largely avoid intentional, targeted influencing. "Traditional" (neoclassical) environmental economic instruments like eco-taxes are primarily targeted at influencing from the "bottom up". Fundamental change processes at "higher institutional levels" (such as new social guiding principles, etc.) are only taken into account to a limited extent, or not at all. Depending on the normative premises and assumed mode of action, the "bottom up" dynamics triggered can or should then (virtually automatically) lead to fundamental change at higher levels. The question of how change at "higher institutional levels" can be implemented in practice is not generally discussed in depth, especially by neoclassical environmental economists. At the same time, this change constitutes an important prerequisite for the political implementation of far-reaching environmental economic measures. Rather than scrutinising this difficulty explicitly and working it out scientifically, up to now a failure of politics was often simply postulated when recommended instruments met no political demand and were not implemented. No doubt: there are relevant political and economic analyses of the rationale behind the behavior of political actors and of obstacles in the way of measures being implemented. However, there is usually no evidence from these analyses as to how the challenges that practical environmental and sustainability policy are facing can be overcome in view of the planetary boundaries. Change in informal and formal institutions generally needs to be understood as a co-evolutionary process in which changing societal behaviour and ideas are mutually dependent.

The "**multi-level perspective"** (Geels 2011) represents another at present widely used heuristic for complex societal change processes. It is based on different theoretical traditions, including technology-driven approaches ("social construction of technology") and the perspective of evolutionary economics. It analyses interrelations between the following three

levels: the socio-technical *regime* at the centre; the overarching socio-technical *landscape* (the exogenous context); and *niche* innovations, which are localised at the lowest level (cf. Geels 2011). Complex interconnections exist between these three levels. Profound change is described as the result of co-evolutionary processes that encompass long periods of time. However, different elements within the levels stabilise each other, not least due to mutual dependencies, which results in considerable resistance to change processes.

The prevailing, dominant socio-technical "system" possesses characteristic attributes (e.g. high consumption of resources) which stem from path dependencies. In the view of proponents of the multi-level perspective, economic instruments alone are barely sufficient for overcoming these path dependencies[100]. Instead, change processes often run on several levels at the same time. For example, innovations can arise from niches (including experimental spaces) and spread until they destabilise the existing socio-technical regime and usher in a change of direction (e.g. towards lower resource usage states). Equally, changes to exogenous factors (landscape) are conceivable, such as changing social guiding principles (e.g. a low-resource society).

The **"deep transition"** (Schot 2017) approach, which is cross-sectoral, ties in with the multi-level perspective. This approach interprets the Industrial Revolution as the first "deep transition", which is characterised by different waves of mostly technological developments. According to Schot, the challenges associated with the Sustainable Development Goals (SDGs) and planetary boundaries make a second "deep transition" necessary. In this respect, Schot no longer focuses on specific socio-technical (partial) systems (such as mobility, for example), but instead starts from cross-sectoral and interconnected transitions[101].

The multi-level perspective and the "deep transition" approach are connected in that they highlight the significance of social innovations and deem the previous focus on technological innovations as the pivotal drivers of societal change processes insufficient (as per Enquete-Kommission 2013: 477).[102] One option for encouraging these types of innovations or improving the foundations for their development is to have appropriately aligned innovation and research policy measures.

The discussions around **innovation policy** have long been shaped by a strong focus on (technical) innovations and innovative capability as prerequisites for economic and social development. The question of the direction of innovation (e.g. for sustainable development) was not addressed for a long time, or was considered inadequate. A change started with more recent debates at EU level, as the "Lund Declarations" of 2009 and 2015 demonstrate. Both declarations aimed at using innovation policy to solve major societal challenges ("Grand Challenges") and attaching great importance to social innovations (cf. Kuhlmann and Rip 2018, Schot and Steinmueller 2018). Innovation policy should accordingly be aligned with societally defined objectives and deliver specific contributions to achieving them.

The significance of these new innovation policy approaches, including in particular the concept of "social innovation", is also increasingly highlighted in the German debate on promoting innovation. The 2017 annual expert report from the Federal Government's Commission of

[100] This is due to the fact that the emergence of the socio-technical system is based, among other things, on various positive feedback mechanisms ("economies of scale", cost benefits and increase in demand), learning curves and network effects. Moreover, (shared) interests develop between established actors (incumbents) that would be jeopardised if there were to be a change of direction.

[101] The key phrase of "transformative environmental policy" (Wolff et al. 2018, in print) is used in discussions to encapsulate the options available to political actors to trigger these change processes or make existing change processes more environmentally friendly.

[102] In socio-technical regimes it can indeed be assumed that both innovation approaches are interconnected; that social innovations thus always have retroactive effects on technological innovations. Nevertheless, in discourses on social innovations the assumption that technological solutions are sufficient is less widespread.

Experts for Research and Innovation (EFI) makes explicit reference to the role and importance of social innovations (EFI 2017). A shift in priorities can be detected in German innovation policy, too, for instance in the context of the Federal Government's High-Tech Strategy 2025[103].

From this the authors derive the necessity of **strengthening transformative elements in innovation policy,** which, in accordance with the societal objectives, address the socio-technical regimes as a whole. The authors state that this type of innovation policy promotes social experiments and societal learning processes, so that hitherto unknown routes to sustainable development can be explored and facilitated. To accomplish this, the authors note that it is necessary to include heterogeneous and, in part, new actors (e.g. civil society organisations), new groupings of actors and alliances in the development and implementation of the research and innovation policy (Kuhlmann and Rip 2018)[104]. Real-world living labs and experimental spaces constitute appropriate instruments through which relevant solutions for complex societal problems (not only for the Grand Challenges) can be generated. Concepts and examples of this can be found at both EU level and Federal Government or regional levels[105]. Corresponding references also exist to the post-growth, degrowth and a-growth discourses[106]. Via corresponding practice-oriented research and implementation projects, a strengthening of transformative elements in innovation policy would allow reorientation of societal objectives (preferences, guiding principles) to be developed in a participatory manner within experimental spaces.

5.2 Action Elements in the Precautionary Post-Growth Approach

As the analyses in Chapter 2 show, neither the green growth nor the degrowth approaches ought to be understood as the sole conceptional starting point for environmental policy action. It should also be noted that the basic concepts ultimately have to be adapted to effective political practice. To that effect, it is only the quality of this transposition that provides direction on the extent to which the transformation path envisaged shows promise. Questions and challenges around governance play a critical role in this respect.

Based on the analyses conducted in this discussion paper, the authors have developed an independent stance: the "precautionary post-growth approach" (cf. Chapter 2, in particular 2.4), which they are putting up for discussion by virtue of this publication. In contrast to green growth and degrowth this approach is open-ended. It has no strong ex ante premises with regard to (i) the evaluation of future economic growth or possible future contraction, or (ii) the possibility of adequate decoupling. According to this approach it is uncertain how the economic output will evolve if the economies of wealthy countries are fundamentally altered in line with

[103] Important changes regarding direction have already been made. These include the alignment of citizen dialogues, new forms of civil society participation, problem orientation and the involvement of new actors. In the latest relaunch of the German High-Tech Strategy 2025 the major challenges are referred to much more clearly once again, and subsequently there is special emphasis on the relevance of social innovations (BMBF 2018a).

[104] Approaches for this have already been developed within sustainability research, in particular in the context of the BMBF's socio-ecological research. The focus of this funding initiative is on innovative, transdisciplinary projects aimed at academic and social relevance.

[105] Examples include the EU's efforts in reference to the development of the circular economy (cf. European Commission 2018) or the funding of living labs in Baden-Württemberg (cf. Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg [Ministry of Science, Research and the Arts of Baden-Württemberg] 2018). On the relevance of living labs for economic policy, cf. BMWi (2017).

[106] Proponents of the post-growth approach ascribe a high level of importance to social innovations and societal experimental spaces (cf. also the explanations in Chapter 5.2). If we consider degrowth approaches it becomes clear that their relatively clear objectives for paths to sustainable development (e.g. regionalisation, etc.) call for appropriate experiments in order to test their societal relevance in terms of generalisability and (more) broadly accepted "desirability". By the same token, there are interesting references to the a-growth approach, which states that it is essential on the one hand to develop new goal orientations beyond the focus on GDP growth; and, on the other hand, to have the ability to "navigate" and consequently conduct welfare diagnostics related to specific political questions (cf. Jakob and Edenhofer 2014: 459 f.).

global ecological objectives. However, there is a serious possibility that, in the context of this transformation, economic output will not increase further, or even contract substantially. At the same time we observe that, due to the current state of early-industrialised, wealthy countries, economic output and the income generated as a result play an important role. Both are essential to the functioning of fundamental societal institutions, which facilitate the various elements of a good life (for example, social security systems, education spending, etc.). This implies the objective of transforming these societal institutions in a precautionary way so they can perform their functions (more) independently of economic output (cf. also Seidl and Zahrnt 2010). The overall quality of life can to a great extent be maintained in a scenario of stagnating or falling economic performance by means of greater independence from growth. If it were possible to design social institutions to be (more) independent of growth, politicians could design necessary (environmental) policy measures with less regard to their supposedly negative effects on economic growth. This would also offer politicians greater room for manoeuvre in conflicts between economic and ecological goals. Environmental policy measures would be placed under less of a "growth proviso".

The "precautionary post-growth approach" is thus characterised by the fact that it is not based on strong premises regarding socially desirable, specific "end states". Instead, a design-oriented **search process** should be triggered that is geared towards guiding principles such as the **precautionary principle**[107] and societal **resilience.**[108] This participative, long-term process that can be controlled only to a limited extent is designed to open up new options for action and development and must take into account the initial societal conditions: the focus on growth and strategies to promote growth is formative for our society, especially at a cultural level. A process of change towards greater independence from growth must therefore also draw on guiding principles that are deeply anchored in society and develop alternatives to these principles.

Three **action-related elements or demands** can be derived from this approach:

1. Compliance with planetary boundaries requires **adaptation of the economic framework conditions,** in particular through the determined use of (market-based) **instruments for internalising externalities that are harmful to the environment.**
2. Participatory search processes, experimental spaces and new innovation and research policy approaches should be deployed to explore and exploit **new paths to societal development.**
3. **Potential options for configuring societal institutions to be less dependent on growth** should be identified and harnessed.

5.2.1 Effective Structuring of Economic Framework Conditions

To make the economic framework conditions more effective in terms of the goal of complying with planetary boundaries, the authors make the case for **economic (market-based) instruments** (i.e. primarily cap and trade systems or eco-taxes) to enable the **implementation**

[107] The precautionary principle is one of the central principles in German environmental politics and, as a consequence, in European environmental politics as well. Precaution plays a role first and foremost under conditions of uncertainty and ignorance, ergo when no (quantitative) risk can be inferred. In terms of precaution it is therefore a matter of dealing with the ignorance or uncertainty (cf. v. Gleich and Petschow 2017).

[108] The concept of resilience has various roots and rose to particular prominence with regard to systems in the work of Holling, who focused on the question of ecosystems' viability and adaptability (Holling 1973). Today, it is used in many fields. It is interpreted in a variety of ways and underpinned by various indicator systems (on multi-disciplinary perspectives of resilience research see e.g. Wink 2016). Moreover, the concept of resilience has grown in importance in the political arena, especially within international organisations and particularly in terms of economic policy (cf. Brinkmann et al. 2017).

At its heart, the resilience concept is concerned with a system's attributes or behaviour when it "encounters" unknown events with unknown occurrence probabilities. We speak of resilient systems where the system is able to continue to deliver defined system services and where, after a shock (followed by absorption, recovery, restoration or new system status), it will either return to its initial status or accede to a new (desirable) status (adaptation to the changes). The crucial aspect is that a resilient system maintains its system service "no matter what" (cf. Brand and v. Gleich 2017).

of adequate, cost-efficient means of internalisation of environmental harm from production and consumption[109].

This rough guidance reduces existing disincentives and creates a context that is conducive to more sustainable behavior. Implementing such approaches politically is by no means a foregone conclusionas they usually touch on distribution effects and vested interests[110].

The competing concepts of green growth, a-growth, post-growth and degrowth differ in their essential focus, sometimes considerably, and are in part incompatible in terms of their central premises. If we consider each stance's recommended instruments, reform approaches and specific paths to be followed, we can nonetheless identify some areas of – occasionally fairly extensive – overlap. One central common point of reference is the conviction that regulatory societal systems ought to be developed within a few years and decades, with the aim of achieving a significant reduction in resource usage (sources and sinks). Extensive **agreement** can also be established with regard to specific **economic instruments** intended to achieve effective, systematic rough tuning. Furthermore, most participants in economic debates deem the relative prices for individual behaviour and the overuse of natural resources (sources and sinks) to be important. All approaches therefore consider change in relative prices an important control element.

Yet, beyond these commonalities, significant **differences** also exist: Proponents of the green growth approach call for the use of market-based instruments that have a major impact on society, but outline hardly any specific, desirable target states of society. Conversely, proponents of the post-growth and degrowth discourse propose more practical societal guiding principles and narratives for a good, low-resource life. They see the cultural change required as a precondition, since correction of the market prices would not suffice to internalise the external effects. Fundamental changes to the existing **economic behaviour** (increased importance of commons, collaboration rather than competition, etc.) would be required accordingly.

It is evident that compliance with planetary boundaries and the corresponding need for change are bound up with significant **potential for societal conflict.** Disputes in distribution issues are becoming more explosive due to the concern that an ambitious environmental/climate policy could potentially result in a loss of economic output, which would not only have a negative impact on employment and income, but also on the provision of publicly funded goods such as healthcare provision and education. The proponents of the green growth approach propose instruments that are undoubtedly appropriate from a theoretical perspective; nevertheless, the political "demand" for these instruments and their effective implementation is highly limited in practice to date. Of course, the greater the depth of intervention that is actually required, the more obstructive this barrier becomes. On the other hand, the ideas and models developed within the ecologically oriented post-growth discourse have received limited appeal and acceptance up to this point. Under current conditions, implementing them would be far from a sure-fire success.

[109] The team of authors was unable to reach a consensus with regard to evaluating the significance of non-market-related policy instruments, which are advocated prominently in the degrowth discourse and in parts of the post-growth discourse. No other conceivable instruments have been listed here, therefore. Measures in the area of education for sustainable development, etc. are undisputed, however.

[110] One point that is certainly relevant is that measures are placed under a "growth proviso" and thus measures that are urgently needed from an environmental perspective are omitted. At the same time interests are also affected, so that distribution effects are inevitable. The current discussion around phasing out lignite and the transformation of mobility illustrates the complex challenges. Ultimately, it is about actively organising how to proceed, and, as part of this, about compensation of those losing out, methods of coping and acceptance where the framework conditions have changed.

5.2.2 Exploring and, Where Applicable, Opening up New Paths to Societal Development

The second stipulation of the precautionary post-growth approach **(exploring and opening up new paths to societal development)** is complementary to the (instrumental) approach initially discussed. It is based on the fact that the precautionary post-growth approach has no strong premises with regard to specific, societally desirable "end states", but that a design-oriented, participatory process is required which is geared towards guiding principles like the precautionary principle and societal resilience.

In the context of the debate on efficiency, consistency and sufficiency,[111] the post-growth discourse generates guidelines for sustainable development and, at the same time, specific implementation options (e.g. regionalisation and sharing). Corresponding **practical initiatives** are predominantly still niche phenomena, where clarification is needed as to whether generalisation through "upscaling" is desirable and possible. Furthermore, adequate development of the institutional embedding is key, such as modifying infrastructures so that they enable sustainable forms of behaviour and "upscaling" of this behaviour. Equally important are practical experiments with societal actors in combination with processes of shared learning "beyond the niche".

The **path dependency of developments** is immense – not only in the technical domain, but also in socio-technical contexts. In this respect, the question arises of how new development paths can be enabled in favour of adhering to the planetary boundaries. Participatory societal search processes, experimental spaces for new social practices and new approaches to innovation and research policy that will stimulate, accompany and support these approaches are essential for exploring more sustainable options for action.

Technological disruptions like those that take place in "industrial revolutions" are frequently market-driven. Even without a conducive political/societal setting or accompanying support measures, entrepreneurs in particular will drive forward the implementation of technological innovations with the aim of conquering a new market or improving their position in the market. These are not sure-fire successes, however, since they depend on adapting institutional structures. Policies aiming to achieve compliance with planetary boundaries depend on overcoming existing path dependencies in the socio-technical systems, which did not usually arise solely as a result of market processes. Therefore, in general, they cannot be overcome solely through market forces. In recent years, transition and transformation research, including socio-ecological research, has particularly focused on appropriate approaches to policy design. Along with the multi-level perspective and the idea of "deep transition", more recent approaches to (socio-technical) innovation research and policy process have been developed, targeted at the exploratory development of new solutions. These include, for example, experimental spaces and living laboratories. These **transformative elements of innovation research and policy** require the inclusion of a wide variety of actors and forms of collaboration for the process of innovation (and the innovation system). Likewise, they emphasise the relevance of social learning processes and consider the satisfaction of social needs. Comparable considerations have only played a subordinate role in the mainstream so far. Nevertheless, it should be noted that a move in the direction of societal issues is already taking place at different political levels, such as in the context of the EU innovation policy with the concept of the "Grand Challenges" which concomitantly introduces a certain directionality in innovation policy. Equally, social innovations are an explicit component within the German Federal Government's High-Tech Strategy 2025. In our opinion, these orientations are only in their infancy, but they offer

[111] On the debate on sufficiency, efficiency and consistency see Huber (1994) for a foundation, together with current references from Schneidewind and Zahrnt (2013), Santarius (2015), Loske (2013 and 2015) and Schneidewind (2018), among others.

considerable potential for exploring solutions to the complex challenges posed by sustainable development. A range of more or less proven methods – transdisciplinary platforms, known as "living labs", experimental spaces, etc. – already exist, which, in light of the challenge of a comprehensive transformation towards sustainability, will doubtlessly need to be developed further.

The approach of exploring and opening up new paths of societal development is invariably bound up with the fact that the growth of GDP should no longer be seen as the dominant societal target. Instead, the focus should move to desirable societal states (social well-being, well-being, good life, etc.). Societal change towards a "culture of sustainability" therefore also requires other **indicator systems** that are the guiding basis for social (self) control. There has long been broad consensus over the limitations of GDP as an indicator of welfare (cf. for example Enquete 2013 as well as, regarding the scientific discourse, Schmidt and aus dem Moore 2013 and, with an historical perspective, aus dem Moore and Schmidt 2013). Nevertheless, it has not been possible to date to achieve a broad anchoring and acceptance of extended indicator systems. This is less a question of availability than one of recognition and implementation. Compelling indicator systems for expanded welfare measurement already exist (such as the W3 indicators proposed by the Select Committee, cf. Schmidt and aus dem Moore (2014), or the indicators in the German sustainability strategy). If they result from a participatory "welfare diagnosis" (Jakob and Edenhofer 2014: 459 f.), they can open up alternative social development paths. So far, however, these indicator systems have not generated sufficient response and therefore cannot take on the role of orienting society. To take account of the variety of morally justifiable and, in modern societies, presumably also factually pursued notions of a good life or social well-being, these notions should be operationalised and underpinned by actionable indicators for target states. This would also provide the opportunity to focus the discourse more fully on agreeing on the appropriate objectives instead of debating on the "right" means.

Political actors can contribute to these types of search processes by creating appropriate and flexible framework conditions, as well as funding and accompanying instruments (e.g. transdisciplinary research and consultancy projects), in order to create greater incentives and support for social and sustainability-oriented innovations and their widespread impact. At the same time, appropriate projects ought to be scientifically evaluated and supported in order to generate a (more) robust basis of empirically verified knowledge about the realisation potentials of a low-resource (post-growth) society and corresponding social innovations. Transdisciplinary projects of this ilk (cf. Bergmann et al. 2010) could deal with processes of structural change, consider specific regional contexts and be implemented together with the corresponding, relevant societal actors. In this way, new potentials for regional development that is socially inclusive and less growth-dependent could be explored and references to different views of a good life and to approaches on expanded welfare measurement could be produced. Future research projects should likewise consider existing lines of research that focus on new welfare concepts, views of a good life, the debate around reforms to the welfare state, or participation.[112] As the statements on open research questions at various points in this discussion paper show, there is also a considerable need for research on fundamental systemic (macroeconomic) questions that need to be processed within both academic disciplines and transdisciplinary groups.[113]

[112] On the current research policy debate around growth independence, please refer to the corresponding discussion process in the context of socio-ecological research, as well as to the results of the conference for socio-ecological research that are based on it. The conference was entitled "Nachhaltigkeitsforschung sozial-ökologisch gestalten" ("Making sustainability research social and ecological") and organised by the Bundesministerium für Bildung und Forschung (German Federal Ministry of Education and Research, BMBF) on 19 and 20 September 2018 (cf. BMBF 2018b).

[113] Refer also to the debate around a transformative economics (Pfriem et al. 2017).

5.2.3 Identifying and Harnessing Potential for Making Societal Institutions and Areas Less Dependent on Growth

In the view of the authors of this discussion paper, another important **path dependency** exists in the **growth dependence of key societal areas and institutions** (cf. Chapter 3.2). In our view, the emphasis on this topic and the discussion of the associated implications represent a substantial contribution by authors from the post-growth discourse to the sustainability debate. Linked to these considerations, for us there is a third element that is constitutive for the precautionary post-growth approach that we have proposed: the **identification** and **harnessing of potential** for making societal institutions and areas **less dependent on growth**. In our opinion this is essential in order to increase the resilience of crucial societal systems. Appropriate measures should be implemented, provided they prove expedient and socially acceptable.[114] Relevant pilot projects in the corresponding field of activity would need to be designed for this.

As the analyses in Chapters 3.2 and 4.3 demonstrate, one could focus these efforts on an area that can undoubtedly be classified as growth-dependent: **social security systems**.[115] This was the central aspect in both the analyses presented in this study and the discussions within the circle of authors. Maintaining the functionality and performance of social security systems is one of the core political reasons for the growth policies pursued up to this point. If the strategy of greater independence from growth were successful, societal acceptance of environmentally motivated policy measures that under certain circumstances have a negative effect on economic growth would potentially increase. Corresponding policy measures would be less subject to a "growth proviso". The **scope** for an **ambitious environmental and sustainability policy** would broaden.

As the explanations in Chapter 4.3 show, however, the **previously acknowledged approaches to achieving greater independence from growth** have proven to be **marginal in terms of their effectiveness**. Up to now, fundamental reform initiatives have only – if at all – been envisaged in small subsections of society and realised through a series of small experiments. It is almost impossible to make a reliable statement about the generalisability of corresponding approaches and their potential for reducing the growth dependency that has existed up to this point. In view of the uncertainty regarding the prospects of success of the strategy of decoupling economic growth and negative environmental impacts, which has so far been predominant, it appears advisable to carry out further work on the design and testing of models that are less heavily dependent on economic growth. In doing so, the design of small-scale pilot projects should be such that they can be scaled up in order to obtain practical experience on a relevant scale. We see a considerable need for research in this area.[116]

[114] With reference to various theoretical economic approaches, as well as available empirical findings, the team of authors has systematised various growth drivers in Chapter 3.1 and assessed them with respect to their present and future relevance for early-industrialised wealthy economies. No joint recommendations for action on dealing with the drivers identified were developed, since there were different ideas within the team of authors on the question of whether a targeted weakening of growth drivers constitutes a sensible policy approach in the first instance. Thus some of the authors of this discussion paper make reference to the fact that a weakening of individual drivers could contribute to reducing consumption of resources and the environment, without this necessarily engendering a concomitant loss of welfare. Other authors express the opinion that a policy that focuses on weakening drivers would restrict economic dynamics without ensuring support for achieving the objectives (compliance with planetary boundaries).

[115] This is not to suggest that there are not further relevant areas of society that are also affected. We were unable to make any assessments of other areas within the scope of the present analysis.

[116] When evaluating the present analyses and proposals for action, as well as the potential of the various transformation discourses regarding the further increase in knowledge, it should be noted that the corresponding protagonists in the academic system possess very different quantitative processing capabilities.

5.3 The Precautionary Post-Growth Approach as a Platform of Further Discourse on Social Well-Being Within Planetary Boundaries

The team of authors explored the fundamental perspectives of green growth, degrowth and post-growth, which are addressed in this discussion paper, for an **early-industrialised, prosperous economy** like Germany.[117] Yet, when determining strategies for political action, **the international perspective** cannot be disregarded in view of the target objective – compliance with planetary boundaries. Further strategy development therefore requires the different levels of action – from the local to the national level and above all the international level – to be taken into account. These levels are interconnected in many different ways and cannot be envisaged independently of each other.

If we compare the current efficacy of the three fundamental approaches in the German sustainability debate, it is clear that the green growth approach can be seen as the prevailing transformative paradigm at the administrative policy level, at least implicitly. This approach has already been discussed fairly widely in the international context. However, to date the corresponding policy proposals have only been implemented on a minor scale. The degrowth approach, in contrast, is far from gaining acceptance and practical relevance for political and societal action at the administrative policy level. Then again, in some parts of civil society it inspires action. A similar situation applies for the post-growth approach in the German-speaking debate; nonetheless, we see greater potential here for integrability with the mainstream.

Both green growth and degrowth strategies are potentially bound up with substantial risks and costs (cf. Chapter 2). However, no assessments could be made in the context of this discussion paper on the social evaluation and quantification of the effects of various measures on social well-being.

Against this backdrop, the precautionary post-growth approach was developed in the course of the project. This approach picks up on differing and mutually compatible core components of the two approaches and amalgamates them into an action-oriented strategy. The following three elements of action are crucial for this strategy:

1. Adaptation of the economic framework conditions, in particular through the purposeful use of (market-based) instruments for internalising external impacts that are harmful to the environment.
2. Exploring and opening up new paths for societal development through participatory search processes, experimental spaces and new innovation and research policy approaches.
3. Identifying and harnessing potential for making societal institutions less dependent on growth.

Firstly, the precautionary post-growth approach represents an inclusive approach and, secondly, it provides a broad stimulus for further discussion around transformation paths, especially in terms of the economic discourse. The concept of "independence from growth" aims to change prevailing social models and path dependencies and, in this sense, has the potential to bring about far-reaching change processes. Having said that, the goal of "social well-being within planetary boundaries" ultimately needs to be fleshed out in social negotiation processes and effective narratives must be developed collaboratively. We interpret the precautionary post-growth approach both in conceptional and practical terms as a relevant and important building block of a consistent global strategy that still needs to be drawn up and that complies with

[117] For these measures to actually have a chance of making a noticeable contribution to complying with planetary boundaries, they must be implemented on the largest possible geographical scale, at least within the European Union. There is broad consensus on this in the post-growth debate. Authors from the post-growth discourse are calling for the first steps of the transformation to be effected in early-industrialised wealthy countries.

planetary boundaries, SDGs and the promotion of individuals' quality of life as well as the welfare of society as a whole. From an action perspective, a post-growth approach understood in this way can also be seen as a starting point and pivotal element of an overarching responsible and ethically motivated strategy of resilience. Given the uncertainty over future economic and societal development, this would contribute to a greater robustness of the transformation process towards a sustainable society operating within planetary boundaries.

Through this discussion paper we hope to provide a stimulus for societal debate with the aim of structuring and orchestrating transformation paths for "social well-being within planetary boundaries", which will prompt and provide structure for a new **process of discussion and research.** The precautionary post-growth approach offers a discourse platform for action strategies that need to be developed further and that meet the challenge of complying with planetary boundaries.

6 Bibliography

Acemoglu, D. (2009): Introduction to modern economic growth. Princeton: Princeton University Press.

Acemoglu, D.; Zilibotti, F. (1997): Was Prometheus unbound by chance? Risk, diversification, and growth. In: Journal of Political Economy, 105(4), 709-751.

Adler, M. D.; Posner, E. A. (2006): New Foundations of Cost-Benefit Analysis. Cambridge, Massachusetts: Harvard University Press.

Arbeitsgemeinschaft Energiebilanzen e.V. (AGEB) (2017): Energieverbrauch 2016. https://ag-energiebilanzen.de/10-0-Auswertungstabellen.html. call up 10.01.2018.

Aghion, P.; Bloom, N.; Blundell, R.; Griffith, R.; Howitt, P (2005): Competition and Innovation: an Inverted-U Relationship. In: The Quarterly Journal of Economics, 120(2), 701–728. https://doi.org/10.1093/qje/120.2.701

Aghion, P.; Bolton, P. (1997): A theory of trickle-down growth and development. In: The Review of Economic Studies, 64(2), 151-172.

Aghion, P.; Howitt, P. W. (2008): The Economics of Growth. Cambridge, Massachusetts; London, England: MIT Press.

Aghion, P.; Akcigit, U.; Howitt, P. (2015): Lessons from Schumpeterian Growth Theory. In: American Economic Review, 105(5), 94–99. DOI: 10.1257/aer.p20151067.

Aghion, P.; Hepburn, C.; Teytelboym, A.; Zenghelis, D. (2014): Path dependence, innovation and the economics of climate change. Policy Paper. A contributing paper to: "The New Climate Economy". Centre for Climate Change Economics and Policy Grantham Research Institute on Climate Change and the Environment.

Ahrens, D. (2004): Gesundheitsökonomie und Gesundheitsförderung- Eigenverantwortung für Gesundheit? In: Das Gesundheitswesen, 66 (4), 213-221.

Akerlof, G. A.; Kranton, R. E. (2000): Economics and Identity. In: The Quarterly Journal of Economics, 115(3), 715-753.

Alcott, B. (2010): Impact caps: Why population, affluence and technology strategies should be abandoned. In: Journal of Cleaner Production, 18(6), 552–560. http://doi.org/10.1016/j.jclepro.2009.08.001.

Alexander, S. (2014): Basic and Maximum Income. In: D'Alisa, G.; Demaria, F.; Kallis, G. (Ed.): Degrowth. A vocabulary for a new era. New York; London: Routledge, 146-148.

Althaus, D. (2007): Das Solidarische Bürgergeld. Sicherheit und Freiheit ermöglichen Marktwirtschaft. In: Borchard, M. (Ed.): Das solidarische Bürgergeld – Analysen einer Reformidee. Stuttgart: Lucius & Lucius.

Altvater, E. (2015): Der Grundwiderspruch des 21. Jahrhunderts. In: Le Monde Diplomatique, Kolleg Postwachstumsgesellschaften (Ed.): Atlas der Globalisierung. Weniger wird mehr. Ahrensfelde: Möller Druck.

Anderson, E. (1993): Value in Ethics and Economics. Cambridge, Massachusetts: Harvard University Press.

Andreucci, D.; McDonough, T. (2015): Capitalism. In: D'Alisa, G.; Demaria, F.; Kallis, G. (Ed.): Degrowth. A vocabulary for a new era. New York; London: Routledge, 59-62.

Andrews, D.; Criscuolo C.; Gal, P. (2016): "The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy", OECD Productivity Working Papers, No. 5, OECD Publishing, Paris, http://dx.doi.org/10.1787/63629cc9-en.

Andrews, D.; Criscuolo C.; Gal, P. (2017): The best vs the rest: The global productivity slowdown hides an increasing performance gap across firms. https://voxeu.org/article/productivity-slowdown-s-dirty-secret-growing-performance-gap. call up 20.05.2018.

Angerer, G. et al. (2016): Rohstoffe für die Energieversorgung der Zukunft: Geologie – Märkte – Umwelteinflüsse. München: Schriftenreihe Energiesysteme der Zukunft.

Antal, M. (2014): Green goals and full employment: Are they compatible? In: Ecological Economics, 107, 276-286.

Antal, M.; van den Bergh, J. (2014): Macroeconomics, Financial Crisis and the Environment. Strategies for a Sustainability Transition. In: Österreichisches Institut für Wirtschaftsforschung (Ed.): WIFO Working Paper, 464. http://econpapers.repec.org/paper/wfowpaper/y_3a2014_3ai_3a464.htm. call up 04.05.2016.

Antal, M; van den Bergh, J. C. (2016): Green growth and climate change: Conceptual and empirical considerations. In: Climate Policy, 16(2), 165–177.

Arrow, K. J. (1951): Social Choice and Individual Values. New York: Wiley.

Asara, V.; Profumi, E.; Kallis, G. (2013): Degrowth, Democracy and Autonomy. In: Environmental Values, 22(2), 217–239. http://doi.org/10.3197/096327113X13581561725239.

Asara, V.; Otero, I.; Demaria, F.; Corbera, E. (2015): Socially sustainable degrowth as a social- ecological transformation: repoliticizing sustainability. In: Sustainability Science, 10, 375-384.

Augurzky, B., Felder, S. (2013): Volkswirtschaftliche Kosten und Nebenwirkungen einer Bürgerversicherung. In: RWI Materialien, 75.

Aus dem Moore, N.; Kasten, T.; Schmidt, C. M. (2014): Do Wages Rise when Corporate Taxes Fall? Evidence from Germany's Tax Reform 2000. Ruhr Economic Papers, Nr. 532.

Aus dem Moore, N.; C. M. Schmidt (2013): On the Shoulders of Giants: Tracing Back the Intellectual Sources of the Current Debate on "GDP and Beyond" to the 19th Century. In: Jahrbücher für Nationalökonomie und Statistik, 233(3), 266-290.

Australian National Health and Medical Research Council (2015): Effectiveness of Homeopathy for Clinical Conditions: Evaluation of the Evidence. https://www.nhmrc.gov.au/guidelines-publications/cam02. call up 04.05.2016.

Ayres R. U.; Ayres, L. W. (1998): Accounting for Resources. Economy-wide Applications of Mass Balance Principles to Materials and Waste. Aldershot, UK: Edward Elgar.

Ayres R. U.; Warr, B. (2005): Accounting for growth: the role of physical work. In: Structural Change and Economic Dynamics, 16, 181–209.

Ayres R. U.; Warr, B. (2012): Useful work and information as drivers of economic growth. In: Ecological Economics, 73, 93-102.

Ayres, R. U.; van den Bergh, J.C. (2005): A theory of economic growth with material/energy resources and dematerialization: Interaction of three growth mechanisms. In: Ecological Economics, 55(1), 96–118.

Ayres, R.U.; Warr, B. (2010): The economic growth engine: How energy and work drive material prosperity. (The international Institute for applied systems analysis). Cheltenham: Edward Elgar.

B.A.U.M. Consult GmbH (2013): E-Energy Abschlussbericht. Ergebnisse und Erkenntnisse aus der Evaluation der sechs Leuchtturmprojekte. Entwurf vom 20.12.2013. Ed.: Bundesministerium für Wirtschaft und Energie (BMWI). München; Berlin. http://www.digitale-technologien.de/DT/Redaktion/DE/Downloads/ab-gesamt-begleitforschung.pdf?__blob=publicationFile&v=4. call up 27.03.2017.

Bach, S. (1996): Wirtschaftliche Auswirkungen einer ökologischen Steuerreform. In: Eichhorn, P. (Ed.): Umweltorientierte Marktwirtschaft. Zusammenhänge-Probleme. Wiesbaden: Gabler, 11-20.

Bach, S. (2009): Zehn Jahre ökologische Steuerreform: Finanzpolitisch erfolgreich, klimapolitisch halbherzig. In: DIW Wochenbericht, 14, 218–227.

Ball, L.; Leigh, D.; Loungani, P. (2013): Okun's Law: Fit at Fifty? Cambridge, Massachusettes: National Bureau of Economic Research. http://www.nber.org/papers/w18668.pdf. call up 16.05.2016.

Banerjee, A. V.; Newman, A. F. (1993): Occupational choice and the process of development. In: Journal of Political Economy, 101(2), 274-298.

Baran, P. A. (1962): The political economy of growth. London: Penguin Books.

Baran, P. A.; Sweezy, P. M. (1966): Monopoly capital: An essay on the American economic and social order. New York: Monthly Review Press.

Barr, Nicholas (2002): Reforming pensions: Myths, truths, and policy choices. In: International Social Security Review, 55(2), 3–36. DOI: 10.1111/1468-246X.00122.

Barro, R. J. (1991): Economic Growth in a Cross Section of Countries. In: The Quarterly Journal of Economics, 106(2), 407–443. https://ideas.repec.org/a/oup/qjecon/v106y1991i2p407-443.html. call up 04.04.2017.

Barro, R. J.; Sala-i-Martin, X. (2004): Economic growth, 2. Auflage. Cambridge, Massachusetts: MIT Press.

Bates, L.; Santerre, R. (2013a): Does the US health care sector suffer from Baumol's cost disease? Evidence from the 50 states. In: Journal of Health Economics, 32(2), 386–391.

Bates, L.; Santerre, R. (2013b): Is the U.S. Private Education Sector Infected by Baumol´s Cost Disease? Evidence from the 50 States. In: Munich Personal RePEc Archive (Ed.), MPRA Paper, No. 52300.

Bauhardt, C.und Gülay, C. (Hg) (2010): Gender and Economics. Feministische Kritik der politischen Ökonomie. Wiesbaden: VS Verlag.

Baumol, W. J. (1967): Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis. In: The American Economic Review, 57(3), 415–426.

Baumol, W. J.; Bowen, W. G. (1966): Performing arts: the economic dilemma: a study of problems common to theater, opera, music and dance. New York: Twentieth Century Fund.

Beck, Ulrich (1986): Risikogesellschaft. Auf dem Weg in eine andere Moderne, Frankfurt am Main: Suhrkamp.

Becker, S.; Naumann M.; Moss, T. (2016): Between coproduction and commons: understanding initiatives to reclaim urban energy provision in Berlin and Hamburg. In: Urban Research & Practice, 0, 1–23.

Beffy, P.-O. ; Fourcade, N. (2004): La ralentissement de la productivité du travail au cours des années 1990: l´impact des politiques d´emploi. In: Économie et Statistique, 376(1), 1–24.

Beinhocker, E. D. (2007): Die Entstehung des Wohlstands. Wie Evolution die Wirtschaft antreibt. Landsberg am Lech: mi-Fachverlag.

Bencivenga, V. R.; Smith, B. D. (1993): Some consequences of credit rationing in an endogenous growth model. In: Journal of Economic Dynamics and Control, 17(1-2), 97-122.

Bender, H.; Bernholt, N. (2017): Unternehmen, die nicht wachsen müssen. Die Unternehmensverfassung einer solidarischen Postwachstumsökonomie – Reformschritte und Umsetzungschancen im europäischen Kontext. In: Frank Adler, Ulrich Schachtschneider und Gesellschaft für Ökologische Kommunikation: Postwachstumspolitiken: Wege zur wachstumsunabhängigen Gesellschaft. München: oekom.

Bennmarker, H.; Mellander, E.; Öckert, B. (2008): Do regional payroll tax reductions boost employment. In: IFAU Working Paper, 19.

Berg, M.; Hartley, B.; Richters, O. (2015): A stock-flow consistent input–output model with applications to energy price shocks, interest rates, and heat emissions. In: New Journal of Physics,17(1), 15011. http://doi.org/10.1088/1367-2630/17/1/015011.

Bergmann, M.; Jahn, T.; Knobloch, T.; Krohn, W.; Pohl, C.; Schramm, E. (2010): Methoden transdisziplinärer Forschung. Ein Überblick mit Anwendungsbeispielen. Campus.

Bernstein, A.; Raman, A. (2015): The Great Decoulping: An Interview with Erik Brynjolfsson and Andrew McAfee. In: Harvard Business Review. https://hbr.org/2015/06/the-great-decoupling. call up 27.03.2017.

Bertram, N. (2014): Alternative soziale Netzwerke. Gibt es ein Leben ohne Facebook? WDR Radiosendung am 03.02.2014. http://www1.wdr.de/radio/wdr5/sendungen/leonardo/facebook_zehnjaehriges100.html. call up 27.03.2017.

Bester, H. (2003): Theorie der Industrieökonomik. Berlin, Heidelberg: Springer-Verlag.

Betz, G. (2008): Der Umgang mit Zukunftswissen in der Klimapolitikberatung. Eine Fallstudie zum Stern Review. In: Philosophia Naturalis, 45(1), 95–129.

Betz, G. (2015): Are climate models credible worlds? Prospects and limitations of possibilistic climate prediction. In: European Journal for Philosophy of Science, 5(2), 191–215.

Bierter, W. (2000): Dematerialisierung und Beschäftigung im Rahmen einer pluralen Ökonomie, In: Wissenschaftszentrum Berlin für Sozialforschung (Ed.): Papers der Querschnittsgruppe Arbeit & Ökologie, Nr. P00-521. http://hdl.handle.net/10419/50304. call up 18.04.2017.

Biesecker, A. (2009): Vorsorgendes Wirtschaften als Alternative. In: Arbeitsbereich Wirtschafts- und Sozialpolitik der Friedrich-Ebert-Stiftung (Ed.): Antworten aus der feministischen Ökonomie auf die globale Wirtschafts- und Finanzkrise: Tagungsdokumentation der Friedrich-Ebert-Stiftung, 32–48.

Biesecker, A.; von Winterfeld, U (2014): Extern? Weshalb und inwiefern moderne Gesellschaften Externalisierung brauchen und erzeugen. In: Working Paper der DFG-KollegforscherInnengruppe Postwachstumsgesellschaften, Vol. 2014, 2, Jena 2014. http://www.kolleg-postwachstum.de/sozwgmedia/dokumente/WorkingPaper/wp2_2014.pdf. call up 17.04.2017.

Biesecker, A.; Wichterich, C.; Winterfeld, U. (2012): Feministische Perspektiven zum Themenbereich Wachstum, Wohlstand, Lebensqualität. In: Hintergrundpapier für die Enquete-Kommission Wachstum, Wohlstand, Lebensqualität des Deutschen Bundestags. http://www.rosalux.de/fileadmin/rls_uploads/pdfs/sonst_publikationen/Biesecker_Wichterich_Winterfeld_2012_FeministischePerspe.pdf. call up 18.04.2017.

Bindoff, N. L.; Stott, P. A.; AchutaRao, K. M.; Allen, M. R.; Gillett, N.; Gutzler, D.; Hansingo, K.; Hegerl, G. C.; Hu, Y.; Jain, S.; Mokhov, I. I.; Overland, J.; Perlwitz, J.; Sebbari, R.; Zhang, X. (2013): Detection and Attribution of Climate Change: from Global to Regional. In: Stocker, P. F.; D. Qin, G.-K.; Plattner, M.; Tignor, S. K.; Allen, J.; Boschung, A.; Nauels, Y. X.; Bex, V. & Midgley, P. M. (Ed.), Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, 867-952.

Binswanger, H. C. (2006): Die Wachstumsspirale: Geld, Energie und Imagination in der Dynamik des Marktprozesses. Marburg: Metropolis. https://sisis.rz.htw-berlin.de/inh2007/12356959.pdf. call up 3.04.2017.

Binswanger, H. C. (2009): Vorwärts zur Mäßigung. Perspektiven einer nachhaltigen Wirtschaft. Hamburg: Murmann.

Binswanger, H. C. (2013): The Growth Spiral: Money, Energy, and Imagination in the Dynamics of the Market Process. Berlin; New York: Springer.

Binswanger, H. C.; Bonus, H.; Timmermann, M. (1981): Wirtschaft und Umwelt: Möglichkeiten einer ökologieverträglichen Wirtschaftspolitik. Stuttgart: Kohlhammer.

Binswanger, M. (2006a): Why does income growth fail to make us happier? In: The Journal of Socio-Economics, 35, 366-381.

Binswanger, M. (2006b): Die Tretmühlen des Glücks. Wir haben immer mehr und werden nicht glücklicher. Was können wir tun? Freiburg im Breisgau: Herder Verlag.

Binswanger, M. (2009): Is there a growth imperative in capitalist economies? A circular flow perspective. In: Journal of Post Keynesian Economics, 31(4), 707–727.

Blankart, Charles B. (2008): Öffentliche Finanzen in der Demokratie. München: Vahlen.

Blaug, M., (1996): Economic Theory in Retrospect. Cambridge University Press.

BMF, Bundesministerium für Finanzen (2011): Struktur und Verteilung der Steuereinnahmen (Monatsbericht, 6). http://www.bundesfinanzministerium.de.

Böhringer, C.; Schwager, R. (2003): Die ökologische Steuerreform in Deutschland: Ein umweltpolitisches Feigenblatt. In: Perspektiven der Wirtschaftspolitik, 4(2), 211–222.

Bosch, G. (2000): Arbeitszeit und Arbeitsorganisation. In: Arbeit, 9(3), 175-190.

Bourdieu, P. (1977): Outline of a Theory of Practice. Cambridge: Cambridge University Press.

Bowen, A. (2014): Green Growth. In: Atkinson, G., Dietz, S., Neumayer, E. und Agarwala, M. (Ed.): Handbook of Sustainable Development. Second Edition. Cheltenham (UK)/Northampton (MA; USA): Edward Elgar, 237-251.

Bowen, A; Hepburn, C. (2014). Green growth: an assessment. In: Oxford Review of Economic Policy, 30, 407-422.

Bower, P.; Chew-Graham, C.; Gately, A.; Kennedy, A.; Lee, V.; Reeves, D. (2010): Expert Patients Programme (EPP). National Evaluation. In: National Primary Care Research and Development Centre (Ed.).

Boyd, J. H.; Prescott, E. C. (1986). Financial intermediary-coalitions. Journal of Economic Theory, 38(2), 211-232.

Boyle, D.; Mulgan, G.; Ali, R. (2006): Life begins at 60: what kind of NHS after 2008? London: New Economics Foundation.

Brand; U.; v. Gleich, A. (2017): Guiding Orientation Processes as Possibility to Give Direction for System Innovations—the Use of Resilience and Sustainability in the Energy Transition. In: NanoEthics, 11(1), 31-45.

Brinkmann, H.; Harendt, C.; Heinemann, F.; Justus, N. (2017): Ökonomische Resilienz – Schlüsselbegriff für ein neues wirtschaftspolitisches Leitbild? Wirtschaftsdienst, 97 (9), 644-650.

Bundesministerium für Bildung und Forschung (BMBF) (2014): Die neue Hightech-Strategie. Innovationen für Deutschland. https://www.bmbf.de/pub_hts/HTS_Broschure_Web.pdf. call up 01.10.2018.

Bundesministerium für Bildung und Forschung (BMBF) (Ed.) (2018a): Forschung und Innovation für die Menschen. Die Hightech-Strategie 2025. https://www.bmbf.de/pub/Forschung_und_Innovation_fuer_die_Menschen.pdf. call up 01.10.2018.

Bundesministerium für Bildung und Forschung (BMBF) (2018b): Agendaprozess Sozial-ökologische Forschung. Themenpapier und Diskussion „Sozial-ökologische Pfade zu einer wachstumsunabhängigen Gesellschaft“. https://www.agenda-konferenz-sozial-oekologische-forschung.de/front/index.php. call up 15.10.2018.

Bundesministeriums für Wirtschaft und Energie (BMWi) (2017): Reallabore: Zukunftsweisendes Instrument der Wirtschaftspolitik? In: Schlaglichter der Wirtschaftspolitik, 01.2017.

Bundeszentrale für politische Bildung (2012a): Bruttoinlandsprodukt (BIP) EU-USA-China. http://www.bpb.de/nachschlagen/zahlen-und-fakten/europa/135823/bruttoinlandsprodukt-bip. call up 30.03.2017.

Bundeszentrale für politische Bildung (2012b): Wirtschaftliche Entwicklung der Bundesrepublik Deutschland [online] http://www.bpb.de/politik/grundfragen/deutsche-verhaeltnisse-eine-sozialkunde/138634/wirtschaftliche-entwicklung?p=all. call up 30.03.2017.

Bundeszentrale für politische Bildung (2013): Energieverbrauch und Energieeinsparung. http://www.bpb.de/izpb/169461/energieverbrauch-und-energieeinsparung?p=all. call up 15.03.2017.

Bundeszentrale für politische Bildung (2016a): Verbrauch von Primärenergie pro Kopf. In Tonnen Öläquivalent, nach Regionen, 2014. http://www.bpb.de/nachschlagen/zahlen-und-fakten/globalisierung/52758/verbrauch-pro-kopf. call up 17.03.2017.

Bundeszentrale für politische Bildung (2016b): Primärenergieversorgung. http://www.bpb.de/nachschlagen/zahlen-und-fakten/globalisierung/52741/primaerenergie-versorgung. call up 15.03.2017.

Brand, U. (2013): Schöne Grüne Welt. Über die Mythen der Green Economy. Berlin: Rosa Luxemburg Stiftung.

Brand, U. (2015): Die Illusion vom sauberen Wachstum. In: Le Monde Diplomatique, Kolleg Postwachstumsgesellschaften (Ed.): Atlas der Globalisierung. Weniger wird mehr. Ahrensfelde: Möller Druck, 52.

Braverman, H. (1974): Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century. New York: Monthly Review Press.

Breidenbach, P.; Döhrn, R.; Schmidt, C. M. (2017): Zeit für Reformen – nicht nur für Steuern. In: Wirtschaftsdienst 96(6), 395-399.

Brekke, K. A.; Howarth, R. B.; Nyborg, K. (2003): Status-seeking and material affluence: evaluating the Hirsch hypothesis. In: Ecological Economics, 45(1), 29-39.

Breyer, F. (2015): Demographischer Wandel und Gesundheitsausgaben. Theorie, Empirie und Politikimplikationen. In: Perspektiven der Wirtschaftspolitik, 16(3). DOI: 10.1515/pwp-2015-0016.

Brickman, P. E.; Campbell, D. T. (1971): Hedonic relativism and planning the good society. In: M.A. Appley (Ed.): Adaptation Level Theory. New York: Academic Press.

Broome, J. (2012): Climate Matters. Ethics in a Warming World. New York: W. W. Norton & Company.

Brown, A. (2014): Green Growth. In: Atkinson, G.; Dietz, S.; Neumayer, E.; Agarwala, M. (Ed.): Handbook of sustainable development. Cheltenham: Edward Elgar Publishing.

Brown, E.K.; Collier B.E. (1995): What Keynes said about deficit spending. In: Journal of Post Keynesian Economics, 17(3), 341-355.

Brynjolfsson, E.; McAfee, A. (2014): The second machine age. Work, progress, and prosperity in a time of brilliant technologies. First Edition. New York: WW Norton & Company.

Bundesministerium der Finanzen (BMF) (2016): Vierter Bericht zur Tragfähigkeit der öffentlichen Finanzen. http://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Oeffentliche_Finanzen/Tragfaehige_Staatsfinanzen/2016-03-04-vierter-tragfaehigkeitsbericht.pdf?__blob=publicationFile&v=7. call up 17.04.2017.

Bundesministerium für Arbeit und Soziales (2014): Sozialbudget 2014. Bundesministerium für Arbeit und Soziales (2016). Sozialbudget 2015. http://www.bmas.de/DE/Service/Medien/Publikationen/a230-15-sozialbudget-2015.html. call up 18.04.2017.

Bundesministerium für Arbeit und Soziales (2016): Sozialbudget 2015, Bundesministerium für Arbeit und Soziales (2016). Sozialbudget 2015. http://www.bmas.de/DE/Service/Medien/Publikationen/a230-15-sozialbudget-2015.html. call up 18.04.2017.

Bundesministerium für Wirtschaft und Energie (BMWi) (2016): Jahreswirtschaftsbericht 2016. Zukunftsfähigkeit sichern- Die Chancen des digitalen Wandels nutzen. [online] http://www.bmwi.de/BMWi/Redaktion/PDF/J-L/jahreswirtschaftsbericht-2016,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf. call up 18.04.2017.

Bursztyn, L.; Ferman, B.; Fiorin, S.; Kanz, M.; Rao, G. (2017): Status Goods: Experimental Evidence from Platinum Credit Cards. Working Paper.

Buslei, H.; Geyer, J.; Haan, P.; Peters, M. (2016): Ausweitung der gesetzlichen Rentenversicherung auf Selbständige. merkliche Effekte auch in der mittleren Frist. In: DIW Wochenbericht, 83(30).

Cabral, L. (2014): Sunk Costs, Firm Size and Firm Growth. In: The Journal of Industrial Economics, 43(2), 161–7.

Calderon, F.; Stern, N.; Oppenheim, J. (2014): Better Growth Better Climate. The New Climate Economy Report. The Global Commission on the Economy and Climate.

Caney, S. (2009): Justice and the distribution of greenhouse gas emissions. In: Journal of Global Ethics, 5, 125-146.

Cette, G., Corde, S.; Lecat, R. (2018): Firm-level Productivity Dispersion and Convergence. Banque de France, WP #662.

CDU Bundesgeschäftsstelle (2013): Regierungsprogramm 2013-2017. https://www.cdu.de/sites/default/files/media/dokumente/bilanz-btw13.pdf. call up 13.04.2017.

Clark, A. E.; Frijters, P.; Shields, M. A. (2008): Relative Income, Happiness, and Utility: An Explanation for the Easterlin Paradox and Other Puzzles, In: Journal of Economic Literature, 46(1), 95-144.

Cleveland, C. J.; Costanza, R.; Hall, C. A. S.; Kaufmann, R. (1984): Energy and the U.S. Economy: A Biophysical Perspective, In: Science, 225, 890-897.

Cohen, G. A. (2008): Rescuing Justice and Equality. Cambridge, Massachusettes: Harvard University Press.

Cohen J.; Coughlin C. (2005): An Introduction to Two-Rate Taxation of Land and Buildings, In: Federal Reserve Bank of St. Louis Review, 87(3), 359-374.

Cooter, R.; Rappoport, P. (1984): Were the Ordinalists Wrong about Welfare Economics? In: Journal of Economic Literature XXII, 507-530.

Cowen, T. (2011): The great stagnation. How America ate all the low-hanging fruit of modern history, got sick, and will (eventually) feel better. New York: Dutton.

Crisp, Roger (2016): Well-Being, *The Stanford Encyclopedia of Philosophy* (Summer 2016 Edition), Edward N. Z. (ed.). https://plato.stanford.edu/archives/sum2016/entries/well-being call up 10.03.2018.

D'Alisa, G.; Deriu; M.; Demaria; F. (2015): Care. In: D'Alisa, G.; Kallis G.; F. Demaria (Ed.): Degrowth a vocabulary for a new era. London; New York: Routledge. Chapter 11.

D'Alisa, G.; Kallis, G.; Demaria, F. (2016): Epilog: from austerity to depense. In: D'Alisa, G.; Kallis G.; F. Demaria (Ed.): Degrowth a vocabulary for a new era. London; New York: Routledge.

D'Alisa, G.; Kallis, G.; Demaria, F. (Ed.) (2016): Degrowth. Handbuch für eine neue Ära. München: oekom Verlag.

Daly, H. E. (1991): Steady-state economics, 2. Auflage. Washington DC: Island Press. http://scholar.google.com/scholar?q=Steady-State+Economics%3A+Second+Edition+With+New+Essays&btnG=&hl=de&as_sdt=0%2C5#0. call up 18.04.2017.

Daly, H. E. (2008): A steady-state economy. UK: Sustainable Development Commission.

Dasgupta, P. (2004): Human Well-Being and the Natural Environment. Oxford: Oxford University Press.

Davies, G. (2016): The internet and the productivity slump. Blogbeitrag [online] http://blogs.ft.com/gavyndavies/2016/04/03/the-internet-and-the-productivity-slump/. call up 27.03.2017.

Deaton, A. (2011): What does the empirical evidence tell us about the injustice of health inequalities? Princeton University, Centre for Health and Wellbeing. https://www.princeton.edu/~deaton/downloads/What_does_the_empirical_evidence_tell_us_about_the_injustice.pdf call up 11.04.2018.

De la Maisonneuve, C.; Oliveira Martins, J. (2015): The future of health and long-term care spending. In: OECD Journal: Economic Studies, 1.

Demaria, F.; Schneider, F.; Sekulova, F.; Martinez-Alier, J. (2013): What is Degrowth? From an Activist Slogan to a Social Movement. In: Environmental Values, 22(2), 191-215.

Demirgüç-Kunt, A.; Maksimovic, V. (1998): Law, finance, and firm growth. In: The Journal of Finance, 53(6), 2107-2137.

Denzau, A.T.; North, D.C (1994): Shared Mental Models. Ideologies and Institutions. In: Kyklos., 47, 3-31.

Department for Business, Energy & Industrial Strategy (Ed.) (2013): 2050 Pathways. Exploring how the UK can meet the 2050 emission reduction target using the web-based 2050 calculator. https://www.gov.uk/guidance/2050-pathways-analysis. call up 20.10.2018.

Der Bodenatlas (2015): Heinrich-Böll-Stiftung, IASS, BUND, Le Monde Diplomatique (Ed.). https://www.boell.de/sites/default/files/bodenatlas2015_iv.pdf. call up 13.04.2017.

Destatis (2016): Statistik über das Steueraufkommen. https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/OeffentlicheFinanzenSteuern/Steuern/Steuerhaushalt/Tabellen/KassenmaessigeSteuereinnahmenVorSteuerverteilung.html. call up 16.11.2016.

Deutsche Rentenversicherung Bund (Ed.) (2018): Unsere Sozialversicherung. Wissenswertes speziell für junge Leute. www.deutsche-sozialversicherung.de/de/wegweiser/grundprinzipien.html. call up 24.10.2018.

Devetter, F.-X.; Rousseau, S. (2011): Working Hours and Sustainable Development. In: Review of Social Economy, 69(3), 333–355.

Di Blasi, Z.; Harkness, E.; Ernst, E.; Georgiou, A.; Kleijnen, J. (2001): Influence of context effects on health outcomes: a systematic review. In: The Lancet, 357(9258), 757-762.

Diener, E.; Lucas, R. E; Scollon, C. N. (2006): Beyond the hedonic treadmill: Revising the adaptation theory of well-being. In: American Psychologist, 61(4), 305–314.

Dittmar, H.; Bond, R.; Hurst, M.; Kasser, T. (2014): The Relationship between Materialism and Personal Well-Being: A Meta-Analysis. In: Journal of Personality and Social Psychology, 107(5), 879–924. DOI:10.1037/a0037409.

DIW (2010): Höhere Benzinpreise: Die Ökosteuer hat den Anstieg des Verkehrsaufkommens gebremst. Pressemitteilung vom 07.04.2010. http://www.diw.de/de/diw_01.c.354629.de/themen_nachrichten/hoehere_benzinpreise_die_oekosteuer_hat_den_anstieg_des_verkehrsaufkommens_gebremst.html. call up 16.11.2016.

DNR (Deutscher Naturschutzring) (Ed.): Geplante Obsoleszenz: Nutzungsdauerverkürzung mit System. https://www.dnr.de/fileadmin/wegewerk_Migration/steckbrief-geplante-obsoleszenz.pdf. call up 6. Juni 2016.

Dolata, U. (2014): Märkte und Macht der Internetkonzerne: Konzentration - Konkurrenz – Innovationsstrategien. In: Stuttgarter Beitrage zur Organisations- und Innovationsforschung, SOI Discussion Paper. https://www.econstor.eu/bitstream/10419/103876/1/804693285.pdf. call up 27.03.2017.

Domar, E. (1946): Capital Expansion, Rate of Growth, and Employment. In: Econometrica, 14(2), 137–147.

Douthwaite, R. (2012): Degrowth and the supply of money in an energy-scarce world. In: Ecological Economics, 84, 187–193. http://doi.org/10.1016/j.ecolecon.2011.03.020. call up 11.11.2016.

Douthwaite, R. J. (2000): The ecology of money. UK: Green Books.

Doyal, L. and Gough, I. (1991): A Theory of Human Need. Macmillan Press.

Duesenberry, J.S. (1949): Income, Savings and the Theory of Consumer Behavior. Cambridge, Massachusettes: Harvard University Press.

Dutt, A. K. (2010): Reconciling the growth of aggregate demand and aggregate supply. In: Setterfield, M. (Ed.): Handbook of Alternative Theories of Economic Growth, 220-241.

Dybczak, K.; Przywara, B. (2010): The role of technology in health care expenditure in the EU. European Commission, Economic Papers 400, February 2010, Brussels.

Eaton, B. C.; Matheson, J. A. (2013): Resource allocation, affluence and deadweight loss when relative consumption matters, In: Journal of Economic Behavior & Organization, 91(C), 159-178.

Edenhofer, O.; Kowarsch, M. (2015): Cartography of pathways: A new model for environmental policy assessments. In: Environmental Science and Policy, 51, 56–64.

Edenhofer, O.; Mattauch; L.; Siegmeier, J. (2015): Hypergeorgism: When Rent Taxation Is Socially Optimal. In: FinanzArchiv/Public Finance Analysis, 71(4), 474-505.

Ehrlich, P.; Holdren J. (1971): Impact of population growth. In: Science, 171(3977), 1212-1217.

Ekins, P.; Drummond, P.; Watson, J. (2017): Economic Approaches to Energy, Environment and Sustainability. In: Matyas, L.; Blundell, R.; Contillon, E.; Chizzolini, B.; Ivaldi, M.; Leininger, W.; Marimon, R und Steen, F. (Ed.): Economics without Borders. Economic Research for European Policy Challenges. Cambridge University Press, 274-323.

Elgin, D. (1993 [1981]): Voluntary simplicity: Toward a way of life that is outwardly simple, inwardly rich. New York: Quill.

Elster, J. (1982): Sour Grapes - Utilitarianism and the Genesis of Wants. In: Sen, A. K. & Williams, B. (Ed.), Utilitarianism and beyond, Cambridge: Cambridge University Press.

Elstner, S. und Schmidt, C.M. (2017): Die Verlangsamung des deutschen Produktivitätswachstums überwinden – Handlungsfelder für die Wirtschaftspolitik Wirtschaftsdienst 97(2): 87-92, https://doi.org/10.1007/s10273-017-2090-9.

Engelhard, P. (2012): Spezielle Markttheorie und Industrieökonomik: Die Evolution des Wettbewerbs in der deutschen Personenkraftwagenindustrie bis 2004. epubli.

Enquete-Kommission (2013): Schlussbericht der Enquete-Kommission “Wachstum, Wohlstand, Lebensqualität - Wege zu nachhaltigem Wirtschaften und gesellschaftlichem Fortschritt in der Sozialen Marktwirtschaft". Deutscher Bundestag Drucksache 17/13300. Bonn: Deutscher Bundestag.

European Commission (2018): Identifying barriers to innovation. https://ec.europa.eu/research/innovation-deals/index.cfm. call up 05.10.2018.

Expertenkommission Forschung und Innovation (EFI) (2017): Gutachten zu Forschung, Innovation und Technologischer Leistungsfähigkeit. Gutachten 2017. https://www.e-fi.de/fileadmin/Gutachten_2017/EFI_Gutachten_2017.pdf. call up 28.09.2018.

Eysenick, M.W. (1994): Happiness: Facts and Myths. Hove, UK: Psychology Press.

Farley, J. C. B.; M., Flomenhoft, G.; Kelly, B.; Murray, D.F.; Posner, S.; Putnam, M.; Scanlan, A.; Witham, A. (2013): Monetary and Fiscal Policies for a Finite Planet. In: Sustainability, 5, 2802–2826.

Fehr, H.; Kallweit, M.; Kindermann, F. (2013): Should pensions be progressive? In: European Economic Review, 63, 94–116. DOI: 10.1016/j.euroecorev.2013.07.004.

Felderer, B.; Homburg, S. (2005[1984]): Makroökonomik und neue Makroökonomik, 9. Auflage. Berlin: Springer. http://ideas.repec.org/b/zbw/esmono/92556.html. call up 13.04.2017.

Fine, B.; Murfin, A. (1984): Macroeconomics and Monopoly Capitalism. Brighton: Wheatsheaf Books.

Fisher, Allan G. B. (1939): Primary, secondary and tertiary production. In: Economic Record, 15, 24–38.

Fleurbaey, M.; Blanchet, D. (2013): Beyond GDP. Measuring Welfare and Assessing Sustainability. Oxford: Oxford University Press.

Fleurbaey, M.; Blanchet, D. (2013): Beyond GDP. Measuring Welfare and Assessing Sustainability. Oxford: Oxford University Press.

Foley, J. A.; DeFries, R.; Asner, G. P.; Barford, C.; Bonan, G.; Carpenter, S. R.; Snyder, P. K. (2005): Global consequences of land use. In: Science, 309(5734), 570–574.

Folke, C.; Carpenter, S. R.; Walker, B.; Scheffer, M.; Chapin, T.; Rockstroem, J. (2010): Resilience thinking: integrating resilience, adaptability and transformability. In: Ecology and Society 15(4), 20.

Foster, J. B. (2014[1986]): The theory of monopoly capitalism: An elaboration of Marxian political economy, New York: Monthly Review Press.

Foster, J. B.; Magdoff, F. (2009): The Great Financial Crisis. New York: Monthly Review Press.

Fourastié, J. (1967): Gesetze der Wirtschaft von morgen: drei grundlegende Essais. Berlin: Econ.

Fourastié, J. (1969): Die große Hoffnung des zwanzigsten Jahrhunderts. (deutsche Übersetzung der 1963 unter dem Titel" Le grand espoir du XXe siècle" veröffentlichten Erstausgabe), 2. Auflage, Köln: Bund.

Frank, R. H. (2005): Positional externalities cause large and preventable welfare losses. In: The American Economic Review, 95(2), 137-141.

Frank, R. H. (2008): Should public policy respond to positional externalities? In: Journal of Public Economics, 92(8-9), 1777-1786.

Fraunhofer Institut (2017): Internet der Dinge. Wandelbare Echtzeit-Logistiksysteme auf Basis intelligenter Agenten.
https://www.iml.fraunhofer.de/de/abteilungen/b1/automation_eingebettete_systeme/Forschung/internet_der_dinge.html. call up 27.03.2017.

Freeman, R. (1998): Work-sharing to full employment: serious option or populist fallacy? In: Russell Sage Foundation (Ed.): Generating jobs: How to increase demand for less-skilled workers, Kapitel 6.

Frey, C.B.; Osborne, M. (2013): The Future of Employment: How Susceptible are Jobs to Computerization? In: University of Oxford (Ed.): Paper for the Oxford University Engineering Sciences Department and the Oxford Martin Programme on the Impacts of Future Technology, Workshop on ‘Machines and Employment’.

Friedman, B. M. (2005): The moral case for growth, In: The International Economy, 19(4), 40-45.

Friedman, M. (1962): Capitalism and Freedom. Chicago: University of Chicago Press.

Frisch, M. (2013): Modeling Climate Policies: A Critical Look at Integrated Assessment Models. In: Philosophy and Technology, 26(2), 117-137.

Fuest, C., Peichl, A. (2009): Grundeinkommen vs. Kombilohn: Beschäftigungs- und Finanzierungswirkungen und Unterschiede im Empfängerkreis. In: IZA Standpunkte, 11.

Ganschar, O.; Gerlach, S.; Hämmerle, M.; Krause, T.; Schlund, S. (2013): Produktionsarbeit der Zukunft - Industrie 4.0., Studie. Ed.: Spath, D., Stuttgart: Fraunhofer Verlag.

Gardiner, S. M. (2011): A perfect moral storm: The ethical tragedy of climate change. Oxford: Oxford University Press.

Gebauer, J.; Sagebiel, J. (2015): Wie wichtig ist Wachstum für KMU? Ergebnisse einer Befragung von kleinen und mittleren Unternehmen. In: Neue Ausg. Schriftenreihe des IÖW, 208(15). Berlin: Institut für ökologische Wirtschaftsforschung.

Gebauer, J.; Lange, S.; Posse, D. (2017): Wirtschaftspolitik für Postwachstum auf Unternehmensebene: Drei Ansätze zur Gestaltung. In: Adler, F.; Schachtschneider, U.; Gesellschaft für Ökologische Kommunikation: Postwachstumspolitiken: Wege zur wachstumsunabhängigen Gesellschaft. München: oekom.

Geels, F. W. (2011): The multi-level perspective on sustainability transitions: Responses to seven criticisms. In: Environmental Innovation and Societal Transitions, 1(1), 24-40.

George H. (2006 [1879]): Progress and Poverty. New York: Kegan Paul, Schalkenbach Foundation, 283-284.

Georgescu-Roegen, N. (1971): The Entropy Law and the Economic Process. Cambridge, Massachusetts: Harvard University Press.

Getzen T. E. (2000): Health care is an individual necessity and a national luxury: Applying multilevel decision models to the analysis of health care expenditures. In: Journal of Health Economics, 19(2), 259-270.

Geyer, J. (2014): Zukünftige Altersarmut. DIW Berlin (Ed.): The German Socio-Economic Panel (SOEP), 25.

Giannelli, G. C.; Jaenichen, U.; Rothe, T. (2016): Doing Well in Reforming the Labour Market? Recent Trends in Job Stability and Wages in Germany. In: Journal for Labour Market Research, 49, 269-29.

Giesecke, M. (2014): Actuarial Adjustments, Retirement Behaviour and Worker Heterogeneity. In: Ruhr Economic Papers, 490.

Giesecke, M.; Okoampah, S. (2014): Inequality of Opportunity in Retirement Age – The Role of Physical Job Demands. In: Ruhr-Economic Papers, 492.

Giljum, S.; Dittrich, M.; Lieber, M.; Lutter, S. (2014): Global patterns of material flows and their socio-economic and environmental implications: a MFA study on all countries world-wide from 1980-2009. In: Resources 3, 319-339.

Glucina, M. D.; Mayumi, K. (2010): Connecting thermodynamics and economics. In: Annals of the New York Academy of Sciences, 1185, 11-29.

Godley, W.; Lavoie, M. (2012[2006]): Monetary economics: an integrated approach to credit, money, income, production and wealth, 2. Auflage. Houndmills: Palgrave Macmillan.
http://dl4a.org/uploads/pdf/Monetary+Economics+-+Lavoie+Godley.pdf. call up 13.04.2017.

Goldin, C. D.; Katz, L. F. (2008): The race between education and technology. Cambridge, Massachusetts: Belknap Press of Harvard University Press.

Goldsmith, R. W. (1969). Financial structure and development. New Haven, CT: Yale University Press.

Gordon, R. J. (2012): Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds. National Bureau of Economic Research, Inc (18315). http://ideas.repec.org/p/nbr/nberwo/18315.html. call up 04.04.2017.

Gough, I. (2014): Lists and thresholds: comparing the Doyal-Gough theory of human need with Nussbaum's capabilities approach. In: Comim, Flavio and Nussbaum, Martha C., (eds.), Capabilities, Gender, Equality: Towards Fundamental Entitlements. Cambridge: Cambridge University Press, pp. 357-381.

Goulder, L. H. (1995): Environmental Taxation and the Double Dividend: A Reader's Guide. In: International Tax and Public Finance, 2, 157–183.

Goulder, L. H. (2013): Climate change policy's interactions with the tax system. In: Energy Economics, 40, 3–11.

Graham, J. R.; Harvey, C. R.; Rajgopal, S. (2005): The economic implications of corporate financial reporting. In: Journal of Accounting and Economics, 40(1), 3-73.

Grasegger, H.; Krogerus, M. (2016): Ich habe nur gezeigt, dass es die Bombe gibt. In: Das Magazin, 3.12.2016. https://www.dasmagazin.ch/2016/12/03/ich-habe-nur-gezeigt-dass-es-die-bombe-gibt/. call up 27.03.2017.

Greenwood, J.; Jovanovic, B. (1990): Financial development, growth, and the distribution of income. In: Journal of Political Economy, 98(5, Part 1), 1076-1107.

Greenwood, J.; Smith, B. D. (1997): Financial markets in development, and the development of financial markets. In: Journal of Economic Dynamics and Control, 21(1), 145-181.

Greffrath, M. (2014): Macht es besser! In: Die Zeit. 09.10.2014. https://www.zeit.de/2014/40/mariana-mazzucato-staat-wirtschaft. call up 20.10.2018.

Griffin, J. (1986): Well-Being. Its Meaning, Measurement and Moral Importance. Oxford: Clarendon Press.

Grubb, M.; Hourcade, J.-Ch.; Neuhoff, K. (2014): Planetary Economics. Energy, Climate Change and the Three Domains of Sustainable Development. Routledge.

Gruber, J. (1994): The Incidence of Mandated Maternity Benefits. In: The American Economic Review, 3, 622–641.

Gruber, J. (1997): The Incidence of Payroll Taxation: Evidence from Chile. In: Journal of Labor Economics, 15(3), 72–101.

Gruber, J.; Krueger, A. B. (1991): The Incidence of Mandated Employer-Provided Insurance: Lessons from Workers' Compensation Insurance. Lessons from Workers' Compensation. In: Tax Policy and the Economy, 5, 111–144.

Grüne-Yanoff, T. (2008): Learning from Minimal Economic Models, In: Erkenntnis, 70, 81-99.

Guellec, D.; van Pottelsberghe de la Potterie, B. (2001): R&D and Productivity Growth. Panel Data Analysis of 16 OECD Countries. In: STI Working Papers, 3.

Gurley, J. G.; Shaw, E. S. (1955): Financial aspects of economic development. In: The American Economic Review, 45(4), 515-538.

Habermann, F. (2016): Economy: UmCARE zum Miteinander. Sulzbach/Taunus: Ulrike Helmer Verlag. http://keimform.de/wp-content/uploads/2016/06/Habermann_Ecommony.pdf. call up 27.03.2017.

Habermas, J. (1968): Technik und Wissenschaft als "Ideologie". Frankfurt am Main: Suhrkamp.

Haldane, A. G (2017): Productivity puzzles. Speech given by Andrew G Haldane, London School of Economics, 20.03.2017. https://www.bankofengland.co.uk/-/media/boe/files/speech/2017/productivity-puzzles.pdf. call up 20.05.2018.

Hand, M.; Shove, E.; Southerton, D. (2005): Explaining showering: A discussion of the material, conventional, and temporal dimensions of practice. In: Sociological Research Online, 10(2). http://www.socresonline.org.uk/10/2/hand.html. call up 04.04.2017.

Hanushek, E. A.; Woessmann, L. (2012): Do better schools lead to more growth? Cognitive skills, economic outcomes, and causation. In: Journal of Economic Growth, 17(4), 267–321. DOI: 10.1007/s10887-012-9081-x.

Harsanyi, J. C. (1982): Morality and the Theory of Rational Behaviour. In: Sen, A. K. & Williams, B. (Ed.), Utlitarianism and beyond, Cambridge: Cambridge University Press.

Hartwig, J (2008): What drives health care expenditure?—Baumol's model of 'unbalanced growth' revisited. In: Journal of Health Economics, 27(3), 603-623.

Harvey, D. (2010): A companion to Marx's capital. London: Verso.

Haug, F. (2011): Die Vier-in-Einem-Perspektive. Eine Politik von Frauen für eine neue Linke. Hamburg: Argument Verlag.

Hauser, R. (2006): Alternativen einer Grundsicherung-soziale und ökonomische Aspekte. In: Gesellschaft Wirtschaft Politik, 55(3), 331.

Hausman, D. M., (2012): Preference, value, choice, and welfare. Cambridge: Cambridge University Press.

Hayden, A. (2006): France's 35-Hour Week: Attack on Business? Win-Win Reform? Or Betrayal of Disadvantaged Workers? In: Politics & Society, 34(4), 503–542.

Hayden, A.; Shandra J. M. (2009): Hours of work and the ecological footprint of nations: an exploratory analysis. In: Local Environment 14(6), 575–600.

Heckman, J.J.; Pagés, C. (2003): Law and Employment. Lessons from Latin America and the Caribbean. In: Nber Working Paper Series, No. 10129.

Hein, E. (2014): Distribution and Growth after Keynes: A Post-Keynesian Guide. Cheltenham: Edward Elgar.

Heine, D.; Norregaard, J.; Parry, I. W. H. (2012): Environmental Tax Reform: Principles from Theory and Practice to Date. In: IMF Working Paper, 12(180).

Heintze, C. (2009): Ausbau öffentlicher und gesellschaftsnaher Dienstleistungen als Teil einer binnenmarktorientierten Vollbeschäftigungsstrategie. Problemaufriss und empirische Ländervergleiche. Ausarbeitung im Auftrag von Verdi. https://wipo.verdi.de/++file++53a83cb7aa698e68a9002502/download/2009-Heintze_Offentliche-und-gesellschaftsnahe-Dienstleistungen.pdf. call up 18.04.2017.

Helfrich, S. (2012): Commons. Für eine neue Politik jenseits von Markt und Staat. Ed.: Helfrich S.; Heinrich-Böll-Stiftung. Großburgwedel: Aalexx Buchproduktion GmbH. https://www.boell.de/sites/default/files/2012-04-buch-2012-04-buch-commons.pdf. call up 27.03.2017.

Helfrich, S.; Bolier, D. (2011): Was sind Gemeingüter? – Essay. http://www.bpb.de/apuz/33206/was-sind-gemeingueter-essay?p=all. call up 04.07.2016.

Helfrich, S.; Bollier, D. (2015): Die Welt der Commons: Muster gemeinsamen Handelns. Bielefeld: transcript.

Helfrich, S.; Bollier, D. (2014): Commons. In: D'Alisa, G.; Demaria, F.; Kallis, G. (Ed.): Degrowth: A vocabulary for a new era, 75–78.

Helpman, E. (Ed.) (1998): General Purpose Technologies and Economic Growth, MIT Press.

Helpman, E; Trajtenberg, M (1998): 'A Time to Sow and A Time to Reap: Growth Based on General Purpose Technologies'. In: Helpman, E. (Ed.) General Purpose Technologies and Economic Growth, MIT Press.

Hepburn, C. (2006): Regulation by prices, quantities, or both: a review of instrument choice. In: Oxford Review of Economic Policy, 22(2), 226-247.

Hepburn, C.; Bowen, A. (2013): Prosperity with growth: Economic growth, climate change and environmental limits. In: Fouquet, R. (Ed.), Handbook on energy and climate change, Edward Elgar Publishing.

Hepburn, C.; Pless, J.; Popp, D. (2018): Encouraging Innovation that Protects Environmental Systems: Five Policy Proposals. In: Review of Environmental Economics and Policy, 12(1), 154-169.

Hilferding, R.; Bottomore, T. (1990): Finance capital: A study in the latest phase of capitalist development. London: Routledge.

Hirsch, F. (1976): Social Limits to Growth. Twentieth Century Fund. Cambridge, Massachusetts; London: Harvard University Press.

Hoch, A.; Handrich, L.; Pavel, F. (2016): Die ökonomische Bedeutung der Werbung. Berlin: DIW Econ GmbH.

Hoh, C.; Honekamp, I. (2010): Selbstbeteiligung als Lösung für das Moral-Hazard-Problem auf dem Arzneimittelmarkt. In: MPRA Paper, No. 27425.

Holling, C. S. (1973): Resilience and stability of ecological systems. Annual Revue of Ecology and Systematics, 4, 1-23.

Höpflinger, F. (2007): Ausdehnung der Lebensarbeitszeit und die Stellung älterer Arbeitskräfte. Perspektiven aus Sicht einer differenziellen Alternsforschung. In: Pasero, U.; Backes G. M.; Schroeter, K.R. (Ed.): Altern in Gesellschaft. Ageing – Diversity – Inclusion, 307-343.

Höpflinger, F. (2010): Alterssicherungssysteme: Doppelte Herausforderung von demographischer Alterung und Postwachstum. In: Seidl, I.; Zahrnt, A. (Ed.): Postwachstumsgesellschaft. Konzepte für die Zukunft. Marburg: Metropolis-Verlag, 53-63.

Huber, J. (1994): Nachhaltige Entwicklung durch Suffizienz, Effizienz und Konsistenz. In: Fritz, P.; Huber. J.; Levi, H. W. (Ed.): Nachhaltigkeit in naturwissenschaftlicher und sozialwissenschaftlicher Perspektive, Stuttgart: Hirzel/Wissenschaftliche Verlagsgesellschaft, 31 - 46.

Hunt, J. (1996): Has work-sharing worked in Germany? In: NBER Working Papers, No. w5724.

Hunt, J.; Katz, L. F. (1998): Hours reductions as work-sharing. In: Brookings papers on economic activity, 1, 339-381.

Husson, M. (2002): Réduction du temps de travail et emploi: une nouvelle évaluation. In: La Revue de l'IRES, 38(1).

Illich, I., (1973): Tools for Conviviality. New York: Harper & Row.

Initiative Unternimm die Zukunft (Ed.) (2018): Unternimm die Zukunft. http://www.unternimm-die-zukunft.de/de/meta/impressum. call up 20.10.2018.

Institut der deutschen Wirtschaft Köln (2015): Innovation und Wachstum. Kurzgutachten.

Jackson, T. (2009): Prosperity without growth? The transition to a sustainable economy, In: The Sustainable Development Commission (Ed.), März 2009. http://www.sd-commission.org.uk/data/files/publications/prosperity_without_growth_report.pdf. call up 1.04.2017.

Jackson, T.; Drake, B.; Victor, P. A.; Kratena, K.; Sommer, M. (2014): Foundations for an ecological macroeconomics: Literature review and model development. In: WWWforEurope (Ed.): Working Paper for the Research Project, No. 65.

Jackson, T.; Peter A. V. (2016): Does slow growth lead to rising inequality? Some theoretical reflections and numerical simulations. In: Ecological Economics, 121, 206–219.

Jackson, T.; Victor, P. A. (2011): Productivity and work in the “green economy”: Some theoretical reflections and empirical tests. In: Environmental Innovation and Societal Transitions, 1(1), 101–108. http://doi.org/10.1016/j.eist.2011.04.005.

Jackson, T.; Victor, P. A. (2015). Does credit create a “growth imperative”? A quasi-stationary economy with interest-bearing debt. In. Ecological Economics, 120, 32–48. http://doi.org/10.1016/j.ecolecon.2015.09.009

Jacobs, M. (2013): Green Growth. In: Falkner, R. (Ed.): Handbook of Global Climate and Environmental Policy. Oxford: Wiley Blackwell.

Jacobs, M.; Mazzucato, M. (2016): Rethinking Capitalism: An Introduction. In: Mazzucato, M.; Jacobs, M. (Ed.): Rethinking Capitalism. UK, Chichester: John Wiley & Sons Inc, 1-27.

Jacquemin, A.; Slade, M. E. (1989): Cartels, collusion, and horizontal merger. In: Handbook of Industrial Organization, 1, 415-473.

Jaeger, C. C.; Paroussos, L.; Mangalagiu, D.; Kupers, R.; Mandel, A.; Tabara, J. D. (2011): A New Growth Path for Europe. Generating Prosperity and Jobs in the Low-Carbon Economy. European Climate Forum.

Jaeggi, R. (2016): What (if Anything) Is Wrong with Capitalism? Dysfunctionality, Exploitation and Alienation: Three Approaches to the Critique of Capitalism. In: The Southern Journal of Philosophy, 54, 44-65.

Jakob, M.; Edenhofer, O. (2014): Green Growth, Degrowth, and the Commons. In: Oxford Review of Economic Policy, 30(3), 447-468.

Jalas, M. (2002): A time use perspective on the materials intensity of consumption. In: Ecological Economics, April 2002, 41(1), 109–123.

Jalas, M. (2005): The Everyday Life Context of Increasing Energy Demands: Time Use Survey Data in a Decomposition Analysis. In. Journal of Industrial Ecology, Januar 2005, 9(1–2), 129–145.

Jänicke, M. (2012): Wir brauchen radikale Lösungen. In: Ökologisches Wirtschaften, 27(4), 20.

Jarass, L. (2008): Schieflage durch Privilegien. Private-Equity- und Hedgefonds profitieren. Das Ausschlachten inländischer Unternehmen wird subventioniert. http://www.jarass.com/Steuer/B/druck.pl.html. call up 16.06.2016.

Jarass, L. (2010): Faire und effiziente Steuerpolitik. In: Seidl, I.; Zahrnt, A. (Ed.), Postwachstumsgesellschaft. Konzepte für die Zukunft. Marburg: Metropolis-Verlag.

Jevons, W. S. (1906[1865]): The coal question: an inquiry concerning the progress of the nation, and the probable exhaustion of our coal-mines. In: Flux, A. W. (Ed.), London.

Johnson, D. (1997): Agriculture and the wealth of nations. In. The American Economic Review, 87(2), 1–12.

Jones, B. F. (2009): The Burden of Knowledge and the “Death of the Renaissance Man”: Is Innovation Getting Harder? In: Review of Economic Studies, 76(1), 283–317. DOI: 10.1111/j.1467-937X.2008.00531.x.

Jörg, J. (2015): Kostenbeteiligung durch Patient und Arzt. In: Berufsethos kontra Ökonomie. Berlin, Heidelberg: Springer, 47-55.

Kahneman, D.; Krueger, A. B. (2006): Developments in the Measurement of Subjective Well-Being. In: Journal of Economic Perspectives, 20, 3-24.

Kaldor, N. (1957): A model of economic growth. In: The Economic Journal, 67(268), 591–624.

Kaldor, N. (1961): Capital accumulation and economic growth. London: Macmillan.

Kalecki, M. (2013[1954]): Theory of economic dynamics. London: Routledge.

Kallis, G. (2011): In defence of degrowth. In: Ecological Economics, 70(5), 873–880. http://doi.org/10.1016/j.ecolecon.2010.12.007 call up 18.04.2017.

Kallis, G. (2015): Social Limits of Growth. In: D’Alisa, G.; Kallis G.; F. Demaria (Ed.): Degrowth a vocabulary for a new era. London; New York: Routledge. Chapter 30.

Kallis, G. (2016): Epilog. In: D’Alisa, G.; Demaria, F.; Kallis, G. (Ed.): Degrowth. Handbuch für eine neue Ära.

Kallis, G.; Kalush, M.; O’Flynn, H.; Rossiter, J.; Ashford, N. (2013): Friday off: Reducing working hours in Europe. In: Sustainability, 5 (4), 1545–1567. http://doi.org/10.3390/su5041545.

Kallis, G., Kerschner, C., und Martinez-Alier, J. (2012): The economics of degrowth. In. Ecological Economics, Ausgabe 84, S. 172–180. http://doi.org/10.1016/j.ecolecon.2012.08.017.

Kallis, G.; Kostakis, V.; Lange, S.; Muraca, B.; Paulson, S.; Schmelzer, M. (2018): Research on Degrowth. In: Annual Review of Environment and Resources 43(1).

Kallis, G.; Martinez-Alier, J. (2010): Caps yes, but how? A response to Alcott. In: Journal of Cleaner Production, 18(15), 1570–1573. http://doi.org/10.1016/j.jclepro.2010.06.010. call up 18.04.2017.

Kay, J. (2009): The Spirit Level. Review of The Spirit Level: Why More Equal Societies Almost Always Do Better by Richard Wilkinson and Kate Pickett. In: Financial Times am 23.03.2009. https://www.ft.com/content/77b1bd26-14db-11de-8cd1-0000779fd2ac. call up 05.06.2018.

Kelley, J. M.; Kraft-Todd, G.; Schapira, L.; Kossowsky, J., & Riess, H. (2014): The influence of the patient-clinician relationship on healthcare outcomes: a systematic review and meta-analysis of randomized controlled trials. In: Pios one, April 2014, 9(4), e94207.

Kennedy, E. H.; Krahn, H.; Krogman, N.T. (2013): Downshifting: An Exploration of Motivations, Quality of Life, and Environmental Practices. In: Sociological Forum, 28(4), 764–783.

Kennedy, M. (2012): Occupy money: Creating an economy where everybody wins. Gabrialo Island, Canada: New Society Publishers.

Keynes, J. M. (2006[1936]): General theory of employment, interest and money. New York: Harcourt, Brace and Company. https://www.marxists.org/reference/subject/economics/keynes/general-theory/. call up 04.04.2017.

Kim, H.-J. (2006): The Shift to the Service Economy: Causes and Effects. Institute for Monetary and Economic Research. The Bank of Korea.

King, R. G.; Levine, R. (1993): Finance, entrepreneurship and growth. In: Journal of Monetary Economics, 32(3), 513-542.

Knight, K. W.; Rosa, E.A.; Schor, J.B. (2013): Could working less reduce pressures on the environment? A cross-national panel analysis of OECD countries, 1970–2007. In: Global Environmental Change, 23(4), 691–700.

Knotek, E. (2007): How useful is Okun's law? In: Economic Review-Federal Reserve Bank of Kansas City, 92(4), 73–103.

Koepp, R.; Schunke, F.; Köhler, C.; Liebig, S.; Schröder, S. (2015): Arbeit in der Postwachstumsgesellschaft. Diagnosen, Prognosen und Gegenentwürfe: Eine kommentierte Literaturübersicht. Working Paper 6/2015 der DFG-KollegforscherInnengruppe Postwachstumsgesellschaften.

Kohlhaas, M. (2005): Gesamtwirtschaftliche Effekte der ökologischen Steuerreform. Band II des Endberichts für das Vorhaben: Quantifizierung der Effekte der Ökologischen Steuerreform auf Umwelt, Beschäftigung und Innovation. Forschungsprojekt im Auftrag des Umweltbundesamts FuE-Vorhaben Förderkennzeichen 204 41 194. DIW Berlin, German Institute for Economic Research.

Koppel, O. (2011): Patente. Unverzichtbarer Schutz des geistigen Eigentums in der globalisierten Wirtschaft, In: IW-Positionen Vol. 48, Köln.

Köstler, U. (2006): Seniorengenossenschaften - Stabilitätseigenschaften und Entwicklungsperspektiven - Eine empirische Studie zu Sozialgebilden des Dritten Sektors auf Grundlage der Gegenseitigkeitsökonomik. In: Neue Kölner Genossenschaftswissenschaft, Ausgabe 2.

Kramarz, F.; Cahuc, P.; Crepon, B.; Schank, T.; Nordström Skans, O.; van Lomwel, G.; Zylberberg, A. (2008): Labour Market Effects of Work-Sharing Arrangements in Europe. In: Boeri, T.; Burda, M. Kramarz, F. (Ed.): Working Hours and Job Sharing in the EU and USA: Are Europeans Lazy? Or Americans Crazy? Oxford: Oxford University Press.

Kramarz, F.; Philippon, T. (2001): The Impact of Differential Payroll Tax Subsidies on Minimum Wage Employment. In: Journal of Public Economics, 82(1), 115–146.

Krausmann, F.; Gingrich, S.; EIsenmenger, N.; Erb, K.; Haberl, H.; Fischer-Kowalski, M. (2009): Growth in global materials use, GDP and polulation during the 20th century. In: Ecological Economics, 68(10), 2696-2705.

Krelle, W.; Coenen, D. (1988): Theorie des wirtschaftlichen Wachstums: Unter Berücksichtigung von erschöpfbaren Ressourcen, Geld und Außenhandel (Texts and Monographs in Economics and Mathematical Systems). Berlin, Heidelberg: Springer.

Krugman, P. (2003): Lumps of Labor. In The New York Times vom 07.10.2003. http://www.nytimes.com/2003/10/07/opinion/07KRUG.html?pagewanted=print. call up 18.04.2017.

Kugler, A.; Kugler, M. (2008): Labor market effects of payroll taxes in developing countries: evidence from Colombia. In: Nber Working Papers, 13855.

Kümmel, R. (2011): The Second Law of Economics. Energy, Entropy and the Origins of Wealth. Berlin: Springer.

Kümmel, R. (2013): Festvortrag auf dem Bauphysikertreffen 2013 der Hochschule für Technik, Stuttgart, 29.11.2013

Kümmel, R.; Lindenberger, D. (2014): How energy conversion drives economic growth far from the equilibrium of neoclassical economics. In: New Journal of Physics, 16(12).

Kümmel, R.; Lindenberger, D.; Eichhorn, W. (1997): Energie, Wirtschaftswachstum und technischer Fortschritt. In: Phys. Blätter. 53, 869-875.

Kuhlmann, St.; Rip, A. (2018): Next-Generation Innovation Policy and Grand Challenges. In: Science and Public Policy, 45(4), 448–454.

Kunce M.; Shogren J. (2007): Efficient decentralized fiscal and environmental policy: A dual purpose Henry George tax. In: Ecological Economics, April 2008, 65(3).

Kurth, M.; Klein-Schmeink, M.; Andrae, K. (2016): Mit Sicherheit in die Selbständigkeit. In: Autorenpapier, Bündnis 90/ Die Grünen.

Kuznets, S. (1933): National Income. In: Seligman, E.; Johnson, A. (Ed.): Encyclopedia of the Social Sciences, 11, New York, 205-224.

Lange, S. (2017): Macroeconomics Without Growth: Sustainable Economies in Neoclassical, Keynesian and Marxian Theories. Dissertation. Hamburg: Universität Hamburg.

Lange, S.; Pütz, P.; Kopp, T. (2018): Do Mature Economies Grow Exponentially? In: Ecological Economics, 147, 123–33.

Lange, S.; Santarius, T. (2018): Smarte grüne Welt? Digitalisierung zwischen Überwachung, Konsum und Nachhaltigkeit. München: oekom Verlag.

Lanier, J. (2015): Warum wollt ihr unseren Quatsch? In: FAZ, 02.07.2015. http://www.faz.net/aktuell/feuilleton/debatten/die-digital-debatte/internet-vordenker-jaron-lanier-im-gespraech-13679623.html. call up 27.03.2017.

Latouche, S. (2009): Farewell to Growth. Cambridge: Polity Press.

Latouche, S. (2015a): Vom Glück zum BIP - und die Alternative des guten Lebens. Blätter für deutsche und internationale Politik, Februar 2015, 83–97.

Latouche, S. (2015b): Es reicht! Abrechnung mit dem Wachstumswahn. Deutsche Erstausgabe. München: oekom.

Lehment, H. (1991): Lohnzurückhaltung, Arbeitszeitverkürzung und Beschäftigung. eine empirische Untersuchung für die Bundesrepublik Deutschland von 1973-1990. In: Die Weltwirtschaft, 2, 72–86.

Leiber, S.; Zwiener, R. (2006): Zwischen Bürgerversicherung und Kopfpauschale: Vorschläge für eine tragfähige Kompromisslösung In: WSI Diskussionpapier, Nr. 146.

Leipprand, A.; aus dem Moore, N. (2012): Die natürlichen Grenzen der Ökonomie. Plädoyer für eine ökologische Schuldenbremse. In: Leviathan, 40(2), 173-201.

Lepenies, P. (2013): Die Macht der einen Zahl. Berlin: Suhrkamp Verlag AG.

Levine, R. (2005): Finance and growth: theory and evidence. Handbook of Economic Growth, 1, 865-934.

Liesen, A.; Dietsche, C.; Gebauer, J. (2013): Wachstumsneutrale Unternehmen: Pilotstudie zur Unternehmensperspektive im Postwachstumsdiskurs. In: Schriftenreihe des Instituts für ökologische Wirtschaftsforschung, Vol. 205. Berlin: Institut für ökologische Wirtschaftsforschung.

Lietaer, B. A.; Arnsperger, C.; Brunnhuber, S.; Goerner, S. (2012): Money and Sustainability: The Missing Link. Axminster: Triarchy Press.

Linebaugh, P. (2008): The Magna Carta manifesto: Liberties and commons for all. California: University of California Press.

LINKE, DIE (2013): Wahlprogramm der Partei DIE LINKE zur Bundestagswahl 2013.

Löhr, D. (2012): The euthanasia of the rentier—A way toward a steady-state economy? In: Ecological Economics, 84, 232-239.

Lorek, Sylvia (2016) Dematerialisierung. In: D'Alisa, G.; Demaria, F.; Kallis, G. (Ed.), Degrowth. Handbuch für eine neue Ära, 100-103.

Loske, R. (2013): The Good Society without Growth. Why Green Growth is Not Enough. BASILIKEN- Presse.

Loske, R. (2015): Politik der Zukunftsfähigkeit: Konturen einer Nachhaltigkeitswende. Fischer Verlag.

Lucas, R. E. (2015): Human Capital and Growth. In: American Economic Review, 105(5), 85–88. DOI:10.1257/aer.p20151065.

Lutter, S., Giljum, S.; Lieber, M. (2016): Die Nutzung natürlicher Ressourcen. Ein Bericht für Deutschland 2016. In: UBA (Ed.). https://www.umweltbundesamt.de/sites/default/files/medien/376/publikationen/die_nutzung_natuerlicher_ressourcen.pdf. call up 16.05.17.

Maisch, N.; Meiwald, P.; Söhne, C.; Kretschmar, M. (2014): Geplante Obsoleszenz.Gekauft, gebraucht, kaputt – vom viel zu kurzen Leben vieler Produkte. In: Bündnis 90/Die Grünen (Ed.): Bundestagsfraktion Berlin, August 2014.

Mandel, Ernest (1974[1962]): Marxist economic theory, 1. Auflage. New York: The Merlin Press.

Mankiw, N. G. (2003): Principles of macroeconomics, 3. Auflage. Mason: South-Western College Publishing.

Mankiw, N. G. (2010): Macroeconomics, 7. Auflage. New York: Worth Publishers.

Mankiw, N. G.; Romer, D.; Weil, D. N. (1992): A Contribution to the Empirics of Economic Growth. In: The Quarterly Journal of Economics, 107(2), 407–437. https://ideas.repec.org/a/oup/qjecon/v107y1992i2p407-437.htm. call up 04.04.2017.

Marckmann, P. D. G.; Möhrle, M.; Blum, A. (2004): Gesundheitliche Eigenverantwortung. In: Der Hautarzt, 55(8), 715.

Martínez-Alier, J.; Pascual, U.; Vivien, F.-D.; Zaccai, E. (2010): Sustainable de-growth: Mapping the context, criticisms and future prospects of an emergent paradigm. In: Ecological Economics, 69(9), 1741–1747.

Marx, K. (1990[1867]): Capital, 1. Ausgabe. London: Penguin Books.

Mason, R.S (1998): The Economics of Conspicuous Consumption: Theory and Thought Since 1700. Cheltenham: Edward Elgar.

Mattauch, L.; Hepburn, C. (2016): Climate Policy When Preferences Are Endogenous—and Sometimes They Are. Midwest Studies in Philosophy XL, 76-95.

Mattauch, L.; Siegmeier, J.; Funke, F. (2017): Wirtschaftswachstum aufgeben? Zur Struktur populärer wachstumskritischer Argumente. MCC Working Paper 1/2017.

Max-Neef, M.; Elizalde, A.; Hopenhayn, M. (1992): Development and Human Needs. In: Ekins, P. & Max-Neef, M. (Ed.): Real Life Economics, Routledge.

Mazzucato, M. (2017): Mission-Oriented Innovation Policy: Challenges and Opportunities. UCL Institute for Innovation and Public Purpose, Working Paper 2017-01, University College London.

Mazzucato, M.; Jacobs, M. (Ed.) (2016): Rethinking Capitalism. Chichester, UK: Wiley Blackwell.

McChesney, R. W.; Foster, J.B.; Stole, I.L.; Holleman, H. (2009): The Sales Effort and Monopoly Capital. New York: Monthly Review.

McChesney, R. W. (2013): Digital Disconnect. New York: New Press.

McCloskey, D. (2016): Bourgeois Equality. How Ideas, Not Capital or Institutions, Enriched the World. Chicago: UP.

McKinsey Global Institute (2017): A future that works: automation, employment, and production. McKynsey&Company.

MEA (2007): Das falsche Nullsummenspiel mit der Arbeitszeit. In: Mannheim Research Institute for the Economics of Aging (Ed.): Policy Brief No. 3.

Meinhard, V. (2014): Wohin soll es mit der gesetzlichen Rentenversicherung gehen? Eine Bürgerversicherung wäre armutsverhindernd und finanzierbar! In: DIW Berlin (Ed.): Vierteljahrshefte zur Wirtschaftsforschung, 83, 49–59.

Mellor, M. (2015): Public money. In: D'Alisa, G.; Demaria, F.; Kallis, G. (Ed.): Degrowth: A vocabulary for a new era, 175–177. Abington: Routledge.

Merkel, A. (2015): Europa braucht eine starke Wirtschaft. https://www.bundesregierung.de/Content/DE/Artikel/2015/03/2015-03-02-merkel-rede-eib-konferenz.html. call up 18.04.2017.

Meyer, B. (2010): Ressourceneffiziente Wirtschaftsentwicklung unter dem Primat ökologischer Ziele. In: Seidl, I.; Zahrnt, A. (Ed.): Postwachstumsgesellschaft. Konzepte für die Zukunft. Marburg: Metropolis-Verlag.

Meyer, T. (2013): Beveridge statt Bismarck! Europäische Lehren für die Alterssicherung von Frauen und Männern in Deutschland. Berlin: Friedrich-Ebert-Stiftung.

Meyerhoff, J.; Petschow, U. (1996): Nachhaltige Entwicklung als langfristiger Wandlungsprozesse. Konsequenzen für die Wirtschafts- und Umweltpolitik. In: Gerken, L. (Ed.): Ordnungspolitische Grundfragen einer Politik der Nachhaltigkeit, Nomos.

Miegel, M. (2010): Wohlstand ohne Wachstum. München: Propyläen.

Mills, E. (1998): The Economic Consequences of a Land Tax. In: Netzer; D. (Ed.): Land Value Taxation: Can It and Will It Work Today? Cambridge, Massachusetts: Lincoln Institute of Land Policy, 31-48.

Ministerium für Wissenschaft, Forschung und Kunst Baden-Württemberg (2018): Baden-Württemberg fördert Reallabore, https://mwk.baden-wuerttemberg.de/de/forschung/forschungspolitik/wissenschaft-fuer-nachhaltigkeit/reallabore. call up 07.10.2018.

Moellendorf, D. (2014): The moral Challenge of Dangerous Climate Change. Values, Poverty, and Policy. Cambridge: Cambridge University Press.

Möhring-Hesse, M. (2010): Warum die Verteilung Gerechtigkeit, nicht aber Wachstum braucht. In: Seidl, I.; Zahrnt, A. (Ed.): Postwachstumsgesellschaft, 117-128.

Möller, J. (2015): Verheißung oder Bedrohung? Die Arbeitsmarktwirkungen einer vierten industriellen Revolution. In: IAB-Discussion Paper, 18. https://www.econstor.eu/bitstream/10419/119443/1/828396299.pdf. call up 27.03.2017.

Mokyr, J. (2016): A Culture of Growth: The Origins of the Modern Economy. Princeton: UP.

Morell, M. F. (2014): Digital commons. In: D'Alisa, G.; Demaria, F.; Kallis, G. (Ed.): Degrowth. A vocabulary for a new era. New York; London: Routledge, 159–161.

Morozov, E. (2013): Es ist lächerlich das Internet erklären zu wollen! In: FAZ, 12.10.2013. http://www.faz.net/aktuell/feuilleton/debatten/evgeny-morozov-im-gespraech-es-ist-laecherlich-das-internet-erklaeren-zu-wollen-12614255-p2.html. call up 27.03.2017.

Muraca, B (2014): Gut leben. Eine Gesellschaft jenseits des Wachstum. Berlin: Klaus Wagenbach.

Muraca, B. (2013): Decroissance: A Project for a Radical Transformation of Society. In: Environmental Values, 22(2), 147-169.

Murray C.; Rivers, N. (2015): British Columbia's Revenue-Neutral Carbon Tax: A Review of the Latest „Grand Experiment". In: Environmental Policy, Duke Nicholas Institute (Ed.): Working Paper, 15(04).

Naturschutzbund Deutschland (NABU) (2011): Die Grundsteuer nachhaltig reformieren: Die bevorstehende Grundsteuerreform für eine nachhaltige Siedlungsentwicklung nutzen. https://www.nabu.de/imperia/md/content/nabude/nachbarnatur/2011-03-01_nabu-hintergrund_grundsteuerreform.pdf. call up 16.11.2016.

Nelson, A. (2016a): Your Money or Your Life. Money and Socialist Transformation. In: Capitalism Nature Socialism, 1-21.

Nelson, A. (2016b): Non-Monetary Degrowth is Strategically Significant. Paper delivered to the 5th International Degrowth Conference in Budapest, Corvinus University.

Newhouse J. (1992): Medical care costs: How Much Welfare Loss? In: Journal of Economic Perspectives, 6(3), 3-21.

Ng, Y.-K.; Wang, J. (1993): Relative income, aspiration, environmental quality, individual and political myopia. In: Mathematical Social Sciences, Juli 1993, 26(1), 3-23.

Nordhaus, W. (2008): Baumol's diseases: a macroeconomic perspective. In: The BE Journal of Macroeconomics, 8(1), 1–39.

Nöthen, M. (2011): Hohe Kosten im Gesundheitswesen: Eine Frage des Alters? Statistisches Bundesamt Wiesbaden.

Nussbaum, M. C. (2000): Women and Human Development. Cambridge: Cambridge University Press.

O'Neill, D.; Dietz, R.; Jones, N. (Ed.) (2010): Enough is enough: Ideas for a sustainable economy in a world of finite resources. The report of the steady state economy conference. Leeds: Center for the Advancement of the Steady State Economy.

O'Neill, J. (1998): The Market, Ethics, Knowledge and Politics. London: Routledge.

Oates W.; Schwab, R. (1988): Economic competition among jurisdictions: efficiency enhancing or distortion inducing. In: Journal of Public Economics, März 2011, 35, 333-354.

Ockwell, D. G. (2008): Energy and economic growth: Grounding our understanding in physical reality, In: Energy Policy, 36, 4600-4604.

OECD (2011): Towards Green Growth. Paris: Organisation for Economic Cooperation and Development.

OECD (2012): Energy, OECD Green Growth Studies, OECD Publishing.

OECD (2015a): OECD Digital Economy Outlook 2015. Paris: OECD Publishing. http://www.oecd-ilibrary.org/science-and-technology/oecd-digital-economy-outlook-2015_9789264232440-en. call up 18.04.2017.

OECD (2015b): The future of productivity. https://www.oecd.org/eco/OECD-2015-The-future-of-productivity-book.pdf. call up 27.03.2017.

OECD (2017): The Next Production Revolution: Implications for Governments and Business. Paris: OECD Publishing.

Oesch, T.; Künzi, K. (2008): Zeitgutschriften für die Begleitung, Betreuung und/oder Pflege älterer Menschen. Literaturübersicht und Einschätzungen von Experten aus der Praxis. Bern: Büro für Arbeits- und Sozialpolitische Studien.

Okun, A. (1963): Potential GNP: its measurement and significance. In: Owles Foundation Paper 190. http://scholar.google.com/scholar?q=Potential+GNP:+Its+Measurement+and+Significance&btnG=&hl=de&as_sdt=0,5#0 call up 02.02.2018.

Open Source Ecology (2017): https://opensourceecology.de/images/Flyer_OSE-Germany_2016_print.pdf. call up 27.03.2017.

Opree, S. J.; Buijzen, M.; van Reijmersdal, E.A.; Valkenburg, P.M (2014): Children's Advertising Exposure, Advertised Product Desire, and Materialism: A Longitudinal Study. In: Communication Research, Juli 2014, 41(5), 717–35.

Ostrom, E. (2005): Understanding Institutional Diversity. Princeton: Princeton University Press.

Ott, K.; Döring, R. (2008): Theorie und Praxis starker Nachhaltigkeit, 2. Auflage. Marburg: Metropolis-Verlag.

Ott, K. (2012): Variants of De-Growth and Deliberative Democracy: A Habermasian Proposal. In: Futures, 44, 571-581.

Paech, N. (2012): Befreiung vom Überfluss auf dem Weg in die Postwachstumsökonomie. 3. Auflage. München: oekom.

Paech, N. (2017): Der zerstörerische Traum vom Fortschritt. In: ZEIT, 03.01.2017. http://www.zeit.de/wirtschaft/2017-01/europa-fortschritt-wachstum-industrie-digitalisierung-oekologie-klimawandel. call up 27.03.2017.

Paech, N.; Paech, B. (2013): Vom Wachstumsdogma zur Postwachstumsökonomie. In: Huncke, W.; Kerwer, J.; Röming, A (Ed.): Wege in die Nachhaltigkeit, Wiesbaden: HLZ, 73-95.

Papanyan, S. (2015): Digitalization and productivity: Measuring Cycles of Technological Progress. In: BBVA Dezember 2015, 33(15).

Paquet, R. (2013): Auswirkungen der Bürgerversicherung auf die Beschäftigung in der gesetzlichen und der privaten Krankenversicherung. Düsseldorf: Hans-Böckler-Stiftung.

Parfit, D. (1984): Reasons and Persons. Oxford: Clarendon Press.

Peters, G.; Hertwich, E. (2008): CO2 Embodied in International Trade with Implications for Global Climate Policy. In: Environment Sciences & Technology, 42(5), 1401-1407.

Pfaff, A.; Langer, B.; Freund, F. (2005): Bürgerversicherung vs. Gesundheitsprämie-Vergleich der Reformoptionen zur Finanzierung der Gesetzlichen Krankenversicherung. In: Volkswirtschaftliche Diskussionsreihe, Beitrag 277.

Picchio, A. (ed.) (2003): Unpaid Work and the Economy. A Gender Analysis of the Standards of Living. London and New York: Routledge.

Piketty, T. (1997): The dynamics of the wealth distribution and the interest rate with credit rationing. In: The Review of Economic Studies, 64(2), 173-189.

Pindyck, R. S. (2013): Climate Change Policy: What Do the Models Tell Us? In: Journal of Economic Literature, 51(3), 860–872.

Pindyck, R. S. (2015): The Use and Misuse of Models for Climate Policy. In: Review of Environmental Economics and Policy, Paper for a symposium on climate models.

Polanyi, K. (2001[1944]): The Great Transformation. The Political and Economic Origins of our Time. Boston: Beacon Press.

Porter, M. E. (2008): Competitive strategy: Techniques for analyzing industries and competitors. Simon and Schuster.

Posse, D. (2015): Zukunftsfähige Unternehmen in einer Postwachstumsgesellschaft: eine theoretische und empirische Untersuchung. In: Schriften der Vereinigung für Ökologische Ökonomie. Heidelberg: Vereinigung für Ökologische Ökonomie. https://www.econstor.eu/bitstream/10419/110257/1/posse-unternehmen-postwachstumsgesellschaft-2015.pdf. call up 01.04.2017.

Prakash, S.; Dehoust, G.; Gsell, M.; Schleicher, T.; Stamminger, R. (2015): Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen ‚Obsoleszenz. In: UBA (Ed.), 10. https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_10_2015_einfluss_der_nutzungsdauer_von_produkten_auf_ihre_umwelt_obsoleszenz_17.3.2015.pdf. call up 01.04.2017.

Pratt, G. A. (2015): Is a Cambrian Explosion Coming for Robotics? In: Journal of Economic Perspectives, 29(3), 51–60. DOI: 10.1257/jep.29.3.51.

Pfriem, R.; Schneidewind, U.; Barth, J.; Graupe, S.; Korbun, T. (Ed.) (2017): Transformative Wirtschaftswissenschaft im Kontext nachhaltiger Entwicklung. Metropolis.

Qian, Y. (2007): Do National Patent Laws Stimulate Domestic Innovation in a Global Patenting Environment? A Cross-Country Analysis of Pharmaceutical Patent Protection, 1978–2002. In: Review of Economics and Statistics, 89, 436–453. DOI: 10.1162/rest.89.3.436.

Quaschning, V.: Statistiken. Weltweite Kohlendioxidemissionen und –konzentrationen in der Atmosphäre. http://www.erneuerbare-energien-und-klimaschutz.de/datserv/CO2/index.php. call up 29.03.2017.

Rae, J. (1834[1965]): Statement of Some New Principles on the Subject of Political Economy. Toronto: University of Toronto Press.

Rappaport, A. (1999): Shareholder Value. Stuttgart: Schäffer-Poeschel Verlag.

Rätz, W.; von Egan-Krieger, T.; Muraca, B.; Passadakis, A.; Schmelzer, M.; Vetter, A. (Ed.) (2011): Ausgewachsen. Ökologische Gerechtigkeit. Soziale Rechte. Gutes Leben. Hamburg: VSA.

Raventós, D. (2007): Basic income: The material conditions of freedom. London: Pluto Press.

Reichel, A. (2013): Das Ende des Wirtschaftswachstums, wie wir es kennen. In: Ökologisches Wirtschaften, 28(1), 15.

Reiner Lenoine Institut (Ed.) (2013): Verbrauch und Optimierung von zentral und dezentral orientierten Ausbaupfaden zu einer Stromversorgung aus erneuerbaren Energien in Deutschland. https://www.bvmw.de/fileadmin/download/Downloads_allg._Dokumente/politik/Studie_zur_dezentralen_Energiewende.pdf.pdf. call up 27.03.2017.

Reuter, N. (2010): Der Arbeitsmarkt im Spannungsfeld von Wachstum, Ökologie und Verteilung. In: Zahrnt, A.; Seidl, I. (Ed.): Postwachstumsgesellschaft. Konzepte Für Die Zukunft, 85–102.

Reuter, N. (2014): Die Degrowth-Bewegung und die Gewerkschaften. In: WSI-Mitteilungen, 7, 555–559.

Reuter, N.; Zinn, K. G. (2011): Moderne Gesellschaften brauchen eine aktive Dienstleistungspolitik. Wirtschafts- und Sozialwissenschaftliches Institut (Ed.): Mitteilungen, 64(9), 462-469.

Rezai, A.; Stagl, S. (2016): Ecological macroeconomics: Introduction and review. In: Ecological Economics, 121, 181–185.

Richters, O.; Simoneit, A. (2016): Consistency and Stability Analysis of Models of a Monetary Growth Imperative. In: VÖÖ Discussion Papers, 1. http://voeoe.de/dp1/. call up 04.04.2017.

Ried, J.; Dabrock, P.; Schneider, D.; Voit, W.; Rief, W.; Hilbert, A. (2010): Verantwortung für die eigene Gesundheit. Eine interdisziplinäre Diskussion am Beispiel der Adipositas. In: Das Gesundheitswesen, 72(3), 98-107.

Robert Wood Johnson Foundation (2007): Service Credit Banking in Managed Care (Grand Results Reports). http://www.rwjf.org/reports/npreports/bankinge.htm. call up 18.04.2017.

Rockström, J.; Gaffney, O.; Rogelj, J.; Meinshausen, M.; Nakicenovic, N.; Schellnhuber, H. J. (2017): A roadmap for rapid decarbonization. In: Science, 355, 1269-1271.

Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin III, F. S.; Lambin, E.; Lenton, T. M.; Scheffer, M.; Folke, C.; Schellnhuber, H. et al. (2009a): Planetary boundaries: exploring the safe operating space for humanity. In: Ecology and Society, 14(2), art. 32.

Rockström, J.; Steffen, W.; Noone, K.; Persson, A.; Chapin, F. S.; Lambin, E. F.; Lenton, T. M.; Scheffer, M.; Folke, C.; Schellnhuber, H. J.; Nykvist, B.; de Wit, C. A.; Hughes, T.; van der Leeuw, S.; Rodhe, H.; Sorlin, S.; Snyder, P. K.; Costanza, R.; Svedin, U.; Falkenmark, M.; Karlberg, L.; Corell, R. W.; Fabry, V. J.; Hansen, J.; Walker, B.; Liverman, D.; Richardson, K.; Crutzen, P.; Foley, J. A. (2009b): A safe operating space for humanity. In: Nature 461, 472-475.

Rodrik, D. (2014): Green industrial policy. In: Oxford Review of Economic Policy, 30(3), 469-491.

Rogall, H. (Ed.) (2008): Ökologische Ökonomik: Eine Einführung, 2. Auflage. Wiesbaden: VS Verlag für Sozialwissenschaften.

Roepke, I. (2010): Konsum: der Kern des Wachstummotors. In: Seidl, I. und Zahrnt, A. (Ed.), Postwachstumsgesellschaft. Konzepte für die Zukunft. Marburg: Metropolis-Verlag, 103-115.

Rogelj, J.; Luderer, G.; Pietzcker, R. C.; Kriegler, E.; Schaeffer, M.; Krey, V. and Riahi, K. (2015): Energy system transformations for limiting end-of-century warming to below 1.5 °C. In: Nature Climate Change, 5, 519-527.

Romer, P. M. (1990): Endogenous Technological Change. In: Journal of Political Economy, 98(5), 71-102. http://www.jstor.org/stable/2937632. call up 04.04.2017.

Ronge, B. (2016): Solidarische Ökonomie als Lebensform. Eine theoretische Skizze. In: Ronge, B. (Ed.), Solidarische Ökonomie als Lebensform. Berliner Akteure des alternativen Wirtschaftens im Portrait. Bielefeld: transcript, 7-26.

Ropke, I.; Christensen, T.H.; Jensen, J. O. (2010): Information and communication technologies. A new round of household electrification. In: Ecological Economics, 55, 309-320.

Rosa, H. (2005): Beschleunigung. Die Veränderung der Temporalstrukturen in der Moderne. Frankfurt am Main: Suhrkamp.

Rosen, R. A.; Guenther, E. (2015): The economics of mitigating climate change: What can we know? In: Technological Forecasting and Social Change, 91, 93–106.

Rosnick, D.; Weisbrot, M. (2007): Are Shorter Work Hours Good for the Environment? A Comparison of U.S. and European Energy Consumption. In: International Journal of Health Services, Juli 2007, 37(3), 405–417.

Rothgang, H.; Arnold, R.; Unger, R. (2011): Berechnungen zu den finanziellen Wirkungen verschiedener Varianten einer Bürgerversicherung in der Gesetzlichen Krankenversicherung. Gutachten im Auftrag der Bundestagsfraktion Bündnis 90, 2010.

Ruh, H. (1996): Anders, aber besser: die Arbeit neu erfinden-für eine solidarische und überlebensfähige Welt. Frauenfeld: Verlag Im Waldgut.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2001): Für Stetigkeit-gegen Aktionismus. Jahresgutachten 2001/02.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2011): Herausforderungen des demografischen Wandels. Expertise im Auftrag der Bundesregierung.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2014): Jahresgutachten des Sachverständigenrats 2014/15. Mehr Vertrauen in Marktprozesse. 1., Aufl. Wiesbaden: Statistisches Bundesamt.

Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (2015): Produktivität. An den Ursachen ansetzen. Jahresgutachten 2015/16, Kapitel 7. https://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/gutachten/jg201516/wirtschafts-gutachten/jg15_07.pdf. call up 27.03.2017.

Sagoff, M., (2004): Price, Principle, and the Environment. Cambridge: Cambridge University Press.

Santarius, T. (2009): Klima und Handel. Warum der Klimawandel zu einer Reform der Welthandelspolitik führt. Studie für das Forum Umwelt&Entwicklung. Bonn; Berlin.

Santarius, T. (2012): Der Rebound Effekt. Über die unerwünschten Folgen der erwünschten Energieeffizienz, Wuppertal. www.santarius.de/967. call up 30.03.2017.

Santarius, T. (2015): Der Rebound-Effekt: Ökonomische, psychische und soziale Herausforderungen für die Entkopplung von Wirtschaftswachstum und Energieverbrauch. Metropolis.

Santarius, T. (2017): Digitalization, Efficiency and the Rebound Effect. Beitrag im Postwachstumsblog. https://www.degrowth.de/en/2017/02/digitalization-efficiency-and-the-rebound-effect/. call up 27.03.2017.

Schachtschneider, U. (2014): Ökologisches Grundeinkommen: Eine Beschleunigungsbremse?! In: Beitrag zur Degrowth Konferenz, Leipzig.

Scharpf, F.W. (1997): Demokratische Politik in der internationalisierten Ökonomie, In: MPIfG working paper, 97(7).

Scherf, W. (2013): 30-Stunden-Woche schafft keine Arbeitsplätze. In: Justus Liebig University Giessen, Fachbereich Wirtschaftswissenschaften (Ed.): Finanzwissenschaftliche Arbeitspapiere, No. 89.

Schindler H. et. al. (2017): Mythos monetärer Wachstumszwang: Am Gelde hängt doch alles? In: Ökologisches Wirtschaften, 32(1).

Schmelzer, M.; Passadakis, A. (2011): Postwachstum: Krise, ökologische Grenzen und soziale Rechte. In: Attac Basis Texte 36. Hamburg: VSA-Verlag.

Schmidt, C. M.; aus dem Moore, N. (2013): Wohlstandsmessung heute: Statistische Grundlagen einer umfassenden gesellschaftlichen Debatte. In: Th. Theurl (Ed.): Akzeptanzprobleme der Marktwirtschaft: Ursachen und wirtschaftspolitische Konsequenzen. Berlin: Duncker & Humblot, 13-32.

Schmidt, C. M.; aus dem Moore, N. (2014): Wie geht es uns? Die W3-Indikatoren für eine neue Wohlstandsmessung. RWI Positionen 56. Essen: RWI.

Schneider, M. (2007): The Nature, History and Significance of the Concept of Positional Goods. In: History of economic review Januar 2007, 45(1), 60–81. DOI:10.1080/18386318.2007.11681237.

Schneider, N. F.; Mergenthaler, A.; Staudinger, U.M.; Sackreuther, I. (Ed.) (2015): Mittendrin? Lebenspläne und Potenziale älterer Menschen beim Übergang in den Ruhestand. Berlin: Verlag Barbara Budrich.

Schneidewind, U. (2018): Die große Transformation: eine Einführung in die Kunst gesellschaftlichen Wandels. Forum für Verantwortung. Herausgegeben von K. Wiegandt und H. Welzer. Fischer Verlag.

Schneidewind, U.; Zahrnt, A. (2013): Damit gutes Leben einfacher wird: Perspektiven einer Suffizienzpolitik. oekom verlag.

Schor, J. (1992): The Overworked American: The Unexpected Decline of Leisure. New York: Basic Books.

Schor, J. (2005): Sustainable Consumption and Worktime Reduction. In: Journal of Industrial Ecology, Januar 2005, 9(1–2), 37–50.

Schor, J. (2015): Work sharing. In: D'Alisa, F., Demaria, und G. Kallis (Ed.): Degrowth. A vocabulary for a new era. New York; London: Routledge, 195–198.

Schot, J. (2017): A New Organising Principle? Transformative Innovation Policy Keynote for launch of 20 years of STI indicator reports in Norway, 19 October 2017.

Schot, J.; Steinmueller, W. E. (2018): Three frames for innovation policy: R&D, systems of innovation and transformative change. In: Research Policy, 47, 1554–1567.

Schratzenstaller, M. (2017): Ökosoziale Abgabenstrukturreform. In: Wirtschaftsdienst 96(6), 400-403.

Schridde, S. (2012): Geplante Obsoleszenz. Gebaut, um kaputtzugehen. In: Politische Ökologie, Juni 2012, 129, 56–61.

Schumpeter, J. (1911): Theorie der wirtschaftlichen Entwicklung. Leipzig: Duncker & Humblot.

Schwendinger, M. (2015): Über Beschäftigungswirkung und Erfolgsbedingungen von Arbeitszeitverkürzungen. Ein Literatureinblick. In: Wirtschaft und Gesellschaft-WuG, 41(1), 107-125.

Scitovsky, T. (1976): The Joyless Economy: an Inquiry into Human Satisfaction and Consumer Dissatisfaction. Oxford: Oxford University Press.

Seidl, I.; Zahrnt, A. (2010): Postwachstumsgesellschaft: Konzepte für die Zukunft. Marburg: Metropolis Verlag.

Seidl, I.; Zahrnt, A. (2012): Abhängigkeit vom Wirtschaftswachstum als Hindernis für eine Politik innerhalb der limits to growth. Perspektiven für eine Postwachstumsgesellschaft. In: GAIA-Ecological Perspectives for Science and Society, 21(2), 108-115.

Seidl, I.; Zahrnt, A. (2015): Social welfare politics cannot ignore growthmania. In: GAIA-Ecological Perspectives for Science and Society, 24(4), 232-235.

Sen, A. K. (1970): Collective Choice and Social Welfare. North-Holland, Amsterdam.

Sen, A. K. (1979): Equality of What, The Tanner Lecture on Human Values. Delivered at Stanford University, http://www.tannerlectures.utah.edu/lectures/documents/sen80.pdf. call up 08.02.2018.

Shove, E.; Walker, G. (2010): Governing transitions in the sustainability of everyday life. In: Research Policy, 39(4), 471–476.

Shue, H. (2014): Climate Justice. Oxford: Oxford University Press.

Sianesi, B.; van Reenen, J. (2000): The returns to education. A review of the macro-economic literature. London: Centre for the Economics of Education, London School of Economics and Political Science (Discussion paper series / Centre for the Economics of Education, no. 6).

Siemoneit, A. und Richters, O. (2017): Wachstumszwänge: Ressourcenverbrauch und Akkumulation als Wettbewerbsverzerrungen. In: Adler, F.; Schachtschneider, U. (Ed.): Postwachstumspolitiken: Wege zur wachstumsunabhängigen Gesellschaft, 169–182. München: oekom.

Sinn, H.-W. (2000): Why a funded pension system is needed and why it is not needed. In: International Tax and Public Finance, 7(4-5), 389–410.

Skidelsky, R.; Skidelsky, E. (2012): How much is enough? Money and the good life. New York: Other Press.

Smith, A. (1998 [1776]): An Inquiry into the Nature and Causes of the Wealth of Nations. London: The Electric Book Company Ltd.

Solow, R. M. (1956): A Contribution to the Theory of Economic Growth. In: The Quarterly Journal of Economics, 70(1), 65-94http://www.jstor.org/stable/1884513. call up 04.04.2017.

Sorman, A. H.; Giampietro, M. (2013): The energetic metabolism of societies and the degrowth paradigm: Analyzing biophysical constraints and realities. In: Journal of Cleaner Production, 38, 80–93.

SPD (2013): Das Regierungsprogramm 2013-2017.

Spindler, G. (2007): Unternehmensinteresse als Leitlinie des Vorstandhandels- Berücksichtigung von Arbeitnehmerinteressen und Shareholder Value. In: Hans Böckler Stiftung (Hrsg). https://www.boeckler.de/pdf/mbf_gutachten_spindler_2008.pdf. call up 26.04.2017.

Springer Gabler Verlag (Hrsg), Gabler Wirtschaftslexikon, Stichwort: Sunk Costs, http://wirtschaftslexikon.gabler.de/Definition/sunk-costs.html. call up 13.04.2017.

Sachverständigenrat für Umweltfragen (SRU) (2011): Wege zur 100 % erneuerbaren Stromversorgung. Sondergutachten. Berlin: Erich Schmidt Verlag. https://www.umweltrat.de/SharedDocs/Downloads/DE/02_Sondergutachten/2011_07_SG_Wege_zur_100_Prozent_erneuerbaren_Stromversorgung.pdf?__blob=publicationFile. call up 27.03.2017.

Statistische Ämter des Bundes und der Länder (2011): Demografischer Wandel in Deutschland, 1.

Statistisches Bundesamt (2015): Statistisches Jahrbuch 2015. Deutschland und Internationales. Wiesbaden.

Statistisches Bundesamt (2016): Gesundheitsausgaben 1995 bis 2014 - Fachserie 12 Reihe 7.1.2.

Steffen, W.; Richardson, K.; Rockstrom, J.; Cornell, S. E.; Fetzer, I.; Bennett; E. M. Biggs, R., Carpenter, S. R.; de Vries, W.; de Wit, C. A.; Folke, C.; Gerten, D.; Heinke, J.; Mace, G. M.; Persson, L. M.; Ramanathan, V.; Reyers, B.; Sörlin, S. (2015): Planetary boundaries: Guiding human development on a changing planet. In: Science, 347(6223), 1259855.

Steindl, J. (1954): Maturity and stagnation in American capitalism. New York: Monthly Review Press.

Steinrücke, M. (2016): Arbeitszeitverkürzung - Ein Weg zu mehr Geschlechtergerechtigkeit? In: N. Bergmann und C. Sorger (Ed.): 40 Jahre 40-Stunden-Woche in Österreich. Und jetzt? Impulse für eine Geschlechtergerechte Arbeitszeitpolitik. Sozialpolitik in Diskussion Juni 2016, Band 18.

Stern, D. I. (2011): The role of energy in economic growth. In: Annals of the New York Academy of Sciences 1219, 26-51.

Stern, N. (2007): The Economics of Climate Change: The Stern Review. Cambridge, UK: Cambridge University Press.

Stern, N.; J. Rydge (2012): The New Energy-Industrial Revolution and an International Agreement on Climate Change. In: Economics of Energy and Environmental Policy, Vol. 2012, Ausgabe 1, 1-19.

Stiglitz, J. E. (2010): Principles and Guidelines for Deficit Reduction. In: Roosevelt Institute Working Paper, Nr. 6.

Stockhammer, E. (2011): Wage-led growth: an introduction. In. Kingston University London (Ed.): Economics Discussion Papers 2011, Ausgabe 1. http://eprints.kingston.ac.uk/22985/1/DP-01-2011.pdf. call up 09.05.2017.

Stockhammer, E. (2013): Why have wage shares fallen. In: ILO, Conditions of Work and Employment Series, Nr. 35.

Straubhaar, T. (2008): Warum das „bedingungslose Grundeinkommen“ mehr ist als ein sozialutopisches Konzept. In: Roman Herzog Institut (Ed.): Bedingungsloses Grundeinkommen: Eine Perspektive für die Soziale Marktwirtschaft? Diskussionspapier Nr. 9, München.

Strunz, S.; Bartkowski, B.; Schindler, H. (2015): Is there a monetary growth imperative?. In: UFZ Discussion Papers, Ausgabe 5. https://www.ufz.de/export/data/global/67091_DP_05_2015_Strunzetal.pdf. call up 04.04.2017.

Studer, H. P. (2003): Förderung der Eigenverantwortung in der sozialen Krankenversicherung der Schweiz–eine Bestandesaufnahme. In: Ebi-forum, 50, 1-13.

Studer, H. P. (2010): Gesundheitswesen als kosteneffizientes Solidarsystem mit Eigenverantwortung. In: Seidel, I.; Zahrnt, A. (Ed.): Postwachstumsgesellschaft: Konzepte für die Zukunft, 65-75.

Studer, H. P.; Busato, A. (2010): Ist ärztliche Komplementärmedizin wirtschaftlich? Die wichtigsten Ergebnisse des Programms Evaluation Komplementärmedizin (PEK). In: Schweizerische Ärztezeitung, 91(18), 707-711.

Swan, T. W. (1956): Economic Growth and Capital Accumulation. In: Economic Record, 32(11), 334–361.

Sweezy, P. M. (1942): The theory of capitalist development: Principles of Marxian political economy. London: Dennis Dobson Ltd.

Tenhagen, H.-J. (2017): Beamte in Hamburg haben jetzt die Wahl. In: Spiegel Online, 12.08.2017. http://www.spiegel.de/wirtschaft/service/krankenversicherung-hamburger-beamte-koennen-waehlen-zwischen-privat-und-gesetzlich-a-1162534.html. call up 30.08.2017.

The Economist (Ed.) (2014): Productivity. Technology isn’t working. The digital revolution has yet to fulfil its promise of higher Productivity and better jobs. In: The Economist, 4.10.2014. http://www.economist.com/news/special-report/21621237-digital-revolution-has-yet-fulfil-its-promise-higher-productivity-and-better. call up 27.03.2017.

Tirole, J. (1988): The theory of industrial organization. Cambridge, Massachusetts: MIT press.

Tirole, J. (2006). The Theory of Corporate Finance. Princeton: Princeton University Press.

Turner, J. A.; Deyo, R. A.; Loeser, J. D.; Von Korff, M.; Fordyce, W. E. (1994): The importance of placebo effects in pain treatment and research. In: Jama, 271(20), 1609-1614.

Uhlmann, R.; Heinrichsdorff, C. A.; Halden, G.; Sohn, S. (2013): Schneller, höher, weiter? Die Grenzen des Wirtschaftswachstums. Norderstedt: Grin.

Ulgiati, S. (2016): Entropie. In: D’Alisa, G.; Demaria, F.; Kallis, G.; (Ed.): Degrowth. Handbuch für eine neue Ära, 123-126.

Umweltbundesamt (UBA) (2012): Deutsche verbrauchen zu viele High-Tech-Metalle. Rohstoffnutzung bald Bremsklotz für die wirtschaftliche Entwicklung? https://www.umweltbundesamt.de/presse/pressemitteilungen/deutsche-verbrauchen-zu-viele-hi-tech-metalle. call up 15.03.2017.

Umweltbundesamt (2013): Ressourcennutzung und ihre Folgen. https://www.umweltbundesamt.de/themen/abfall-ressourcen/ressourcennutzung-ihre-folgen. call up 16.05.17.

Umweltbundesamt (2016a): Die Nutzung natürlicher Ressourcen. Bericht für Deutschland 2016. https://www.umweltbundesamt.de/sites/default/files/medien/376/publikationen/die_nutzung_natuerlicher_ressourcen.pdf. call up 15.3.2017.

Umweltbundesamt (2016b): Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz". https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_11_2016_einfluss_der_nutzungsdauer_von_produkten_obsoleszenz.pdf. call up 22.10.2018.

Umweltbundesamt (2017a): Primärenergieverbrauch. https://www.umweltbundesamt.de/daten/energie-als-ressource/primaerenergieverbrauch#textpart-1. call up 15.05.2017.

Umweltbundesamt (2017b): Energieproduktivität. https://www.umweltbundesamt.de/daten/energie-als-ressource/energieproduktivitaet#textpart-1. call up 15.3.2017.

Unanue, W.; Vignoles, V.L.; Dittmar, H.; Vansteenkiste, M. (2016): Life Goals Predict Environmental Behavior. Cross-Cultural and Longitudinal Evidence. In: Journal of Environmental Psychology, Juni 2016, 46, 10–22.

United Nations Environment Programme (UNEP) (2011a): Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. Nairobi: United Nations Environment Programme. http://www.unep.org/GreenEconomy/Portals/93/documents/Full_GER_screen.pdf. call up 18.04.2017.

United Nations Environment Programme (2011b): Decoupling natural resource use and environmental impacts from economic growth. A report of the Working Group on Decoupling to the Internatinoal Resource Panel. United Nations Environment Programme.

Uppenberg, K.; Strauss, H. (2010): Innovation and productivity growth in the EU services sector. In: European Investment Bank (Ed.)

Van den Bergh, J. (2011): Environment versus growth - A criticism of ‚degrowth´ and a plea for ‚a-growth´. In. Ecological Economics 70(5), 881–890.

Variyam, J. N.; Kraybill, D.S. (1992): Empirical evidence on determinants of firm growth. In: Economics Letters, 38(1), 31–36.

Vatn, A. (2005): Institutions and the Environment. Cheltenham, UK; Northampton, MA: Edward Elgar Publishing.

Veblen, T. (1899[1834]): A Theory of the Leisure Class. An Economic Study of Institutions. Introduction by Stuart Chase. New York: The Modern Library.

Veblen, T. (2005 [1904]): The theory of business enterprise. New York: Cosimo Classics.

Verein zur Förderung der Gemeinwohl-Ökonomie (Ed.) (2015): Handbuch zur Gemeinwohl-Bilanz. https://www.ecogood.org/media/filer_public/c9/cd/c9cd687a-60fc-433e-a7c4-beae86541902/handbuch_v41_cc_release.pdf. call up 01.02.2017.

Victor, P. (2008): Managing without Growth: Slower by Design, not Disaster. Cheltenham: Edward Elgar Publishing Limited.

Victor, P. A. (2012): Growth, degrowth and climate change: A scenario analysis. In: Ecological Economics, 84, 206–212.

Victor, P. A.; Rosenbluth, G. (2007): Managing without growth. In. Ecological Economics, 61(2–3), 492–504.

Victor, P.; Jackson, T. (2011): Doing the maths on the green economy. In: Nature, 472, 295.

Victor, P.; Jackson, T. (2012): Towards an Ecological Macroeconomics. Paper prepared for the INET Annual Plenary Conference "Paradigm Lost: rethinking economics and politics". Paradigm Lost: rethinking economics and politics. April 2012, Berlin.

Wagner, T.; Jahn, E. J. (2004): Neue Arbeitsmarkttheorien. Stuttgart: Lucius & Lucius Verlagsgesellschaft.

Walker, T. (2000): The 'Lump-of-Labor'Case against Work-Sharing: Populist Fallacy or Marginalist Throwback? In: Golden, L.; Figart, D. (Ed.): Working Time: International trends, theory and policy perspectives, 196-211.

Ward, J. D.; Sutton, P. C.; Werner, A. D.; Costanza, R.; Mohr, S. H.; Simmons, C. T. (2016): Is Decoupling GDP Growth from Environmental Impact Possible? In: PLOS ONE 11, 1-14.

Warr, B.; Ayres, R. U. (2012): Useful work and information as drivers of economic growth, In: Ecological Economics, 73, 93-102.

Watson, J.J. (2003): The Relationship of Materialism to Spending Tendencies, Saving, and Debt. In: Journal of Economic Psychology, Dezember 2003, 24(6), 723–39.

Weimann, J. (1995): Umweltökonomik. Eine theorieorientierte Einführung. Dritte Auflage. Berlin/Heidelberg: Springer.

Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU) (2011): Welt im Wandel Gesellschaftsvertrag für eine Große Transformation. Hauptgutachten 2011. Berlin.

Weber, E.; Elstner, S.; Schmidt, C.M. et al. (2017): Schwaches Produktivitätswachstum — zyklisches oder strukturelles Phänomen? Wirtschaftsdienst 97(2). https://doi.org/10.1007/s10273-017-2090-9.

Weiss, Y.; Fershtman, C. (1998): Social status and economic performance. In: European Economic Review, 42, 801-820.

Wellisch D. (1995): Locational choices of firms and decentralized environmental policy with various instruments, In: Journal of Urban Economics, Mai 1995, 37(3), 290-310.

World Bank (2012): Inclusive Green Growth: The Pathway to Sustainable Development. Washington D.C.: The World Bank.

Welzer, H. (2013): Selbst denken: Eine Anleitung zum Widerstand. Berlin: Fischer Taschenbuch.

Welzer, H. (2015): Die smarte Diktatur. Der Angriff auf unsere Freiheit. Frankfurt am Main: S. Fischer.

Wendner, R.; Goulder, L. H. (2008): Status effects, public goods provision, and excess burden. In: Journal of Public Economics, 92(10), 1968-1985.

Wenzlaff, F.; Kimmich, C.; Richters, O. (2014): Theoretische Zugänge eines Wachstumszwangs in der Geldwirtschaft. In: Centre for Economic and Sociological Studies, Discussion Papers, 45. http://www.econstor.eu/handle/10419/103454. call up 04.04.2017.

Werding, M. (2011): Modell für flexible Simulationen zu den Effekten des demographischen Wandels in Deutschland (SIM.11-eSUV). Im Auftrag der Bertelsmann Stiftung. Lehrstuhl für Sozialpolitik und öffentliche Finanzen: Ruhr-Universität Bochum.

Werding, M. (2013): Alterssicherung, Arbeitsmarktdynamik und neue Reformen: Wie das Rentensystem stabilisiert werden kann. Ruhr Universität Bonn, im Auftrag der Bertelsmann Stiftung Gütersloh.

Werding, M. (2014): Demographischer Wandel und öffentliche Finanzen. Langfrist-Projektionen 2014 - 2060 unter besonderer Berücksichtigung des Rentenpakets der Bundesregierung. In: Arbeitspaper 01/2014 des Sachverständigenrats zur Begutachtung der gesamtwirtschaftlichen Entwicklung.

Werner, G. W. (2007): Einkommen für alle. Der dm-Chef über die Machbarkeit des bedingungslosen Grundeinkommens. Köln: Kiepenheuer & Witsch.

Westmore, B. (2013): R&D, Patenting and Growth. The Role of Public Policy. In: OECD Economics Department Working Papers, Vol. 1047, Paris: OECD Publishing.

Wilkinson, R.; Pickett, K. (2010): The spirit level. Why equality is better for everyone. London: Penguin.

Williamson, O.E. (2000): The New Institutional Economics: Taking Stock, Looking Ahead. In: Journal of Economic Literature, 38(3), 595-613.

Wink, R. (Ed.) (2016): Multidisziplinäre Perspektiven der Resilienzforschung. Springer.

Wittmann, F. (2014): Zeit für die Wohlstandsdebatte. In: Konzeptwerk Neue Ökonomie (Ed.): Zeitwohlstand: Wie wir anders arbeiten, nachhaltig wirtschaften und besser leben, 74–85.

Wittmann, F.; Deuling, S.; Kuhnhenn, K. (2014): Sinn fürs Geschäft - Soziale, ökologische & demokratische Unternehmen in Leipzig. Leipzig: Konzeptwerk Neue Ökonomie.

Wölfl, A. (2003): Productivity growth in service industries: An assessment of recent patterns and the role of measurement. In: OECD Science, Technology and Industry Working Papers, 7.

Wößmann, L. (2009): Bildungssystem, PISA-Leistungen und volkswirtschaftliches Wachstum. In: Ifo Schnelldienst, 62(10), 23–28. https://ideas.repec.org/a/ces/ifosdt/v62y2009i10p23-28.html. call up 04.04.2017.

Wößmann, L.; Piopiunik, M. (2009): Was unzureichende Bildung kostet. Eine Berechnung der Folgekosten durch entgangenes Wirtschaftswachstum. Bertelsmann Stiftung. http://www. bertelsmann-stiftung. de/cps/rde/xchg/bst/hx. xsl/index.html. call up 27.04.2016.

Wolff, F. et al. (2018): Transformative Umweltpolitik: Nachhaltige Entwicklung konsequent fördern und gestalten. Ein Wegweiser für den Geschäftsbereich des BMU. UBA Texte, Dessau-Roßlau.

World Resources Institute (WRI) (2017): CAIT Climate Data Explorer. Washington, DC: World Resources Institute. Available online at: http://cait.wri.org. call up 30.12.2017.

World Wide Fund For Nature (WWF) (2016): Living Planet Report 2016. Kurzfassung. http://www.wwf.de/fileadmin/fm-wwf/Publikationen-PDF/WWF-LivingPlanetReport-2016-Kurzfassung.pdf. call up 15.03.2017.

Zenghelis, D. (2016): Decarbonisation: Innovation and the Economics of Climate Change. In: Jacobs, M.; Mazzucato, M. (Ed.): Rethinking Capitalism. Economics and Policy for Sustainable and Inclusive Growth. Blackwell: Wiley, 172–190.

Zinn, K. G. (2014): Vom Industriekapitalismus zum Neofeudalismus? Überlegungen zu einer Zukunft auslaufenden Wirtschaftswachstums. Jena: Manuskript.

Zwickl, K.; Disslbacher, F.; Stagl, S. (2016): Work-sharing for a sustainable economy. In: Ecological Economics, 121, 246-253.